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To Flash or Not to Flash

Christy Overly
University of Arkansas, Fayetteville

UNIVERSITY OF ARKANSAS
College of Education and Health Professions
Eleanor Mann School of Nursing

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Christy Overly

The University of Arkansas
Eleanor Mann School of Nursing

DNP Chair: Dr. Callie Bradley

DNP Team Member(s): Dr. Allison Scott

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Abstract

In 2015, healthcare-associated infection (HAI) prevalence survey found that there were an estimated 110,800 surgical site infections (SSIs) associated with inpatient surgeries in 2015. Consequently, instruments and implants sterilized by immediate use steam sterilization (IUSS) have been found to increase the patient's risk for an SSIs. Due to these risks, the Joint Commission (TJC) determined that organizations should implement evidenced-based protocols to reduce IUSS use. A needs assessment revealed a gap in care in that the increasing SSI rates appeared to be correlated with the misuse of IUSS at the physician owned surgical hospital in Tulsa, Oklahoma. This Doctor of Nurse practice (DNP) project was designed to close that gap in care by creating an IUSS reduction process protocol. A review of literature analyzed IUSS use and its correlation with increased SSI rates. Lewin's Change Theory provided the underlying theoretical framework for this quality improvement (QI) project development and implementation. Pre-implementation and post-implementation SSI and IUSS rates were compared and determined that decreasing IUSS rates reduces SSI rates. Pre-educational seminar surveys and post-education seminar surveys were compared, and it was determined that the surgical staff's knowledge of IUSS and its correlation with SSIs increased after the seminar.

Keywords: Immediate use steam sterilization, terminal sterilization, steam sterilization, surgical site infection

To Flash or Not to Flash

The purpose of this DNP quality improvement (QI) project was to decrease surgical site infection (SSI) rates with the implementation of an immediate use steam sterilization (IUSS) reduction process protocol. Research shows that patients' who undergo a surgical procedure where surgical instruments or implants are processed by IUSS are at an increased risk of SSIs (Hutzler et al., 2013). To decrease IUSS misuse hospitals should update their policies and procedures to reflect evidence-based practices, professional organization guidelines, and regulatory agency recommendations in efforts to decrease IUSS use (Seavey, 2013). The following paragraphs will discuss the current incidence of IUSS use within the surgical department and its impact on surgical patients. Background information examined IUSS use and its correlation with increased SSI rates, which was supported by an extensive review of the literature. A quality improvement model design was utilized to aid in the implementation of an IUSS reduction process protocol within the identified organization. Additionally, this paper outlines the current IUSS practices at the clinical site, detail the significance of reducing IUSS use, and outline the methodology and evaluation plan detailing the steps of implementation of an IUSS reduction process protocol.

Background and Significance

Steam Sterilization/Autoclave

Each day millions of surgical instruments are cleaned and sterilized in the United States (Brooks, 2018). The key component of steam sterilization as completed in an autoclave, is to expose medical devices to direct steam contact for the specified time, temperature, and pressure (Centers for Disease Control and Prevention [CDC], 2016). There are two types of steam sterilizers gravity displacement and prevacuum (Clayton, 2017). Steam sterilization is the actual sterilization process. For this proposal prevacuum sterilization will be the sterilization process discussed. In prevacuum sterilization creating a vacuum is the first part of the sterilization

process, then air is evacuated from the sterilizer prior to the insertion of steam (Clayton, 2017). Once steam enters the sterilizer the pressure vacuum allows the steam to penetrate the entire surgical instrument or set (Clayton, 2017). The principal of steam sterilization is to expose each item to direct steam at a temperature of 121° to 140° C, pressure of 16-35 pounds per square inch (PSI), and specified time to destroy all microorganisms and ensure the surgical instruments and implants are sterile (Green et al., 2018). The temperature must be maintained up to 30 minutes to kill microorganisms (CDC], 2016). Steam sterilization uses saturated steam under pressure as the sterilant and it is the preferred method for sterilization (The World Health Organization [WHO], 2016).

Terminal Sterilization

The Association for the Advancement of Medical Instrumentation (AAMI), Centers for Disease Control and Prevention (CDC), The Joint Commission (TJC), Centers for Medicare and Medicaid (CMS), and the Association of Perioperative Registered Nurses (AORN) endorse terminal sterilization as the desired sterilization method (Seavey, 2013). Terminal sterilization encompasses the entire sterilization process which includes point of care cleaning, transporting to the processing area, cleaning, inspecting/packaging, sterilization, and storage (Graybill-D'Ercole, 2013). Terminal sterilization is the ideal sterilization process and is considered the safest, fastest, and the most cost-effective sterilization process (TJC, 2021). Also, terminal sterilization is recommended since the instruments are packaged, sterilized, and can be stored for later use (Nania, 2013). Terminal sterilization utilizes cleaning, disassembling, decontamination, inspecting, and assembling of the surgical instrument prior to the sterilization process to ensure the instrument is free from microorganisms and safe for patient use (Nania, 2013). Terminal sterilization of surgical instruments and implants is a multifaceted process rendering the device free from microorganisms and safe for patient use (Seavey, 2013). Those steps include cleaning, disassembling, decontamination, inspecting, and assembling of the surgical instrument prior to

sterilization. Reprocessed surgical instruments can retain residual debris from previous use. The retained bioburden places patients and staff at risk of transmission of infectious organisms (Costa et al., 2018).

IUSS Sterilization

History of IUSS. Flash sterilization, flash cycle, point-of-care sterilization, and IUSS are all terms used to describe the fast-sterilizing process which eliminates essential steps in the sterilization process. All terms refer to a shortcut in the sterilization process of surgical instruments. In 2010, AAMI held a conference on the topic of flash sterilization where the term flash sterilization was changed to IUSS to better define the sterilization process (Seavey, 2013). The name was changed from flash sterilization to IUSS because flash implies that essential steps in the sterilization process are omitted whereas, immediate conveys that the instrument was needed urgently (Seavey, 2013). The goal of the name change was to convey that IUSS should be used for immediately needed surgical instruments, for example. IUSS is intended to be used when surgical instruments were dropped or somehow contaminated during surgery. However, it was not intended to be used as an alternative to terminal sterilization (Nania, 2013).

IUSS. IUSS is defined as the shortest time between sterilization, removal from the sterilizer, and aseptic transfer to the operating room (Seavey, 2013). IUSS is the practice of sterilizing instruments quickly by omitting the drying cycle of the sterilization process and performing the sterilization process near the area where the instrument will be used immediately (Seavey, 2013). IUSS can be used for instruments that are non-porous and do not have a cavity or thin tube in the center (WHO, 2016). The IUSS process consists of the sterilization of unwrapped single instrument at a temperature of 132° C for three minute and can be used on instruments that are needed immediately and no other process is not available (CDC, 2016). IUSS sterilizers, are typically located in or near the operating room and are high-speed sterilizers used for single instruments and the instrument is wet and hot when delivered to the operating

room (WHO, 2016). IUSS sterilization should be avoided since surgical instruments are sterilized without packaging and the sterilization process eliminates the drying cycle, which can result in recontamination of the surgical instrument (WHO, 2016).

Surgical instruments processed using IUSS require documentation which includes the date, time the cycle was run, operating room number, patient's name and medical record number, name of the instrument processed, load number, temperature reached, length of cycle, person's name who started and retrieved the instrument, reason for use, and whether it was an implantable device (Simon et al., 2020). Documentation ensures that instruments or implants that undergo IUSS can be traced to the patient it was used on or implanted in, in case of a poor outcome (Young, 2013). This documentation also shows that the IUSS process is monitored, cycle is met, and provides accountability (Young, 2013).

Although, there is no benchmark for IUSS, it is recommended that organizations track their IUSS rate and compare it to previous months to determine increases or decreases in their IUSS use (Seavey, 2013). IUSS rates are calculated by monthly IUSS occurrence divided by the number of surgical procedures performed during the same period take the number of IUSS cycles ran each month and divide that figure by the number of surgical procedures performed per month then, benchmark the IUSS rate against themselves to trend IUSS use and improvements (Seavey, 2013). AORN recommends organizations benchmark against themselves to determine baseline data and track their progression over time (Seavey, 2014). Also, it is suggested that organizations track IUSS for the procedure, instrument, and reason for use to ascertain improvement strategies (Gilman et al., 2020).

IUSS use has become a routine practice in some surgical departments, being used for entire surgical instrument sets, multiple trays, and implantable devices, but this is well beyond its intended use (Simon et al., 2020). Restrictions on time may result in pressure on the operating room staff to eliminate or modify essential steps in the sterilization and cleaning process for

surgical instruments (Young, 2013). The time constraint results in overlooking best practices and using IUSS in place of terminal sterilization (Ames et al., 2019).

Consequences of IUSS

Consequences of IUSS use include adverse events such as, SSIs and patient and staff burns (Seavey, 2013). Contaminated surgical instruments, surgical times, and IUSS use all increase a patient's SSI risks (Ames et al., 2019). Surgical instruments that are not cleaned and sterilized properly can result in debris and bacteria can entering the patient's wound, thus causing an SSIs (Ames et al., 2019). Also, IUSS use has been found to increase the risk for surgical site infections and should not be used for implantable devices (Seavey, 2013). Finally, IUSS should not be used in lieu of purchasing ample surgical instruments or to reduce surgery turnover times (Seavey, 2013). IUSS misuse can lead to an SSI.

There are reports of patients acquiring burns during a surgical procedure from instruments processed using IUSS (CDC, 2016). The CDC recommends that instruments are cooled by air or immersion in sterile saline to prevent patient burns. An example of this is discussed by David et al. (2015) who highlighted a case scenario where a patient sustained second degree burns due to an instrument processed by IUSS and required four additional debridement surgical procedures because of burns.

Surgical Site Infections

An SSIs is defined as an infection that occurs within 30 days of the operative procedure, or 90 days for procedures with an implanted device (Agency for Healthcare Research and Quality [AHRQ], 2019). Surgical instruments that are not cleaned and sterilized properly can result in debris and bacteria that can enter the patients wound, thus causing an SSI (Ames et al., 2019). SSIs are named one of the key causes of hospital readmissions as these patients can endure serious health consequences and even death (Ames et al., 2019). Ames and colleagues found that contaminated surgical instruments, duration of surgery, and IUSS all increase the

patients SSI risk (2019). According to statistics from 2019, 2-4% of surgical procedures performed on inpatients result in an SSI, of which 3% will die because of their infection (AHRQ, 2019).

In 2020, the project's clinical site SSI rate was 0.33 which is trending up from the previous year's rate of 0.24. It should be noted that there was a decrease in the number of surgical procedures performed at the clinical site 2020. In 2019, 17,272 surgical procedures were performed, however in 2020 there were only 15,644 surgical procedures. In 2020, a total of 1078 instruments and 19 medical implant devices were processed by IUSS within the clinical site.

In 2015, the CDC healthcare association infection prevalence survey discovered an estimated 110,800 SSI linked with inpatient procedures (CDC, 2021). SSIs are the leading cause of patient morbidity and mortality following a surgical procedure (AHRQ, 2019). SSIs are named one of the key causes of hospital readmission as these patients endure serious health consequences and even death (Ames et al., 2019).

SSIs are the primary causes of economic burden worldwide and they are the third most costly hospital associated infection (HAI). HAI investigators noted an increase in SSIs in neurosurgical patients and it was found that the implantable plate used during craniotomy surgeries were processed by IUSS between procedures (CDC, 2016). Thoracolumbar SSI rate ranges from 2% to 13%, however recent findings conclude that the incident rate is about 12.7% (Agarwal et al., 2018). According to Agarwal and colleagues, SSIs extend the patient length of stay from seven to nineteen days and orthopedic SSIs procedures require additional fourteen days, costing around $4500 dollars per day (Agarwal et al., 2018). Resulting in an estimated cost for an orthopedic SSI at $63,000 dollars per case (Agarwal et al., 2018).

SSIs are the most common cause for a revision of a total hip arthroplasty (Mayer et al., 2016). In 2003, the estimated cost to treat a prosthetic joint infection was $50,000 (Mejia et al., 2015). A revision of a total hip arthroplasty surgery is estimated to cost 3.6 times the cost of the

primary surgery or approximately $100,000 per patient (Mayer et al., 2016).

Increased Healthcare Costs

SSIs are costly to hospitals since they can increase the patient's length of stay, risk of readmission, and probability for additional surgical procedures, and are linked to a greater mortality rate (Hutzler et al., 2013). A SSI is the most expensive component of the HAI, with the estimated cost of $3.3 billion, and is linked to nearly one million additional inpatients days annually (CDC, 2021). Iskandar and colleagues noted the estimated cost of a SSIs, per patient, at $20,785 (2019). SSIs are not only costly to organizations, but also the patients. The costs listed above do not include the patients cost from lost wages and additional medical expenses which places a financial strain and burned on patients and their families (Mejia et al., 2015).

A thorough surgical instrument reprocessing system is needed to ensure patient safety and maintain their reimbursements rates (Ames et al., 2019). Organizations' SSI rates directly correlate with their reimbursement rates. As reimbursement is tied to the safety, quality of care, efficiency, cost reductions, and the patient and their family's satisfaction scores (Ames et al., 2019). Facilities can receive penalties or rewards depending on their SSI rates (Ames et al., 2019). In 2016, a new payment program was implemented for Comprehensive Care for Joint Replacement. This program bundled payments for care measure associated with hip and knee joint replacements surgeries for example hospitals will lose money as a result of their SSI occurrences (Ames et al., 2019). Lastly, the Affordable Care Act reduced reimbursement rates for facilities with higher-then-expected readmission rates.

Recommendations

The Association of Perioperative Registered Nurses (AORN) guidelines recommend limiting IUSS use, stating it should only be used in an emergency situation when an instrument or implant is contaminated during a surgical procedure and another one is not readily available (Seavey, 2013). Strict guidelines have been published by both AORN and the CDC on limiting

IUSS use, and facilities should strive to meet that standard (Green et al., 2018). IUSS should not be used in place of purchasing more instruments or due to ineffective scheduling (Seavey, 2013). The Centers for Medical & Medicaid approved IUSS for immediately needed instruments which are contaminated during the surgical procedure, and another is not readily available, however they do not approve of IUSS for routine use (CMS, 2017). As mentioned previously, improper sterilization of surgical instruments, sets, and implants can result in an increase in SSI rates, readmission rates, and healthcare cost. IUSS use should be limited to and not used for implants (Seavey, 2014). Pressure on staff to decrease turnover times can result in skipping critical steps in the cleaning process (Seavey, 2014). IUSS should follow the same multistep process as terminal sterilization (Seavey, 2014). The steps include processing surgical instruments, implants according to the manufacturer's instructions for use (IFU), use of aa closed container, decontamination of debris occurs, item is immediately used, and efforts to prevent contamination take place during transportation (Link, 2019). Although, IUSS is an acceptable process if all the steps of the sterilization process are followed and it is in accordance with the manufacturers IFU, it should still be limited due to the associated increased risk for SSI with resulting decreased patient outcomes, high financial cost and burden to both healthcare organizations and patients, and a lack of compliance to evidence-based practices (Nania, 2013).

Problem Statement

The problem statement for this DNP quality improvement project is that patients are placed at high risk for SSIs due to IUSS misuse within the surgical department at the identified clinical site. In 2020, the clinical site SSI rate was 0.33% which is trending up from the previous year's rate of 0.24%. It should be noted that there was a decrease in the number of surgical procedures performed at the clinical site in 2020 due to the federal mandate to stop all elective surgeries due to the COVID-19 pandemic. In 2019, 17,272 surgical procedures were performed, however in 2020 there were only 15,644 surgical procedures. In 2020, a total of 1078

instruments and 19 medical implants were processed by IUSS with the clinical site even though best practice is to eliminate the need for IUSS altogether (Ames, 2019).

Purpose Statement

The purpose statement for this DNP quality improvement project is to decrease IUSS use in the surgical department through the implementation of an IUSS reduction process protocol. It was expected that decreasing IUSS use would aid in decreasing the number of post-surgical SSIs and improve post-surgical patient outcomes. Sterilization failures and infectious outbreaks have been attributed to improper cleaning, disinfection, and sterilization of medical devices (Link, 2019). The same sterilization steps used in terminal sterilization of surgical instruments, sets, and implants should be used in the IUSS process as well.

PICOT Question

In surgical procedural patients (P), how does the standardization process of terminal sterilization use (I), compared to the current practice of immediate use steam sterilization (C), affect surgical site infections rates (O) within a 3-month period (T)?

Needs Assessment

Objective

The objective of the Needs Assessment was to analyze the current process for IUSS use within the surgical department, identify barriers, and facilitators to the implementation of a sterilization process through guided interviews with key informants. Each participant interviewed was asked a set of six questions. The questions were used to assess the need for improvement of the IUSS use within the organization.

Participants

The participants of the Needs Assessment included individuals that have a variety of professional qualifications that allows them to identify barriers to the implementation of a sterilization process protocol. A target group and key informants were surveyed to identify a

quality improvement need within the organization. The key informants included the director of surgical services and one of the orthopedic surgeons. The director is the supervisor of surgical services and is a member of the administrative team that influences the target group. She has been employed at surgical hospital for four months. Her previous roles include director of surgery at a level 1 trauma facility in California, robotic team coordinator, and circulating/scrub nurse. She has a Bachelor's in Nursing degree and has been a nurse for 21 years. The orthopedic surgeon completed his Doctor of Osteopathic medicine in 2007, his orthopedic residency in 2012, and orthopedic adult reconstruction surgery fellowship in 2013. He became a shareholder at the facility in 2014. Finally, the target group included three nurses and two surgical scrub technicians all of whom have a vast number of surgical experiences. The surgery nurses experience ranged from four to twenty-eight years, and the surgical technicians experience ranges from four to ten years. Target groups employment history at the facility ranged from two to fourteen years.

Rationale of the Needs Assessment

The Needs Assessment was performed to identify a quality improvement need within the organization, which resulted with the key informants voicing concerns that the increase in SSI rates appeared to be correlated with the misuse of IUSS. In 2020 the SSI infection rate at the facility was 0.33%, which was an increase from the previous year noted at 0.24%. In 2020, a total of 1078 instruments and 19 medical implant devices were processed by IUSS. As determined by Nania (2013) SSIs are the third most common healthcare associated infection. Although the key influencer and stakeholders have ultimate authority over approval of the quality improvement project, the target population will be directly involved in implementing the project. One barrier identified by the interviewees included that the central sterile department was unable to keep up with the demands for surgical instruments needed by the surgical department. Also, medical device representative were not following the organizations

policy for surgical instruments to be brought the day before the needed surgical procedure. Another barrier noted was the length of the terminal sterilization process and risk for increasing the operating room turnover times. Finally, the key influencers identified there were not enough surgical instruments for the surgery schedule caseload. Facilitators to the project include the support from administrations and shareholders for the reduction IUSS use within the surgical department. Lastly, another facilitator of the project is the staffs drive to provide good quality safe care to the patients.

Data Collection Tools

The Needs Assessment utilized key informants and target groups to collect information on the current IUSS process in the surgical department. A questionnaire that was composed of six open ended questions, was administered to the key informants. Refer to the questionnaire in Appendix A. The questionnaire was constructed to identify reasons, existing culture surrounding, and trends in IUSS use. During the interviews, guided questions were asked to determine the key participants' perception of the IUSS use within the surgical department. The use of guided interview questions allows for variances in staff responses and the opportunity to clarify the information gathered.

Sample, Sample Size, and Sample Procedure

The participants interviewed were chosen based on their knowledge of IUSS use in the surgical department. A purposive sample was used in selecting participants for interviews based on each participant's knowledge of sterilization practices. A total of seven participants were asked six open-ended questions. All interviews were approximately fifteen to thirty minutes in length and were completed between February 02, 2021 and March 03, 2021.

Implementation and Data Analysis

Each interview was conducted based on the availability of the staff members, surgeon, and administration. All interviews took place in a private setting such as an office or an

unoccupied operating room. The interview questions included their thoughts on the current IUSS use, why they felt it was overused, and any trends in IUSS use like particular days, specific surgeons or certain medical instruments.

Specific findings with the use of the questionnaire identified a correlation between all participants in that they felt IUSS was misused within the surgery department. All the interviewees felt IUSS was overused and not used according to the current recommended guidelines. The participants felt that 45% of the time the central sterile department could not keep up with the demands for surgical instrument, 25% of the time the medical device representatives did not bring their surgical instruments in the day before, 5% of the time the surgical instruments were dropped and another instrument was not readily available, and lastly 25% of the time the surgical instrument wrapper had a hole in it. Also, there was consensus in that all participants interviewed felt there was not enough surgical instruments sets for the surgery caseloads in the department. The days identified as high volume of IUSS use were Monday, Tuesday and Thursday due to the high volume of total joint surgeries and Wednesday and Friday due to the high volume of sports medicine procedures. Individual physician total joint instrument sets and surgeon specific sports medicine surgical sets such as anterior cruciate ligament (ACL), hand instrument and shoulder scope sets were identified instruments set that were routinely processed by IUSS. Finally, the trends in surgeons identified that if the surgeon had more than two of the same cases in a row the sets for the third case had to be sterilized using IUSS.

In conclusion, there was consensus among all interviewed participants that the IUSS was currently being misused in the surgical department. Reasons identified for the consistent use of IUSS within the surgical department included dropped instruments, holes in wrappers, improperly cleaned instruments and lack of available surgical instrument sets. According to CMS (2014) surgical disinfection and sterilization procedures are expected to be consistent with

accepted standards of practice to prevent the transmission of infectious disease and protect the health and safety of patients. IUSS use should be reserved for emergency use only. Lastly, best practice is to eliminate the need for IUSS altogether (Ames, 2019).

Aim and Objectives

The aim for this DNP quality improvement project was to decrease the number of post-surgical SSIs through the reduction of IUSS by March 2022.

The objectives were as follows:

- To identify the factors influencing the current IUSS use within the organization
- To increase the surgical staff's knowledge regarding IUSS and its correlation with SSI rates
- To develop and implement a standardized sterilization process protocol ensuring proper approval and use of IUSS
- To decrease the utilization of IUSS by 90% within the organization
- To reduce the SSI rate at or below 0.23% within the organization

Review of Literature

A literature search was performed using a variety of scholarly databases with the assistance of the Research Librarian for the University of Arkansas Library Center. Databases searched included CINAHL and MEDLINE. Combinations of key words were used to search for articles related to immediate use steam sterilization. The words searched included "*immediate use steam sterilization,*" *steam sterilization," "flash sterilization,"* and *"surgical instrument processing."* Additional searches included immediate use steam sterilization and surgical site infection. Professional originations and regulatory agency searches included Association of Perioperative Nurses (AORN), Centers for Disease Control and Prevention (CDC), the World

Health Organization (WHO), the Joint Commission (TJC), Centers for Medicare and Medicaid (CMS), Agency for Healthcare Research and Quality (AHRQ), and International Association of Healthcare Central Service Material Management (IAHCSMM). Inclusion criteria included scholarly peer reviewed articles written between 2016 and 2021; however, articles with evidence-based practices or current guidelines pertinent to the DNP topic were not excluded. Exclusion criteria included articles not written in English, research unrelated to the DNP topic, and articles written before 2013. After applying the inclusion and exclusion criteria, 25 articles remained. A total of 14 articles were included for this literature review on implementation of a quality improvement project to reduce IUSS for surgical instruments and implants.

Preventing Surgical Site Infections

Prevention of SSIs begins with the proper cleaning and sterilization of surgical instruments and implants. Steam sterilization failures rank from 1.5-43.0% worldwide (Panta et al., 2020). Improper cleaning, disinfecting, and sterilization of surgical instruments can lead to surgical site infections (Link, 2019). Contaminated instruments are known to attribute to surgical site infections, which can occur when instruments are improperly cleaned then sterilized (Nania, 2013). According to the literature, one solution identified in preventing and reducing SSIs is the implementation of an IUSS reduction process protocol (Simon et al., 2021). This has been found to decrease the patient's risk for SSIs (Simon et al., 2021). Common elements often included in a standardized process protocol include requiring approval prior to use, proper cleaning technique and inspection, proper documentation, improved communication, and policies on scheduling, transportation, and storage.

Organizational Policies and Procedures

To decrease IUSS misuse hospitals should update their policies and procedures to reflect evidence-based practices, professional organization guidelines, and regulatory agency recommendations in efforts to decrease IUSS use (Seavey, 2013). This begins with reviewing the

current organization policies and procedures on sterilization, IUSS, and manufacturer's IFU for processing surgical instruments and implants (Link, 2019). Surgical instruments and implants manufacturer's instructions should state if it can be sterilized by IUSS (Link, 2019). In a study conducted by Hutzler et al (2013), implementation of an IUSS process change with an organization was able to reduce processing implants by IUSS from 10.22% in 2011 to 0.09% in 2012, an 99.11% reduction in eight months. In 2010, the same organization noted 79.0% of surgical procedures used instruments processed by IUSS, after the process change the rate lowered to 7.5% (Hutzler et al., 2013). After implementing strict guidelines for IUSS use one organization noted they decreased reliance on IUSS from 180 loads per 28-day period to 25 (Sheffer, 2015).

Organizational policies should follow the necessary steps to ensure the sterility of the surgical instrument or implant (Simon et al., 2020). This includes cleaning, inspecting, sterilizing of surgical instrument or implants, and transferring to the sterile field aseptically (Link, 2019). AAMI, AORN, Accreditation Association for Ambulatory Health Care (AAAHC), Association for Professionals in Infection Control and Epidemiology (APIC), American College of Surgeons (ACS), Association of Surgical Technologist (AST), and the International Association of Healthcare Central Service Material Management (IAHCSMM) agree that staff sterilizing surgical instruments should be knowledgeable and utilize standardized practices for sterilization. Policies need to address each sterilization step, detail the IUSS process, and include the manufacturer's IFU. The IUSS process should include cleaning, inspecting, and decontamination steps such as those that are used with terminal sterilization (Link, 2019). To ensure reusable surgical instruments are safe for patient use, the organization should follow the manufacturer's recommendations for cleaning, disinfection, and sterilization (Seavey, 2013). It is vital that organizations follow the manufacturer's recommendations for sterilization of each surgical instrument due to the complexity of the today's instruments. Newer instruments have smaller and

more moving parts then previous instruments. Thus, following the manufactures guidelines for sterilization will ensure instruments are safe for patient use (Seavey, 2013).

Hutzler and colleagues noted that polices should include requiring a manager approval prior to IUSS utilization (2013). The updated IUSS policy process should require a manager's approval prior to IUSS use (Hutzler et al., 2013). Requiring approval will allow time to identify if another surgical instrument is available. If the instrument is not available this process will ensure the instrument is processed utilizing the appropriate steps.

Recommendations For Reducing IUSS Use

TJC (2021) noted other strategies to reduce IUSS use these are as follows:

- Loaner instruments from medical devices representative should be delivered in sufficient time to allow for terminal sterilization.
- Develop policies, procedures, orient staff and ensure competency of evidence-based guidelines for IUSS use.
- Leadership involvement with regular rounding in areas where IUSS and terminal sterilization are occurring.
- Review manufacturer's IFU for the instrument and the sterilizer.
- Allow sufficient time to observe reprocessing activities.
- Illicit questions and concerns from staff on IUSS process, reduction plans and elimination concerns.
- Ensure sterilization practices are incorporated in the facilities Quality Assessment performance improvement activates.
- Evaluate compliance with IUSS evidence-based guidelines, policies, procedures, practices, and competencies.

- Using an IUSS reduction team to identify risks, gaps in compliance, conduct a risk assessment, ensure compliance with evidence-based practices, and manufacturer's IFU.

IUSS Reduction Team

Implementation of an IUSS reduction team can be effective in decreasing IUSS use (Ames et al., 2019). The goal of an IUSS reduction team is to identify ways to reduce IUSS and to implement process changes within the surgical department to reduce IUSS use (Hutzler et al., 2013). Simon et al. (2021) found that with the utilization of an IUSS reduction team reduced IUSS use from 2211 in 2013 to 467 in 2019 a 79% reduction in its use. An IUSS reduction team can work to develop guidelines for IUSS use. TJC (2021) noted that organizations should adopt evidence-based guidelines to decrease IUSS use. Fist, facilities need to define when it is appropriate to use IUSS (TJC, 2020).

The IUSS reduction team aids in identifying causes for IUSS use of surgical instruments and implants (Hutzler et al., 2013). The IUSS reduction team should review IUSS logs to determine what instruments are frequently being process by IUSS to make educated recommendations (Green et al., 2018). A risk assessment can examine a process in detail including series of events, actual and potential risks, failures, or barriers to the process (TJC, 2021). The team is accountable to review IUSS logs, track IUSS rates, and identify reasons for its use (Ames et al., 2019).

IUSS reduction team members should be responsible to ensure proper documentation on IUSS logs (Simon et al., 2021). The required documentation for IUSS use includes date, time, room number, patient identifiers, items processed, load number, temperature, length of cycle, integrator results, operator's information, reason for use and whether it was an implant (Simon et al, 2021). This information is required for tying the individual patient to the instrument or implant, the operating room, and IUSS sterilizer for quality and infection control tracking

purposes.

Organizations should follow the recommended guidelines for IUSS sterilization (AORN, 2019). Effective IUSS processing requires that cleaning, cycle times, exposure times, temperature settings, and drying times are met (Seavey, 2019). The team will be accountable to ensure all IUSS sterilization steps have been followed. Also, the team should ensure that only instruments and implants are following the manufacturer's IFU (Seavey, 2019). When an organization undergoes a survey, they may ask to see where the manufacturer's instruction for use is located (Nania, 2013). If an instrument or implant is not cleaned properly, it cannot be deemed sterile (Nania, 2013). IUSS use is effective when in compliance with the manufacturer's IFU for instruments, sterilizers, containers, and follows regulatory guidelines (Nania, 2013).

Implementation of IUSS Reduction Process Protocol

The only thing constant in healthcare is change (Nilsen et al., 2020). Knowledge of factors that can influence successful change within an organization can improve the project's outcome (Nilsen et al., 2020). Nilsen and colleagues noted allowing staff input, clear communication, and staff buy in as factors that lead to the successful implementation of a change within an organization (2020). Involving staff early in the project and allowing input aids in its success (Nelsen et al., 2020). Communicating with the staff prior to implementation of the project allows time for the staff to process, accept, and prepare for the change (Nelson et al., 2020). Communication should be clear, precise, and utilize different modes of communication (Dick et al., 2018). Ensuring staff understand why the change is occurring like, improving patient outcomes they are more accepting of the change (Nelson et al., 2020). Knowing why the change is occurring can help in establishing the benefits of the project (Dick et al., 2018).

It is recommended that implementation of a rapid processing guidelines be in place for staff to follow when IUSS must be used (Hutzler et al., 2013). This process include a thorough cleaning and inspection by the central sterile department before the instrument is processed by

IUSS. As a method of IUSS reduction, organizational policies, procedures, and processes should outline when IUSS can appropriately be used (Simon et al., 2021; Links, 2019). It is recommended that healthcare organizations' policies include specific situations surrounding appropriate IUSS utilization as outlined by TJC:

- When a specific instrument is needed for an emergency surgical procedure.
- When a surgical instrument has been contaminated and is needed immediately to complete the procedure.
- When an instrument is dropped and is needed to complete the surgical procedure.

Lastly, organization policies in reference to medical devices representative and loaner instruments, should be updated to require surgical instruments and implants arrive at the organization 24 hours before the scheduled procedure. This will allow time for those surgical instruments and implants to be processed by terminal sterilization (Hutzler et al., 2013). To negate IUSS misuse policies should reflect a specific time for the arrival of loaner instrument and implant to the facility (Link, 2019). Having loaner instruments and implants arrive at a specified time will all for the terminal sterilization process to occur. Updating the medical device representative policy for loaner instruments and implants a facility was able to decrease IUSS use to < 3% and sustained the reduction for over a year Green et al., 2018).

Terminal sterilization in place of IUSS

Steam sterilization is the most common sterilization process used for surgical instruments, sets, or implants (TJC, 2015). According to the CDC, steam under pressure is preferred since it is considered, the safest, fastest, and most cost-effective sterilization process for healthcare facilities (TJC, 2015). AORN terminal sterilization recommendations reflects best practices to meet the standards determined by Occupational Safety and Health Administration (OSHA), TJC, CDC, AAMI, IAHCSMM and include:

- Contaminated instruments should be transported from the operating room to the decontamination area in a closed container or case cart.
- The contaminated instrument should be disassembled and rinsed to remove any retained matter. (Nania, 2013)
- Contaminated medical devices should be cleaned, decontaminated, inspected, packaged, sterilized, following the manufacturer's IFU, and stored in a controlled environment.
- Medical devices should be inspected for cleanliness and proper function prior to packing and sterilization.
- Medical devices should be packaged to promote complete saturation of steam during sterilization. (Clayton, 2013)

Communication

Good communication is vital in any workplace; however, it is essential in the operating room environment (Green et al., 2018). The surgery department and central sterile department must have a clear understanding of what each department needs to prevent inappropriate IUSS processing, including which instrument and implants are needed for the day and which instruments are needed quickly, allowing time for the central sterile department to terminally sterilize the items (Green et al., 2018).

Roles and Responsibilities

Departments must have a clear understanding of their roles and responsibilities in decreasing IUSS use (Hutzler et al., 2013). Each department must understand their responsibility to ensure adequate surgical instruments are available and updating preference cards to reduce opening of unnecessary surgical instruments (Hutzler et al., 2013). Hutzler et al., (2013) noted that it is vital that the surgery schedule be assessed for conflicts with surgical instruments and implants. For example, if a surgical procedure is scheduled incorrectly, or a medical device representative was not notified about the procedure and the needed instrument set was not

delivered in time to terminally sterilize, results in IUSS use (Hutzler et al., 2013). Finally, having a clear understanding of roles and responsibilities can reduce IUSS misuse.

Standard of Care

The CDC, TJC, and AORN all say that IUSS should be reserved for emergency situations and should not be used for surgical implants (Hutzler et al., 2013). It is noted by many professional organizations that the best practice is terminal sterilization (Ames et al., 2019). AORN guideline recommendation state that IUSS use should be limited and only used in emergency situations and performed in a controlled environment (Seavey, 2013). Every patient merits the same "standard of care" with the sterilization process which includes following the manufacturer's instructions for use (Sheffer, 2015).

IUSS Reduction Education

Staff Competency

The AAMI, AORN, AAAHC, APIC, ACS, AST, and IAHCSMM recommend that healthcare organizations ensure their staff are educated and competent on essential steps in the sterilization process. Proper sterilization of surgical instruments can prevent SSI, therefor it is vital that surgery staff are knowledgeable on sterilization standards of practices (Chakiris, 2013). Link (2019) noted that the sterilization process should only be completed by staff who are proven competent in their sterilization practices. Competency verification provides a mode for documenting and assuring that operating room staff understand the processes for safe and effective sterilization practices (Link, 2019). Organizations should be able to demonstrate that the staff responsible for sterilizing surgical instruments are competent and have annual education and competency verification (Nania, 2013). Providing initial and annual education, competency verification allows the organization to verify that personnel understand the sterilization process (Link, 2019). Persons who sterilize surgical instruments or implants should be trained and competent to perform the sterilization process correctly (Sheffer, 2015).

Training Components

Education plays a vital role in reaching organizational goals (Chaghari et al., 2016). Education and training are fundamental in improving the efficiency and workflow of an organization (Chaghari et al., 2016). The first step to implementation of a IUSS process change is educating the surgical department and central sterile department on effects of IUSS misuse on patients (Hutzler et al., 2013). Education should begin with the consequences of IUSS misuse, which include increased risk for SSIs, readmissions, and a reduction in hospital reimbursement (Ames et al., 2019). When used improperly, IUSS can result in contaminated surgical instruments being used during operative procedures which increase risks of SSIs (Simon et al., 2020).

Training should include the process of sterilization of surgical instruments according to the device, container, and manufacturers' IFU (Link, 2019). Link noted that additional needed education includes sterilization equipment, how to operate the sterilizers, interpretation of chemical indicators, when biological indicators are needed, how to read biological indicators, and required documentation (2019). Educating team members on rapid processing guidelines and the organizations expectations are a means for decreasing IUSS misuse (Hutzler et al., 2013).

Assessing Educational Attainment

To measure educational attainment pre and post surveys are commonly used (Davis et al., 2017). Davis and colleagues noted an increase in knowledge from the pre-implementation survey to the post-implementation survey demonstrates the effectiveness of the educational intervention (2017). Assessing the effectiveness of education examines if the staff gained a greater understanding of the new process (Arian et al., 2019). All staff that sterilizes instruments and implants should be certified and have annual competency evaluated (Nania, 2013).

Summary

IUSS use should be reduced within surgical departments (Chakiris, 2013). Evidence

shows that IUSS use results in an increased risk for SSIs (Hutzler et al., 2013). CMS, TJC, and AORN have addressed IUSS and recommend a reduction of its use (Hutzler et al., 2013). The first step in reducing IUSS use is understanding why it is being used (Link, 2019). Hutzler and colleagues determined this can be achieved with the use of an IUSS reduction team (2013). The team's role is to review IUSS logs, track IUSS use, and reasons for its use (Nino et al., 2020). Using a multidisciplinary team, the organization can identify why IUSS is being used and ways to decrease its use with the implementation of an IUSS policy (Link, 2019). Other policy changes include contacting the surgery manager prior to IUSS use and requiring loaner instruments and implants arrive 24 hours prior to the scheduled procedure (Hutzler et al., 2013). Contacting the surgery manager prior to using IUSS will allow for time to investigate if another instrument or implant is available. Education and annual competency evaluations can aid in ensuring the staff using IUSS understand the sterilization process, manufacturer's instruction for use, and best practice for the sterilization process (Link, 2019). Addressing scheduling conflicts prior to the day of surgery can help reduce IUSS use (Sheffer, 2013). Another way to decrease IUSS is to work to improve communication between the surgical department and central sterile department (Hutzler et al., 2013). The use of a closed container for all IUSS use can decrease the risk of contamination of the instrument while transporting it to the operating room (Young, 2013). Finally, continued monitoring of IUSS use will allow for addressing issues when they arise (Hutzler et al., 2013.

Theoretical Framework

This DNP project was designed to decrease post-surgical site infections through the implementation of IUSS reduction process protocol. Lewin's Change Theory is a three-stage process with components that include unfreezing, changing, and refreezing (Petiprin, 2016). The theory provided the appropriate framework for this project as it aids in implementing purposeful change, decreasing resistance, and apprehension to the change within an organization.

Lewin's Change Theory

Lewin's theory proposes that people are influenced by restraining forces aimed at keeping the existing processes and driving forces pushing them into the direction that allows the change to occur (Wojciechowski et al., 2016). This tension between the driving and restraining forces maintains the balance for the existing practices or culture within the organization (Wojciechowski et al., 2016). Successful organizations tend to remain in their existing state of motion (DaCosta, 2018). The restraining force within successful organizations are that they stay focus on what has brought them success in the past (DaCosta, 2018). This is referred to as "inertia as the inability of organizations to change with the changing environment" (DaCosta,2018). Lewin believed that stability was based on the equilibrium supported by the driving and restraining forces (DaCosta, 2018). Lewin's change theory can assist in changing the existing practices and aid in the transition into a new process (Wojciechowski et al., 2016).

Lewin's three stages model requires unfreezing of the current behaviors, acceptance of the change, and refreezing to the new process. The first stage begins with the unfreezing, this is where the old habits are released and there is an openness to the new ways. The next stage is changing or "moving in a new direction" (Petiprin, 2016). In this stage the staff are open to the concept. Then, the final stage is the refreezing of the new process. In the final stage, the new process becomes the "standard operating procedure" (Petiprin, 2016). Finally, these three stages can be repeated until the changed behavior has become the new standard of care.

Lewin's change theory was utilized in the quality improvement project to reduce the use of IUSS within the surgical department. The aim of the quality improvement project was to decrease the number of SSIs with a reduction of immediate use steam sterilization (IUSS). The objectives for the project were to identify factors influencing the current IUSS use, increase staff's knowledge of how IUSS use correlates with SSI rates, develop and implement a IUSS process, to decrease IUSS use, thus reducing SSI rates.

Step 1: Unfreezing

Unfreezing was the first stage of the process; this was where the acceptance of the change occurs (Petiprin, 2016). Unfreezing the current culture requires buy in from staff, administration, and surgeons (Chakiris, 2013). Addressing the current culture in the surgery department and identification of barriers can help with acceptance of the project (Sheffer, 2013). The unfreezing stage staff's apprehension for the new IUSS process was identified, and barriers were addressed. Also, identification of factors influencing the current IUSS use was identified in this stage. Barriers affecting employee's resistance to change include lack of training, participation, lack of management involvement, incentives, and experience (Nino et al., 2020). Another factor influencing the IUSS misuse, is surgery turnover times. The expected turnover times in the surgery depart are 10-30 minutes depending on the type of procedure and includes taking the patient to the recovery room, cleaning of the operating room, and preparing for the next patient. The staff's reluctance to use terminal sterilization was due to the thinking that IUSS is quicker, therefore, the staff used IUSS instead of surgical instruments or sets processed via terminal sterilization process. The staff's acceptance was increased once the staff understand the terminal sterilization process will be more efficient and safer for the patients (Sheffer, 2013). The goal of the unfreezing stage is feelings of openness by staff to the new sterilization process and acceptance that IUSS misuse needs to be reduced and terminal sterilization becoming the standard of practice for all surgical instruments and implants.

Step 2: Changing or Moving

After unfreezing old behaviors, next was the changing stage (Petiprin, 2016). This stage involved seeking alternatives and decreasing obstacles that are negatively affecting the change (Wojciechowski et al, 2016). This stage included working on problem solving and implementing a changed behavior. This stage included training, competency evaluation, and implementing the new process change. Project objectives in this stage were to, increasing staff's knowledge of how

IUSS misuse can increase SSI rates and the implementation of the new IUSS reduction process protocol aimed at decreasing overall SSI rates. These objectives were achieved with staff training the staff on how the proper sterilization processes can reduce the risk for poor patient outcomes. Another intervention was to improve communication between the surgical and central sterile departments. Clear communication between departments consisted of discussing what instrument were needed to be turned over quickly, allowing time for terminally sterilization to occur. Implementation of policies and procedures which reflect evidence-based practices and professional organization guidelines decreased staff utilization of IUSS (Seavey, 2013). Lastly, this stage aids in the acceptance of the change and a willingness to comply with the new sterilization processes.

Step 3: Refreezing

Refreezing was the final stage of Lewin's Change theory. This was where the staff's acceptance of reducing IUSS use occurred, and the new process become integrated into their daily practice. This was reflected as the staff incorporates the new IUSS reduction process into their daily routine, thus reducing IUSS utilization. The refreezing stage was needed to reduce the likelihood of sliding back to old habits (Petiprin, 2016). This stage was where purpose and intention occur to achieve the desired outcome, which was to reduce SSIs. The result of this stage was limitation of IUSS misuse among surgical staff as the newly created IUSS reduction protocol became the standard.

Summary

Utilization of Lewin's Change Theory reduced the staff reluctance for change and improved the success of the quality improvement project. In the unfreezing stage, the staff sought to understand and accept the new IUSS reduction protocol. The next stage resulted in implementation of the new IUSS reduction protocol. In the refreezing stage, the new IUSS reduction process was integrated into the surgical staff's culture and practice standard. Lewin's

change theory was used to decrease resistance and apprehension to the new IUSS reduction process thereby, decreasing SSI by reducing IUSS misuse.

Methodology

Project Design

The proposed DNP Quality Improvement (QI) project utilized a quasi-experimental research design which seeks to establish the cause and effect of the IUSS reduction protocol intervention and SSI rates. A quasi-experimental design was appropriate because the participants were not randomly assigned (Trochim, 2021). PDSA cycles were used to monitor implementation of the new terminal sterilization process.

The goal of any QI initiative is to promote an improvement in healthcare. QI is defined by identification of a patient care need or problem with the intent to improve care by applying an enquiry, intervention, solution, and reassessment (CMS, 2003). QI methods are ongoing processes where teams collaborate to improve a process with the aim of reducing costs, increasing efficiency, and increasing satisfaction (CMS, 2003). A QI project method is in line with the clinical site's mission which is to embrace the highest standards in patient care and clinical outcomes, and endeavors to ensure that the overall patients experience will exceed the patients' expectations (Oklahoma Surgical Hospital [OSH], 2021). This project design was selected to achieve objectives to decrease SSI by implementing an IUSS process protocol.

Project Description

The DNP project was a QI initiative since the goal of the project was the improvement of a healthcare outcome (Morgan et al., 2020). The aim of the project was to decrease SSIs rates by reducing IUSS misuse, replacing this error with terminal sterilization. The aim was achieved by identifying factors influencing current IUSS misuse, training staff on IUSS misuse and its consequences, and implementation of an IUSS reduction process protocol. Chart audits examined current IUSS use were analyzed using audits performed by the IUSS reduction team.

The staff's education attainment was assessed utilizing pre and post implementation survey questionnaires. The Likert scale questionnaire was used to determine if staff's knowledge of correct sterilization procedures increased after the educational seminar. Likert scales allow the staff members to rate how much they agree or disagree with the surgery questions, giving the staff an opportunity to voice their opinion. Also, the implementation of an IUSS reduction process protocol included a requirement for approval by the operating room manger prior to using IUSS therein, reducing misuse of the process and allowing time to determine if another instrument is available.

Setting

This DNP QI project was conducted within the surgical department of a physician-owned facility in Tulsa, Oklahoma. The facility is licensed for 75 inpatient beds and is a short-term acute care facility.

Study Population

The study population for the project consisted of all patients who underwent a surgical procedure within the hospital operating rooms during a three-month period and acquired an SSI or had surgical instruments or implants processed by IUSS. The facility provides surgical procedures for the following service lines: orthopedics, neurosurgery, general surgery, colorectal, breast, gynecology, urology, and otolaryngology. In 2021, a total of 16,688 surgical procedures were performed. Which was an increase from the previous year. In 2020, a total of 15,644 surgical procedures were performed which was a decrease from 17,272 procedures the previous year. The QI project team did not have direct patient contact, but reviewed IUSS logs and SSI logs following all surgical procedures.

Study Measures

Conceptual Definitions. The main concepts for this DNP project include *IUSS, terminal sterilization, SSI,* and *staff knowledge of IUSS and its consequences.*

- The conceptual definition of the term *IUSS* is described as using the fastest sterilization process which eliminates the drying cycle and needed immediately, and another instrument is not available. Surgical instruments that undergo IUSS processing are intended to be used immediately and cannot be stored for later use (Seavey, 2013).
- The conceptual definition of the term *terminal sterilization* is proper sterilization process including cleaning, decontamination, inspection, assembling, packaging, and sterilizing following the manufacturer's IFU.
- The conceptual definition of the term *SSI* is a patient who acquired an SSI after an operation where a surgical instrument or implant was processed by IUSS.
- The conceptual definition of the term *staff knowledge of IUSS use and effects on SSIs* refers to information retained from the staff in-service.

Operational Definitions.

- The operational definition of the term *IUSS* is the process where an unwrapped instrument is processed using steam sterilization at 270° for 4 minutes at 28-30 psi. IUSS use will be determined by reviewing IUSS logs daily and analyzing its use.
- The operational definition of the term *terminal sterilization* is described as following the process where surgical instruments are processed with steam sterilization at 270° for 30 minutes with 28-30PSI. Items that are to be sterilized are cleaned, decontaminated, inspected, assembled, packaged, and sterilized following the manufacturer's IFU (Graybill-Derocle, 2013).
- The operational definition of the term *SSI* is described as an infection that occurs within 30 days of the operative procedure, or 90 days for procedures with an implanted device (AHRQ, 2019). SSI will be measure by analyzing SSI logs and IUSS logs to determine the percentage of SSI related to IUSS use.

- The operational definition of *staff knowledge of IUSS and its effects on SSI* is a measure of staff's knowledge of IUSS, the process, and how it can increase the patient's risk for an SSI. This information will be analyzed using pre-implementation and post-implementation survey questionnaires.

Outcome Measures. The outcome measure for this DNP QI project was used to evaluate the effect on implementation of an evidenced-base practice change (Melnyk & Fineout-Overholt, 2019). The specific aim of this DNP projects was to reduce the number of SSI rates in postprocedural patients. Data was collected on SSI rates three months pre and three months post implementation of the IUSS reduction process protocol and determine that increasing terminal sterilization rates resulted in a decreased rate of SSIs in post-surgical patients. The goal was to reduce the SSI rates at or below 0.23. SSI logs were compared to IUSS logs to determine if a patient who developed an SSIs had a surgical instrument or implant processed by IUSS. The clinical sites SSI rate for 2020 was 0.33 which was trending up from the previous year.

Additional outcome measures to be evaluated included the comparison of pre-implementation and post-implementation educational surveys and pre-implementation and post-implementation IUSS percentages. Surveys were distributed before and after the educational seminar. Pre-implementation and post-implementation survey questionaries were used and determine that educational seminar increased staff knowledge on the IUSS process, consequences of IUSS use, and the steps of the IUSS reduction process protocol. A retrospective review of previous IUSS logs was conducted to gather data on the percentage of IUSS use over the last three months prior to the implementation of the project. Post-implementation of the IUSS reduction process protocol the IUSS log was monitored daily to ensure compliance with the protocol. After three months of data was collected on the IUSS use then it was calculated and compared with the previous months and ensured an adequate reduce in IUSS use took place. IUSS log data was imputed onto a spread sheet. Surgical instruments that meet the requirements

for IUSS use documentation included date, time cycle was run, operating room (OR) number, patients name, and medical record number, name of the instrument processed, load number, temperature reached, length of cycle, person's name who started and retrieved the instrument, reason for use, and whether it was an implantable device (Simon et al., 2020). Patient demographic information was not relevant to this project and was not collected. Since there was not a benchmark for IUSS use, it was recommended that organizations benchmark IUSS use among themselves (Seavey, 2013). The goal was to decrease IUSS utilization by 90%.

Process Measures. The process measure for the DNP project was to assess the success and adherence of a reduction in IUSS reduction protocol. This was accomplished with the development and implementation of a standardized IUSS reduction process using the quality improvement model. The process measure benchmark was 90% of the staff utilized the standardized process for sterilizing surgical instruments. An additional process measure was staff survey completion rate with the goal of obtaining 45%-50% of the completed pre and post surveys.

Staff utilization was measure with monthly audits completed by the IUSS team during their meeting. The PDSA cycles were used to monitor achievements of the process measure during the implementation phase. This was done using the PDSA cycle to identify current IUSS use and barriers to the process implementation. The PDSA allowed staff to engage in assessing the problem, make suggestions, and testing solutions (AHRQ, 2020).

Balancing Measures. The balancing measures for this DNP project was to evaluate both positive and negative effects of the implementation of the IUSS reduction process protocol. The negative balancing measure for the DNP project included surgery turnover times. We were not able to determine if the implementation of an IUSS reduction process protocol increased surgery turnover times due to a conversion of a new EMR system that took place during the pre-implementation phase of the project. The positive balancing measure for the DNP project is

hospital reimbursement rates. This data was not able to be determined with the reimbursement time frame for payment. The time frame to determine a positive wound culture meets the requirements of and SSI is 30 to 90 days.

Benefits and Risks

The benefits of this DNP QI project include the implementation of an evidence-based practice intervention through an IUSS reduction process protocol. The benefits of the IUSS reduction process protocol include decrease in SSIs rates and increase in hospital reimbursement rates. Studies show when IUSS is used routinely essential steps can be skipped or overlooked (Seavey, 2013). This can lead to inadvertently using contaminated instruments or implants for patient procedure. Overlooking essential steps results in an increased the risk for sterilization errors, and increased risk for surgical site infection (Nania, 2013). An organization's SSI rates directly correlates with their reimbursement rates. Facilities can receive penalties or rewards depending on their SSI rates (Ames et al., 2019).

The risk for this DNP project included the possibility of increasing surgery turnover times. The staff's perception of why IUSS is used was related to the expectation for fast surgery turnover times. Prolonged turnover times could result in encoring an increase in costs to the facility. We were not able to determine if the surgery turnover times increased due to a ERM conversion that took place due the pre-implementation phase. There was no loss of patient privacy and confidentiality through data collection. IC nurse who comparand SSI rates with IUSS logs was the only person accessing patient information, which was protected. Patient demographics were not relevant to other team members.

Subject Recruitment

This QI project was an implementation of a standard practice therefore, subjects were not recruited for this DNP project**.** The project was to implement a IUSS reduction process protocol. The IC nurse received emails of positive wound cultures if the culture met the requirements of an

SSI, then they were be added to the SSI Log. The SSI log was then compared to IUSS logs to discover if there was a correlation between the infection and IUSS use.

Consent Procedures

Consents were collected and maintained through the clinical site when the patient consents for a surgical procedure. Informed consent was obtained from all staff participants and was obtained in person prior to educational training and implementation. See *Appendix K* for the *Informed Consent Form.*

Subject Costs and Compensation

There were no costs incurred by the DNP project or the implementation team. The terminal sterilization process did not result in a cost to the organization. The central sterile department is already staff and performing this process. Also, each of the team member are paid employees of the facility and the projects task are roles they are already performing these roles already. The project did not include additional equipment or instrument to be purchased. Compensation for the participating in the project did not occur.

Project Timeline

The actual timeline differed greatly from the initial, projected timeline. Initially, implementation was projected to take place from October 2021 through March 2022; however due to delays with the Arkansas University IRB review implementation did not begin until November 18, 2021. Retrospective data on IUSS logs and SSI logs was projected to begin in October, however SSI data was provided by the IC nurse on March 4, 2022, and IUSS log review was conducted on March 11, 2022, by the central sterile director and myself. Training in-service was held November 18. 2021 at the surgery monthly staff meeting. Pre-educational surveys were distributed on November 18, 2021, prior to the educational seminar. Post-educational surveys were distributed on February 21, 2022. The plan was to start collecting IUSS and SSI log data after the training was provided and the IUSS implementation process took place. However as

noted above a retrospective review was conducted on March 11, 2022. The plan was to collect pre and post implementation data and analyze the results in March 2022 once three months of post implementation data has been collected. The planned visual timeline is provided in the Gantt chat in appendix F. The actual IUSS Gantt chart is provided in appendix G.

Resources Needed and Economic Considerations

There was minimal cost associated with the implementation of the DNP project. Approximately $50 dollars was spent by the facility providing educational handouts, checklists, and IUSS reduction process protocol. Additional resources that were used include the DNP student's personal laptop, computers, internet access, statistical package for the social science (SPSS), and Qualtrics.

Implementation

Study Interventions

The DNP project intervention involved the implementation of an evidenced based immediate use steam sterilization (IUSS) reduction process protocol to decrease surgical site infection (SSI) rates in post-surgical patients at a physician owned surgical hospital in Tulsa, Oklahoma. The IUSS reduction process protocol reflects evidence-bases practices, professional organization guidelines, and regulatory agency recommendations which are to decrease IUSS use (Seavey, 2013). The association of perioperative registered nurses (AORN), Centers for Disease Control and Prevention (CDC), The Joint Commission (TJC), and Centers for Medicare and Medicaid recommend organizations implement policies to reduce IUSS use.

Implementation of the IUSS reduction process protocol began November 18, 2021, following approval from the International Review Board (IRB) at the University of Arkansas. The study interventions consisted of the identification of current factors influencing IUSS use, implementation of a standardized sterilization process protocol for IUSS, and education of surgical staff on IUSS and its consequences. After the staff training the new IUSS reduction

process protocol was implemented requiring the managers approval prior to using IUSS. IUSS logs were audited to identify trends in surgical instrument that were routinely being processed by IUSS. The IUSS reduction team met bi-weekly to assess and make changes to the project as needed. See appendix N for the IUSS reduction process protocol and educational materials.

Pre-Implementation Phase

During the pre-implementation phase multidisciplinary team meetings were held to discuss the current and proposed IUSS process. The IUSS reduction process protocol was developed by key stakeholders, which include the director of surgical services, surgery manager, director of central sterile, and me. During the pre-implementation phase the project goals were identified and each team members roles were discussed. The goal of the project was to reduce SSI rates by decreasing IUSS misuse. The team roles included reviewing IUSS and SSI logs and supporting and enforcing the implementation of the IUSS reduction process protocol. Reviewing of the IUSS logs included, looking for trends in which instruments, sets, or implants were processed by IUSS, what day of the week and time of day IUSS was most frequently utilized, and identified trends with surgeons that utilize IUSS more frequently. The task of reviewing IUSS logs was assigned to myself and the director of central sterile. The task of reviewing SSI logs was assigned to the IC nurse. The IC nurse reviewed all the positive wound cultures to determine if they meet the requirements of an SSI. Then the IC nurse compared the SSI log to the IUSS logs to determine if a patient with a positive culture had an instrument processed by IUSS. The role of supporting and enforcing the IUSS process was assigned to the manager of surgery and director of surgical services.

Next the process flow for IUSS use was outlined and clearly defined steps which required prior authorization before IUSS was used. The team identified the manger as the person the surgery staff would be required to contact prior to using IUSS. Requiring the managers approval prior to using IUSS allowed time to identify if another instrument is available. Hutzler and

colleagues noted that polices should include requiring a manager approval prior to IUSS utilization (2013). Then the team addressed the need for clear communication between the surgery and central sterile departments on the high priority instruments which were needed throughout the day. That included determining the best mode of communication on surgical instruments that were needed for additional surgical procedures that day, thus allowing time for the instrument to be terminal sterilized. The plan was to have the scrub technician return the dirty case cart or instrument to the central sterile department and discuss with the central sterile team which instruments were needed to be turned over and when the instruments were needed. Another mode of communication identified was to write the needed instrument or set on the central sterile white board noting the time it was needed.

After the IUSS process was outlined and approved, and the mode of communication identified, I educated the surgery staff on the IUSS process, consequences of IUSS use, and the steps for the IUSS reduction process protocol. The pre-implementation surveys and IUSS training took place at the November 18, 2021, surgery staff meeting. The pre-implementation surveys were distributed to the surgery staff prior to the educational seminar. Pre-implementation surveys were returned to me at the end of the meeting. A total of 45 surveys were distributed to the surgery staff all were returned, however only 20 surveys were completed. In an attempt to obtain a higher survey response rate, the pre-implantation surveys were emailed to the surgery staff on November 29, 2021. Only five more survey were completed, for a total of 25 pre-implementation surveys enter in Qualtrics. See appendix M for pre-implementation survey and appendix O for educational materials.

Implementation Phase

The IUSS reduction process protocol implementation began on 11-18-2021, however the implementation phase experienced some unplanned deviations. Staffing shortages and the increasing number of surgical procedures during November and December months resulted in

IUSS being used more frequently than anticipated. Also, lack of administrative engagement, support, and enforcement resulted in higher-than-expected IUSS use. The following sections will detail the variations with the implementation of the IUSS reduction process, as well as detail specifics of the planned and actual implementation phase.

Planned Implementation Phase.

Following the educational seminar was held the new IUSS reduction process began. During the implementation phase the plan was to monitor IUSS logs bi-weekly and report the findings to the IUSS reduction team. This allowed the team to identify trends in IUSS use and determine if the interventions are working or if a change needed to occur.

Also, during the implementation phase interdepartmental communication was fine-tuned. Staff were educated on the expected mode of communication between the surgery department and central sterile on high priority instruments that needed to be sterilized for additional procedures. Clearly identifying high priority surgical instruments by means of white board and verbal communication was the plan to allow for those surgical instruments to be processed by terminal sterilization. However, a new process was put in place by the director of surgical service to help with the increased surgery caseloads during the November and December months. The patient care technicians took the case carts to the central sterile department, which resulted in a breakdown in communication on high priority instruments that needed to be turned over for another surgical procedure.

Lastly, the plan was to analyze six months of IUSS and SSI logs prior to the implementation of the IUSS reduction process protocol and training seminars. This data collection would allow for a comparison of pre-implementation and post-implementation for IUSS reduction process protocol to determine if there was a decrease in IUSS misuse and/or SSI rates. However, there was a delay with IRB approval and National Health and Safety Network (NHSH) criteria which requires post-surgical follow up for 30 -90 days to determine if a patient

positive wound culture meets the qualifications of an SSI. Hence, the timeline did not allow for planned six months post data collection. Therefore, adjustments in data collection timeframe occurred and resulted in three months of pre-implementation and post implementation IUSS and SSI data collected.

Actual Implementation phase.

The implementation phase took place between November 18, 2021, through February 28, 2022. As stated previously the DNP project encountered some hurdles during the implementation phase. Throughout the implementation phase, the surgery staff continued to use IUSS without the managers approval. One major barrier was the lack of support with enforcing the new process by leadership. The IUSS reduction team had bi-weekly meetings planned which turned into me meeting with each member individually. I attempted to meet with the manager of surgery and director of surgical services bi-weekly to discuss the project and inquire if there was anything I could do to aid in the success of the project. Each meeting the surgery leadership team stated they were too busy to meet that their focus was on their staffing shortages. Next, I met weekly with the director of central sterile who was motivated for the project to succeed; however, her department was also short staff. She had only four employees in the central sterile department with the average number of surgical cases per day being around 115 during the November and December months. Moving forward there where many efforts to engage with the IUSS reduction team members. Conversely, when the surgery caseloads decreased the meetings with the central sterile director proved more successful. She indicated she was able to start reviewing the IUSS logs. However, she again declined help from me. The following will detail the portions of the implementation phase that were completed and other that did not occur.

The week prior to the scheduled November surgery meeting the director of surgery informed me that there were several topics on the meeting agenda and the presentation would have to be shorter than expected. Instead of the 30 minutes that was allocated for the educational

seminar the time was shortened to only a few minutes. The goal of the educational seminar was to increase the surgery staff's knowledge on IUSS and its correlation with SSIs, the allotted time did not allow for questions and a thorough discussion. With the shortened presentation time and the staff turnover there was need to ensure all staff clearly understood the new IUSS process and the consequences of using IUSS. Therefore, an educational handout was created explaining the new IUSS process, informing staff of how the process was progressing, and reinforcing why IUSS should be decreased. The educational handout was updated as need and include information the success of the project.

In the weeks after the educational seminar staff interviews were conducted to assess their thoughts on IUSS, its adverse effects, and the new IUSS process. The interviews identified a process flow change that affected communicate between the surgery and central sterile departments. The process change was to have the patients care technicians take the dirty case cart back to central sterile to improve surgery turnover times. However, previously when the scrub technicians took their dirty case carts back to central sterile, that was when they discuss which instruments that are needed to be turned over for additional procedures that day. Patient care technicians did not know which instruments were needed to be turned over, therefore the new process resulted in an increase in IUSS use. Once the breakdown in communication was identified the team revised the process for retuning dirty case cart to central sterile. The process change was to have the scrub technician return their dirty case carts back to central sterile when an instrument or set was needed for additional surgical procedure.

The project plan was to review IUSS logs bi-weekly with the director of central sterile to identify trends in IUSS use. Each scheduled bi-weekly meeting the director explained she did not have time to review the logs due to staffing shortages and increasing workloads. I offered to review the logs myself and collected data however the director declined the offer. A new IUSS log was placed by each IUSS sterilizer in the morning once the biologic tests are run, the logs are

collected at the end of each day and kept in the central sterile director's office. Therefore, to review the logs approval would be needed. However, during the November and December months the I preformed random checks of the IUSS logs during clinical visits and noted that IUSS was being used without the manger's approval. Additional random check of the IUSS logs in January and February noted the staff continue to use IUSS without the managers approval.

The pre-implementation SSI rate included SSIs that occurred from August 1, 2021, through October 31, 2021. All positive wound cultures were reviewed by the IC nurse once they were confirmed as meeting the NSHN criteria for an SSI the data was placed on the SSI log. Between August 1, 2021, and October 31, 2021, a total of six positive wound culture met the NHSH criteria of a SSI. However, to date the IC nurse has not received the IUSS logs. Hence, she is unable to determine if the patient with an SSI had an instrument or implant processed by IUSS. Post-implementation SSI rates data included SSI that occurred from November 1, 2021, through January 31, 2022. There was a total of five SSIs that met the NHSN criteria for SSIs in the post implementation phase. However, two of the SSIs occurred prior to the implementation of the new IUSS process on November 18, 2021. The IC nurse also explained that February data will be difficult to complete due to the requirements to quality for an SSI. February SSI data would not be complete until May 31, 2022, per the 30 or 90 if there was an implanted surgical device. To allow time to analyze the data the I needed all the SSI and IUSS data by end of February.

Post-implementation surveys were disturbed to the surgery staff via email on February 21, 2021. Paper surveys were also provided to the surgery staff. In terms of survey participation 25 of the 45 post surveys were returned completed for a survey response rate of 55.5%, which was greater than the stated goal of receiving 45-50% of the completed surveys. Once the surgery caseloads decreased additional educational tools were provided to the staff to improve compliance with the IUSS process. The goal was to decrease IUSS use by enforcing receiving

the surgery managers approval prior to using IUSS. Obtaining the managers approval allowed time to identify if another sterile surgical instrument is available and thus would decrease IUSS use. Also, the director of central has informed me that she wanted to use the Process flow chart, IUSS process protocol educational tools for new employees. See appendix Q for educational tools.

The final process flow chart was to follow the expected process flow chart which required the managers approval prior to using IUSS. See Appendix N. The actual process flow chart during the implementation phase was the same as the proposed process flow chart identified from the needs assessment. See Appendix B. However, the ongoing plan is to continue to enforce requiring the managers approval therefore the process flow has not changed.

Plan-Do-Study-Act Cycles.

During the implementation phase, Plan-Do-Study-Act (PDSA) cycles were used to address various issues as they arose. Utilizing the PDSA cycle, the IUSS reduction team could monitor IUSS use to intervene and make adjustments to the intervention as needed. During the implementation phase the following concepts were identified and addressed using PDSA cycles.

Pre & Post Implementation Survey. Prior to the educational session 45 pre implementation surveys were distributed to the surgery staff. At the end of the meeting 20 completed surveys were returned to me. To increase the survey responses the director of surgery emailed the survey to the surgery staff. After the email an additional 5 surveys were completed for a total of 25 surveys entered into Qualtrics. To ensure higher survey response post-implementation surveys will be sent by email. This should ensure that the staff understand responses are confidential.

IUSS Log Review. The first weeks after the training IUSS logs were reviewed and identified higher than expected IUSS use. Sixteen loads were run using IUSS in a four-day period. During the IUSS meeting the trends were discussed and it was noted that the manger was

not signing off on IUSS use. The staff were using IUSS without acquiring approval. To reduce IUSS use stop signs were placed on the IUSS sterilizers indicating to see the manager prior to using IUSS. Also, the IUSS logs were revised to include a place for the manager's signature. Additional reviews of the IUSS logs in January and February months noted the surgery staff continue to use IUSS without obtaining the managers approval. Therefore, a new educational handout was distributed to the surgery staff reminding them of the IUSS process.

Staff Education. The educational seminar was held on 11-18-2021, however the presentation time was shortened to only a few minutes. The time allotted did not allow for questions and a thorough discussion on the IUSS process and the consequences of IUSS use. Therefore, I was not able to confirm that the staff's knowledge on IUSS and its correlation with SSI was increased. Also, both departments have undergone a large turnover in staff. The new staff did not attend the original meeting therefore, they did not receive the IUSS training. To increase staff's knowledge an educational sheet was created to aid in educating the staff on IUSS reduction process, how the new process is going reinforcing, and why IUSS should be decreased. This will keep the staff updated on the process, how it was going, and reinforce the projects goals.

Breakdown in Communication. The staff interviews identified a breakdown in communication between the surgery department and central sterile. The breakdown was occurring due to a new process that was put in place to reduce surgery turnover times due to the department being short staffed and the increasing surgical cases. The director implemented a process to have the patient care technicians take the scrub technicians dirty case carts back to central sterile. This process although helpful did not allow for the scrub to discuss with the central sterile department which instruments, or sets needed to be turned over for additional procedures. The process was change to if an instrument or set is needed for another procedure the scrub technicians would return the case cart to central sterile and inform the department

which instrument is needed and when it is needed. This process will aid in reducing IUSS use by improving communication between the two departments.

Data collection. During the implementation phase, it was difficult to collect data on IUSS use. Both the surgical and central sterile departments were running short staffed, and leadership had to fill in where needed, thus neglecting their managerial duties. The central sterile department was running with four staff members with over a 115 surgical cases per day. After weeks of trying to get data on IUSS rates and use I met with my site champion to get her guidance on how to obtain the data. When she was unable to provide insight on retrieving IUSS data. Therefore, I met with met again with the central sterile director to discuss the project and expectations noting how I understood how over worked she was. Then I explained what data I had to have, and she said she was going to start working on her quality reports and I should have the data I need soon. Staying persistent helped, me to achieve the results I needed.

Interprofessional Team Dynamics. During the pre-implementation phase the IUSS team was very supportive and eager for the project succeed. The central sterile director and the director of surgical services were extremely motivated for the project to flourish. However, during the implementation phase once the departments became short staffed the directors' priorities shifted to staffing concerns and the project seemed to be less of a priority. With the increased surgery caseloads and the staffing shortages the IUSS meeting resulted in blaming other departments rather than improving teamwork and communication. For example, if an instrument was found to have residual tissue on it the surgery director blamed central sterile for not cleaning the instrument thoroughly and the director of central sterile blamed the surgery staff for not precleaning the instrument. As the project progressed the team dynamics has continued to decline. During a recent meeting with the IC nurse when asked about SSI data she noted that the August to November 2021 data was completed but has not received IUSS information. In short, the interpersonal team dynamics declined once the workload increased which was when the

interdepartmental separation became apparent and project support deteriorated.

Post- Implementation Phase

IUSS data extraction began on March 11, 2022, with a retrospective review of IUSS logs conducted by the central sterile director and me. This included reviewing all IUSS use from August 1, 2021, to February 28, 2022. The data collected included pre-implementation review of IUSS logs from August 1, 2021, through October 31, 2021, and post-implementation IUSS log review from November 1, 2021, through February 28, 2022. SSI rate data was provided by the IC nurse on March 4, 2022. The SSI data included SSI rates from July 1, 2021, through January 31, 2022. Post educational surveys were distributed to the surgery staff on February 21, 2022. The University of Arkansas Qualtrics survey link was sent to the surgery staff email. Paper surveys were disturbed to the surgery staff and then entered in Qualtrics by me. See Appendix J for post-educational survey. The surveys questions were similar the pre-implementation survey, but specifically questioned if their knowledge of IUSS improved after the educational seminar. The Qualtrics survey data was extracted and stored on a excel spread sheet on a password protected computer with only access provided by me.

Evaluation of Results

Data Maintenance and Security

A Microsoft spreadsheet was created and used for all data collection. On March 4, 2022, a retrospective review of immediate use steam sterilization (IUSS) logs was conducted by the central sterile director and me reviewing all IUSS use that occurred three months pre-implementation and three months post-implementation. The IUSS logs displayed the number of times IUSS was used, the item processed, reason for its use, and if the manager authorization was acquired. No patient identifiers were stored on the IUSS spreadsheet. Surgical site infection (SSI) data was collected by the infection control (IC) nurse who provided a report on SSI rates from August 1, 2021, to January 31, 2022. This data encompassed three months pre-

implementation and three months post-implementation of the new IUSS process protocol. No patient identifying information was collected in reference to SSI data. All IUSS and SSI data collected was stored on a password protected computer, where I was the only person with access to this data. As no patient information was collected, the data will not have to be destroyed and consents did not need to be obtained.

Surgery staff pre and post implementation survey results were saved on a password protected computer, where I was the only person with access this data. This data was not transferred through any other devices. Data did not contain names of participants, the name of the facility, or any specific contact information. Following completion of project dissemination, the data will be deleted from the computer system.

Some of the SSI data has not been collected due to the NHSH criteria which requires post-surgical follow up for 30 -90 days to determine if a patient positive wound culture meets the qualifications of an SSI. The missing data includes February SSI rates. Also, the December and January SSI rate could potentially be increased with the 90-day positive wound criteria. As, SSI data was collected from September 2021 to January 31, 2022, the NHSN criteria for an SSI requires a 30- 90 day follow for SSI, therefore December and January could result with additional SSI after the project results are completed, and that data would not be included in the projects results. A retrospective review of IUSS logs was completed and included number of times IUSS was used, number of implants processed by IUSS, percentage of managers approval that was obtained, and reason the implant was processed by IUSS. The IUSS logs were reviewed on March 11, 2022. The IC nurse has not received the IUSS logs from the central sterile director therefore she has not been able to determine if a patient with an SSI had an instrument or implant processed by IUSS. The IC nurse will review IUSS log once logs have been provided to her. The IC nurse noted that reviewing of the logs is not a timely project and will give the data to me once she has obtained the information.

Data Analysis

The project data was analyzed to determine if the implementation of a standardized sterilization process protocol decreased SSI rates in post-surgical patients. Data analysis included the use of both descriptive and inferential statistical methods to summarize results of the DNP project implementation. Outcome measures included pre and post IUSS rates, SSI rates, and staff pre and post educational seminar surveys. The process measure for the IUSS reduction protocol was used to assess the effect of a reduction in IUSS use on SSI rates. Balancing measures included survey turnover times and the facility reimbursement rates.

Outcome Measures

The objective of this DNP project was to evaluate how the implementation of an IUSS process protocol affected SSI rates in post-surgical patients. Outcome measures were evaluated and compared pre-implementation data to post-implementation data to determine the impact of the DNP project. Three outcome measures for the DNP project were identified during the project planning which included comparison of pre and post implementation SSIs, IUSS use rates, and pre and post educational seminar surveys.

A retrospective review of SSI logs and IUSS logs were conducted at the clinical site to gather data regarding SSI rates and IUSS use rates that occurred three months prior to the project implementation phase and three months after implementation. Data collected on the IUSS rate, and the SSI rate were be compared to determine if the implementation of the IUSS process protocol decreased both rates. Originally, data collected was to include six months pre-implementation and six months post-implementation, from September 10, 2021, to March 1, 2022. Unfortunately, the data collected only included a three-month period between November 18, 2021, to January 31, 2022, due to delay in International Review Board (IRB) approval and the NHSH criteria for SSIs which requires post-surgical follow up for 30 -90 days.

Outcome Measure #1: Percentage of SSI rates.

The specific aim, and the first outcome measure, was to reduce the number of SSIs in postprocedural patients from the 2020 SSI rate of 0.33% to at or below 0.23% by March 1, 2022. SSI data was collected and compared from August 1, 2021, through January 31, 2022. The SSI rate post-implementation was 0.19% which is less than the goal set benchmark of 0.23%. See figure 3 for SSI rate data. This is the lowest SSI rate the facility has ever seen. The organizations' SSI rate for 2020 was 0.33%, noting a rate decrease of 0.14%. This indicates that the project innovation of reducing IUSS use was successful in reducing SSI infections as hypothesized.

The projects aim was to decrease the number of post-surgical SSIs through the reduction of IUSS by March 2022. The projects objectives were to identify factors influencing the current IUSS use, increasing the staff's knowledge regarding IUSS and how it can affect SSI rates, to develop and implement a standardize sterilization process protocol ensuring proper approval and use of IUSS, to decrease IUSS utilization by 90%, and reduce the SSI rates at or below 0.23%. To address the project's specific aim and clinical outcome measure, the percentage of SSI rates were compared three months pre and three months post implementation of the standardized sterilization process, to determine if decreasing IUSS use decreased the rate of SSIs in post-surgical patients. Data collected on the IUSS rate, and the SSI rate were compared to determine if the implementation of the IUSS process protocol decreased both rates. Originally, as noted above, the data collection plan was to collect six months pre and post implementation SSI rates. However, with the delay in IRB approval and NHSH criteria which requires post-surgical follow up for 30 -90 days the data collection time frame was reduced. Also, SSI logs were compared to IUSS logs to determine if a patient who developed an SSIs had a surgical instrument or implant processed by IUSS.

The SSI rates are displayed utilizing a time ordered graph to present the changes over time. See figure 1 for SSI rates. The total number of SSIs from August 1, 2021, to October 31,

2021was six and the total number of SSI from November 1, 2021, to January 31, 2022, was four However, two of Novembers SSIs occur prior to the implementation of the new IUSS process protocol. Therefore, only two SSIs have occurred since the implementation of the project. See figure 1 and 2 for SSI totals and the number of surgical procedures compared to SSIs.

Also, the paired t-test was utilized to compare the pre and post SSI rates to determine if there was a statistically significance difference between the two rates. There was not a statistical difference p=0.225 between the pre and post SSI rates. (m=2.0, SD=2.0, p=0.225) However, the decrease in the SSI rate and a lack of statistical significance was likely to due with a low power, rather than actual lack of significance. The effect size is -0.509 which means the difference between the pre, and post SSI rate is less than 0.2 standard deviation the difference is negligible.

Figure 1

Figure 1 Surgical Site Infection Totals.

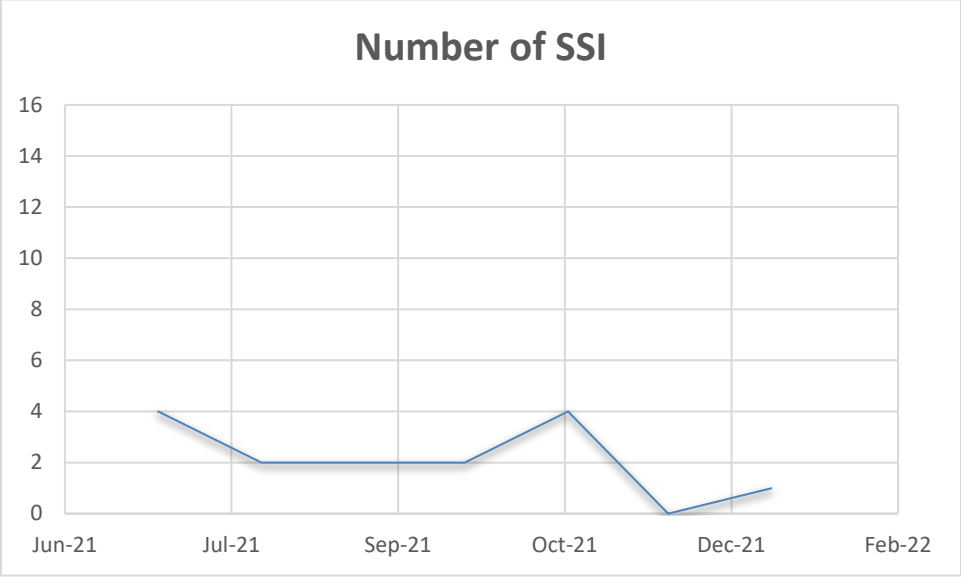


Figure 2

Figure 2 Total Number of Surgical Procedures Compared to Total Number of Surgical Site Infections

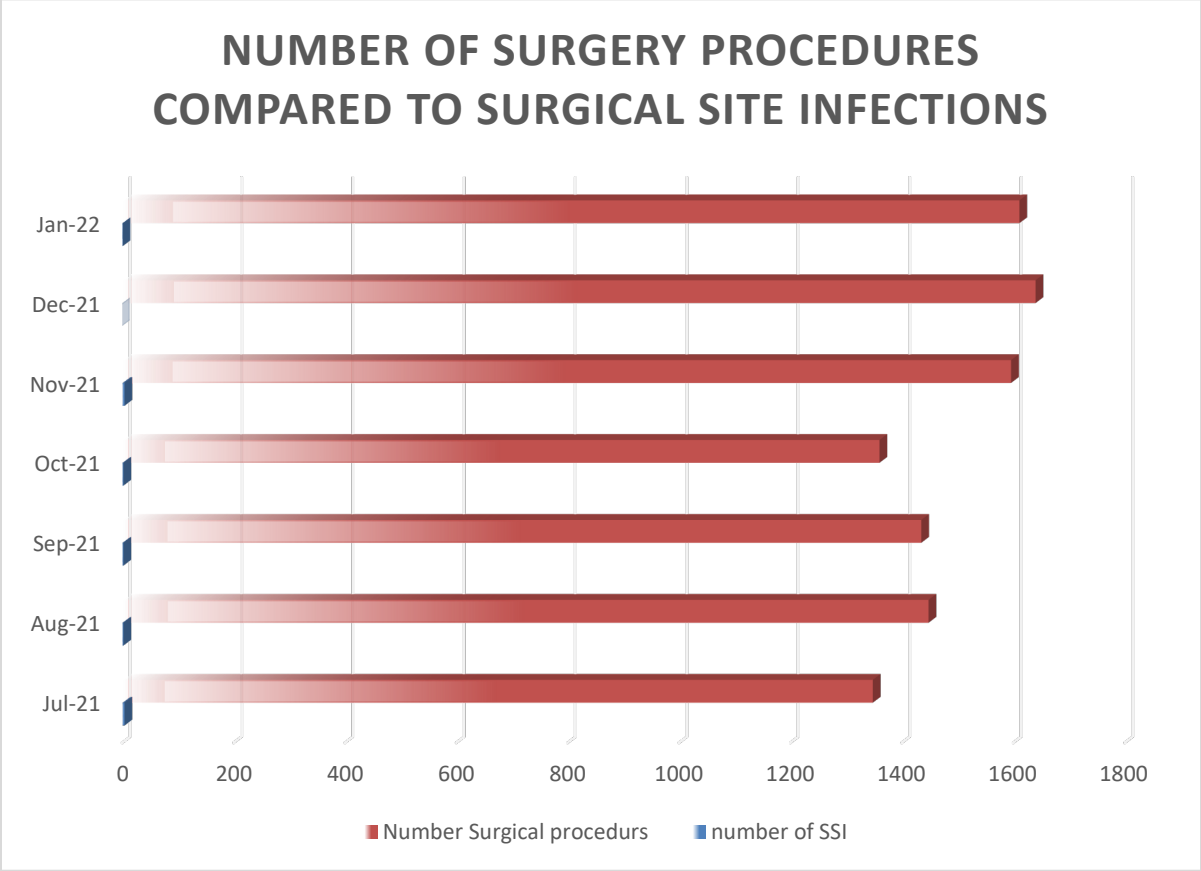
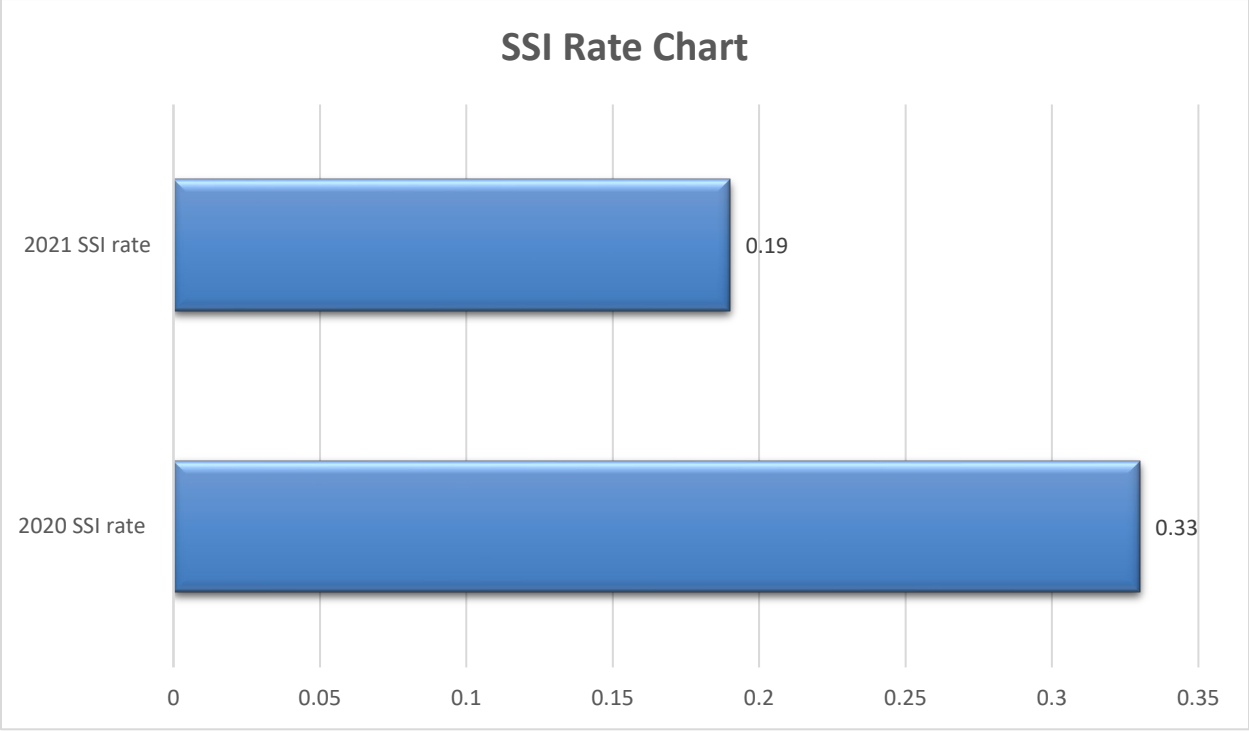


Figure 3

Surgical Site Infection rate



Outcome Measure #2: IUSS Use Rates.

The second outcome measure was to compare the pre-implementation IUSS use to post-implementation IUSS use to determine if the project decreased IUSS use. Currently, there is no benchmark for IUSS, and rather it is recommended that organizations track their IUSS rate and compare it to previous months to determine increases or decreases in their IUSS use (Seavey, 2013). The IUSS results were displayed utilizing percentages. Data collected from the IUSS logs will show a decrease in IUSS use with goal achieving that 90% of the surgery staff utilizing the standardized process for sterilization of surgical instruments. There was a 75% decrease in IUSS utilization after the educational seminars with is less the project goal. Three months pre and post implementation IUSS use was compared to determine if the implementation of the standardized sterilization process decreased IUSS use.

Additionally, IUSS rates are displayed below with a time ordered graph to present the changes over time. See Figure 4 for IUSS rates. A time ordered graph can assess trends over time and can be a better solution for displaying data for quality improvement projects (Williams, 2018). The pre-implementation IUSS rates for July 2021 was 2.1%, August 2021 was 2.0%, September 2021 was 1.8%, and October 2021 was 2.0%. The post-implementation IUSS rates were November 2021, at 1.9%, December 2021 at 2.1%, January 2022 at 2.1%, and February 2022 at 1.5%. See figure 4 for time ordered graph of IUSS use. The total pre IUSS rate was 7.9% and post implementation IUSS rate was 7.6% noting a .03% decrease in the IUSS rate. Pre-implementation review of IUSS logs identified that in July 2021 IUSS was utilized for 131 loads and 1 implant, August 2021 IUSS was utilized for 123 loads and 2 implants, September 2021 IUSS was utilized for 119 loads and 1 implant, October 2021 IUSS was utilized for 128 loads and 1 implant. Post-implementation review of IUSS logs identified that in November 2021 IUSS was utilized for 126 loads and 0 implants, December 2021 IUSS was utilized for 164 loads and 1 implant, January 2022 IUSS was utilized for 134 loads and 2 implants, February 2022 IUSS was

utilized for 97 loads and 3 implants. See figure 5 for IUSS use volume. See figure 6 for a comparison of pre and post terminal sterilization and IUSS use totals. Additional educational handouts and tools were distributed and placed on IUSS sterilizers February 2022 as noted in figures 4 and 5 IUSS rate and volume decreased after additional education was provided.

Additionally, the paired t-test was utilized to compare the pre and post IUSS rates and IUSS volume to determine if there was statistical significance in the IUSS rates or IUSS volume after implementation. There was not a statistically significant difference p=1.00 between the pre and post IUSS rates. (m=0.00, SD=0.36, p=1.00) Also, there was not a statistically significant difference p=0.416 between the pre and post IUSS volume. (m=-414.000, SD=704.185, p=0.416) The Cohen's d effect size for the IUSS volume was 1.027 meaning that the pre IUSS and post IUSS volume differ by 1 standard deviation. However, there was a noted decrease in IUSS volume and rates and the lack of statistical significance was likely due to a low power, rather than an actual lack of significance. See figures 4 and 5 for a decrease in IUSS rate and volume and figure 6 for an increase in terminal sterilization.

Figure 4

IUSS Rate

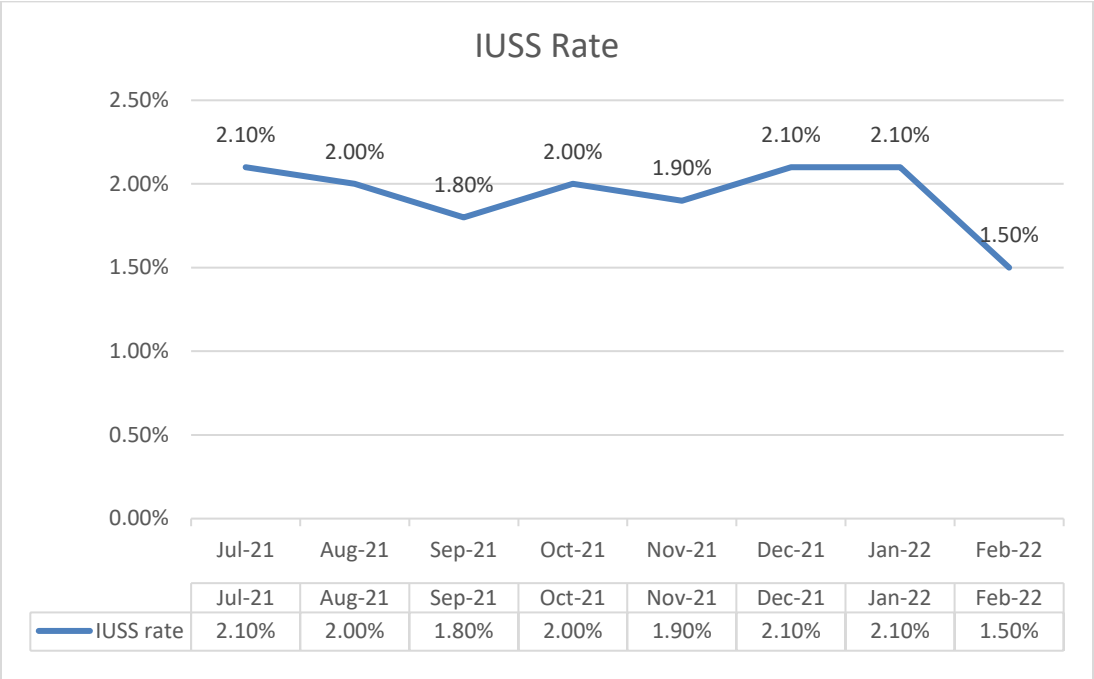


Figure 5

IUSS Volume

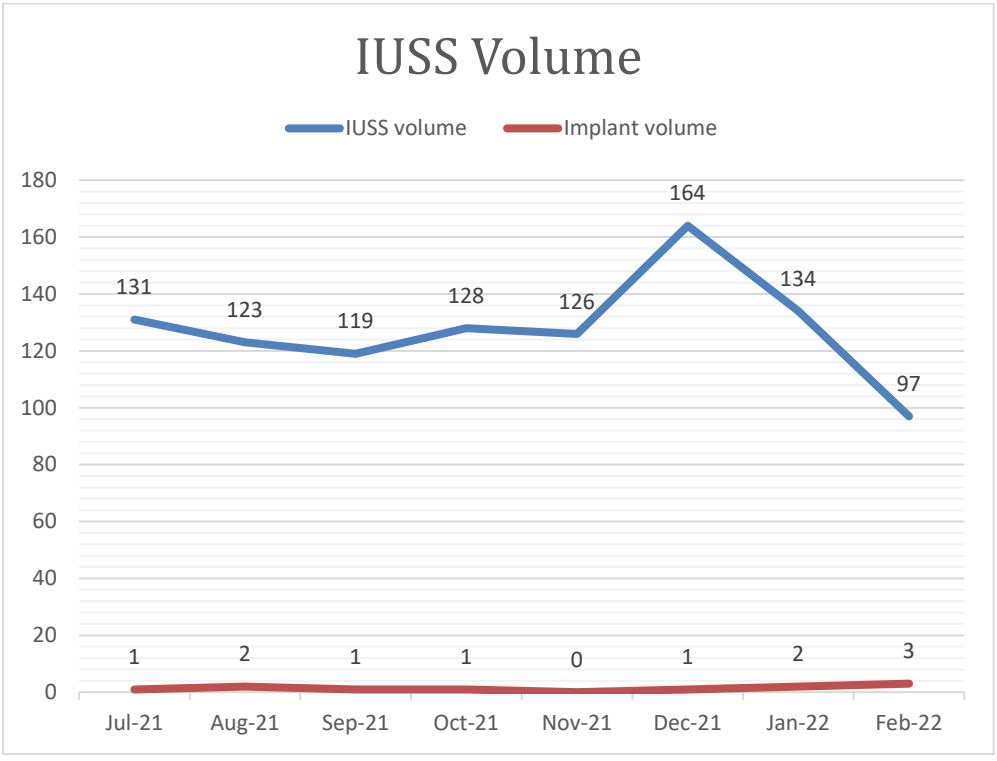
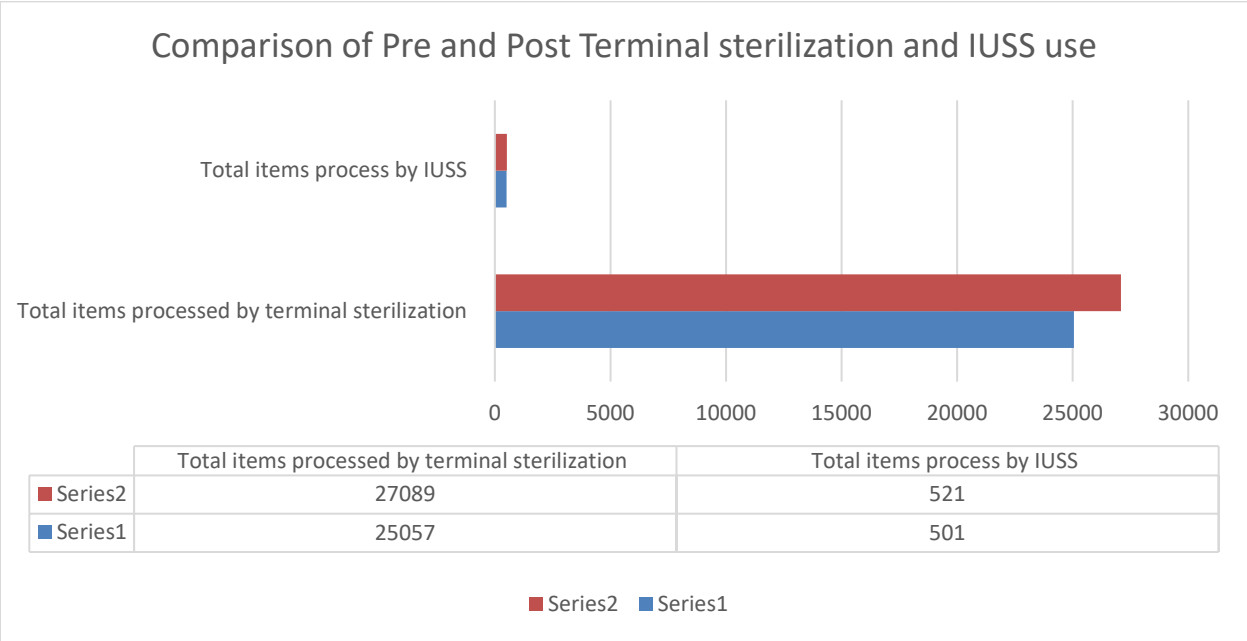


Figure 6

Pre and Post Terminal Sterilization and IUSS use (Series 2 is post-results Series 1 is pre-results)



Outcome Measure #3: Pre-Post Survey.

The third outcome measure was the comparison of pre and post educational surveys to determine if the educational seminar increased the staff knowledge on the IUSS process, consequences of IUSS use, and the steps of the IUSS process protocol. Surgery staff received the pre-implementation surveys prior to the educational seminar held on November 18, 20211. The survey was generated by Qualtrics, and the link was dispersed by email. Also, paper copies were provided for both the pre and post surveys to the surgery staff then uploaded into Qualtrics by me. Post-implementation surveys were emailed on February 21, 2022. The surveys were intended to gauge if surgery staff's knowledge of IUSS and the consequences of using IUSS increased after the educational seminar. The project survey utilized a 5-point Likert scale to assume the strength or intensity of the staff's experience and their perception of the importance of using the proper means of sterilization. The scale views the information as important or not important to reduce bias. The scale is from 1 to 5 with a 5 as being more positive and a 1 as more negative. In addition, the staff base their feelings on a topic based on a scale including, extremely important, very important, moderate important, slight importance, and not at all important. The questions addressed the importance of acquiring the managers approval prior to using IUSS, the

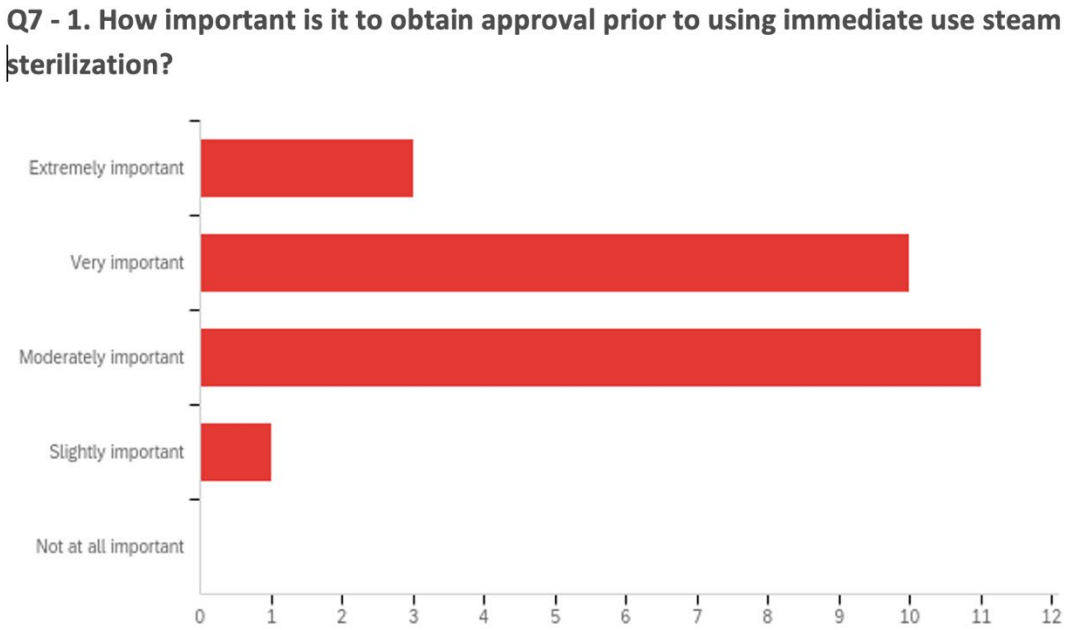
importance proper cleaning and sterilizing surgical instruments, the importance of proper documentation on the IUSS logs, and if their knowledge of IUSS increased after the educational seminar. The responses to each question were displayed on an Excel spread sheet with the number of each response recorded. The Likert scale results were summarized and displayed using a bar chart comparing the staffs pre and post responses to the survey questions. The bar graph is used to denote frequency of the answer (In & Lee, 2017). This displayed which concepts the staff strongly agree or strongly disagree with. As noted in figure 7 and 8 the educational seminar increased the staff's awareness of the importance of acquiring the managers approval prior to using IUSS. On the pre-implementation survey 20% of the staff felt it was extremely important to obtain approval prior to using IUSS. However, on the post-implementation survey 68% felt acquiring the managers approval was extremely important. See figure 7, 8, and 9 manger approval survey question results.

Also, the paired t-test was used to compare the result of the pre- and post-survey to determine if there was an increase in the staff's knowledge after the educational seminar and determine if there was statistical significance in the staff's responses. A paired-t test is applied when the data is collected twice from the same objects (Albassam & Aslam, 2021). There was a statistically significant difference between the pre and post educational survey on the question on the importance of obtaining the managers approval prior to using IUSS. The post survey respondents noted it was extremely important to obtain the manger approval at a p value =0.003. (m=-0.840, SD= 1.281, p=0.003). Question 2 on the pre and post educational survey ascertained the importance of proper cleaning of the instruments prior to using IUSS. There was a statistical significance p=<0.001difference in the importance of proper cleaning between the pre- and post-survey. (M=-0.720, SD= 0.678, p=<0.001) Question 3 asked the importance of opening hinges, disassembling, and placing the chemical indicator in the sterilization tray. There was a statistically significant difference between the pre and post survey responses of a p=<0.001.

(M=-0.720, SD=0.542, p=<0.001). On question 4 which asked the importance of ensuring sterilizer parameters is met when using IUSS. There was a statically significance difference on between the pre and post survey the responses p=< 0.001. (M=-0.720, SD=.542, p=<0.001). For question 5, the importance of completing the IUSS log. There was a statistically significant difference between the pre and post survey responses p=<0.001. (M=-0.720, SD=0.614, p= <0.001). Therefore, the goal of increasing the staff's knowledge after the educational seminar was met. This indicates that the project innovation of increasing the staff's knowledge of IUSS and its consequences with the use of an educational seminar was successful as hypothesized.

Figure 7

Pre-implementation survey response to importance of obtaining IUSS approval

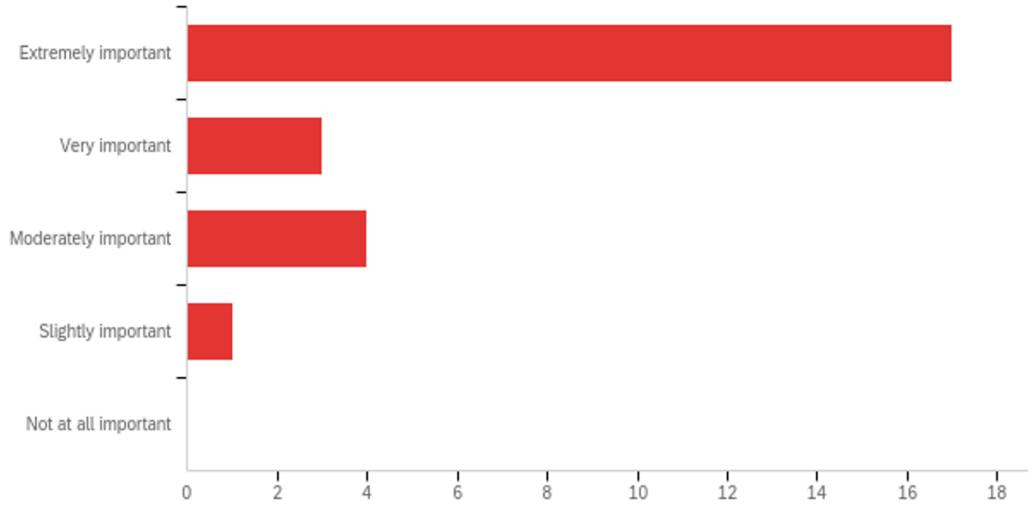


#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	1. How important is it to obtain approval prior to using immediate use steam sterilization?	1.00	4.00	2.40	0.75	0.56	25

Figure 8

Post-implementation survey response to importance of obtaining IUSS approval

Q7 - How important is it to obtain approval prior to using immediate use steam sterilization?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	How important is it to obtain approval prior to using immediate use steam sterilization?	1.00	4.00	1.56	0.90	0.81	25

Figure 9

Importance of obtaining managers approval survey question results

The survey response goal was to have 45-50% of the staff to complete both surveys. In terms of survey participation, 25 of the 45 pre and post surveys were returned completed for a response rate of 55.5% which is greater than the stated goal of receiving 45-50% of both completed surveys. The number of responses was displayed using the actual percentage. In & Lee determined that if quantitative data is to be displayed consisting of one or two numbers, written language is preferred over graphs (2017). See figures 9,10,11 for survey response results. As for the gender demographics 17 females, 1 male, 7 preferred not to say answered the pre-survey and 17 females, 2 males and 7 preferred not to say answered the post survey. Demographic data was analyzed using paired t-test to determine if gender, certification type, years of experiences, and years of employment affected the staff's responses to the survey. The Levene's test for equality was used to determine how demographic data affected the survey responses. The p value was < 0.01. Therefore, the null hypothesis is accepted there is no difference between demographic data and survey responses. See figures 10-15.

The results of the Levene's test for equality on how gender affected the survey responses

to all eight questions the p value was greater than 0.5 therefor the 2 tailed p value was reviewed for each of the questions and all p values were greater than .05 therefor there was not a statistically significant difference between gender and the survey responses. Question 1 p=.833 and the 2-tailed p=.833. Question 2 p=.174 and the 2-tailed p=.562. Question 3 p= .321 and the 2-tailed p= .651. Question 4 p=.485 and the 2-tailed p=.742. Question 5 p=.275 and 2-tailed p=.631. Question 6 p=.964 and the 2-tailed p=.694. Question 7 p=.964 and the 2-tailed =.694. Question 8 p=.700 and the 2-tailed p=.272.

The results of the Levene's test for equality on how certification affected the survey responses to all eight questions the p value was greater than 0.5 therefor the 2 tailed p value was reviewed for each of the questions and all p values were greater than .05 therefor there was not a statistically significant difference between gender and the survey responses. Question 1 p=.274 and the 2-tailed p=.599. Question 2 p=.003 and the 2-tailed p=.200. Question 3 p= .110 and the 2-tailed p=.479. Question 4 p=.321 and the 2-tailed p=.651. Question 5 p=.274 and 2-tailed p=.599. Question 6 p=.198 and the 2-tailed p=.485. Question 7 p=.198 and the 2-tailed =.485. Question 8 p=.274 and the 2-tailed p=.599.

The results of the Levene's test for equality on how years of experience affected the survey responses to all eight questions the p value was greater than 0.5 therefor the 2 tailed p value was reviewed for each of the questions and all p values were greater than .05 therefor there was not a statistically significant difference between gender and the survey responses. Question 1 p=.0.30 and the 2-tailed p=.,265. Question 2 p=<.001 and the 2-tailed p=.392. Question 3 p= .190 and the 2-tailed p= .274 Question 4 p=.190and the 2-tailed p=.549. Question 5 p=.190 and 2-tailed p=.549. Question 6 p=.670 and the 2-tailed p=.896. Question 7 p=.670 and the 2-tailed =.896 Question 8 p=.719 and the 2-tailed p=.867.

The results of the Levene's test for equality on how years of employment affected the survey responses to all seven of the eight questions the p value was greater than 0.5 therefor the

2 tailed p value was reviewed for each of the questions and all p values were greater than .05 therefor there was not a statistically significant difference between gender and the survey responses. However, question 8 how satisfied are you with the IUSS process protocol there was a statistical difference between years of experience and survey responses. Question 1 p=.040 and the 2-tailed p=.085. Question 2 p=.230 and the 2-tailed p=.294. Question 3 p= .320 and the 2-tailed p= .294. Question 4 p=.485 and the 2-tailed p=.742. Question 5 p=.275 and 2-tailed p=.631. Question 6 p=.021 and the 2-tailed p=.104. Question 7 p=.021 and the 2-tailed =.104. Question 8 p=.001 and the 2-tailed p=.040.

Figure 10

Completed Survey

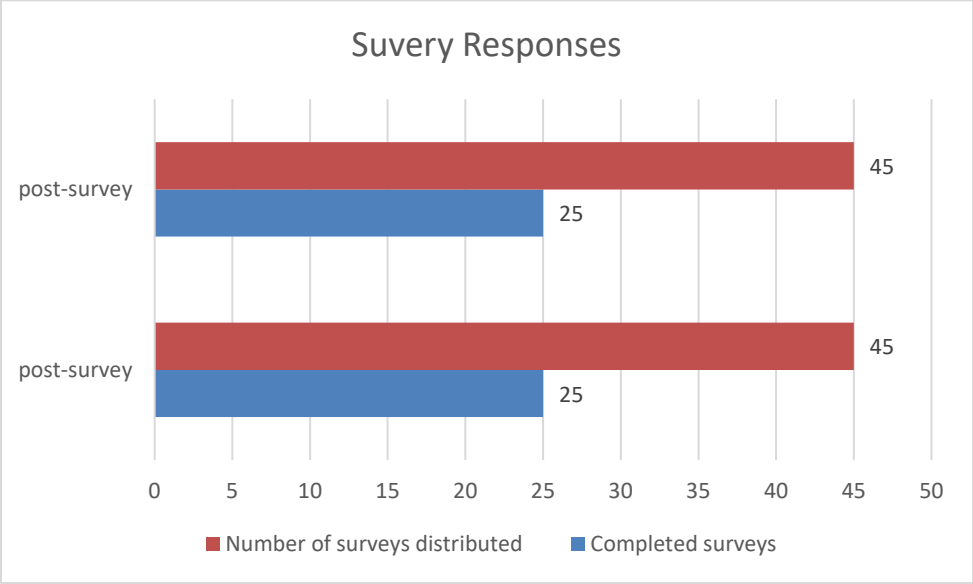


Figure 11

Percentage of completed pre-survey

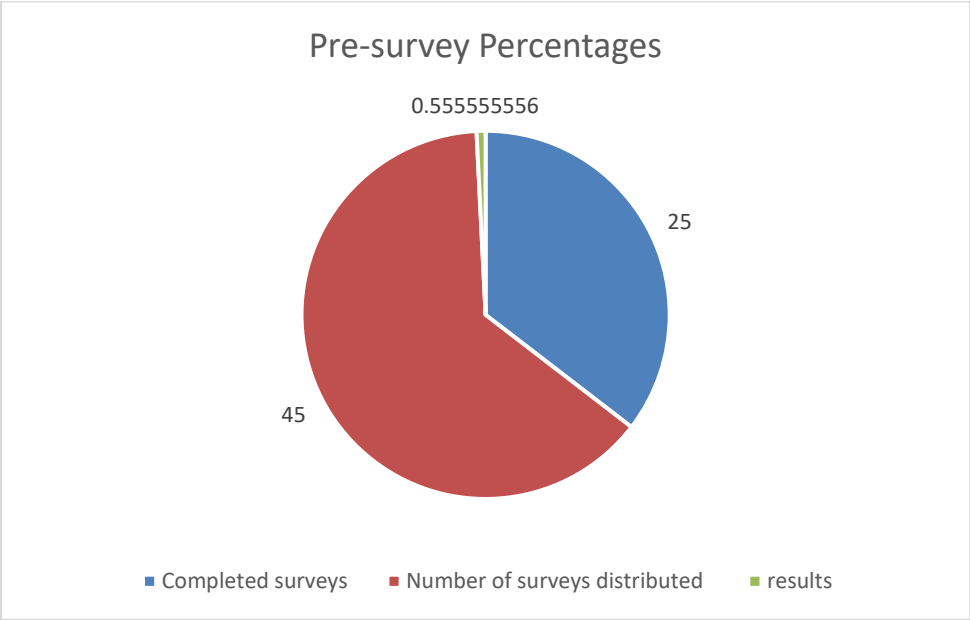
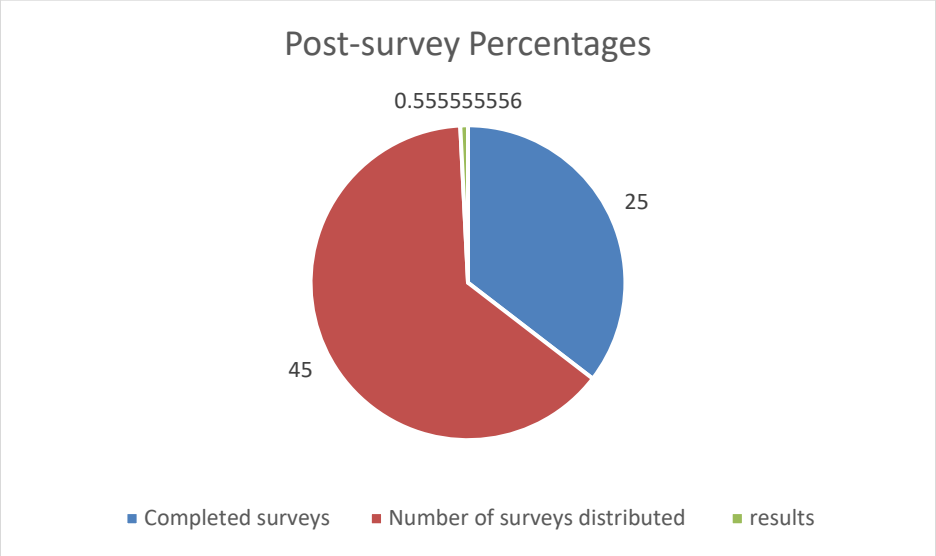


Figure 12

Percentages of completed post-survey



Process Measures

The process measures for this DNP project were used to monitor the effects of the implemented change at the clinical site. The project utilized the plan, do, study, and act (PDSA) cycle to monitor and make changes to the interventions as needed during the DNP project implementation (AHRQ, 2020). When barriers were identified the team worked to develop a

plan of action to overcome these obstacles to obtain the benchmark for the process measure. See appendix C for weekly PDSA cycles. During implementation, different obstacles, and processes changes for the IUSS process were identified and modified as needed using the PDSA cycles. See Appendix R for Implementation Evolution Over Time.

The process measure for the DNP project was to assess the effectiveness of reducing IUSS use on SSI rates. There is not a benchmark for IUSS use however the process measure benchmark defined for this project was that 90% of surgery staff would utilize the standardized process for sterilizing surgical instruments. Prior to implementation of the new IUSS process IUSS logs were reviewed during clinicals visits to gain an understanding of why IUSS was being used. The information was logged on an excel spreadsheet and included the type of instruments, reasons for IUSS, implanted device, and mangers approval obtained. See figure 16 through 22.

To accomplish a reduction in IUSS use a standardized sterilization process was created requiring the surgery manager approval prior to using IUSS. See appendix B for IUSS Process Flow Chart. The process measures were measured by audits and then results depicted on a run chart. Run charts are used to determine if interventions have resulted in improvement and if the improvements have sustained (Wells et al., 2016). Run charts are simple to understand, uncomplicated and straightforward to use (Wells et al., 2016).

Process observations and compliance with the IUSS process protocol plan was to be monitored bi-weekly by myself and the central sterile director. However, at each bi-weekly meeting with the central sterile director was unable to review logs due to staffing shortages. A retrospective review of IUSS logs as conducted on March 11, 2022, by the central sterile director and me. The review identified that the managers approval was obtain a third of the time that IUSS was used. See figure 28 for managers approval data.

As noted in figure 5 there was a 75% decrease in IUSS use from November 2021 to February 2022 which is less than the project benchmark of 90%. Additionally, there was an

increase in utilizing the standardized sterilization method noted after additional education was provided to the surgery staff. Also, the IUSS rate decreased from 20% to 1.5%. See figure 5.

Figure 16

Number of Times an Instrument was Process by IUSS between 11-8-2021 through 11-17-2021

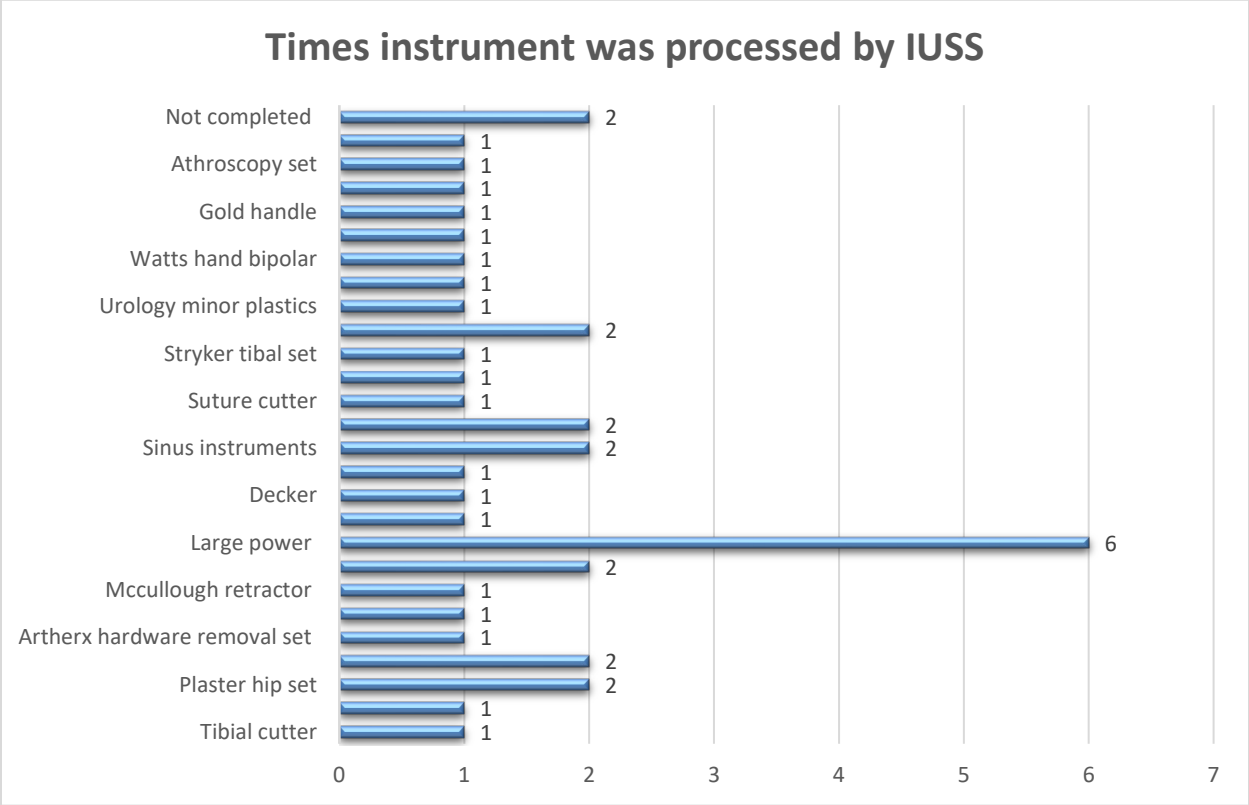


Figure 17

Reasons for IUSS use between 11-8-2021 through 11-17-2021

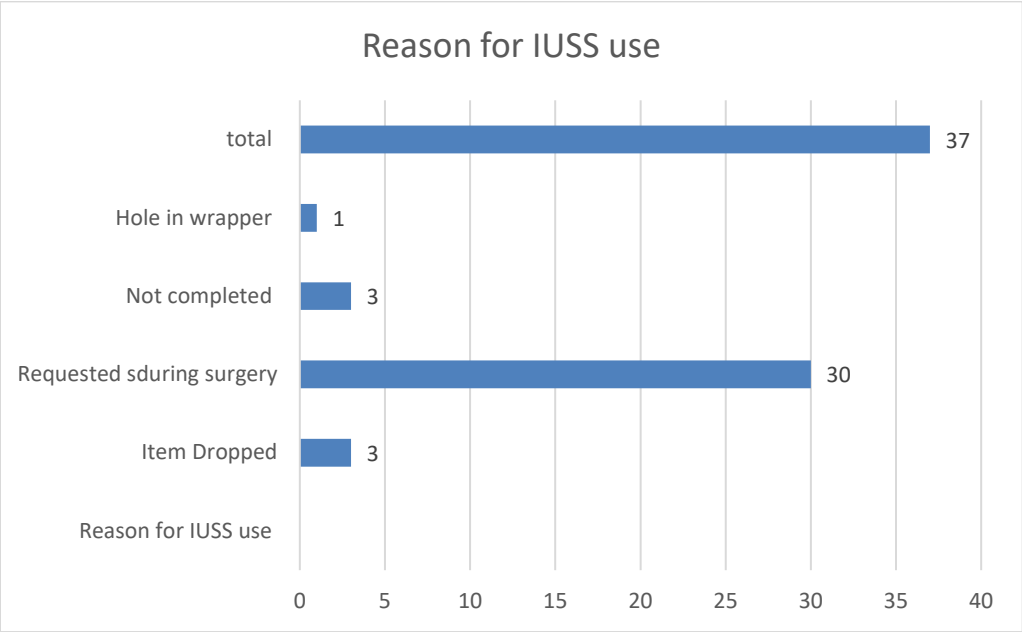


Figure 18

Number of Times the Managers Approval was Obtained between 11-8-2021 through 11-17-2021

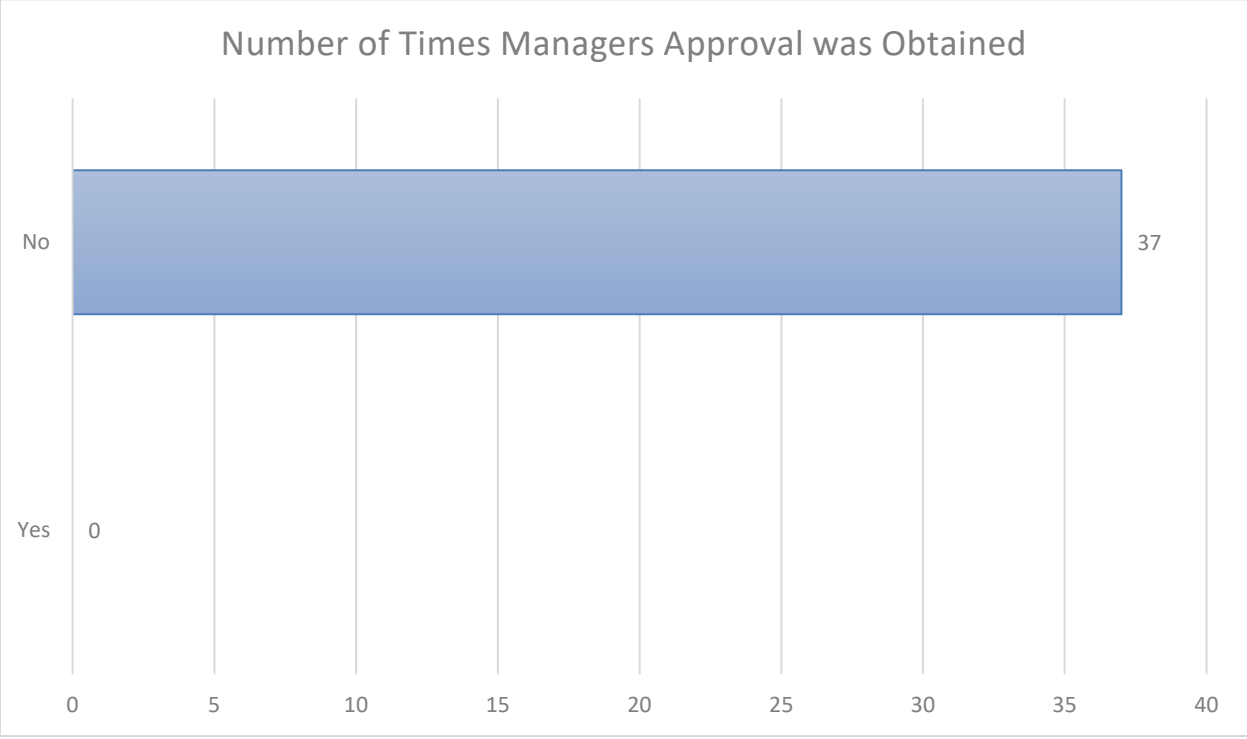


Figure 19

Number of Times an Implant was Processed by IUSS between 11-8-2021 through 11-17-2021

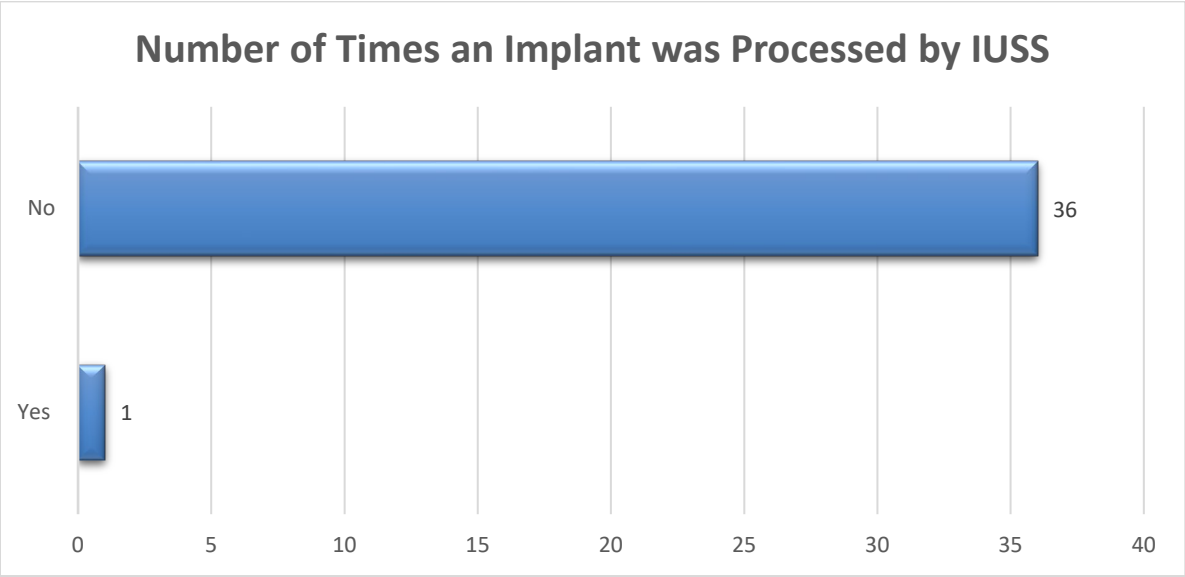


Figure 20

IUSS Trends per day

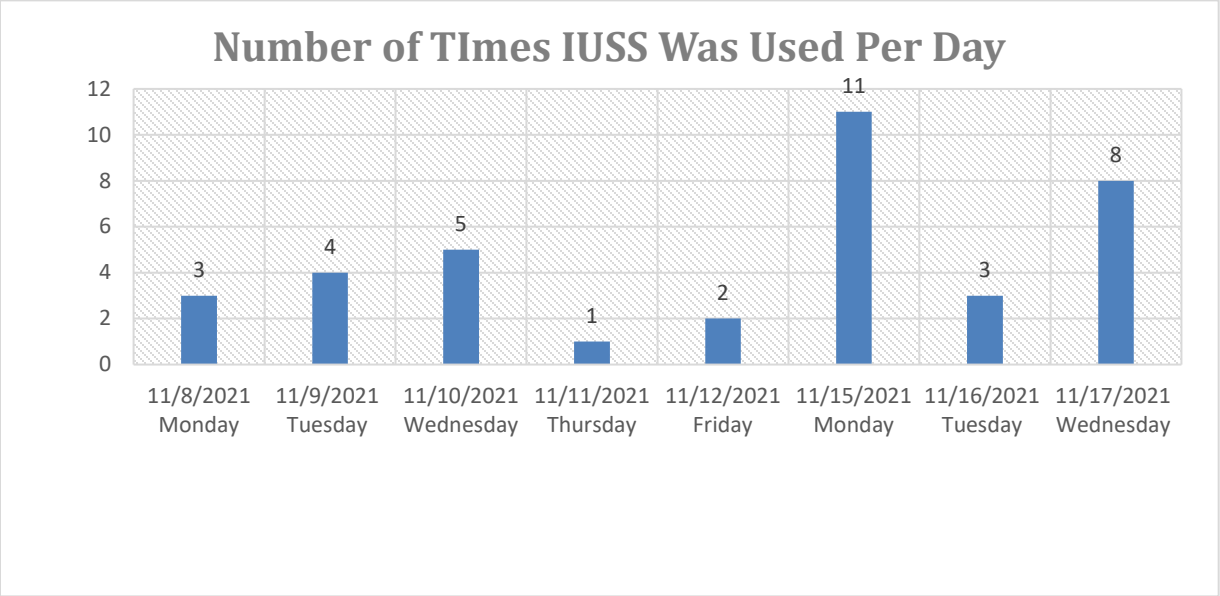


Figure 21

Trends in IUSS use per day of the week 11-8-2021 through 11-17-2021

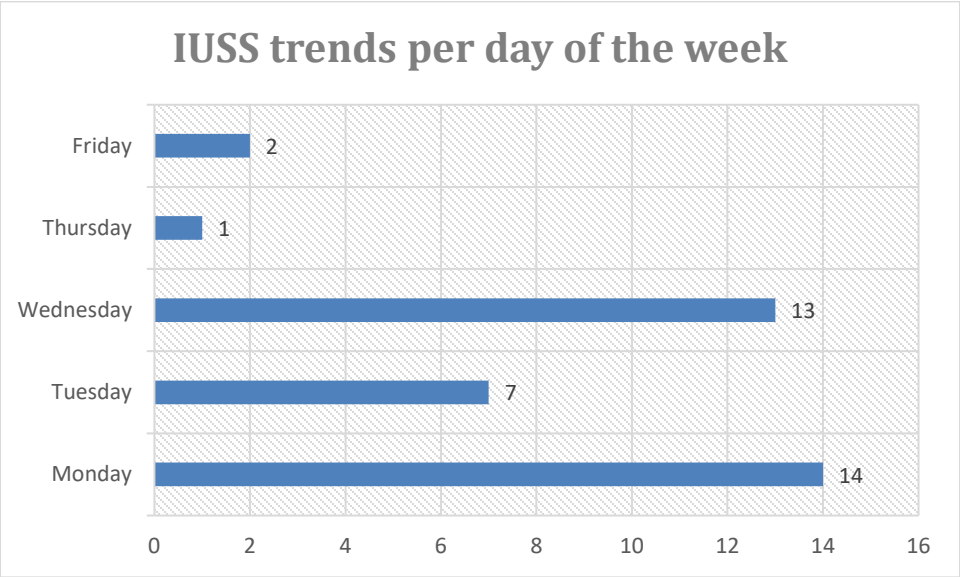
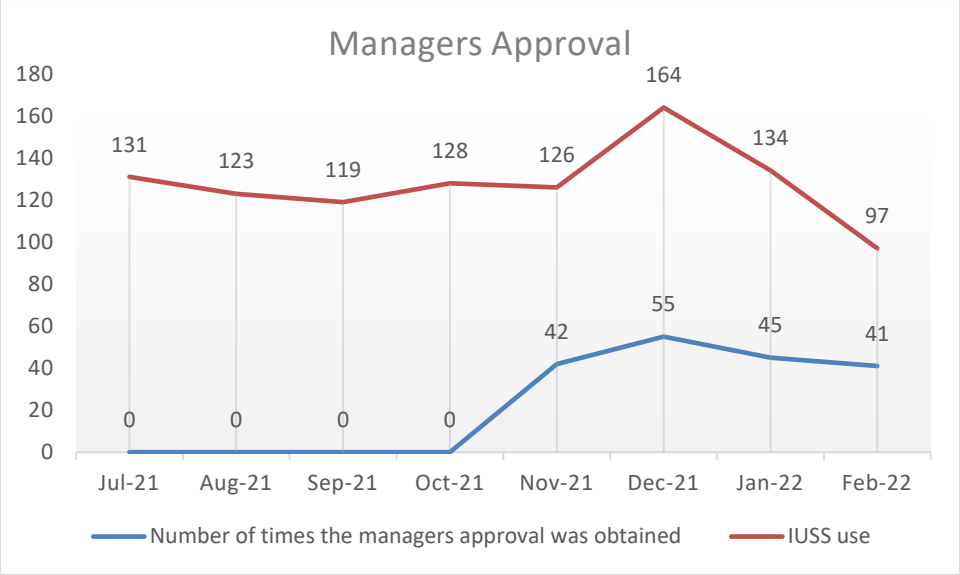
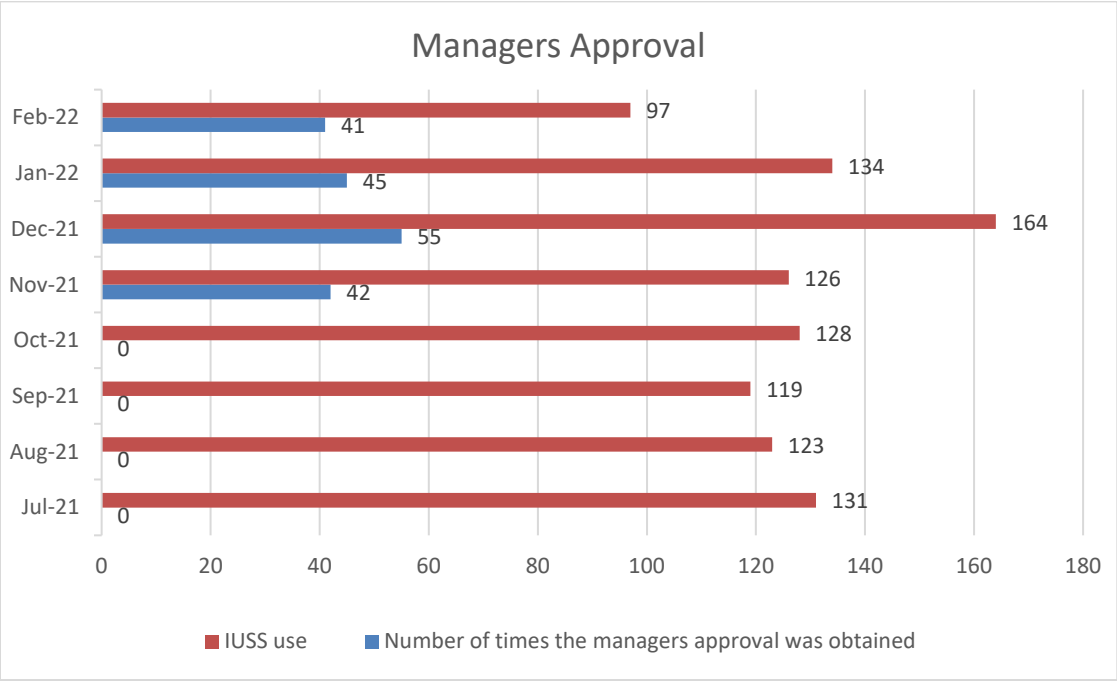


Figure 22

Mangers Approval Data





Balancing Measures

The balancing measures for this DNP project were to evaluate both positive and negative effects of the implementation of the IUSS process protocol. The negative balancing measure for the DNP project included surgery turnover times. Did the implementation of an IUSS process protocol increase the surgery turnover times? Surgery turnover time is defined as the amount of time it takes to clean the operating room (OR) after a surgical procedure has been completed, then set up and prepare for the next surgical patient. The surgery turnover time begins when one patient leaves the OR and ends when the next patient enters the OR. This data was not able to be collected due to a conversion of a new EMR system that took place during the pre-implementation phase of the project.

The positive balancing measure for the DNP project was the hospital reimbursement rates. Did the implementation of the IUSS process protocol increase the organizations reimbursement rates? This data was not able to be determined with the reimbursement time frame for payment. As noted above the time frame to determine a positive wound culture meets the requirements of and SSI is 30 to 90 days. Reimbursement rates also look at readmission. The

readmission rates are also 30 to 90 days. Readmissions and SSI decrease a facilities reimbursement rate from Medicare and Medicaid (Ames et al., 2019). Since 55% of all healthcare coverage is provided by Medicare and Medicaid, they have influence over hospital reimbursement rates (Ames et al., 2019). The facility had three readmissions prior to implementing the standardized sterilization process. The readmissions diagnoses included a hematoma, dislocation, and dizziness. The facility also had three readmissions post-implementation of the standardized sterilization process. However, one was an infection of a total knee arthroplasty. The other two were a hematoma and dislocation. The infected total knee was identified January and the original surgery took place November 9, 2021. Which was prior to the implementation of the new protocol. As noted above positive wound cultures where a medical device was implanted have 90-day criteria to be classified as an SSI.

The SSI rate post-implementation was 0.19% which is less than the goal set benchmark of 0.23%. This is the lowest SSI rate the facility has ever seen. The organizations' SSI rate for 2020 was 0.33%, noting a rate decrease of 0.14%. This indicates that the project innovation of reducing IUSS use was successful in reducing SSI infections as hypothesized. There was a 75% decrease in IUSS utilization after the educational seminars with is less the project goal of decreasing IUSS utilization by 90%. Additional educational handouts and tools were distrusted and placed on IUSS sterilizers February 2022 and the IUSS rate and volume decreased after additional education was provided. The IUSS volume decreased from 131 in August to 97 in February. Also, the IUSS rate decreased from 2.1% in August to 1.5% in February.

Discussion

The impact of the IUSS reduction protocol has proven to decreases the SSI rate at the surgical hospital. Although there were delays to the implementation of the project which resulted only collecting data for three months pre- and post-implementation. However as noted above there was a 0.14% decrease in the SSI. Also, IUSS rate decrease from 2.1% in august to 1.5% in

February. Also, the organization has indicated that the IUSS reduction protocol will remain the standard of care for its patients.

Healthcare Quality Impact

The implementation of the IUSS protocol was created based on current, evidence-based practice recommendation from AORN, TJC, CMS, and the CDC. The evidence indicates that organization should limited their IUSS use and should strive to meet that standard (Green et al., 2018). Although this project did not achieve as drastic of an IUSS reduction as seen in the other studies. This project did decrease their IUSS rate to 1.5% from the pre-implementation rate of 2.1%. Also, the facility was able to achieve the lowest SSI rate since they opened in 2002. Also, the organization strives to make this protocol the standard of care at the facility. The organization had three hospital readmissions pre-implementation and three post-implementations. Also, one of post-implementation readmission was an SSI. After investigating it was identified that the original surgery took place November 9, 2021. Which was prior to the implementation of the new protocol.

Anticipated and Observed Outcomes

The anticipated outcome was to have 90% of the staff utilizing the standardized sterilization process. However, data resulted with 75% of the staff utilizing this standardized sterilization process. The reason for the difference between the observes and anticipated was the initial lack of support by leadership and with the shortened time allotted for the educational seminar. The SSI rates far excessed the anticipated outcome expected by the innovation. As noted, the facility achieved the lowest SSI rate ever. One reason for the difference between the observed SSI rate and the anticipated could be the education provided to the staff on the consequences of IUSS use.

Economic and Cost Benefits

SSIs are the third most costly type of healthcare associated infections, with estimated

cost of $20,785 dollars per patient (Iskandar et al., 2019). Iskandar and colleagues noted that the current annual cost to the healthcare system was billions which has doubled since 2005 (2019). The economic burden of SSI is directly related to medical costs, such as increased length of stay, heightened level of care, additional surgeries, and utilization of medical resources (Iskandar et al., 2019). They noted that indirect cost associated with SSI include, an increased risk of morbidity and mortality which is two to eleven times more likely in SSI patients than in non-infected patients. Loss of quality of life, missed work, and loss of wages are associated with SSI (Iskandar et al., 2019). As SSI rates continue to increase, it is estimated that the cost of SSIs increases healthcare cost an additional 10 million dollars each year (Ames et al., 2019).

Also, an organizations SSI rates directly correlates with their reimbursement rates. Facilities can receive penalties or rewards depending on their SSI rates (Ames et al., 2019). Research shows that a patient who undergoes a surgical procedure where surgical instruments or implants are processed by IUSS are at an increased risk for a SSIs (Hutzler et al., 2013). Hutzler and colleagues noted that the Affordable Care Act reduced reimbursement rates for facilities with higher-then-expected readmission. SSIs are named one of the key causes of hospital readmissions; these patient's endure serious health consequences and even death (Hutzler et al., 2013). Reducing IUSS use reduces risk for post-operative SSIs and decrease healthcare expenditures. Hospitals are reimbursed according to readmission rates and SSIs rates. Reducing an organizations SSI rate could positively impact its reimbursement rates. Therefore, by reducing organizations SSI rates this could decrease the economic burden of SSIs and decrease health care expenditures.

Limitations

There were several limitations to the DNP project, including the potential presence of bias. Utilization of the Likert scale aided in decrease the risk of bias. Since it views the

information as important or not important which aid in reducing bias. Due to the project's design using the PDSA cycle, the goal was to show change, opposed to demonstrating statistical significance. Another limitation is the timeframe, due to IRB approval we were only able to collect data for four months pre-post implementation, rather than the six months originally discussed. Also, this study was performed in a physician owned facility, which may not be universal to other organizations. The approach to reducing IUSS may not be relevant to workflows at other organizations. The small sample size is another limitation. Only 25 staff members participated in both surveys. Lastly the balance measures were not able to be analyzed. The negative balance measure was not analyzed due to a conversion of a new EMR system that took place during the pre-implementation phase of the project. The positive balancing measure was the hospital reimbursement rates. This data was not able to be analyzed due to the reimbursement time frame for payment. As noted above the time frame to determine a positive wound culture meets the requirements of and SSI is 30 to 90 days.

Sustainability

Administration and the key stakeholders are committed to decreasing IUSS use within the surgical department. They are vested, supportive, and passionate toward patient care and decreasing SSI. The project results will be disseminated to administration, surgeons, and staff to emphasize the importance in reducing IUSS use. The facility will continue to make the IUSS process protocol the standard of care for their surgical patients and the protocol will continue to be implemented.

Recommendations

Healthcare Quality Impact

The implementation of an IUSS process protocol is based on recommendations from the CDC, TJC, and AORN (Hutzler et al., 2913). The CDC, TJC, and AORN all say that IUSS should be reserved for emergency situations and should never be used for surgical implants

(Hutzler et al., 2013). These organizations noted that it is best practice to eliminate IUSS use (Ames et al., 2019). Instruments and implants sterilized by IUSS can increase the patient's risk for an SSIs (Hutzler et al., 2013). An IUSS process protocol has been shown to limit the use of IUSS within the surgery department, thus improving patient safety scores and the hospital's reimbursement rates (Ames et al., 2019). After implementation of the IUSS process protocol the clinical site noted its lowest ever SSI rate which was 0.19%. Few SSI results in better patient outcomes. Thus, reducing hospital's readmission rates and improving patient safety scores.

Policy Implications

Currently, there are no national or state policies for an IUSS process protocol. The facility has a IUSS policy, but it is currently not being enforced. Implementation of an IUSS process protocol would support the current policy, provide guidelines, and create awareness of consequences of its use. The process will use the national standards and recommended guidelines from the American Nation Standard Institute (ANSI) and the Association for the Advancement of Medical Instruments (AAMI) which nationally recognized standards for best practices. AORN who published the recommended practice guidelines for IUSS. The process protocol will follow the national standards and recommended guidelines of IUSS use. Due to the positive results of this DNP project the IUSS reduction process protocol will now become the standard of practice resulting in new standard site policy for IUSS use.

Translation

This process protocol could be implemented in other surgical departments or outpatient surgery centers to decrease IUSS use and ultimately reduce the rates of surgical site infections. Some elements of the protocol may need to be adjusted due to the exact flow or process of the site, but the favorable results and clear protocol guidelines can easily be translated and replicated.

Dissemination

Site and DNP Committee Reporting

The project results will be disseminated via PowerPoint poster presentation to the clinical site surgery staff and key stakeholders following the University of Arkansas DNP Intensive Presentation. I will present project results to the doctoral committee at the University of Arkansas Eleanor Mann School of Nursing on April 20, 2022, at 1100 during the DNP intensive. The poster presentation will be utilized to disseminate data findings to the surgery staff and key stakeholders since the next surgery meeting following the intensive presentation occurs May 17, 2022. The poster can be displayed on the employee's educational board. Also, the post presentation will be disseminated to key stakeholder at the IUSS team meeting. The poster presentation could also be shared with the infection control committee, quality improvement committee, and the clinical operations committee at the organization. The dissemination of evidence-based practices (EBP) innovations is a crucial step in EBP (Beckett & Powell,2021). Dissemination of quality improvement project findings is an important factor within health care organizations to improve patient outcomes and evidence-based practices (Beckett & Powell, 2021).

Professional Reporting

One area of interests for dissemination of the project results is the local AORN Northeast chapter 3702. A poster presentation can be displayed during the chapter meeting. Another venue for dissemination is the Association of Oklahoma Nurse Practitioners (AONP). The 2022 conference will be held on September 14th and 15th. Also, the poster presentation will be presents at the Eleanor Mann School of Nursing research day on May 13, 2022.

The nursing journals that have been considered for future publication include the *Association of Perioperative Nurses and Perioperative Care and Operating Room Management*. Dissemination of QI findings can aid in organizations learning from each other's

experiences and improve patient outcomes and set appropriate expectations for future QI projects (Beckett & Powell, 2021). Therefore, by disseminating the DNP project findings to nursing journals other organization can implement a similar project within their organization. The association of perioperative nurses' journal provides resources for perioperative nurses to invest in their practice, health, and well-being to provide the safest patient care (AORN, 2022). Perioperative care and Operating Room Management is an online journal that serves as a multidisciplinary, peer-reviewed source of information related to the administrative, economic, and operational safety, and quality aspects of ambulatory and in-patient operating room and interventional procedural processes (Elsevier, 2022).

Conclusion

The DNP projected demonstrated the effectiveness of an IUSS process protocol in reducing SSI rates. The implementation of the standardized sterilization process protocol reduced SSI in post-surgical patients. The SSI rate post-implementation was 0.19% which is less than the goal set benchmark of 0.23%. There was a 75% decrease in IUSS use from November 2021 to February 2022 which is less than the project benchmark of 90%. The implementation of the IUSS process protocol increased the staff's knowledge on IUSS and its effects on SSIs, provided guidelines for IUSS use, and required approval for its use. There was a statistically significant difference between the pre and post educational survey for all the survey questions. Also, the educational seminar increased the staff's awareness of the importance of acquiring the managers approval prior to using IUSS. On the pre-implementation survey 20% of the staff felt it was extremely important to obtain approval prior to using IUSS. However, on the post-implementation survey 68% felt acquiring the managers approval was extremely important. This project has proven that by decreasing IUSS utilization you can decrease SSI rates in post-surgical patients. By reducing the IUSS the facility was able to reduce the SSI rates to the lowest the facility has ever had. The research proves that there was a gap in care with utilizing IUSS instead

of using the proper means of sterilization which is terminal sterilization. By changing the IUSS process to a standardized sterilization process protocol requiring the managers approval the organization decreased its SSI rates, IUSS rates, and increased the staff's knowledge of IUSS and its effects on SSIs.

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Appendices

A. Global Aims Assignment

B. Process Flowchart

C. Evidence Table

D. Theoretical Framework

E. Conceptual Model

F. Gantt Chart

G. Final IUSS Gantt chart

H. Statement of Mutual Agreement for DNP Guidance

I. PRISMA Flow Chart

J. IUSS Pre and Post Questionnaire

K. Informed Consent

L. Survey Recruitment Script

M. Copy of Pre-Post Survey Questionnaires

N. IUSS reduction Process Flow Chart

O. IUSS Reduction Process Protocol

P. Check List for Sterilization

Q. Educational tools

R. HIPAA Completion Forms

S. Copy of Site's IRB Approval, if applicable

T. Implementation over time

U. Process Flowchart

V. PDSA weekly cycles

Appendix A:

Global Aim Statement

Write a Theme for Improvement: _To decrease the use of immediate use steam sterilization therein aiding in a reduction of surgical site infections.

Global Aim Statement

Create an aim statement that will help keep your focus clear and your work productive:

_____We aim to decrease the use of immediate use steam sterilization_____

(Name the process)

In: _the surgical department in a hospital

_____

(Clinical location in which process is embedded)

The process begins with: assessment of the current practices of the organization to identify why IUSS is being used like the types of surgical instruments, type of surgical procedures, specific surgeons and the time of day to analyze why IUSS is being used. Spring 2021 in Dr Kilmer class NURS 628V_____

(Name where the process begins)

The process ends with: by identification of ways to reduces the IUSS use. __Spring 2022 in Dr Kilmer class NURS 7142_____

(Name the ending point of the process)

By working on the process, we expect: __the goal is to see a reduction of surgical site infections.

_____

(List benefits)

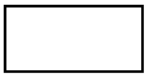
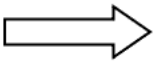
It is important to work on this now because: _CMS reported that IUSS even when all steps are preformed properly, should be limited to situation in which there is an urgent need and insufficient time to process an instrument by using terminal sterilization. Also, according to the Joint commission evidenced based guidelines should be adopted to minimize the use of immediate use steam sterilization (IUSS). Also, the center for Medicare & Medicaid Services (CMS) noted surgical instruments must ordinarily be sterilized using terminal sterilization cycles within rigid sterilization containers, wrappers, or primary packaging designed to maintain the instruments sterility and which allows the devices to be stored for later use (terminal sterilization). CMS also noted that IUSS is used to describe the process for steam sterilization an instrument that is needed immediately, not intended to be stored for later use and which allows for minimal or no drying after the sterilization cycle.

_____

(List imperatives)

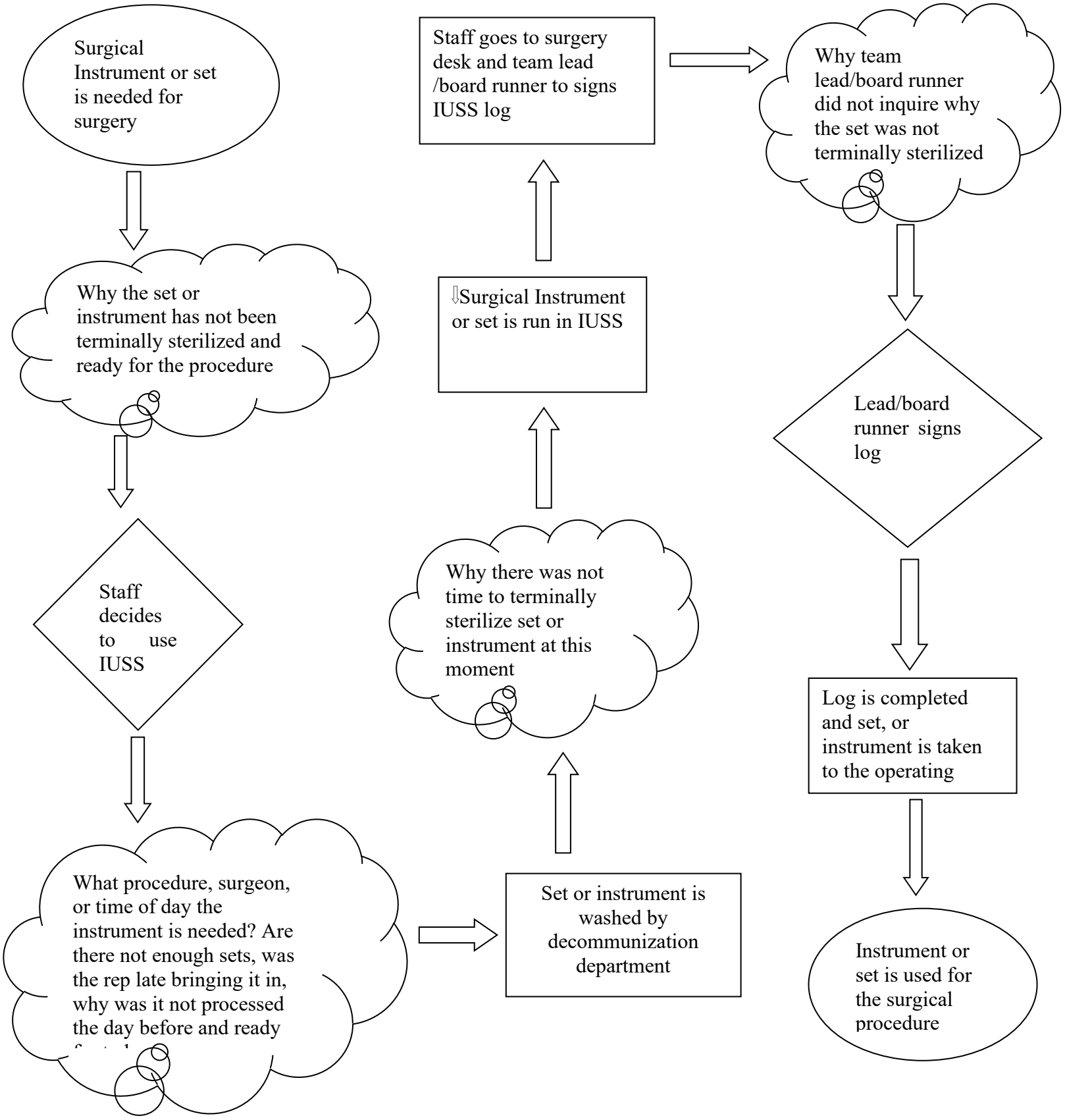
Appendix B:

Process Flow Chart Key

	Process beginning or end
	Activity Step
	Decision Points
	Waits and Delays
	Things you don't know
	Connector, such as off page
	Process flow direction

Appendix B:
Process Flow Chart

Current process for immediate use steam sterilization (IUSS)



Appendix: C

Evidence Table

Authors	Year	Country where research conducted	Theory guiding the study and identification of concepts	Independent or Treatment Variable(s)	Dependent or Outcome Variable(s)	Research Design	Sample Method (N=)	Data Collection Process	Brief Summary of Results	Strength of evidence (Level)
Link	2019	United States	Guideline for processing reusable medical equipment	Sterilization	medical equipment	Descriptive study	Scenario one facility	Descriptive analyses	Sterilization process steps and ensure proper sterilization of medical equipment to eradicate microbial contamination	IV
Panta et al.	2020	Nepal	Understanding the compliance of primary and secondary care public hospitals in Nepal with the standard practices for medical devices reprocessing	Standard practice for steam sterilization	Medical device reprocessing	Comprehensive observational study	N=189 Total number of medical device reprocessing cycles audits	Randomized sampling	Analysis of standards of practice for reprocessing medical devices in Nepal hospitals and explanation of findings and interventions for improvement	III
Elgafy et al.	2018	United States	Reduction of surgical site infection	Glycemic management, preoperative skin preparation, limiting operating room traffic, limit number of people in surgical procedures, eliminate	Decrease postoperative spine wound infections	Systematic review	Searched articles including key terms using electronic data bases searched from 1990-october 2014	Systematic review of literature	To define a ten step protocol that reduces the incidence of surgical site infection in spinal surgery practice	II

				flashing of equipment, double-gloving, local application of vancomycin power, redosing antibiotics, irrigation of subcutaneous tissue with iodine, use of Duraprep						
Brooks et al.,	2019	United States	To analyze the entire surgical process and address adverse patient events.	Role between the operating room staff and sterile processing department	Use of IUSS	Qualitative data collection	N=22 qualitative interviews and qualitative bench-marching databases	inductive qualitative analysis approach with thematic analysis. double blinded copy coded the interviews.	Creative approaches of staff and equipment management in sterile processing	III
Panta, et al.,	2019	New Zealand	Understanding the effectiveness of autoclaving in sterilized reusable medical devices.	Medical devices	Effectiveness of autoclaving	Systematic review of descriptive studies	N=253	Systematic review of literature	Inadequate reprocessing of medical devices and its effect on surgical site infections.	IV
Zucco, et al.,	2019	Italy	Nursing knowledge and attitudes on evidenced bases practices to prevent surgical site infections.	Surgical site infections	Nursing knowledge on preventative practices like, hair remove, IUSS, dressing changes	Cross sectional survey	N=1305	Descriptive analyses	The studied questioned 1305 nurses on their understanding preventative practices used to decrease surgical site infections.	III

CDC	2016	United Stated	Clinical practice guideline	Sterilization methods	Bioburden	Guideline for use	N/A	Standard of care	Guideline for disinfection and sterilization in healthcare facilities	
World Health Organization	2016	Switzerland	Decontamination and reprocessing of medical devices for health care facilities	sterilization process	Eliminating bioburden	Clinical practice guideline	N/A	Sponsored by the WHO	Instructions on how to decontaminate and reprocess medical devices	
OR manager	2017	United States	Reducing IUSS is challenging but adherence to standard is essential for patient safety and successful accreditation survey	Team interventions	Dropping IUSS use	Quality improvement process	1 hospitals data. Number of IUSS incidents by the number of cases over a month to track trends	Tracking use of IUSS	How one hospital analyzed their IUSs process, identified why and when the IUSS was being utilized and implemented a process change and ultimately decreased their IUSS use	V
Alexander et al.,	2016	United States	Using best practice guidelines to overcome facility challenges with elimination of IUSS	Analyzed reasons for each IUSS use	Develop, validate, prioritize and implement interventions	Quality improvement process	1000 surgical cases	Tracking surgical cases and use of IUSS	Using a multidisciplinary team collaborate to decrease use of IUSS	V
Sheffer	2015	United States	Lowering the risk of surgical site infection by increasing rigor of immediate use steam sterilization policy	Identify current practice and implementing a change in policy	The facilities process for sterilization medical equipment	Quality improvement process.	1 hospital in the US	Tracking IUSS load in a 28 day period. decreased	How one hospital decreased its IUSS load from 330 in a 28 day period to almost nil. The steps they took to identify why the IUSS was being used and how they changed the operating rooms perception of IUSS	V
Hospital infection and prevention	2017	United States	Citing for flash sterilization	Tracking and analyzing common reasons staff are using IUSS	What surgical instruments needed to be purchased related to use of IUSS	Clinical practice guideline	1000 operative case	Tracking use of IUSS	Using CMS and Joint Commission guideline to eliminate IUSS	V
Foster et al.	2015	United States	Elimination of flashing surgical equipment by implementation of fast track method of sterilization	Elimination of IUSS	Implementation of Code flash	Quality improvement program	One facility reduction of IUSS use	Tracking use of IUSS	The way one facility change the perception of the surgery team on elimination of immediate use steam sterilization	V
AORN Guidelines	2021	US	Guidelines for perioperative practice	Guideline	Professional organization guideline	Clinical practice guidelines			AORN guidelines on IUSS use	
Hutzler et al.	2013	US	Eliminating preventable causes of IUSS use	Elimination of preventable causes of IUSS USE	Surgical instruments and implants	Quality improvement program	N=16000 surgeries annually	Preventable causes of IUSS use and unpreventable causes, number of IUSS uses for instruments and implants	One facilities QI project to eliminate preventable cause of IUSS use. Implementation strategies, education, and process changes	IV

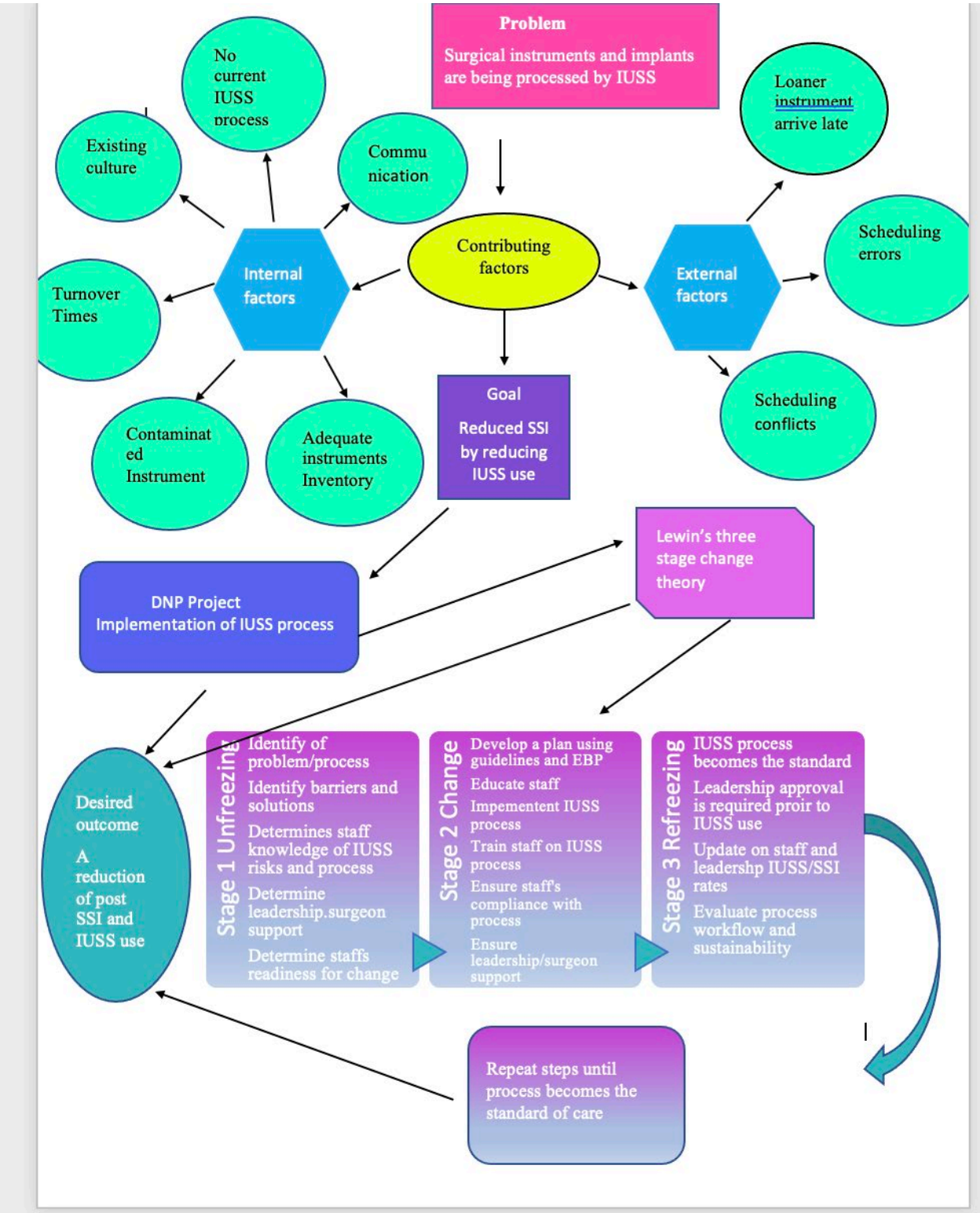
									and process changes	
Ames et al.	2019	US	Hospital reimbursement and what affects the amount of compensation	Quality of care provided, best practices, patient experiences	Hospital's reimbursement rates	Revenue bases care	N/A		Impact of sterile processing on hospital reimbursement rates. Discusses what factors reduce the hospitals reimbursement. Like SSI, readmission, patient satisfaction	V
Aakash et al.	2018	US	Synthesis of literature on sterilization	SPD, OR	Sterilization practices	Quality improvement	N/A	Synthesis of literature	Adherence to sterilization protocols and those involved in the process. A review of logistics, cost, and potential adverse effects with current practice of sterilization.	V
Seavey	2019	US	Updates guidelines for sterilization	Sterilization process	Surgical instruments and implants	Recommended practices	N/A	Recommended practices	Sterilization updated guidelines reviewed	V
Costa et al.	2018	Brazil	Reprocessing loaned instruments and implants and biofilm left after sterilization	Sterilization processes loaned instruments	Bioburden	Quality/safety	N=40	Safety issues	To determine the condition of loaned instruments and implants when delivered to a hospital assess quality of the complex design by manual	VI

									cleaning and effects of multiple reprocessing of single use implants.	
Seavey	2013	US	Recommend practices	IUSS	Surgical instruments	Quality/safety	N/A	Guidelines	IUSS process understanding all the steps that need to take place when using IUSS. Risk of IUSS and organization position statements on IUSS	V
Nania	2013	US	Guidelines for steam sterilization use	Sterilization	Surgical instruments	Compliance with sterilization practices	N/A	Recommendations	Different types of sterilization processes. Background on sterilization. Sterilization guidelines from professional organizations. Steps in the sterilization process.	V
Simons et al.	2021	US	AAMI standards of methodology in reducing IUSS	IUSS rates	Phaco kits	Framework to provide reliable sustainable process for sterilization process	Standards for Quality Improvement Reporting Excellence (SQUIRE)	Navigational changes in point of care sterilization	How one facility used the framework to decrease IUSS use with ophthalmology services line and eventually expanded the practice to tother services lines. It reviews the	V

									sterilization history, process, implementation of process changes, education and policy changes.	

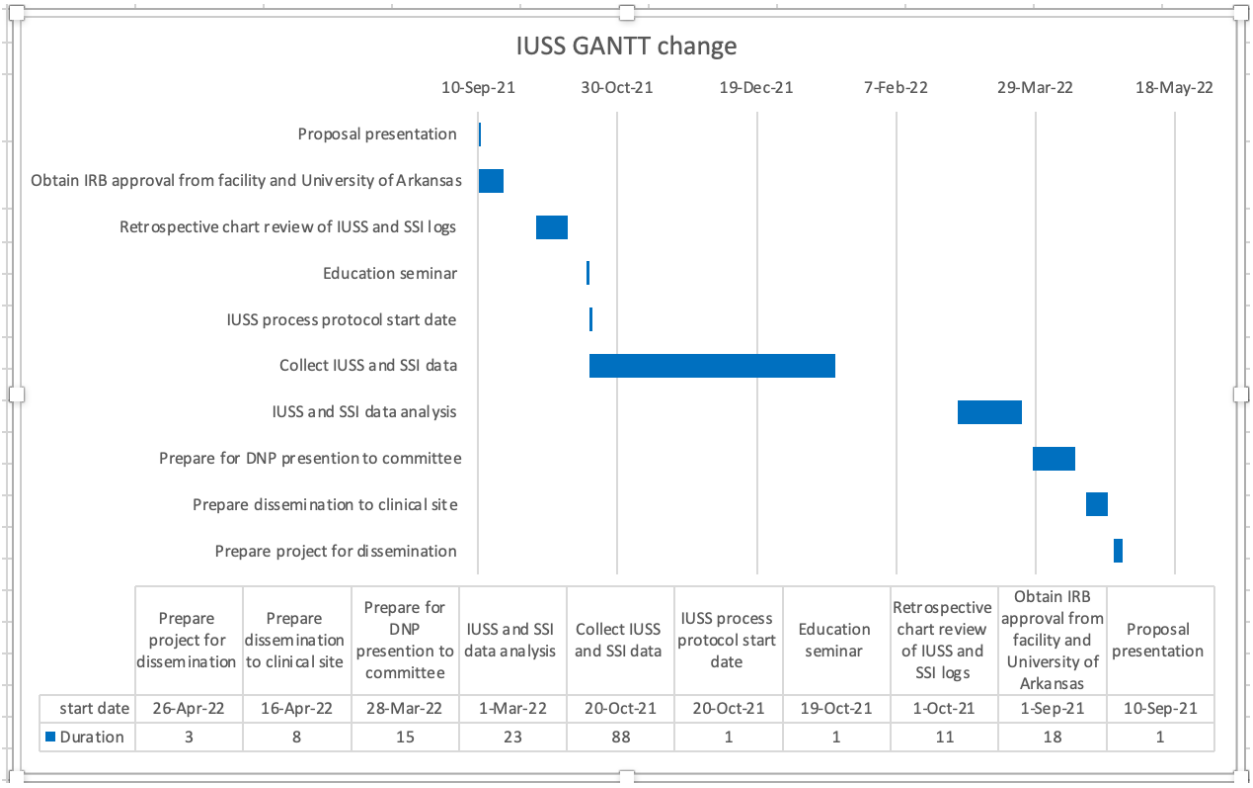
Young, M.	2013	US	IUSS facts	Facilities sterilization practices	IUSS use	Quality improvement	N/A	Standards for IUSS use	When and how to use IUSS	V
Reseendiz, et al.	2020	US	What bacteria can remain on instrument after sterilization	Steam sterilization	bioburden	Quality improvement	N=60	Plot study	How ineffective sterilization practices increase patient SSI risk.	V
Aakash, et al.	2015	US	Effective reprocessing system	SPD	Increased cost	Quality improvement	N/A	Shifting toward terminal sterilization	Working toward using terminal sterilization to decrease cost and improving the SPD workflow	V
Mathias	2015	US	Improving sterilization practices	IUSS use	Decreased reimbursement rates	Quality improvement	N/A	Survey preparation	IUSS process, how to be survey ready	V
Mejia et al.	2015	US	Identifying factors that increase SSI	Sterile environment	Decreasing prosthetic joint infections	Quality improvement project	N/A	SSI infection rates	How one facility worked to decrease prosthetic joint SSI by a interdisciplinary team to identify factors increasing patient SSI risks	V
Green et al.	2018	US	Decreasing IUSS rate in one facility	Loaner instruments, lack of adequate instruments, communication	Increased use of IUSS processing	Quality/safety	N/A	Benchmarking IUSS use against previous use	How one facility decreased ISS us by 50% in 15 months by using an IUSS team and identifying areas that needed action.	V
Nino et al,	2020	US	Enhanced Kaizen event framework and PDCA	SPD department	Increased waste	Quality improvement	N/A	Case study	Use of framework to decrease waste and increase productivity in the SPD	VI
Melo Costa et al.	2018	Brazil	Assessment of residual biofilm after sterilization	Sterilization process	Bacteria	Patient safety	N=60	Safety issues with reprocessed instrument s	How bacteria can remain on instruments that are sterilized improperly	V

Appendix: E
Conceptual Model



Appendix: F

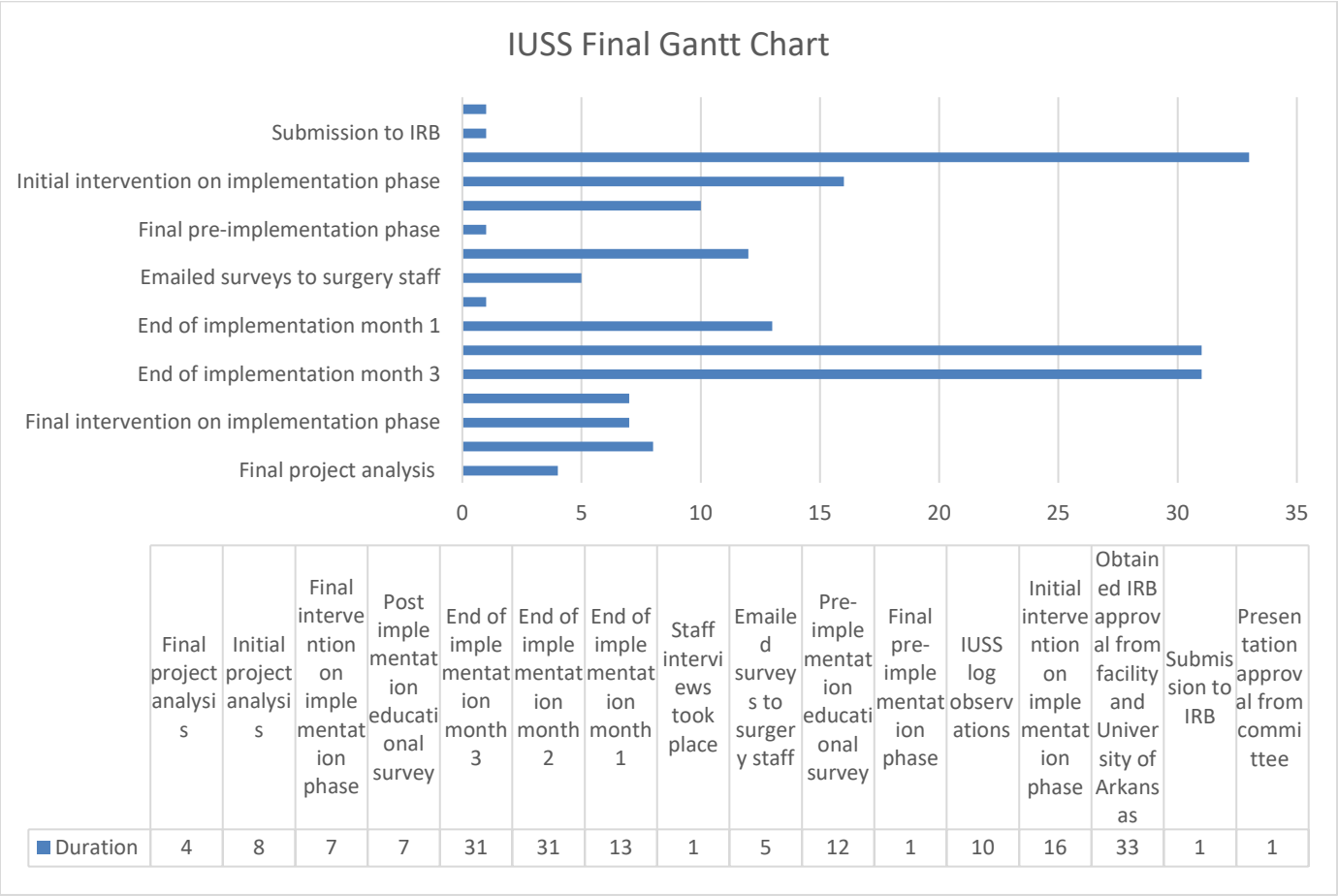
IUSS Gannt Chart



	Prepare project for dissemination	Prepare dissemination to clinical site	Prepare for DNP presention to committee	IUSS and SSI data analysis	Collect IUSS and SSI data	IUSS process protocol start date	Education seminar	Retrospective chart review of IUSS and SSI logs	Obtain IRB approval from facility and University of Arkansas	Proposal presentation
start date	26-Apr-22	16-Apr-22	28-Mar-22	1-Mar-22	20-Oct-21	20-Oct-21	19-Oct-21	1-Oct-21	1-Sep-21	10-Sep-21
Duration	3	8	15	23	88	1	1	11	18	1

Appendix G

Final IUSS Gantt Chart



	Final project analysis	Initial project analysis	Final intervention on implementation phase	Post implementation educational survey	End of implementation month 3	End of implementation month 2	End of implementation month 1	Staff interviews took place	Emailed surveys to surgery staff	Pre-implementation educational survey	Final pre-implementation phase	IUSS log observations	Initial intervention on implementation phase	Obtained IRB approval from facility and University of Arkansas	Submission to IRB	Presentation approval from committee
Duration	4	8	7	7	31	31	13	1	5	12	1	10	16	33	1	1

Appendix: H

Statement of Mutual Agreement

UNIVERSITY OF ARKANSAS
College of Education and Health Professions
Eleanor Mann School of Nursing

Appendix B: Statement of Mutual Agreement for DNP Guidance

DNP Student Name: Christy Overly Clinical Site or Agency: Oklahoma Surgical Hospital

DNP Committee Chair: Dr. Callie Bradley Site Champion Name & Title: Scarlett Young

DNP Project Title: IUSS Process Protocol

Expected On-Site Activities: Implementation of an IUSS Process Protocol, Educational seminar on IUSS consequences, pre and post survey assess staff's knowledge of IUSS and its effect on SSI.

Agency Approval for Presentations and Publications:

- How agency will be referenced: Oklahoma Surgical Hosptial
- Approval granted to use agency name in presentations/ publications:
- Approval granted to use agency name in the University of Arkansas DNP Project Scholar Works online repository:
- Is IRB submission required at site? ___ Yes X No

DNP Student Signature: Date: 7/21/2021

Committee Chair Signature: Callie Bradley Date: 7/26/21

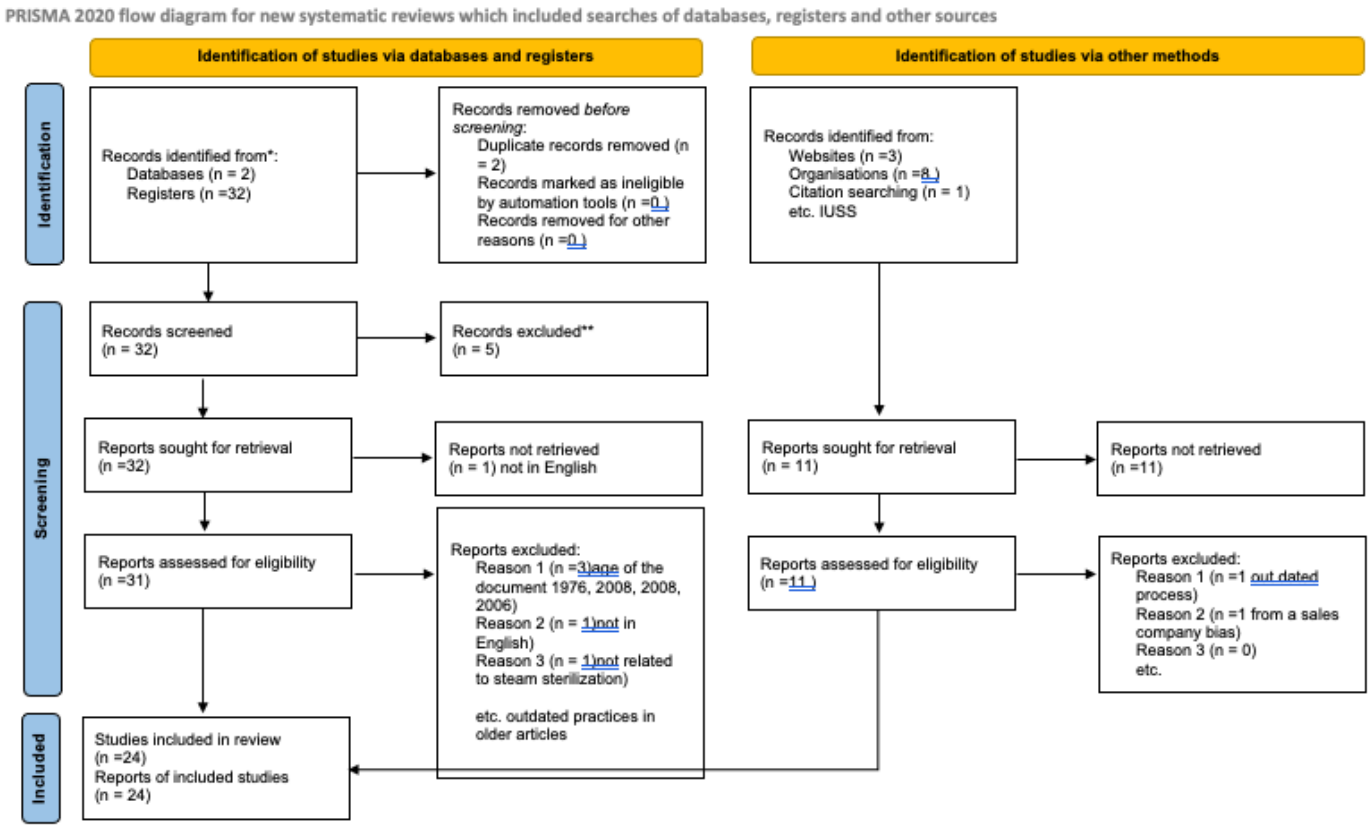
Site Champion Signature: Scarlett Young Date: 7/21/2021

Preceptor Signature: Date: 7/21/2021

1

Appendix: I

Prisma Flowchart



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers).
**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/

Appendix: J

Immediate use steam sterilization questionnaire

1. What are your thoughts on the IUSS currently in the surgery department?
    a. Is it used appropriately?
    b. Used too frequently?
    c. Used according to the IUSS guidelines?
2. What do you think the reason is for the frequent IUSS use?
    a. Surgical Instruments not processed overnight by the central sterile department?
    b. Surgical Instruments was not deliver the day before by the medical device sales rep?
    c. Surgical instruments dropped during procedure and not another replacement sterile?
    d. Not enough surgical instruments or sets available for the days surgery case load?
    e. Hole in the sterile wrap around surgical instruments?
3. Is there a certain day the IUSS is used more frequently?
4. Are there any trends in the surgical instruments that are being sterilized using IUSS more frequently?
5. Are there trends with surgeons and IUSS use?
    a. If so how many surgical instrument sets does that surgeon have?
    b. How many cases does that surgeon have on a typical day?
6. Are there any other reasons for the IUSS is used instead of the surgical instrument processed by the central sterile department?

Appendix: K

Informed consent IUSS Reduction Process Protocol

TITLE OF PROJECT: To Flash or Not to Flash

PRINCIPAL INVESTIGATOR
Christy Overly
University of Arkansas Eleanor Mann School of Nursing
606 N. Razorback Rd.
1-479-575-3904
[coverly@uark.edu]

FACULTY ADVISOR
Callie Bradley, DNP, FNP-C
University of Arkansas Eleanor Mann School of Nursing
606 N. Razorback Rd.
435-559-4653
cmbradle@uark.edu

PURPOSE OF PROJECT

You are being asked to take part in a DNP project. Before you decide to participate in this project survey, it is important that you understand why the project is being done and what it will involve. Please read the following information carefully. Please ask the principal investigator if there is anything that is not clear or if you need more information.

The purpose of this project is to decrease Immediate use steam sterilization (IUSS) use in the surgical department through the implementation of an IUSS reduction process protocol. It is expected that decreasing IUSS use would aid in decreasing the number of post-surgical SSIs and improve post-surgical patient outcomes. Sterilization failures and infectious outbreaks have been attributed to improper cleaning, disinfection, and sterilization of medical devices (Link, 2019). The same sterilization steps used in terminal sterilization of surgical instruments, sets, and implants should be used in IUSS process.

This project's aim is to decrease the number of post-surgical site infections (SSI) through the reduction of IUSS. The goal is to decrease the utilization of IUSS by 90% and to reduce the SSI rate at or below 0.23 within the organization.

PROJECT PROCEDURES

The following is the suggested procedures that will take place:

- IUSS reduction process protocol will be implemented
- Staff will be trained on IUSS process protocol and IUSS consequences
- Surgery manager approval will be required prior to using IUSS
- Instruments that meet the requirement for IUSS use will be cleaned, inspected, sterilized following the manufacturer's instructions for use.

- IUSS documentation will be properly completed
- Improved communication between the central sterile department and surgery on instruments needed to be turned over for additional surgical procedures
- Loaner instruments and implants will be delivered to the facility no later than 24 hours prior to the needed surgical procedure
- IUSS reduction team will identify causes for current IUSS use, ensure proper documentation, and ensure sterilization practices follow the manufacturers instruction for use
- Terminal sterilization will be the preferred sterilization process

RISKS

There are minimal risks for completion of this survey. There is a for potential loss of participant survey information, but this will be limited due to anonymous nature of the survey and secure storage of information.

BENEFITS

Benefits to participating in this project include:

- Implementation of an evidence-based practice intervention
- Decrease in SSI rates
- Increase in hospital reimbursement rates

CONFIDENTIALITY

Your responses to the surveys will be anonymous. Please do not write any identifying information on your surveys. The only identifiable information will be a unique coded number provided by the survey participant to match pre-and post-survey results.

To assure patient confidentiality, it is requested that data is de-identified when provided to the principal investigator. The principal investigator will keep data in a computer that is password protected. Notes, interview transcriptions, and any other identifying participant information will be secured in a locked file cabinet in the personal possession of the principal investigator.

Participant data will be kept confidential to the extent allowed by law and University policy. The researcher is legally obligated to report specific incidents which include, but may not be limited to, incidents of abuse and suicide risk.

CONTACT INFORMATION

If you have questions at any time about this project, or you experience adverse effects as the result of participating in this project, you may contact the principal investigator, whose contact information is provided on the first page. If you have questions regarding your rights as a study participant, or if problems arise which you do not feel you can discuss with the Principal Investigator, please contact the University of Arkansas Institutional Review Board at 1-479-575-2208.

VOLUNTARY PARTICIPATION

Your participation in this project survey is voluntary. It is your decision whether or not to take part in this survey. If you decide to take part in this project, you will be asked to sign a consent form. After you sign the consent form, you are still free to discontinue the survey at any time and without giving a reason. Withdrawing from this survey will not affect the relationship you have, if any, with the principal investigator. If you withdraw from the survey before data collection is completed, your data will be returned to you or destroyed.

CONSENT

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost.

Please provide your consent to participate in the survey:

	Yes	No
I consent to participate	[ ]	[ ]

Appendix L

Survey Recruitment Script

Hello, my name is Christy Overly, and I am a DNP student at the University of Arkansas. I am conducting a survey to investigate your understanding of surgical sterilization processes within the surgical department. You are being asked to participate in this survey given your role within the surgical department and participation with the newly implemented IUSS reduction Process Protocol.

Your participation in this survey is voluntary and it is your decision whether or not to take part in this survey. You are not required to participate in the survey and withdrawing from this survey will not affect your relationship you have with me or the surgical department.

Please complete the survey that has been passed out. The survey is designed to take less than 5 minutes.

Thank you for your participation.

Appendix: M

IUSS Pre Survey

Demographic information:
Male or Female
License or certification type (Select all that apply): RN BSN CNOR CST
Years of experience working in the operating room: _____
Years of employment at OSH: _____
Identifier last 4 of phone number_____

Circle the answer that best applies

1. How important is it to obtain approval prior to using immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

2. How important is it that the needed instrument is taken to central sterile for cleaning, disassembly, and inspection prior to using immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

3. How important is it that the hinges are open, instrument is disassembled, and a chemical indicator is placed in the sterilization tray?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

4. How important is it to ensure the sterilizer parameters are met prior to using an instrument process by immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

5. How important is it to complete the immediate use steam sterilization log?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

IUSS Post Survey Questionnaire

Demographic information:
Male or Female
License or certification type (select all that apply): RN BSN CNOR CST
Years of experience working in the operating room: _____
Years of employment at OSH: _____
Identifier last 4 of phone number_____

Circle the answer that best applies

1. How important is it to obtain approval prior to using immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

2. How important is it that the needed instrument is taken to central sterile for cleaning, disassembly, and inspection prior to using immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

3. How important is it that the hinges are open, instrument is disassembled, and a chemical indicator is placed in the sterilization tray?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

4. How important is it to ensure the sterilizer parameters are met prior to using an instrument process by immediate use steam sterilization?
   Very important
   Important
   Moderately important
   Slightly important
   Not important

5. How important is it to complete the immediate use steam sterilization log?
   Very important
   Important
   Moderately important
   Slightly important
   Not important
6. My knowledge of the risks of immediate use steam sterilization have increased following the educational instruction.
   Strongly Agree

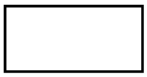
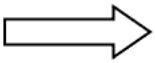
Agree
Undecided
Disagree
Strongly Disagree

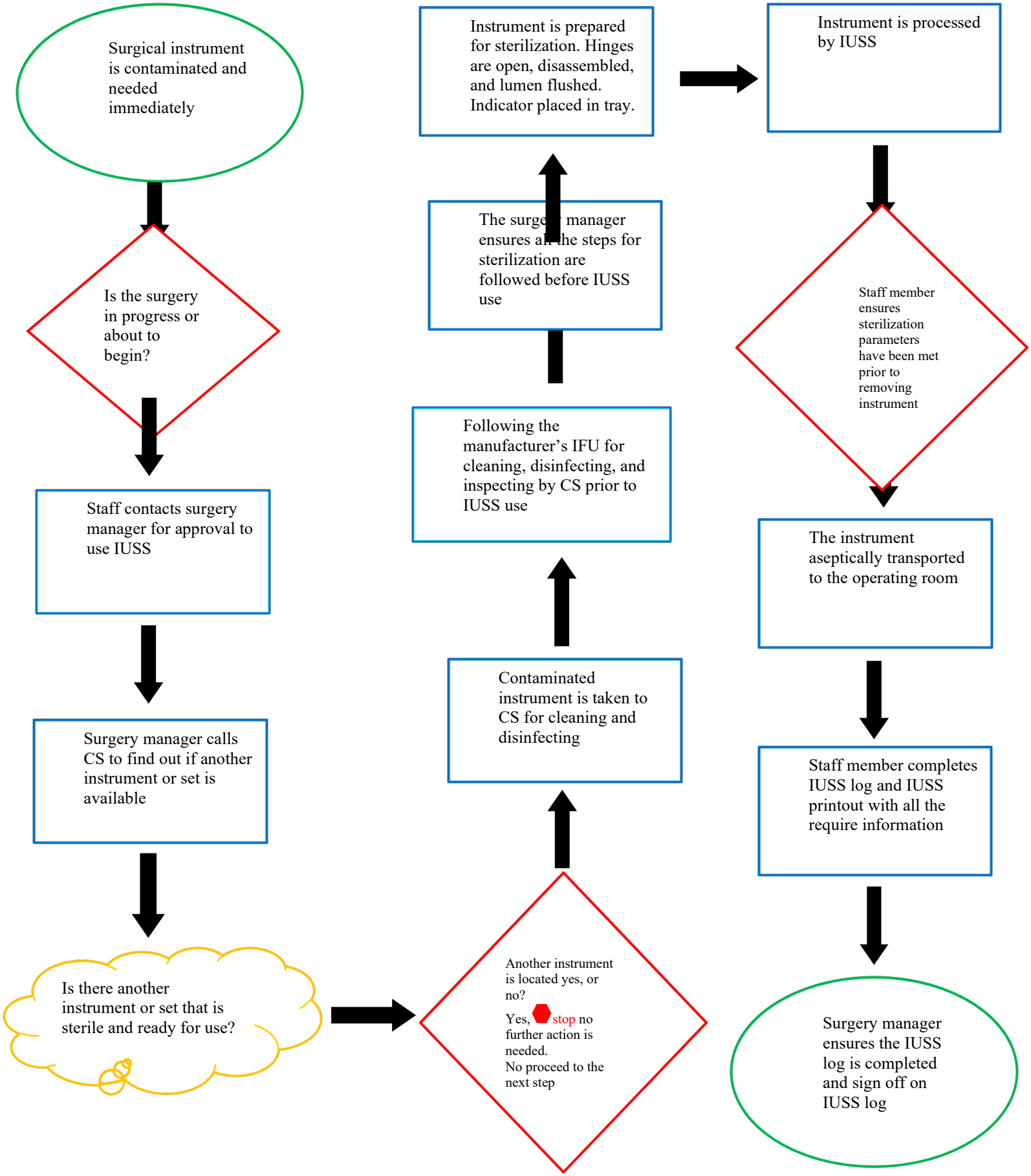
7. My knowledge of the IUSS reduction process protocol have increased following the educational instruction.
   Strongly Agree
   Agree
   Undecided
   Disagree
   Strongly Disagree

8. Overall, I am satisfied with the implemented IUSS reduction process protocol.
   Strongly Agree
   Agree
   Undecided
   Disagree
   Strongly Disagree

Appendix: N

Process for Immediate use steam sterilization
Flow Chart Key

	Process beginning or end
	Activity Step
	Decision Points
	Waits and Delays
	Things you don't know
	Connector, such as off page
	Process flow direction


Surgical instrument is contaminated and needed immediately
Is the surgery in progress or about to begin?
Staff contacts surgery manager for approval to use IUSS
Surgery manager calls CS to find out if another instrument or set is available
Is there another instrument or set that is sterile and ready for use?
Another instrument is located yes, or no?
Yes, stop no further action is needed.
No proceed to the next step
Contaminated instrument is taken to CS for cleaning and disinfecting
Following the manufacturer's IFU for cleaning, disinfecting, and inspecting by CS prior to IUSS use
The surgery manager ensures all the steps for sterilization are followed before IUSS use
Instrument is prepared for sterilization. Hinges are open, disassembled, and lumen flushed. Indicator placed in tray.
Instrument is processed by IUSS
Staff member ensures sterilization parameters have been met prior to removing instrument
The instrument aseptically transported to the operating room
Staff member completes IUSS log and IUSS printout with all the require information
Surgery manager ensures the IUSS log is completed and sign off on IUSS log

Appendix: O

IUSS Reduction Process Protocol

Immediate-Use Steam Sterilization (IUSS), formerly termed "flash" sterilization, is described as "the shortest possible time from the item being removed from the sterilizer to the aseptic transfer onto the sterile field" (Seavey, 2013). IUSS items are not intended to be stored for future use. Lastly, IUSS should be used sparingly and when meeting specific criteria.

IUSS may be appropriate:

- A specific instrument is needed for an emergency procedure.
- A non-replaceable instrument has been contaminated and needs to be replaced to the sterile field immediately.
- An item has dropped on the floor and is needed to continue a surgical procedure.

Considerations for IUSS:

- Review and adhere to manufacturer instructions for use (IFU) to determine if the device or instrument may be reprocessed via IUSS. If so, follow the manufacturer's IFUs regarding cycle type, temperature setting, exposure time, and drying times.
- IUSS does not imply that reprocessing steps, such as appropriate cleaning and transport, may be omitted.
- Items are to be reprocessed in approved/validated containers/trays suitable for IUSS.
- IUSS should not be used for mere convenience, or due to limited instruments or equipment for the number of cases/procedures performed.

Hospital IUSS Policy: IUSS should be used in emergency situations where there is insufficient time to process an item by the preferred wrap or container method. IUSS will not be used for instruments on patients with known or suspected Creutzfeldt-Jakob Disease (CKD) or similar disorders. IUSS will not be used on single use devices. Documentation of cycle information and monitoring results will be maintained to provide patient specific tracking.

Hospital IUSS Procedure: Measures will be taken to prevent cross contamination. IUSS should be utilized:

- An emergency situation exists, a needed instrument is contaminated, and a replacement item is not available.
- The manufacturer's IFU approve IUSS use for sterilization of an instrument.
- The instrument has been disassembled and thoroughly cleaned with detergent and water to remove soil, blood, fats, and other substances.
- The lumens have been flushed with hospital approved cleaning solution and rinsed thoroughly.

Hospital IUSS guidelines:

- All items are to be unwrapped with instruments open and disassembled.
- All instruments will be washed with appropriate enzymatic cleaner.
- Items should be placed in a metal pan prior to being placed in the sterilizer.
    - Items should be placed in the sterilization tray in a manner that allows steam to contact all instruments parts. Items will not be stacked and will not protrude outside of the track frame or exceed height limits.

    - A new sterility indicator should be placed at the bottom of the pan. A new indicator will be used for each cycle. Indicator must be a class 5 or 6 chemical indicator.
    - Towels (paper or cloth) will not be used. Packaging and wrapping are not to be used unless sterilizer and packaging are designed for intended use.
- The open pan containing the instrument should be placed in the center of the sterilizer chamber, and the door secured tightly.
- Press the appropriate cycle per the item required (single, metal, non-lumened, non-implantable items).
- Allow the chamber pressure to reach zero prior to opening the sterilizer door.
- Non-sterile personnel will remove the instrument avoiding contamination, and aseptically transfer to the sterile field.
- Once at the sterile field the instrument has cool prior to using to avoid burning staff and patient.

Hospital required documentation:

- The sterilizer log requirements include the following:
    - Patient sticker identifying patient name, patient medical record number (MRN), patient date of birth (DOB), and visit number.
    - Specific instrument contained in the load.
    - First and last name of person running the load.
    - Time in and time out of sterilizer.
    - Operating room number.
    - If an implant was processed and used (yes or no).
    - Reason for IUSS use.
- At conclusion of cycle, parameters of sterilization (27-30 pounds per square inch [psi] and 270ºF temperature) must be verified and noted on the IUSS printout.
- Required documentation for the IUSS printout includes patient's MRN and first and last name of the person operating IUSS.

IUSS: is the shortest possible time between a sterilized item removal from sterilizer and its aseptic transfer to the sterile field.

- IUSS a sterilized instrument that is sterilized in a manner that usually does not have a dry time and does not allow for storage.
- This contrasts with traditional terminal sterilization cycles, where instruments are sterilized within containers, wrapped, or primary packaging designed to maintain the instruments sterility and allow for storage and later use.
- Manufacturer's IFU may or may not require a dry time and may require a cycle length or temperature different than the traditional times.
- Manufacturers IFU should include requirements for cleaning, cycle type, exposure time, temperature settings and dry times if required.
- IUSS decontamination and cleaning should follow the same process as terminal sterilization.
- IUSS should be used when the manufacturers IFU include instructions for IUSS use.
- IUSS should not be used for implants except in emergency situations when no other option is available. Following the manufacturers IFU, placing a biological indicator and a chemical indicator. Implant should not be used until the biological indicator results are known.

Consequences of IUSS use

- Consequences of IUSS use include adverse events such as, surgical site infections (SSI) and patient and staff burns.
- Contaminated surgical instruments, surgical times, and IUSS use all increase a patient's SSI risks.
- When surgical instruments are not cleaned and sterilized properly, debris and bacteria can enter the patient's wound, thus causing an SSIs.
- There are reports of patients and staff acquiring burns during a surgical procedure from instruments processed using IUSS

5 steps to IUSS use

1. **Cleaning, disassembly, inspection, and sterilization:**
   When items undergo IUSS, the expectation is that that a rigorous process of compliance with current standards and instrument manufacturer's instructions, including cleaning, disassembly and sterilization is followed. This step reduces bioburden and removes all visible and invisible soil and blood from instruments before sterilization. Failures in this step have resulted in the transmission of infectious agents.
   - Manufacturer's instructions should be available and followed.
   - Ensure items are disassembled and thoroughly cleaned with detergent, enzymatic cleaner, and water to remove soil, blood, body fats, and other substances.
   - Flush lumens with cleaning solution and rinse thoroughly.
   - Don personal protective gear prior to cleaning instruments.
2. **Prepare instrument for sterilization**:

This ensures that steam will contact all parts of the instrument placed in the sterilization container or tray.

- Ensure hinged instruments are open, disassemble devices with removable parts, and thoroughly flush instruments lumens.
- Ensure chemical indicator is in with the instrument
- Indicators should be placed in areas that are the most difficult to sterilize.

3. **Sterilization**:

Immediate use steam sterilization is performed.

- Ensure that the manufacturer's instructions for use are followed.

4. **Parameters and transporting**:
   Before removing instrument:
   - Ensure the parameters of time and temperature have been met by reviewing the printout.
   - Once verified prevent contamination of the sterile instrument during transfer to the operating room.
5. **Complete the IUSS log:**

The last step is documenting each sterilization cycle onto IUSS log.
Documentation should include:

- Patient sticker identifying patient name, patient medical record number (MRN), date of birth (DOB), and visit number.
- Specific instrument contained in load
- First and last name of the person running the load
- Time in and time out
- Operating room number

- Load number
- Of an implant was processed (yes or no)
- Reason for using the immediate use steam sterilization (IUSS)
- At the end of the cycle parameters of sterilization (27-30 psi and 270ºF) must be verified and noted on IUSS print out
- On IUSS print out the MRN, and first and last name of the operator must be documented

Appendix P

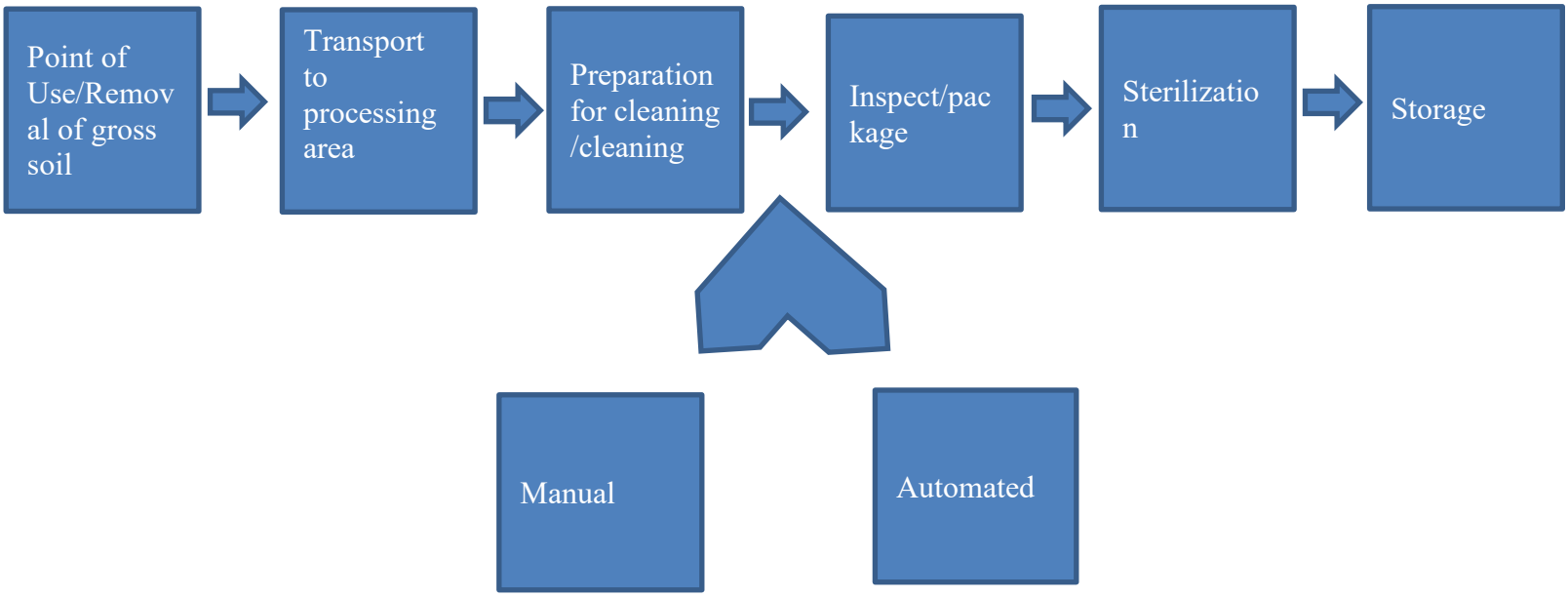
CHECKLIST FOR STERILIZATION PROCESS Point-of-Use

- Procedure completed
- Pre-cleaning with a product recommended for pre-cleaning with manufacturer's instructions-for-use followed, that is applied at point-of-use in the procedure room or O.R. to remove blood, body-fluids, and bioburden from items that are to be re-processed based on manufacturer's instructions-for-use and evidence-based guidelines
- Items labeled as single-use disposable are disposed of and not reprocessed
- Use of a foam, gel, spray solution, or moist towel indicated per manufacturer to keep instruments and devices moist during transport prevents blood/body fluids/ bioburden from hardening on the equipment
- Instruments, devices, and supplies are to be kept moistened to make it easier to clean in the decontamination room. This is particularly true if instruments must wait to be cleaned because other areas are also transporting instruments to the decontamination area
- Pre-cleaning is the initial step to the sterilization process

Transport to Decontamination Area

- Items are contained to protect the transporter and others from contents within the container
- Items are to be kept moist during transport to prevent hardening of bioburden
- The type of container used is based on what is being transported
- All containers must be leak-proof, puncture-proof, and labeled as biohazardous
- Examples: bins with lids, impermeable bags, etc.

Reprocessing for Sterilization



Appendix Q

Educational Tools

Once a Week Testing – Microbial Testing

1) Place one (1) Verify® Chemical Integrator and one (1) Verify Dual Species Self-Contained Biological Indicator (SCBI) in each configuration to be tested.

2) Run each cycle to be tested using the shortest exposure time for the temperature and configuration being tested.

3) Remove Integrator and SCBI.

4) Interpret and record the integrator results.

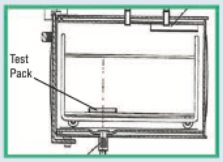
5) Seal and activate the SCBI and incubate at 55-60°C for 24 hours.

6) Interpret and record the results.

Daily Air Removal Testing – Bowie Dick Test

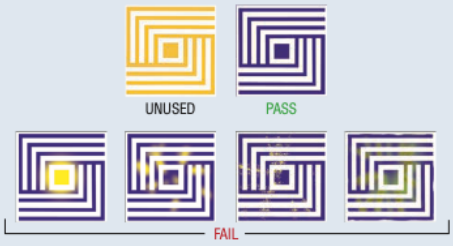
For Prevacuum Sterilizers Only

1) Place one (1) Verify Bowie Dick Test Pack on the bottom shelf over the drain.



2) Perform the test cycle.

3) Remove the pack, open it and interpret the results.



Flash Sterilization Cycle Release (3' gravity, 10' gravity, EXPRESS cycle)

1) Place one (1) chemical integrator with the item to be flash sterilized.

2) Perform the flash sterilization cycle.

3) Interpret the result of the appropriate indicator ink spot for the cycle that was run.

STERIS®

For further information, please contact us in the United States at 800-548-4873, in Canada at 800-661-3937 or visit our website at www.steris.com.

For emergency sterilization of implants per AAMI ST 37

1) Place one (1) chemical integrator and biological indicator with the item to be flash sterilized.

2) Perform the flash sterilization cycle.

3) Interpret the result of the appropriate indicator ink spot for the cycle that was run.

5) Seal and activate the SCBI and incubate at 55-60°C for 24 hours.

6) Interpret and record the results.

Print employee name

Signature:

Cycle approved: Y / N Date:

PROGRAM FINISHED CORRECTLY

FO value	160.1min
Time above target val. chamber	10:00m:s
Max. sterilizing temperature	271.5°F
Min. sterilizing temperature	270.8°F

20:20	End of program	956	137.6
19:38	Aeration	18	130.1
19:30	Drying	118	150.4
16:34	Post-vacuum	2977	271.2
15:35		2987	271.5
14:34		2983	271.4
13:34		2983	271.4
12:34		2985	271.4
11:34		2963	271.2
10:34		2985	271.4
9:34		2973	271.4
8:34		2981	271.4
7:33		2968	271.2
6:33	Sterilization	2951	270.8
4:00	Heating up	1080	213.6
0:02	Flowing	1078	127.7

m:s
Time Phase mbara T2 °F

Program start : 07/21/2022 / 07:25a

	Drying time	1.0min
	Sterilizing temp.	270.1°F
	Sterilizing time	10.0min
Target values :	Grav. step time	4.0min

Version : PR: 08/13/2020 SW: 197
Program : 7: Gravity 270 10S/10
User : User
Current no. : 0001643
Machine type : 6-0-6 VG1 No:2011163
Department : OR #6
Operat. comp. : OSH
DELIMED CYCLE DOCUMENTATION

Place patient sticker must be placed here

Required documentation for Immediate use steam sterilization (IUSS) log

- Patient sticker
- Date
- Time in sterilizer
- Time out of sterilizer
- Item
- Operator first/last name
- OR number
- Load number
- Implant yes or no
- Reason for using IUSS
- Managers authorizing

Sterilization Temp

Load number

If patient sticker is unavailable required documentation includes Patients Name and MRN

.

DATE: **IMMEDIATE USE STEAM STERILIZATION** **STERILIZER**
Emergency/Patient Safety Only

Place Patient Sticker Here ↓	Date	Time In Sterilizer	Time out Sterilizer	Item	Operator First/Last Name	OR #	Load #	Implant Yes/BIOLOGICAL No Removal	Reason for Sterilization Check One/Surgery Manger Authorization
BOWIE DICK BIOLOGICAL									O Hole In Wrapper O Item Dropped O Rep. Brought In Late O Requested During Surgery Auth:______________
PATIENT STICKER									O Hole In Wrapper O Item Dropped O Rep. Brought In Late O Requested During Surgery Auth:______________
PATIENT STICKER									O Hole In Wrapper O Item Dropped O Rep. Brought In Late O Requested During Surgery Auth:______________
PATIENT STICKER									O Hole In Wrapper O Item Dropped O Rep. Brought In Late O Requested During Surgery Auth:______________
PATIENT STICKER									O Hole In Wrapper O Item Dropped O Rep. Brought In Late O Requested During Surgery Auth:______________

RECONCILIATION: LOG AND STERILIZER PRINT OUT MATCH WITH LOAD NUMBER AND PATIENT'S MRN YES/NO SIGNATURE

DATE: **Main O.R. Gravity 270Degrees**

STERIS

VERIFY 24 HOUR

BIOLOGICAL CULTURE TEST RECORD

- **Incubate the VERIFY Steam-24 BI for 24 hours, 57°C +/- 2°C.** Test organism growth is indicated by a color change from purple to yellow.
- Store in a cool dry place.

	Cycle and Load Identification Intended for use in monitoring Steam Cycles				BI Culture Results + Growth (Yellow) - No Growth (Purple) (Circle one)		Incubator Temp 57C +/- 2C (Circle Result)	
Patient Sticker	Date/ Time In	BI Lot Number Cycle Number	Control Sterilizer Incubator	Operator Print first and last name	CONTROL BI Purple to Yellow	TEST BI Purple to Purple		Print first and Last Name/Date Comments/Time out
CONTROL			C Incubator C		+ −	+ −	Yes No	
BIOLOGICAL			Sterilizer Incubator		+ −	+ −	Yes No	
PATIENT STICKER			Sterilizer__ Incubator_		+ −	+ −	Yes No	
PATIENT STICKER			Sterilizer__ Incubator_		+ −	+ −	Yes No	
PATIENT STICKER			Sterilizer__ Incubator_		+ −	+ −	Yes No	

Appendix R

Implementation Evolution Over Time

Implementation Evolution Over Time		
Implementation Timeline	Progress	New Changes
11-1-2021	University of Arkansas IRB Approval	
11-2-2021	IUSS reduction team meeting	IUSS team developed the IUSS reduction process protocol. Allocated team members roles which included reviewing IUSS logs, SSI logs, and supporting and enforcing the implementation of the IUSS reduction process protocol. Role of reviewing IUSS logs was delegated to the central sterile director and the PI. Role of reviewing and determining if the SSI meets the requirements of SSI was assigned to the infection control nurse. It was also determined that the infection control nurse would identify if the patient with an SSI had an instrument processed by IUSS. Support and enforcing the protocol will remain the responsibility of the surgery manager and the director of surgical services.
11-9-2021	Process flow for IUSS use and interdepartmental communication steps were clearly defined	The team agreed the surgery manager would be the person the surgery staff would have to contact to approve IUSS use. The IUSS team deicided to that when the case carts

		with instruments were returned to central sterile the surgery staff would communicate with the central sterile department on instruments or set that needed to terminal sterilized for an additional procedure. The use of the white board in central sterile was identified as the other means to communicate instruments or sets were needed to be terminal sterilized for an additional procedure. Team determined the next step was to educate the staff on the new process.
11-18-2021	Pre-implementation surveys distributed to surgery staff. Educational seminar presented to surgery staff. Implementation of the IUSS reduction process protocol began.	45 distributed 20 completed surveys returned. Identified needed another way to collect pre-implementation survey. The week prior to the meeting the presentation time was reduced to a few minutes instead of the 30 minutes originally agreed upon. Staff education included the IUSS process, consequences of IUSS, and the steps for the IUSS reduction process protocol. Identified that the staff needed more visual aids to reinforce obtaining managers approval prior to using IUSS.
11-22-2021	Placed stop signs on IUSS sterilizers indicating to see the manager prior to using IUSS	Identified the surgery staff needed more information Created an educational handout to inform staff of how the new process is

		going and reinforcing why IUSS should be decreased.
11-23-2021	Emailed pre-implementation survey to surgery staff	To improve survey responses the PI asked the director of surgical services if the survey could email to staff. 11-29-2021 the director of surgical services emailed pre-implementation surveys to the surgery staff. An additional 5 surveys were completed. 11-23-2021 emailed infection control nurse updating her on the project and what data will be needed from her and when it is needed.
11-30-2021	Interview surgery staff	The interviews with survey staff identified a breakdown in communication between the surgery department and central sterile. Implement a change in the process for case cart returns to central sterile 12-1-2021. If an instrument or set is needed for another procedure the scrub technician is to return the case cart to central sterile and inform the department what is needed and when it is needed.
11-30-2021	End of implementation Month 1	All reviewed IUSS logs noted manager approval has not occurred for any of the cycles run. Stops signs were placed on IUSS sterilizer noting to see the manager prior to using IUSS and

		educational handouts were created to re-educate the new sterilization process.
12-7-2021	Bi-weekly with central sterile director.	Unable to review IUSS log. At each of the meetings with the director of central sterile she was unable to review IUSS logs due to staffing shortages. Also, she declined allowing the PI to review the logs alone.
12-14-2021	Meeting with director of surgical services and manager of surgery.	Identified the staff needed reinforcement on the IUSS process. Updated stop signs on IUSS sterilizers. Highlighted IUSS log where manger signature is required.
12-21-2021	Bi-weekly meeting with central sterile director.	Unable to review IUSS logs due to staffing shortages. Identified needed to stay persistent on getting IUSS data.
12-31-2021	End of implementation month 2	Unable to review IUSS logs. The director of central sterile was unable to review IUSS logs at each of the scheduled meetings due to staffing shortages. Also, she declined allowing the PI to review the logs alone.
1-4-2022	Bi-weekly meeting with director of central sterile	Unable to review IUSS logs due to staffing shortages. Identified needed to continue to stay consistent on obtaining IUSS data. Meeting with director of

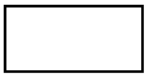
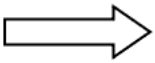
		surgical services and surgery manager.
1-11-2022	Meeting with director of surgical services and manager.	Identified the need for surgery leadership to support and reinforce IUSS process at by addressing the process at the February surgery staff meeting.
1-18-2022	Bi-weekly meeting with the director of central sterile	Unable to review IUSS logs. Identified needed to obtain guidance on how to access IUSS data. Scheduled meeting with site champion.
1-27-2022	Meeting with site champion.	Meeting to discuss barriers to collect ion of IUSS data.
1-31-2022	End of implementation month 3	Unable to review IUSS logs Central sterile director was unable to review IUSS logs at scheduled meetings. She declined the PI offer to review the logs alone.
2-1-2022	Bi-weekly meeting with central sterile director. Emailed infection control nurse	Unable to review IUSS logs. No response from email sent infection control nurse to get 4 months prior SSI rates and inquire on her ability to get IUSS information for her infection control reports.
2-8-2022	Meeting with director of central sterile Emailed infection control nurse.	Director of central said she was starting to work on IUSS logs. Identified via PDSA cycle staying persistent pays off. Identified the infection control logs are 3 months behind because an

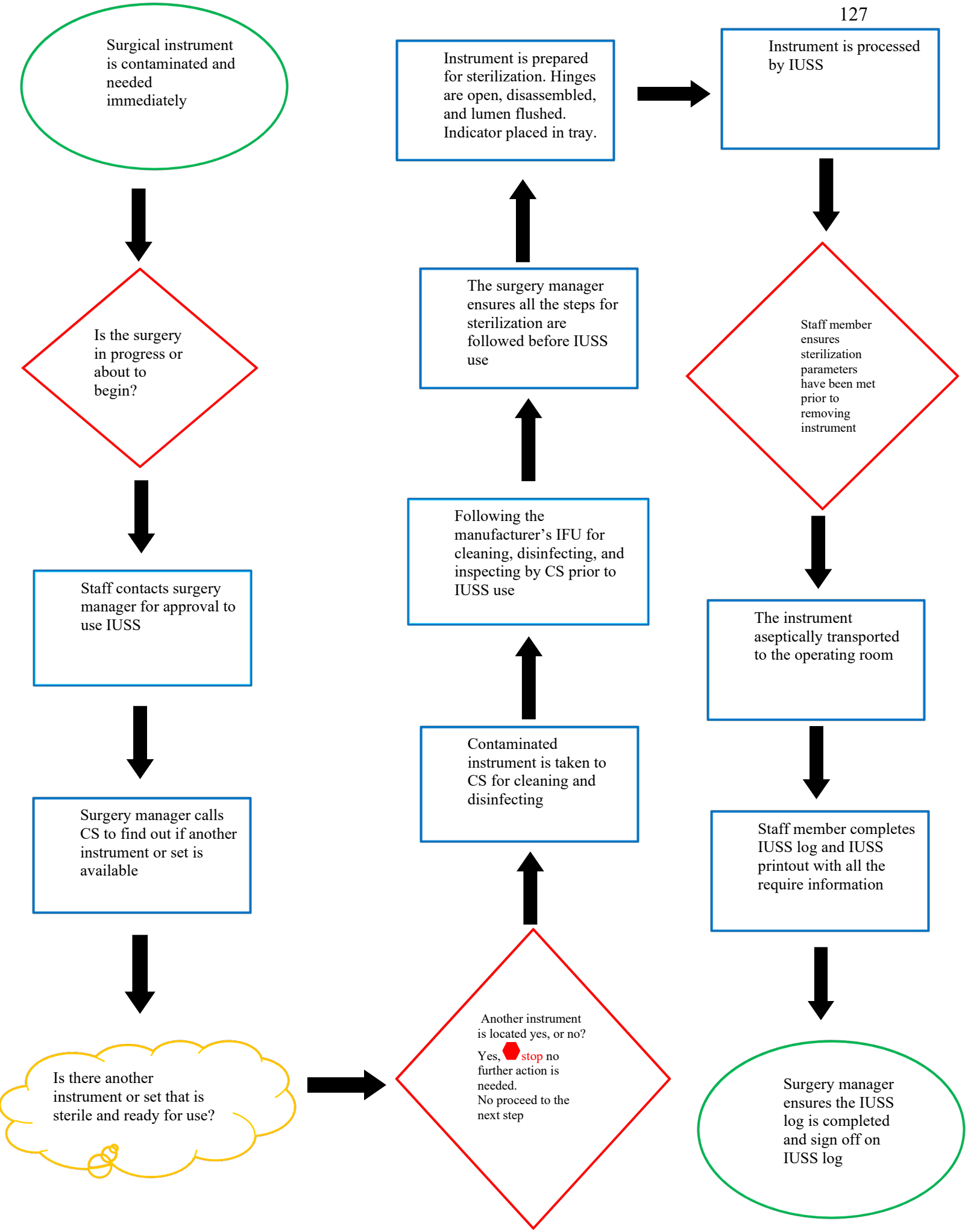
		infection can be considered a hospital acquired SSI up to 90 days after the procedure.
2-15-2022	Post-implementation survey forms organized, and email created to send post survey link. Meeting with central sterile director.	Identified need to educate new employees on the IUSS process with the high turnover rates in the surgery department. Gather IUSS information from central sterile director to create new IUSS signs and create a packet on IUSS for new staff.

Appendix S

Process for Immediate use steam sterilization

Flow Chart Key

	Process beginning or end
	Activity Step
	Decision Points
	Waits and Delays
	Things you don't know
	Connector, such as off page
	Process flow direction


Surgical instrument is contaminated and needed immediately
Is the surgery in progress or about to begin?
Staff contacts surgery manager for approval to use IUSS
Surgery manager calls CS to find out if another instrument or set is available
Is there another instrument or set that is sterile and ready for use?
Another instrument is located yes, or no?
Yes, stop no further action is needed.
No proceed to the next step
Contaminated instrument is taken to CS for cleaning and disinfecting
Following the manufacturer's IFU for cleaning, disinfecting, and inspecting by CS prior to IUSS use
The surgery manager ensures all the steps for sterilization are followed before IUSS use
Instrument is prepared for sterilization. Hinges are open, disassembled, and lumen flushed. Indicator placed in tray.
Instrument is processed by IUSS
Staff member ensures sterilization parameters have been met prior to removing instrument
The instrument aseptically transported to the operating room
Staff member completes IUSS log and IUSS printout with all the require information
Surgery manager ensures the IUSS log is completed and sign off on IUSS log

Appendix T
PDSA cycles

PDSA cycle 1		
OBJECTIVE: To identify the factors influencing the current immediate use steam sterilization within the organization		
Change Idea: Review immediate use steam sterilization (IUSS) logs to identify trends in IUSS use within the organization to aid in reducing IUSS use		
	Person Responsible	Due Date
Plan: beginning 11-4-2021 review IUSS logs to identify who, what, when, and why surgical instruments are being processed by IUSS.		11/5/21
Do: IUSS logs were reviewed from previous day noting that IUSS was used more than expected. IUSS loads were run for 17 different surgical procedures. Total instruments sets, major basins, and physician instrument sets. Multiple instruments and sets were run in one load.		11/5/21
Study: This was not the expected findings. Results showed that the central sterile department could not keep up with the surgery department's needs.		11/5/21
Act: Review IUSS logs for several days to determine if this is a common trend or if it was an isolated event.		11/12/21

PDSA cycle 2		
OBJECTIVE: To increase the surgical staff's knowledge regarding IUSS and its correlation with SSI		
Change Idea: Educate staff on IUSS and its adverse effects		
	Person Responsible	Due Date
Plan: 11-18-2021 surgery staff educational seminar. Explain the new process for reducing IUSS and the process flow. When IUSS could be uses, if used the steps to correctly use IUSS. Educate staff on the new IUSS reduction process protocol. Explain adverse effects of IUSS which include increased risk for surgical site infections, patient and staff burns.	PI	11/18/21
Do: Staff was educational seminar occurred on 11-18-2021	PI	11/18/21
Study: On 11-18-2021 I was not allotted as much time as I expected during the meeting therefore, I had to shorten my presentation. This resulting in not ensuring the staff completely and understood IUSS process and its consequences.	PI	11/18/21
Act: 11-22-2021 Will place stop signs on the IUSS sterilizers indicating to see the manager prior to using. Create a weekly information sheet on the IUSS reduction process, discussing how the new process is going, and reinforce why IUSS should be decreased. Interview staff randomly on IUSS, its adverse effects,	PI	11/24/21

and how the new process is going.		

PDSA cycle 3		
Objective: To increase the surgical staff's knowledge regarding IUSS and its correlation with SSI rates.		
Change Idea: Assess staff's knowledge of IUSS and its correlation with SSIs using pre-post surveys		
	Person Responsible	Due Date
Plan: Distribute pre-surveys at November surgery staff meeting (11-18-2021).	PI	11/18/21
Do: Survey were distributed on 11-18-2021 to surgery staff. Then collected at the end of the surgery staff meeting.	PI	11/18/21
Study: 45 surveys were distributed to staff on 11-18-2021 only 20 of the completed surveys were returned to the PI. The goal for the survey completion rate was to obtain 45%-50% of the completed pre and post surveys. The rate of surveys collected is 44.4% which is less than the stated goal.	PI	11/18/21
Act: Will meet with director of surgery on 11-23-2021 and determine if surveys could be emailed to surgery staff using Qualtrics. However, the education seminar has already been held which could affect the surgery staff's survey responses.	PI	11/23/21

PDSA cycle 4		
Objective: To identify the factors influencing the current IUSS use within the organization		
Change Idea: Decrease IUSS use within the surgical department with the implementation of an IUSS reduction process protocol		
Plan: Interview surgery staff on 11-30-2021. The interviews would include discussing their thoughts on the IUSS reduction process, any ideas they may have that would aid in reducing IUSS use, and their thought on IUSS and its adverse effects.	PI	11/30/21
Do: Interviews took place on 11-30-2021.	PI	11/30/21
Study: The interviews identified a breakdown in communication between the surgery department and central sterile. The breakdown was occurring due to a new process that was put in place to reduce surgery turnover times due to the department being short staffed. The director implemented a process for the patient care technicians (PCTs) to take the scrub technicians case carts back to central sterile. This process although helpful did not allow for the scrub to discuss with the central sterile department which instruments, or sets needed to be turned over for additional procedures. The projects' goal is to decrease IUSS use by 90% within the organization.	PI	11/30/21
Act: Implement a change in the process for case cart returns to	PI	12/1/21

central sterile 12-1-2021. If an instrument or set is needed for another procedure the scrub technicians is to return the case cart to central sterile and inform the department what is needed and when it is needed. This process will aid in reducing IUSS use by improving communication between the two departments.		

PDSA cycle 5		
Objective: To identify the factors influencing the current IUSS use within the organization		
Change Idea: Decrease IUSS use within the surgical department with the implementation of an IUSS reduction process protocol.		
	Person Responsible	Due Date
Plan: Meet with site champion on 1-27-2022 to discuss barriers to collect IUSS data. Meet with site champion to discuss interaction with the central sterile director and ask for guidance or help gathering the needed data.	PI	1/27/22
Do: Meeting with site champion took place on 1-27-2022.	PI	1/27/22
Study: During the meeting I discussed previous interactions with the central sterile director. I explained offering help and how I understood the department was extremely short staffed. Asked for ideas on how to get the needed information or ideas on how to help the director get caught up with the IUSS data collection. I stated that the central director told me she felt IUSS use had decreased, and staff were trying to find another instrument prior to using IUSS. However, I have no data reflecting this information. My site champion was unable to offer any help with this. She noted that the director of that department is the only one with this information and she does not like help with her quality reports. When I ask if she thought I would have this data prior to the end of the semester she shook her head and shrugged her shoulders. I left feeling defeated. The projects' goal is to decrease IUSS use by 90% within the organization.	PI	1/27/22
Act: Try again 2-1-2022 to offer help on IUSS data collection. Continue to monitor interaction with the surgery department and central sterile. Continue to meet the IUSS reduction team bi-weekly. Stay positive and confident during interactions. Review daily IUSS log when at the clinical site to get some idea of current IUSS use. 2-1-2022 email infection control nurse to get 4 months prior SSI rates and inquire on her ability to get IUSS information for her infection control reports.	PI	2/1/22

PDSA cycle 6
OBJECTIVE: To identify the factors influencing the current IUSS use within the organization
Change Idea: Decrease IUSS use within the surgical department with the implementation of an IUSS reduction process protocol.

	Person Responsible	Due Date
Plan: Meet with the director of central services to work on IUSS data collection.	PI	2/1/22
Do: Meeting with director of central services 2-1-2022	PI	2/1/22
Study: During the meeting I lead with I understand that you are extremely busy with the staffing shortages. Once she disused all that was going on and was able to express her exhaustion and discouragement. I asked if she thought I would be able to at least ger 4 months pre implementation and post implementation IUSS numbers. Then I explained what data I had to have, and she said she was going to start working on her quality reports and I should have the data I need soon. She stated that she had asked for help with some of the other areas she was over and that she was going to start working on the IUSS logs. Staying persistent helped, me to achieve the results I needed.	PI	2/1/22
Act: Meet again 2-8-2022 and try help on IUSS data collection. Continue to monitor interactions with the surgery department and central sterile. Continue to meet the IUSS reduction team bi-weekly. Stay positive and confident during interactions. Continue to review IUSS log when at the clinical site to get some idea of current IUSS use. With the weather issue I will email infection control nurse again next week and remind her of the data needed for the project and see what her timeline is for that information. Infection control logs are 3 months behind because and infection can be considered a hospital acquired SSI up to 90 days after the procedure.	PI	2/8/22

PDSA cycle 7		
OBJECTIVE: To identify the factors influencing the current IUSS use within the organization		
Change Idea: Educate staff on IUSS and its adverse effects		
	Person Responsible	Due Date
Plan: Meet with the director of central services to work on IUSS data collection.	PI	2/8/22
Do: Meeting with director of central services 2-8-2022	PI	2/8/22
Study: Met with the director of central services. She has begun reviewing IUSS logs. But during our designated meeting time she was unable to review logs with me. To gather some information on how the IUSS process is working I began to review the daily logs by the sterilizers. The three days this past week while at the clinical site I noted that IUSS was used 11 times. The days that IUSS was used the trends noted sinus instruments were processed for the same surgeon by IUSS 3 times in one day, one surgeon's total instrument set was processed 3 different times, another orthopedic surgeon had instruments processed by IUSS 3 times however only 2 of them were the same set, with remaining instruments no trends were	PI	2/8/22

noted. However, all 11 times IUSS was there was no manager approval. .		
Act: Meet with the manager of surgery, director of surgical services, and director of central sterile on 2-15-2022 and discuss IUSS use and how the staff are not getting approval prior to using IUSS. Discuss what can be done to ensure the staff get approval prior to using IUSS. Meet with central sterile staff and ask how the communication between the departments is going. Inquire what could be done to improve communication. Interview staff that used IUSS and inquire if they communicated with central sterile and if they tried to find another instrument. I will continue to monitor interactions with the surgery department and central sterile. Continue to review IUSS log when at the clinical site to get some idea of current IUSS use.	PI	2/15/22

PDSA cycle 8		
OBJECTIVE: To increase the surgical staff's knowledge regarding IUSS and its correlation with SSI		
Change Idea: Educate staff on IUSS and its adverse effects		
	Person Responsible	Due Date
Plan: Met with the director of central services to work on IUSS data collection.	PI	2/15/22
Do: Meeting with director of central services 2-15-2022	PI	2/15/22
Study: Met with the director of central sterile. She again was unable to review logs with me. However, she said she is going to come in on a Saturday to get IUSS logs up to date. In the meeting it was identified that we needed a way to educate new staff on the IUSS process. I collected the information she wanted to be created to place on the IUSS sterilizers and educational handouts. We determined the best way was to create a book on IUSS containing the ISSS reduction protocol, checklist for sterilization, consequence of IUSS, and copies of the IUSS log noting what is required to be completed if used.	PI	2/15/22
Act: : Meet with the director of central to approval booklet for new hires and IUSS sterilizer information on 2-22-2022. Inform her I have 4 weeks to collect all the IUSS data. Offer to help with logs. Email infection control nurse inform her I have 4 weeks to ger all the SSI data for the project. Met with the director of surgical services and manager on the IUSS information and booklet get their approval and discuss how staff are not getting approval prior to using IUSS. Inquire about any ideas they must help improve the outcome. Email post-implementation surveys.	PI	2/22/22