Surgical Stewardship: A New Frontier in Preventing Surgical Site Infections

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Preventing surgical site infections (SSI) requires a significant investment by patients, healthcare professionals, and institutions. SSI prevention begins with entry into the healthcare system, through their successful discharge and return of their optimum health. This process in total, is surgical stewardship. Surgical stewardship focuses upon improving each patient's outcomes by applying the best evidence-based practices and research with every patient. A multidisciplinary approach is vital to the success of a robust surgical stewardship program, with all members contributing to prevention measures throughout the three perioperative phases.

Surgical stewardship requires action by everyone. This is accomplished through advocacy, education, implementation of evidenced-based practices, the measurement and assessment of patient outcomes, and in the dissemination and sharing of results.

In order to capitalize on the benefits of a surgical stewardship program, there are key evidence-based activities the entire care team should utilize. A seven-step evidence-based bundle can be used as a foundation for a surgical stewardship program.

❶ Safe Operating Room

The foundation of every surgical stewardship program is having a safe perioperative environment where care is delivered and received. A key aspect of establishing a safe operating room is the implementation of national standards, recommendations and guidelines by the healthcare team and institution. The Association of periOperative Registered Nurses (AORN) has published numerous peer-reviewed guidelines focused on preventing surgical site infection and establishing a safe operating room. The entire care team should be knowledgeable about the national standards that are related to infection prevention within the perioperative setting, which include:

Aseptic Practices	Sterilization and Disinfection	Patient and Worker Safety
•Patient Skin Antisepsis	•Flexible Endoscopes	•Sharps Safety
•Environmental Cleaning	•High Level Disinfection	•Transmissible Infections
•Hand Hygiene	•Instrument Cleaning	•Environment of Care
•Surgical Attire	•Packaging Systems	
•Sterile Technique	•Sterilization	

Source: AORN, Guidelines for Perioperative Practice, ed. R. Connor. 2020, Denver, CO: AORN, Inc.

❷ Pre-admission Screening for Risk Factors and Colonization with Staphylococcus aureus

Preadmission risk factors

During the preoperative period, the goal is to fully prepare the patient for surgery by identifying risk factors that must be corrected in order to have the patient in the best possible health prior to surgery. Addressing and correcting these risk factors should be the focus of the preadmission care plan.

Once the patient has achieved their health goal, they are ready for education and counselling.[1] Patients should receive individualized education and written instructions regarding their specific surgical preparation, not simply the surgical procedure. Delivery of individualized education/counseling should be focused on assisting the patient with meaningful lifestyle modifications that can influence SSI risk reduction (e.g., smoking cessation, alcohol consumption, and/or nutritional support).[2-5]

Preoperative education and counseling is focused on reinforcing SSI reduction measures by lowering their anxiety and promoting better retention of education provided.[6-9]

Maintaining normothermia is a proven strategy to reduce SSI and other complications. "There are many methods described to conserve body temperature, including pre-warming and humidification of anesthetic gases, warming IV and irrigation fluids, and forced air-warming blankets and devices."[10] However, there is some controversy about the safety of forced air-warming (FAW) since contaminants may be dispersed into the air and land in the surgical field. Although ECRI Institute and AORN have stated that FAW is safe, there are a few articles and a guideline questioning the safety of FAW and the increased risk of surgical site infection.[10-16]

Screening for Staph aureus

Mitigating the risks of methicillin-resistant Staphylococcus aureus (MRSA) and methicillin-sensitive S aureus (MSSA) by using active surveillance, preoperative nasal screening, and selective decolonization protocols is common in many hospitals, especially for high-risk surgeries such as prosthetic joint implants. Patients found to be colonized in their nares are at a higher risk of developing an SSI. If a patient is found positive, then a preop nasal and body decolonization protocol would be implemented. If they are colonized with MRSA, the surgical prophylaxis is adjusted for coverage of the resistant strain.

❸ Pre-Surgical Showers

To decolonize the skin prior to surgical admission, a preoperative shower is recommended the night before and morning of surgery. The shower can be done with liquid

chlorhexidine (CHG) 4 percent, CHG washcloths 2 percent or soap. This process prevents exogenous contamination in the hospital and operating room as well as rendering their skin physically clean.

Patients unable to use CHG due to a prior adverse reaction, published guidelines also recommend the use of plain soap which removes bacteria, oils and debris from skin's surface. There are some facilities using a topical immune skin health system applied head to toe after the patient bathes to maintain a healthy acidic skin pH and healthy microbiome. This topical skin cleansing system was demonstrated to be non-inferior to CHG.[17]

❹ Surgical Skin Preparation

Starting with physically clean skin, the goal of surgical skin preparation is to prepare and decolonize the incision site. Today, the popular choice for skin prep agents include either an iodine or chlorhexidine (CHG)-based alcoholic solution in a sterile applicator. The benefit of alcohol in skin preparations is its rapid and broad-spectrum of antimicrobial activity.[18]

Alcohol-based solutions that contain CHG or iodophors have sustained and durable antimicrobial activity that lasts long after alcohol evaporation. Because alcohol dries on exposed skin within minutes of application, these can be applied with a single step as opposed to a scrub-and-paint technique.

❺ Surgical Irrigation

Surgical wound irrigation is the cornerstone in keeping the tissues moist, removing debris, and preparing the wound for closure. Unfortunately, there is no consensus on the ideal solution, volume, or even pressure one should use to deliver irrigation to the wound.[19] Depending upon the surgical procedure and the individual surgeon, the solution and additives, if any, often vary greatly. In order to comply with national guidelines, institutions should prepare the sterile irrigation solution in the pharmacy following USP standards or choose to use a commercially available irrigation solution.[20] Some healthcare institutions have standardized their irrigation solution choices which reduced the risk for medication errors and it saved them approximately 7 minutes per surgical procedure when the OR circulator didn't need to mix the irrigation solution.[21]

❻ Antimicrobial-Impregnated Sutures

In 2002, the Food and Drug Administration (FDA) approved the first surgical suture that was coated with an antimicrobial agent called triclosan. It is one of the most used antibacterial agents over the counter for products such as toothpaste, deodorant and antibacterial soap. Triclosan exhibits a broad-spectrum activity against both Gram-negative and Gram-positive organisms. The amount of triclosan in the antimicrobial suture has been deemed a safe and effective biocide, showing insignificant tissue reactions post-operatively.[22-23]

Sutures act as a foreign body and it only takes 100 colony-forming units (CFU) of bacteria colonized in tissue to contribute to an infection. There have been no published studies showing that triclosan coated sutures are associated with the development of multidrug-resistant organisms (MDRO). To date, there have been 13 published meta-analyses documenting the clinical benefits of the antimicrobial suture in preventing surgical site infections, where reductions in surgical site infections range from 20 percent to 60 percent.[24] The Centers for Disease Control and Prevention, World Health Organization and the American College of Surgeons all endorse and recommend the use of the antimicrobial sutures in their SSI prevention guidelines.[25-27]

❼ Post-operative Dressings

Appropriate postoperative incision management is imperative to prevent complications, including wound dehiscence, exogenous contamination with body fluids and potential development of surgical site infection. Postoperative wound management are applicable to healing by primary intention, secondary intention where the wound edges cannot be brought together and tertiary intention when a wound is heavily contaminated. In tertiary intention the wound is closely watched and cleansed for several days and when it appears to be on its way to healing, it is closed surgically. When there is an injury that results in tissue loss, the wound closure is often delayed to control wound debris and necrotic tissue. Infection is frequent in certain types of injuries that almost always become infected (i.e. dog bite injuries, gun shots and avulsion injury); these are frequently closed only when infection is controlled after being left open for a period of time.[28] These factors make it a challenge to standardize skin closure and application of postoperative dressings.

Staples have been shown to increase the risk of postop infection in orthopedics and caesarean incisions.[29-31] The staple punctures not only the skin, but also sebaceous glands and hair follicles, where bacteria may be present. As the patient's skin warms up after surgery, there can be tension applied to the staples resulting in small dehiscence, allowing bacteria and body fluids to enter.

An alternative to staples is a knotless barbed suture that provides strong, secure closure appropriate for high-tension areas, such as fascia.[32-33] If sutures are used the incision can be sealed with occlusive dressings that include topical skin adhesive, a combination of a skin adhesive with a mesh dressing,[34] transparent occlusive dressing,

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a transparent CHG- impregnated occlusive dressing[35] and silver antimicrobial dressing.[36]

The selection of post-op dressing material would benefit from a collaboration with surgeons, wound care professionals, infection preventionists, physician assistants and nursing.[37] In addition, patient satisfaction should be considered since occlusive dressings allow the patient to shower immediately after surgery, have better cosmesis when compared to staples, allow visualization of the incision to monitor for signs of infection and the dressings can be left in place for several post-op days to provide additional would protection.

In conclusion, surgical stewardship requires an intentional effort by the entire perioperative team to optimize the patient's outcomes in preparation for surgery. This process begins with the patient's entry into the healthcare system and concludes when they have attained their optimal health upon discharge. It is those deliberate steps and actions which take place between entry and exit that every healthcare provider has an impact upon. Using a standardized bundled approach establishes a framework to begin upon. There are numerous guidelines out there that address SSI reduction. It is up to us to develop and deliver a surgical stewardship program that produces results for the patient and ultimately, for the entire healthcare system.

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