Surgical Site Infection Prevention

Surgical site infections (SSIs) are infections that occur in the body part where the surgery was performed within 30 days following the surgery or up to 90 days following an implant procedure (Centers for Disease Control and Prevention [CDC], 2024; Evans, 2024). SSIs are one of the most common and costly healthcare-associated infections in the United States (Anderson & Sexton, 2022). Approximately 50% of all SSIs are preventable. It is important that the entire perioperative team have knowledge of current, evidence-based strategies to prevent SSIs.

SSIs may be superficial, involving only the skin, or more complicated involving deeper tissues, organs or implanted devices.

Potential symptoms of SSIs include (CDC, 2019; Seidelman et al., 2023; Evans, 2024):

- Redness (erythema), induration, and pain at or around the surgical site
- Systemic signs of infection including fever, rigors
- Purulent drainage at the incision site
- Surgical wound dehiscence
- Abscess formation along surgical site

Patient Preparation

- Prior to elective surgeries, identify and treat any existing infections; postpone elective procedures until current infections are resolved.
- Advise patients to stop using tobacco at least 30 days prior to elective surgery. Smoking is associated with an increased risk for SSI and other post-operative complications (Anderson & Sexton, 2024).
- Instruct patients to shower or bathe their full body with soap (antimicrobial or non-antimicrobial) or with an antiseptic agent the night before surgery.
- Preoperative skin cleansing with chlorhexidine-based preparations are more effective than povidone-based solutions (Anderson & Sexton, 2024).
- In certain high-risk, orthopaedic, and cardiothoracic surgeries, screening for nasal colonization with *Staphylococcus aureus* may be required. If screening is positive, patients may require decolonization with an intranasal and/or topical antistaphylococcal agent for 5 days prior to surgery (Seidelman et al., 2023).
- Only remove hair at or around the intended incision site if it will interfere with the procedure; when necessary, remove it immediately prior to the operation, using clippers. Avoid shaving hair with razors at the operative site as shaving is associated with a high risk for SSI.
    - If hair removal is necessary, perform in preoperative holding area, not in the operating room.
- Ensure that skin at or near the incision site is free of gross contamination prior to applying antiseptic skin preparations.
- Bowel preparation prior to colon surgery reduces SSI rates (Anderson & Sexton, 2024).

Perioperative Staff Preparation

- Perform antisepsis of hands (including under the nails) and forearms with an antiseptic agent immediately prior to the procedure, in accordance with manufacturer's recommendation for the specific product in use.
- Ensure all staff wear a surgical mask that fully covers the mouth and nose when they are present in the operating room, at any time when sterile instruments are exposed, when surgery is about to begin or in progress, and for the duration of the procedure.
- Wear a new, disposable, or hospital-laundered head covering for each case and ensure it fully encases all hair on the head and all facial hair not covered by a surgical mask.
- Every member of the scrubbed surgical team should wear sterile gloves, donned after the sterile gown is in place.
- Use only surgical gowns and drapes that are water resistant.
- Change scrubs if they become visibly soiled, contaminated, or are penetrated by blood or other infectious materials as soon as possible. Scrubs should not be worn during patient encounters outside the operating room or outside the hospital perimeter (Anderson & Sexton, 2024).
- Remove or cover all head and neck jewelry.
- Ensure that a surgical safety checklist is being utilized based on organizational policy to promote consistent adherence to and implementation of best practices (Seidelman at al., 2023).

Operating Room & Surgical Instruments

- Maintain positive pressure ventilation in the operating room and adjoining spaces.
- Sterilize all surgical instruments according to published guidelines and manufacturer's recommendations.
- Reserve flashing, or immediate-use steam, for patient care items that will be used immediately in emergency situations when no other options are available.
- Limit traffic through the operating room, both the number of people and the number of door openings to only those that are essential.

Sterile and Surgical Technique

- Adhere to principles of sterile technique for all invasive surgical procedures.
- Protect primary incisions with a sterile dressing for 24-48 hours postoperatively.
- Perform intraoperative skin preparation with an alcohol-based antiseptic agent, unless contraindicated.
- Consider intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution. Intra-peritoneal lavage with aqueous iodophor solution in contaminated or dirty abdominal procedures is not necessary.
- The following strategies are not required to prevent SSIs:
    - Use of plastic adhesive drapes (with or without antimicrobial properties)
    - Application of a microbial sealant immediately following intraoperative skin preparation
- Research is ***inconclusive*** to support the following:
    - Soaking prosthetic devices in antiseptic solutions prior to implantation

- Repeat application of antiseptic agents to the surgical site prior to closure

Antimicrobial Prophylaxis (AMP)

- Parenteral
  - Administer preoperative antimicrobial agents only in cases that fit criteria established by published clinical practice guidelines.
  - If prophylactic antibiotics are recommended, time the administration so that therapeutic levels are reached when the incision is made, generally, within 60 minutes of incision to maximize tissue concentration of the antibitoics.
  - For cesarean sections, administer antibiotic prophylaxis before the incision is made.
  - For clean and clean-contaminated surgical sites, do not re-dose prophylactic antibiotics after the surgical incision is closed, even if a drain is present. This standard applies to all patients, even prosthetic joint arthroplasty patients receiving immunosuppressive therapy or systemic steroids.
  - Weight-based adjustments of parenteral doses of antimicrobial agents are not recommended.
- Nonparenteral
  - Unless contraindicated, use alcohol-based skin preparations used in the operating room.
  - Do not apply antimicrobial agents (e.g.,. ointments, solutions, or powders) to the surgical incision to prevent SSIs.
  - Triclosan-coated sutures may be considered to prevent SSI.
  - There is ***weak or no evidence*** to support the following:
    - Antimicrobial irrigation solutions
    - Soaking prosthetic devices in antimicrobial solutions prior to implantation
    - Application of ointment, solutions, or powders to cover incisions
    - Use of autologous platelet-rich plasma
    - Use of antimicrobial dressings after primary surgical site closure

Glycemic Control

- Perioperative hyperglycemia has been associated with an increased risk of infection (Anderson & Sexton, 2024).
  - The CDC recommends perioperative glucose target levels less than 200 mg/dL and to avoid hypoglycemia.
  - Consider checking blood glucose level every one to two hours during the surgery
- There is no established optimal hemoglobin A1C target for patients with and without diabetes mellitus, for prevention of SSIs.
- In the post-operative period, monitor blood glucose regardless of diabetes status and maintain glucose values between 110 and 150 mg/dL (Seidelman et al., 2023).

Normothermia

- Maintain normal body temperature in all patients during surgery; perioperative hypothermia may increase risk for SSI due to vasoconstriction and reduced oxygen to the tissues.
- There are no specific standards for timing or duration of perioperative temperature management or lower limit of normothermia.

Oxygenation

- High-inspired (supplemental) oxygen used perioperatively may decrease rates of SSI.
- For patients with normal pulmonary function undergoing general anesthesia, with endotracheal intubation, administer an increased fraction of inspired oxygen during surgery, after extubation, and in the immediate postoperative period.
- To optimize oxygen delivery to the tissues, maintain normothermia, tissue perfusion, and adequate volume replacement.
- Supplemental oxygen via facemask has ***not*** been established as beneficial in SSI prevention for patients receiving general anesthesia without endotracheal intubation or neuraxial anesthesia (e.g., spinal, epidural, or local nerve blocks).
- Optimal duration, delivery method, or target level of supplemental oxygen administration has ***not*** been established.

Prosthetic Joint Arthroplasty Considerations

- Do not withhold blood transfusions from surgical patients to decrease SSIs.
- There are ***no clear recommendations*** regarding the use of the following to reduce SSIs in prosthetic joint arthroplasty:
    - Systemic corticosteroid or other immunosuppressive therapy
        - *Note:* For prosthetic joint arthroplasty patients on systemic corticosteroid or other immunosuppressive therapy (in clean and clean-contaminated procedures), do not administer additional prophylactic antimicrobials after the surgical incision is closed in the operating room, even in the presence of a drain.
    - Pre-procedure intra-articular corticosteroid injection
    - Anticoagulation or use of venous thromboembolism prophylaxis
    - Orthopaedic surgical space suite
    - Strategies to prevent biofilm
        - Antimicrobial/modified joint cement
        - Modified prosthetic joints
        - Vaccinations to prevent biofilm
        - Biofilm control agents (biofilm dispersants, quorum-sensing inhibitors, or novel antimicrobial agents)

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