Actionable Patient Safety Solution (APSS) #2C: SURGICAL SITE INFECTIONS (SSI)

Executive Summary Checklist

In order to establish a program to reduce surgical site infections (SSIs) the following implementation plan will require these actionable steps. The following checklist was adapted from the core prevention strategies recommended by the CDC.¹

- Hospital governance and senior administrative leadership must champion efforts to raise awareness of the problem in their own institution, in order to prevent and safely manage SSIs.
- Educate patients and families on SSI prevention.
- Implement surveillance and metrics to measure patient outcomes. The results of this monitoring should be reviewed at periodic caregiver education sessions, such as “grand rounds.”

Pre-operative:

- Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines.²
  - Administer within 1 hour prior to incision (2 hours for vancomycin and fluoroquinolones)
  - Select appropriate agents on basis of:
    1. Surgical Procedure
    2. Most common SSI pathogens for the planned procedure
    3. Known allergies or drug reactions of each specific patient.
    4. Published recommendations
- Do not remove hair at the operative site unless it will interfere with the operation.
- Use appropriate antiseptic agent and technique for skin preparation.
- Maintain immediate postoperative normothermia.
- If appropriate, mechanically prepare patients for colorectal surgery by enema or cathartic agents.
  Administer non-absorbable oral antimicrobial agents in divided doses on the day before the operation.

Intraoperative:

- Keep operating room (OR) doors closed during surgery except as needed for passage of equipment, personnel, and the patient. Ensure that interior of operating room is at “positive pressure” relative to adjacent corridors.

Postoperative:

- Protect primary closure incisions with sterile dressing for 24-48 hours post-op
- Discontinue antibiotics within 24 hours after the surgery end time (48 hours for cardiac patients), unless signs of infection are present.

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The Performance Gap

There are approximately 300,000 surgical site infections (SSIs) annually (17% of all HAI; second to UTI). SSIs occur in 2%-5% of patients undergoing inpatient surgery\(^3\). The SSIs mortality rate is 3%, with a 2-11 times higher risk of death versus other infections. Seventy-five percent of deaths among patients with SSI are directly attributable to the SSI. Long-term disabilities can result from SSIs and while studies have been done on mortality, no studies have been done on the life-altering long-term disabilities and associated financial burdens that can result from SSIs.

A surgical site infection is an infection that occurs after surgery in the part of the body where the surgery took place. Most patients who have surgery do not develop an infection. Some of the common symptoms of a surgical site infection include redness and pain around the surgical site area, drainage of cloudy fluid from the surgical wound, and fever.

Surgical site infections can result in 7-10 additional postoperative hospital days due to an SSI. Direct costs can be between $3,000-$29,000 per SSI, depending upon the procedure and pathogen. On a national scale, direct and indirect medical costs combined can reach up to $10 billion annually.\(^4\) These estimated costs do not account for the additional costs of rehospitalization, post-discharge outpatient expenses, and long-term disabilities.

The pathogenesis of SSIs can be endogenous (patient flora, seeding from a distant site of infection) and exogenous (surgical personnel, OR physical environment and ventilation, tools, equipment, and materials brought to the operative field). Challenges exist in detecting SSIs such as the lack of standardized methods for post-discharge/outpatient surveillance due to an increased number of outpatient surgeries and shorter postoperative inpatient stays. Another challenge is the increasing trend toward resistant organisms which may undermine the effectiveness of existing recommendations for antimicrobial prophylaxis.

Education and awareness of risk factors amongst healthcare workers, physicians and nurses followed by the implementation of standardized guidelines can minimize the incidence of SSIs in hospitals. Some key preventive measures include appropriate antimicrobial prophylaxis, preoperative identification and treatment of existing infections, proper site preparation methods (hair removal, skin site), maintenance of normothermia in the immediate postoperative period, and keeping OR doors closed during surgical procedures.

Leadership Plan

- Hospital governance and senior administrative leadership must champion efforts in raising awareness around the high incidence of SSIs and prevention measures.
- Healthcare leadership should support the implementation of standards on pre-, intra- and postoperative guidelines to minimize incidence of SSIs.
- Senior leadership will need to address barriers, provide resources, and assign accountability throughout the organization.
- Hospital administration should implement surveillance and metrics to measure outcomes.

Practice Plan

- Pre-operative skin cleansing
  - Develop standardized process for pre-operative skin cleansing that includes the repeated use of chlorhexidine gluconate (CHG).

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○ Educate patients on how to appropriately apply the CHG prior to surgery, and about the risk that they might reduce the residual beneficial effects of the CHG if they apply lotions or deodorants after cleansing.

● Pre-operative screening for patients at risk for SSI
  ○ Develop a protocol to conduct nasal Staphylococcus aureus (SA) screening in patients undergoing cardiac and elective orthopedic surgery.
  ○ Develop a protocol to attempt to decolonize SA carriers that includes intranasal Mupirocin.

● Educate patients and families on SSI prevention
  ○ The adverse effect of tobacco use on wound healing and the importance of ceasing tobacco use for a minimum of 1 month pre- and post-surgery.
  ○ Importance of proper nutrition pre- and post-operatively to support competent immune response to infection.
  ○ In patients with diabetes, the importance of ensuring their blood sugar is well controlled.
  ○ Appropriate preoperative bathing and skin cleansing.
  ○ Identify any skin irritation or hypersensitivity in prior surgical experiences, and any new skin conditions.
  ○ Postoperative wound handling techniques and hand hygiene.
  ○ Early signs of sepsis

● Peri-operative skin antisepsis
  ○ Use preoperative skin antiseptic agents that have been FDA-approved or cleared and approved by the health care organization’s infection control personnel; these should be used for all preoperative skin preparation. This preparation should significantly reduce microorganisms on intact skin, contain a non irritating antimicrobial preparation, be broad spectrum, be fast acting, and have a persistent effect.
  ○ Develop standardized practices, guided by the product insert, for the peri-operative application of skin antiseptic agents that ensures an appropriate therapeutic dose covers and is maintained across the entirety of the skin surface.
  ○ Educate perioperative personnel on the safe application and use of selected skin antiseptic agents, and the benefits of skin antisepsis to reduce the microbial burden on the skin prior to surgery.

● Proper hair removal
  ○ Remove only hair that interferes with the surgical procedure.
  ○ Clip hair at the surgical site using a single-use hair clipper, or with a clipper with removable head that can be disinfected between patients. Razors should not be used.

● Appropriate timing, selection, and duration of prophylactic antibiotics

● Maintenance of normothermia
  ○ Use warmed forced-air blankets prophylactically, during surgery, and in PACU.
  ○ Use warmed fluids for IVs and flushes in surgical sites and openings.

**Technology Plan**

*Suggested practices and technologies are limited to those proven to show benefit or are the only known technologies with a particular capability. As other options may exist, please send information on any additional technologies, along with appropriate evidence, to info@patientsafetymovement.org*

● Consider implementing technologies that provide skin antiseptic activity such as:
  ○ 3M® Duraprep™ and Carefusion® Chloraprep™

● Consider implementing technologies that support intraoperative wound protection such as:
  ○ Applied Medical® Alexis™ and 3M® SteriDrape™
Metrics

Topic:

**Colon Surgical Site Infection Rate (Colo SSI):** Rate of patients with a Colon Surgical Site Infection per 100 NHSN colon operative procedures

Outcome Measure Formula:

**Numerator:** Colon surgical site infections based on [CDC NHSN definitions](https://www.cdc.gov/nhsn/)

**Denominator:** Total number of colon operative procedures based on [CDC NHSN definitions](https://www.cdc.gov/nhsn/)

*Rate is typically displayed as SSI/100 Operative Procedures*

Metric Recommendations:

**Indirect Impact:**
All patients requiring a colon operative procedure

**Direct Impact:**
All patients requiring a NHSN colon operative procedure

**Lives Spared Harm:**

\[
Lives = (SSI Rate_{baseline} - SSI Rate_{measurement}) \times Operative Procedures_{baseline}
\]

Notes:
To meet the NHSN definitions, infections must be validated using the hospital acquired infection (HAI) standards.

Data Collection:
All NHSN colon operative procedures require infection surveillance for 30 days following the procedure date. Operative procedures are defined by ICD and CPT codes.

Colon SSIs can be displayed as a Standardized Infection Ratios (SIR) using the following formula:

\[
SIR = \frac{Observed SSI}{Expected SSI}
\]

Expected infections are calculated by NHSN and available by location (unit type) from the baseline period.

Mortality (will be calculated by the Patient Safety Movement Foundation):

The PSMF, when available, will use the mortality rates associated with Hospital Acquired Conditions targeted in the Partnership for Patient’s grant funded Hospital Engagement Networks (HEN). The program targeted 10 hospital acquired conditions to reduce medical harm and costs of care. “At the outset of the PiP initiative, HHS agencies contributed their expertise to developing a measurement strategy by which to track national progress in patient safety—both in general and specifically related to the preventable HACs being addressed by the PiP. In conjunction with CMS’s overall leadership of the PiP, AHRQ has helped coordinate development and use of the national measurement strategy. The results using this national measurement strategy have been referred to as the “AHRQ National Scorecard,” which provides summary data on the national HAC rate.\(^5\)

Topic:

**Abdominal Hysterectomy Surgical Site Infection Rate (Hyst SSI)**

Rate of patients with an abdominal hysterectomy surgical site infection per 100 NHSN abdominal hysterectomy operative procedures

**Outcome Measure Formula:**

**Numerator:** Abdominal hysterectomy surgical site infections based on **[CDC NHSN definitions]**

**Denominator:** Total number of abdominal hysterectomy operative procedures based on **[CDC NHSN definitions]**

*Rate is typically displayed as SSI/100 Operative Procedures*

**Metric Recommendations:**

**Direct Impact:**

All patients requiring a NHSN abdominal hysterectomy operative procedure

**Lives Spared Harm:**

\[ \text{Lives} = (\text{SSI Rate}_{\text{baseline}} - \text{SSI Rate}_{\text{measurement}}) \times \text{Operative Procedures}_{\text{baseline}} \]

**Notes:**

To meet the NHSN definitions, infections must be validated using the hospital acquired infection (HAI) standards.

**Data Collection:**

All NHSN abdominal hysterectomy operative procedures require infection surveillance for 30 days following the procedure date. Operative procedures are defined by ICD and CPT codes.

Colon SSIs can be displayed as a Standardized Infection Ratios (SIR) using the following formula:

\[ \text{SIR} = \frac{\text{Observed SSI}}{\text{Expected SSI}} \]

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