
YNHH Initiative to Reduce Surgical Site Infections (SSI)



Background: Surgical Site Infections (SSI)

- In spite of advances in infection prevention practices, surgical site infections (SSIs) remain a substantial cause of morbidity and mortality among patients.
- A systematic approach must be applied with the awareness that SSI risk is influenced by characteristics of the patient, operation, personnel, and healthcare setting.

Background: Scope of Problem¹

- Estimated 24 million surgical procedures/year
- 2 to 5% of operations are complicated by an SSI
- SSIs account for 24% of all Hospital Acquired Infections (HAI)
 - ✓ Third most frequent HAI
 - ✓ Most costly HAI
- SSIs prolong hospital stay an average of 7-10 days
- Patients with an SSI have a 2-11 times higher risk of death compared with operative patients without an SSI
- Total cost may exceed \$10 billion/yr
 - ✓ Attributable costs vary: \$3000-\$29,000

¹Anderson, Kaye, Classen et al. Strategies to Prevent Surgical Site Infections in Acute Care Hospitals *Infect control Hosp Epidemiol* 2008;29:S51-S61.

SSI Definition: CDC National Healthcare Safety Network (NHSN)

- General definition:
 - ✓ Inflammatory changes
 - Pain
 - Warmth
 - Swelling
 - Redness
 - ✓ Wound dehiscence
 - ✓ Purulent drainage or abscess formation
 - ✓ Usually within 30 days of operation
 - Up to 1 year if foreign body implanted
- SSIs are classified as follows:
 - ✓ Superficial incisional
 - Involving only skin or subcutaneous tissue
 - ✓ Deep incisional
 - Involving fascia and/or muscular layers
 - ✓ Organ/space

Surveillance for SSI

- Direct methods (daily wound examinations) are rarely used in practice
 - ✓ Impractical
 - ✓ Resource utilization requirements
- Indirect methods consists of a combination of the following:
 - ✓ Review microbiology reports and individual patient medical records
 - ✓ Surgeon and/or patient surveys
 - ✓ Screening for readmission of surgical patients
 - ✓ Other information such as coded diagnoses or operative reports
 - ✓ Sensitivity 84-89%, specificity 99.8%
- Measure SSI rates for the first 30 days following procedures that do not involve inserting implantable devices
 - ✓ Measure SSI rates for *one year* following procedures that involve the insertion of implantable devices
- About 70% of SSIs manifest themselves post-discharge
 - ✓ Rate varies by type of operation and type of SSI

Pathogenesis of Surgical Site Infections

- Microbial contamination of the surgical site is a necessary precursor of SSI.
 - ✓ Dose of bacterial contamination x virulence = risk of SSI
Resistance of the host patient
 - ✓ The risk of SSI is increased if a surgical site is contaminated with $>10^5$ organisms per gram of tissue.
 - ✓ Dose of contaminating organism required to produce infection may be much lower when foreign material is present.
- Endogenous sources of pathogens include the patient's skin, mucous membranes, or hollow viscera
- Exogenous sources of pathogens include:
 - ✓ Surgical personnel
 - ✓ Operating room environment
 - ✓ Tools, instruments and materials brought to the sterile field during an operation

SSI Risk Factors

Wound Classification

Infection Rate

Clean

<2%

Clean contaminated

<10%

Contaminated

20%

Dirty

30 to 40%

SSI Risk Factors

- Endogenous
 - ✓ Diabetes mellitus
 - ✓ Advanced age
 - ✓ Obesity
 - ✓ Malnutrition, recent weight loss
 - ✓ Cancer
 - ✓ Immunosuppressed (e.g., steroid use)
 - ✓ Other remote site of infection
- Exogenous
 - ✓ Prolonged preoperative stay
 - ✓ Preoperative hair removal by shaving
 - ✓ Length of operation
 - ✓ Maintenance of body temperature
 - ✓ Surgical technique
 - ✓ Incorrect use of prophylactic antibiotics

SSI Prevention Strategies: Pre-operative Measures

- Pre-operative antibiotics: *“Timing is everything”*

<u>Antibiotic given</u>	<u>SSI rate</u>
Early (2-24 hours before incision)	3.8%
Within 2 hours before incision	0.6%
Within 3 hours after incision	1.4%
Post-op	3.3%

Classen et al. (NEJM 1992)

SSI Prevention Strategies

- Minimize patient microbial burden
 - ✓ Surgical site disinfection before incision
 - ✓ Pre-operative antibiotic prophylaxis
 - ✓ Smoking cessation
- Optimize wound condition
- Optimize patient immune defenses
 - ✓ Control blood glucose in diabetics

Surgical Care Improvement Project (SCIP)

- SCIP tracks all of the following at YNHH
 - ✓ Antibiotics received *within 1 hour prior to incision* for those procedures where antibiotics are indicated
 - For quinolones and vancomycin a 2 hour time frame is acceptable
 - ✓ Antibiotic selection
 - CABG, other cardiac and vascular -> cefazolin, cefuroxime, or vancomycin*
 - Hysterectomy -> cefotetan, cefazolin, cefoxitin, cefuroxime, or ampicillin/sulbactam
 - Hip/knee arthroplasty -> cefazolin, cefuroxime, vancomycin*

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 - ✓ Antibiotic selection
 - Colon operations -> cefotetan, cefoxitin, ampicillin/sulbactam, ertapenam, or cefazolin, cefuroxime and metronidazole
 - For beta-lactam allergic patients alternative recommendations are available
 - **Reason for use of vancomycin must be documented by physician/APRN/PA if patient not beta-lactam allergic*

Surgical Care Improvement Project (SCIP)

- SCIP tracks all of the following at YNHH
 - ✓ Antibiotic discontinuation
 - Antibiotics must be stopped within 24 hours of surgery end time for elective surgical cases
 - For cardiac surgery antibiotics must be stopped within 48 hours of surgery end time
 - ✓ Cardiac surgery patients must have blood glucose <200 mg/dl at 6AM on post-operative day #1 and day #2.
 - ✓ Hair removal must be with clippers or depilatory only (no shaving), only if necessary and performed immediately prior to incision.
 - ✓ Colorectal surgery patients must have a temperature $\geq 96.8^{\circ}\text{F}$ within 15 minutes of leaving the operating room.

Background: Regulation and Reporting

- CMS no longer reimburses for SSIs in the following instances:
 - ✓ Mediastinitis after coronary artery bypass grafting
 - ✓ Total knee replacement
 - ✓ Laparoscopic gastric bypass and gastroenterostomy
 - ✓ Ligation and stripping of varicose veins
- Some states have requirements for public reporting of SSI rates post hysterectomy, knee and hip replacements, coronary artery bypass graft
- The 2009 Joint Commission (TJC) National Patient Safety Goals (NPSG)
 - ✓ Mandates education for nursing and physician providers, who care for surgical patients, upon hire and *annually*
 - ✓ Mandates patient and family education
 - ✓ Administer antimicrobial agents for prophylaxis for a particular procedure or disease according to evidence based best practices
 - ✓ When hair removal is necessary, use clipper or depilatories; *shaving is an inappropriate hair removal method*

Background: Regulation and Reporting

- Reduction of SSIs is one of several components of hospital wide efforts to reduce Hospital Acquired Infections (HAIs)
- Data on YNHH SSIs is provided to physicians, nursing staff, and hospital leadership
 - ✓ National Surgical Quality Improvement Program (NSQIP) – reports to Department of Surgery quarterly
 - ✓ Cardiac surgery (CABG, valves) SSI reported on the weekly QISS HAIReport
 - Annual report to Cardiac Surgery, more often if trends or concerns identified on interim analysis
 - ✓ Pilot SSI surveillance projects (e.g., liver and kidney transplant, university OB service C-section) reported to the appropriate department/section

Components of Efforts to Reduce SSI

- Patient and Family Education
 - ✓ All surgical patients must be educated regarding measures to prevent SSIs.
 - Educational materials that have been developed specifically for patients should be used.
- Whiteboard
 - ✓ Pre-operative antibiotic choice (if indicated), timing, duration; follow evidence based guidelines
 - ✓ Hair removal – no shaving, razors removed from OR
 - ✓ Normothermia
 - ✓ Glucose control
- Monitor compliance with best practices or evidence based guidelines
 - ✓ Everyone is empowered to **stop** a procedure if there has been a breach in sterile technique or any non-adherence with checklists/protocol.

YNHH Initiative to Reduce Surgical Site Infections (SSI)

Review Questions

Question #1

- Patient factors that increase the risk of a surgical site infection (SSI) include all of the following except:
 - A. Obesity
 - B. Diabetes Mellitus
 - C. Low albumin
 - D. Coronary artery disease
 - E. Cancer



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 - A. Obesity
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 - C. Low albumin
 - D. Coronary artery disease
 - E. Cancer

(D) Explanation: Diabetes, advanced age, obesity, malnutrition, cancer, immunosuppression (e.g., steroids) and other remote site of infection are all endogenous risk factors for SSI. Coronary artery disease is not a SSI risk factor.

Question #2

- Which of the following documented findings would not be considered a superficial SSI by NSQIP criteria
 - A. Purulent drainage from the wound
 - B. An erythematous, tender, warm wound
 - C. Isolation of bacteria from an aseptically obtained wound culture.
 - D. Wound opened by the surgeon with a negative culture
 - E. B and D



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(D)

Question #3

- Which of the following are characteristics of SSIs
 - A. Complicate 8-10% of all surgical interventions.
 - B. Are an uncommon example of a hospital acquired infection.
 - C. Are associated with both a longer hospital length of stay and increased patient mortality.
 - D. Nationally cost 3-5 million dollars per year.
 - E. Source is often the surgeon's naso-pharyngeal flora.



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 - D. Nationally cost 3-5 million dollars per year.
 - E. Source is often the surgeon's naso-pharyngeal flora.
- (C)** Explanation: SSIs are estimated to complicate 2-5% of all surgical interventions and account for 24% of hospital acquired infections at a cost of \$10 billion/year. Sources of organisms causing SSIs are both endogenous (the patient's own flora) and exogenous (personnel, instruments, environment).

Question #4

- Which of the following are components of efforts to reduce SSIs?
 - A. Administer pre-operative antibiotic prophylaxis (if indicated) within 60 minutes before incision (2 hours for vancomycin or quinolones).
 - B. Do not use shaving as a method of hair removal.
 - C. Maintain normothermia for colo-rectal surgery patients.
 - D. Maintain glucose control for cardiac surgery patients.
 - E. All of the above.

(E)

Question #5

- Which of the following is correct?
 - A. Most SSIs manifest themselves before patients are discharged home.
 - B. Patients and their families don't need to be educated regarding measures to prevent SSIs if they don't ask for the information.
 - C. Pre-operative antibiotic prophylaxis should be continued until the patient is discharged.
 - D. Everyone is empowered to stop a procedure if there has been a breach in sterile technique or any non-adherence with checklists/protocol.



Question #5

- Which of the following is correct?
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 - C. Pre-operative antibiotic prophylaxis should be continued until the patient is discharged.
 - D. Everyone is empowered to stop a procedure if there has been a breach in sterile technique or any non-adherence with checklists/protocol.

(D) Explanation: The majority of SSIs manifest themselves *after* patients are discharged. All surgical patients and their families must be educated regarding measures to prevent SSIs. Pre-operative antibiotic prophylaxis must be stopped within 24 hours of surgery end time for elective surgical cases (exception: within 48 hours of surgery end time for cardiac surgery).

- ✓ Everyone is empowered to **stop** a procedure if there has been a breach in sterile technique or any non-adherence with checklists/protocol.