

Surgical Site Infection Prevention

Last updated 2019

Basics of Infection Prevention
Healthcare-Associated Infections Program
Center for Health Care Quality
California Department of Public Health



Objectives

- Review the epidemiology of surgical site infections (SSI)
- Explore causes and mechanisms of SSI
- Describe evidence-based practices for preventing SSI
- Discuss adherence monitoring and feedback

SSI in California Hospitals

- Reported 3,676 SSI in 2017
 - Adult: 635,320 surgeries with 3,564 SSI
 - Pediatric: 23,358 surgeries with 112 SSI
- Would have needed to prevent 770 SSI to achieve 2020 reduction goal

CDPH HAI in California Hospitals Annual Report January to December 2017

<https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AnnualHAIReports.aspx>

2020 SSI Prevention Goal

- Target set by National Action Plan to Prevent HAI
 - Recommended by CDPH HAI Advisory Committee for California hospitals
- 30% SSI reduction from 2015 baseline = **SIR 0.70** in 2020

On track if

- **SIR 0.82** in **2018** *(for each procedure type)*
- SIR 0.76 in 2019

SSI Epidemiology

- SSI generally occur within 30 days following surgery
 - 8 California-mandated procedures monitored to 90 days
- 2% of hospitalized surgical patients acquire SSI
 - 3% die (75% attributable to the SSI)
 - Many result in long term disability
- SSI increase hospital length of stay by 7-10 days

Source of SSI Pathogens

- Patient's flora
 - From skin, GI tract, mucous membranes
 - Due to inadequate skin prep
 - Seeding from pre-existing sites of infection
- Surgical personnel flora
 - Inadequate hand hygiene
 - Breaks in aseptic techniques
- Contaminated equipment (*less common*)
 - Surgical instruments
 - Medical devices in operating room
- Ventilation problems (*less common*)



Common SSI Pathogens

Staphylococcus aureus – 21%

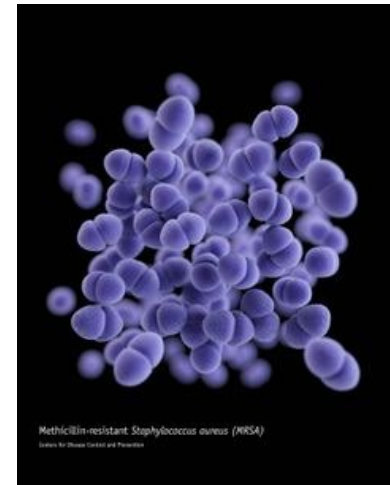
Escherichia coli – 14%

Coagulase-negative Staphylococci – 8%

Enterococcus faecalis – 8%

Pseudomonas aeruginosa – 5%

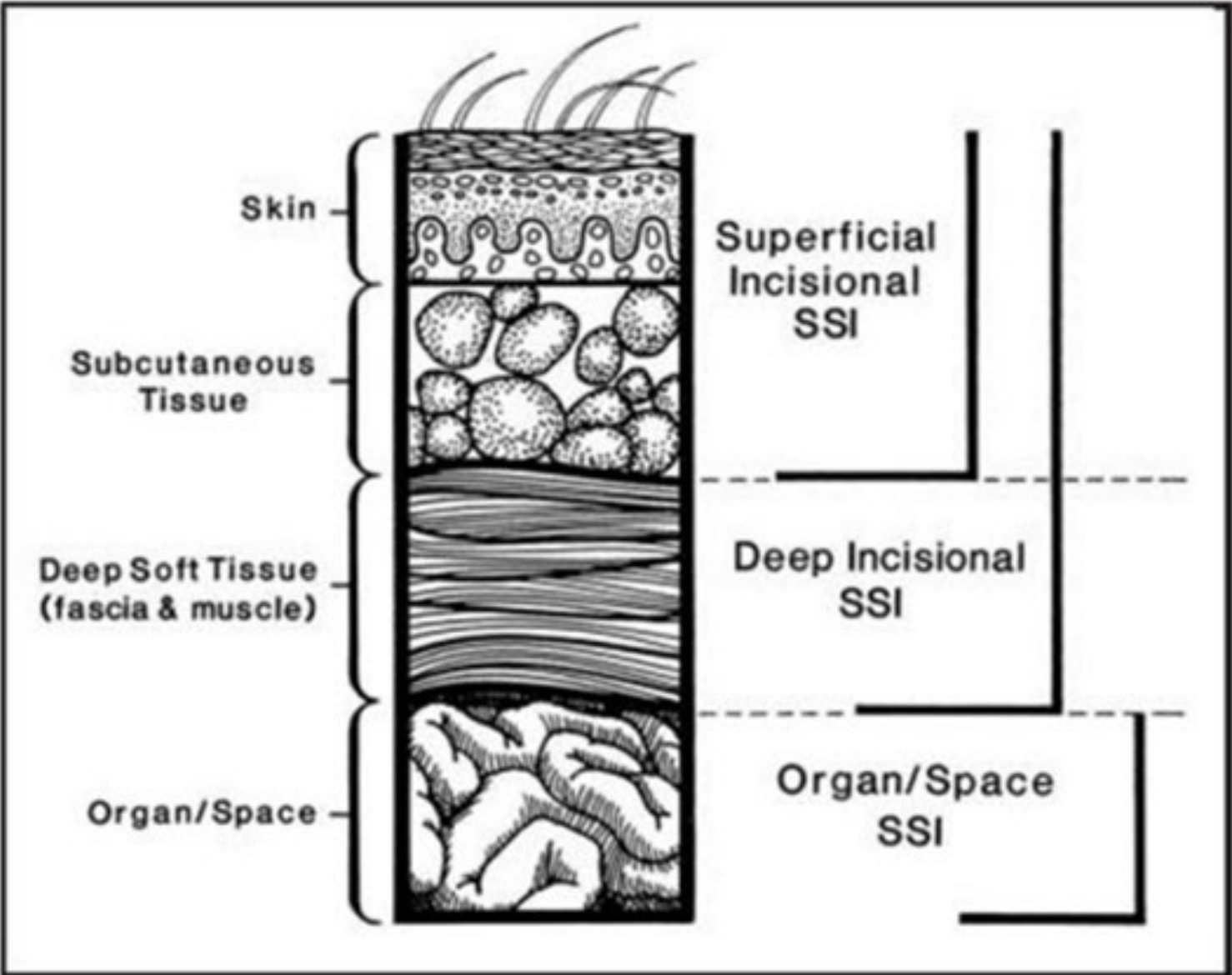
Bacteroides - 5%



[Appendix to Table 4 of the 2011-2014 NHSN Antimicrobial Resistance Report](https://www.cdc.gov/nhsn/xls/reportdatatables/2014-appendix-pathogens.xlsx)

(<https://www.cdc.gov/nhsn/xls/reportdatatables/2014-appendix-pathogens.xlsx>)

SSI Types



SSI Prevention – What works?

Evidence-based SSI prevention practice
recommendations from

- **CDC/HICPAC SSI Prevention Guideline, 2017**
- **CDC SSI Prevention Guideline, 1999**

Antimicrobial Prophylaxis

- Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines
 - Administer such that bactericidal concentration is highest in serum and tissues at time of incision
 - Administer before skin incision in all **Cesarean sections**
 - For all clean and clean/contaminated procedures, **STOP antibiotics** after incision is closed in the OR, even in the presence of a drain
- Topical antimicrobial agents (such as ointments, solutions, or powders) should not be applied to the surgical incision

Antiseptic Prophylaxis

- Before surgery, patients should shower/bathe (full body)
 - Soap **or** an antiseptic agent
 - At least the night before the operative day
- Skin preparation in the operating room should be performed with an **alcohol-based** antiseptic

Perioperative Care

- **During surgery**, control **blood glucose** level in **all patients** (<200mg/dl)
- Maintain perioperative **normothermia** in **all patients**
- Administer increased fraction of inspired oxygen (**FiO₂**) **during surgery** and **after extubation** in the immediate postoperative period
for patients with **normal pulmonary function** undergoing anesthesia with endotracheal intubation

Prosthetic Joint Arthroplasty

- Transfusion of blood products should not be withheld from surgical patients as a means to prevent SSI
- For prosthetic joint patients receiving systemic corticosteroid or other immunosuppressive therapy,
in clean and clean-contaminated procedures,
do not administer additional antimicrobial prophylaxis doses after the surgical incision is closed in the operating room,
even in the presence of a drain

Preparation of Surgical Patient

- Identify and treat remote infections before elective operation
 - Postpone elective operation until infection resolved
- **Do not remove hair** unless will interfere with the operation
 - If necessary, remove hair immediately before the operation with **clippers** immediately prior to procedure
- Encourage tobacco cessation for minimum of 30 days prior to surgery
- Ensure skin around incision site is free of gross contamination prior to antiseptic skin preparation

Hand and Forearm Antisepsis for Surgical Team

- Perform preoperative hand and forearm antisepsis according to manufacturer's recommendations for the product being used
- Refer to additional recommendations in CDC Guidelines for Hand Hygiene in Healthcare Setting, 2002 (*summarized on next slide*)

Surgical Hand Antisepsis

- Remove rings, watches, and bracelets before beginning the surgical hand scrub
- Remove debris from underneath fingernails using a nail cleaner under running water
- Perform surgical hand antisepsis using either an antimicrobial soap or an alcohol-based hand rub with persistent activity before donning sterile gloves
- When using an alcohol-based surgical hand-scrub product with persistent activity, allow hands and forearms to dry thoroughly before donning sterile gloves

Operating Room Ventilation

- Maintain positive pressure ventilation in the operating room and adjoining spaces
- Maintain the number of air exchanges, airflow patterns, temperature, humidity, location of vents, and use of filters in accordance with recommendations from the most recent version of the Facilities Guidelines Institute – Guidelines for Design and Construction of Hospitals and Outpatient Facilities (current version – 2014)

Cleaning and Disinfection of Environmental Surfaces

- Do not perform special cleaning or closing of OR after contaminated or dirty operations

Reprocessing Surgical Instruments

- Sterilize all surgical instruments according to published guidelines and manufacturer's recommendations
- Immediate-use steam sterilization should never be used for reasons of convenience, as an alternative to purchasing additional instrument sets, or to save time.
 - This practice should be **reserved only for patient care items that will be used immediately** in emergency situations when no other options are available.
- Refer to CDC HICPAC 2008 Guideline for Disinfection and Sterilization in Healthcare Facilities for additional recommendations.

Surgical Attire and Drapes

- Wear a **surgical mask** that fully covers the mouth and nose
 - When entering the operating room if an operation is about to begin or already under way
 - If sterile instruments are exposed
 - Wear the mask throughout the operation
- Wear a new disposable or hospital-laundered **head covering** for **each case**
 - Whenever entering the operating room
 - Ensure it fully covers all hair on the head and all facial hair not covered by the surgical mask
- Wear **sterile gloves** if serving as a member of the scrubbed surgical team
 - Put on sterile gloves after donning a sterile gown

Surgical Attire and Drapes - continued

- Use surgical gowns and drapes that are effective barriers when wet
 - Materials that resist liquid penetration
- Change scrub suits that are visibly soiled, contaminated, and/or penetrated by blood or other potentially infectious materials

Post-Op Incision Care

- Protect primarily closed incisions with a sterile dressing for 24-48 hours postoperatively

Sterile and Surgical Technique

- Adhere to principles of sterile technique when performing all invasive procedures
- If drainage is necessary, use a closed suction drain
 - Place drain in a separate incision distant from the operative incision
 - Remove drain as soon as possible

Hospital Role in SSI Prevention

- Ensure policies and practice reflect current evidence based practices
 - CDC guidelines
- Ensure staff competency upon hire and at least annually
 - Return demonstration to ensure competency
 - New hire orientation
 - Annual skills fair
- Perform SSI surveillance
- Develop an adherence monitoring program for SSI prevention practices
- Provide feedback to frontline staff and leaders
 - Present adherence results with SSI incidence to surgeons, perioperative services, and surgical units

**Are SSI Prevention Care Practices Used
Routinely in YOUR facility?**

You won't know if you don't monitor!

Adherence Monitoring for SSI Prevention

- OR observations
- Hand hygiene
- Safe injection practices
- Environmental cleaning and disinfection
- Device reprocessing
- High level disinfection of reusable devices
- Sterilization of reusable devices

CDPH Adherence Monitoring Tools

www.cdph.ca.gov/hai

Monitoring in the Operating Room



Healthcare-Associated Infections Program Adherence Monitoring Operating Room Observations

Regular monitoring with feedback of results to staff can maintain or improve adherence to SSI prevention tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type

Instructions: Observe each practice in the operating room and check a box if adherent, Yes or No. In total, record the number of “Yes” for adherent practices observed and the total number of observations (“Yes” + “No”). Calculate the percentage of “Yes” responses.

Surgical Site Practice		OR Observations 1	OR Observation 2	OR Observation 3
SS1.	Pre-operative hand antisepsis following manufacturer’s recommendations. No long or artificial nails, no jewelry worn.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
SS2.	Hair not removed. If necessary, removed just prior to surgery with clippers.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
SS3.	Skin prep in OR with alcohol-based agent	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Monitoring Device Reprocessing



Healthcare-Associated Infections Program Adherence Monitoring Device Reprocessing

Regular monitoring with feedback of results to staff can maintain or improve adherence to device reprocessing practices. Monitoring may be performed in any type of location where device reprocessing occurs.

Instructions: Observe each practice in the reprocessing area and check a box if adherent, Yes or No. In the summary section, report the number of observations for adherent practices observed and the total number of observations (“Yes” + “No”). Calculate adherence percentage.



Device Reprocessing Practices		Procedure 1
DR1.	Policies, procedures, and manufacturer reprocessing instructions for reusable medical devices used in the facility are available in the reprocessing area(s).	<input type="checkbox"/> Yes <input type="checkbox"/> No
DR2.	Reusable medical devices are cleaned, reprocessed (disinfection or sterilization) and maintained according to the manufacturer instructions. <i>Note: If the manufacturer does not provide such instructions, the device may not be suitable for multi-patient use.</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No
DR3.	Single-use devices are discarded after use and not used for more than one patient. <i>Note: If the facility elects to reuse single-use devices, these devices must be reprocessed prior to reuse by a third-party reprocessor that it is registered with the FDA as a third-party reprocessor and cleared by the FDA to reprocess the specific device in question. The facility should have documentation from the third party reprocessor confirming this is the case.</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No

Preventing SSI: The MOST Important Things

Prevent the Devastating Effects of Deep/Organ Space SSI

Prophylactic antibiotics

Right drug, right dose, right time

No doses after incision closed

Alcohol-based skin prep

Blood glucose control, all patients

Normothermia, all patients

Increased FiO₂, if normal function

Pre-night shower or bath

Treat other infections

Smoking cessation at least 30 days

No hair removal; if must, clippers

Maintain positive pressure ventilation

Hand hygiene

Surgical attire worn entire time including mask and head cover (covering all head and facial hair)

Clean and disinfect all surfaces between cases

Flash sterilization only if emergency

Sterile dressing for 24-48 hours

Additional SSI Prevention References and Resources

- Anderson DJ, Podgorny K, Berríos-Torres SI, et al. Strategies to prevent surgical site infections in acute care hospitals. *Infect Control Hosp Epidemiol*.35:605-27, 2014 <http://www.jstor.org/stable/10.1086/676022>
- Institute for Healthcare Improvement (IHI), <http://www.ihl.org/Engage/Memberships/MentorHospitalRegistry/Pages/InfectionPreventionSSI.aspx>
- Surgical Care Improvement Project (SCIP), <https://www.qualitynet.org/dcs/ContentServer?cid=1137346750659&pageName=Medqic/Content/ParentShellTemplate&parentName=TopicCat&c=MQParents>
- World Health Organization (WHO), www.who.int/patientsafety/safesurgery/en/

Questions?

For more information,
please contact any
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Or email

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