

# Surgical Site Infection Prevention

Last updated 2017

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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 Epidemiology

- SSI generally occur within 30 days following surgery
  - Some procedures are monitored up to 90 days
- 1.9% of hospitalized surgical patients acquire SSI
  - 3% die
  - 75% of deaths are attributable to the SSI
  - Many result in long term disability
- SSI increases hospital length of stay by 7-10 days
  - Cost estimates vary, ~\$30,000 per SSI
  - Most estimates do not account for re-hospitalization, outpatient affected treatment, post-discharge expenses, quality of life for the patient, or any long term disability costs

# SSI Pathogenesis

## Endogenous

- Patient Flora
  - Skin
  - GI tract
  - Mucous membranes
- Seeding from pre-existing sites of infection

## Exogenous

- Surgical personnel flora
- Inadequate skin prep
- Inadequate hand hygiene
- Contaminated equipment, surgical tools, devices within operative field or environment, including ventilation
- Breaks in aseptic techniques

## SSI Pathogens

*Staphylococcus aureus* – 21%

*Escherichia coli* – 14%

Coagulase-negative Staphylococci – 8%

*Enterococcus faecalis* – 8%

*Pseudomonas aeruginosa* – 5%

Bacteroides - 5%

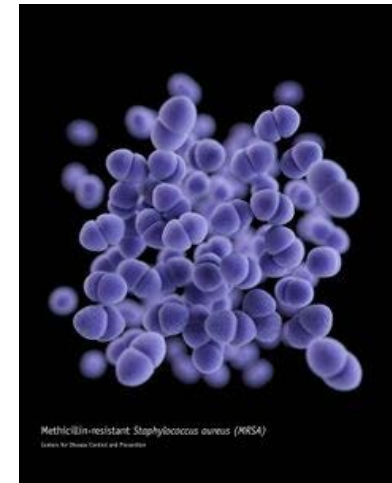
Enterobacter spp. – 4%

Enterococcus spp. - 4%

*Enterococcus faecium* – 3%

Proteus spp. 3%

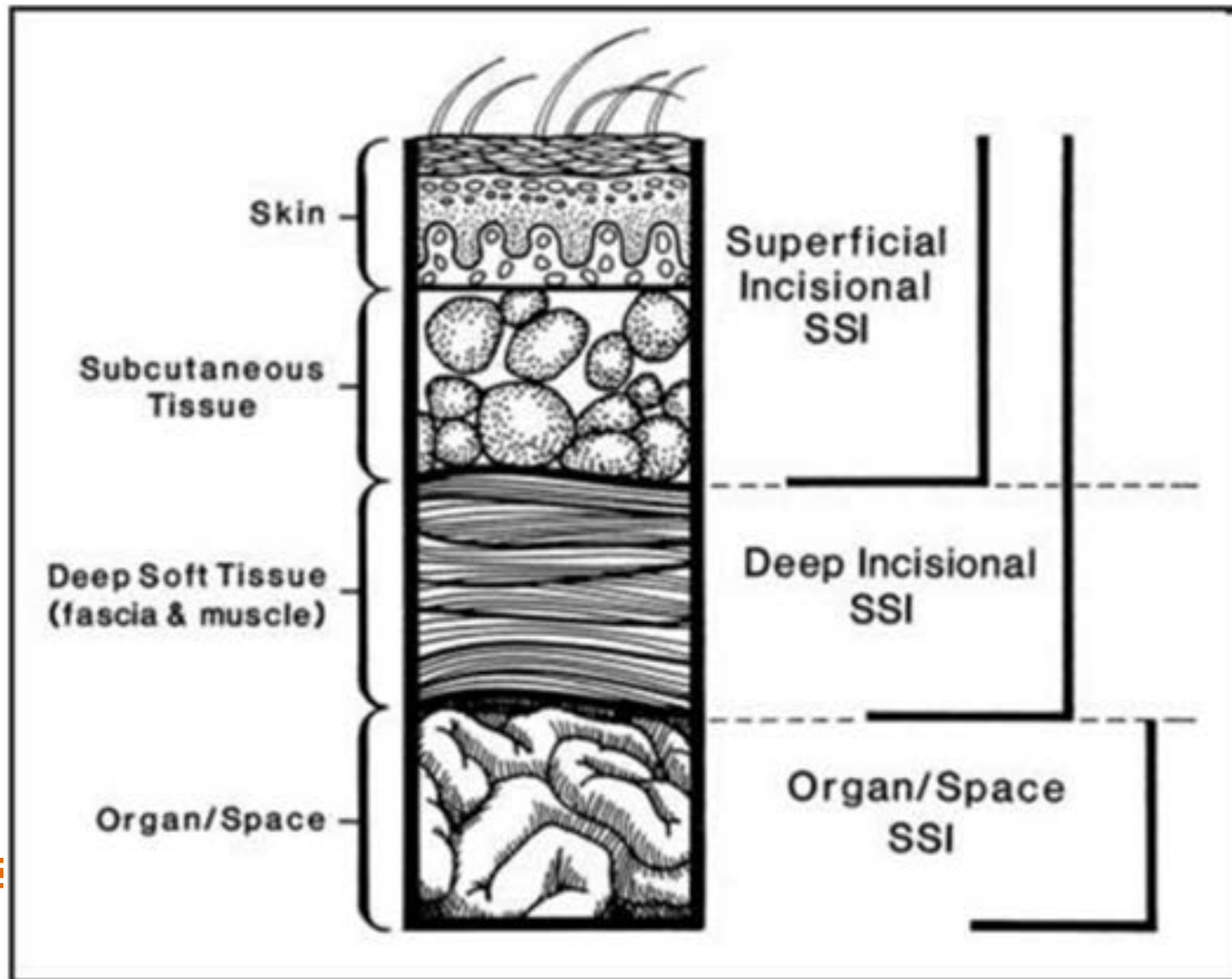
*Streptococcus Viridans* – 2%



Appendix to Table 4 of the 2011-2014 NHSN Antimicrobial Resistance Report

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

# SSI Severity Range



## SSI Prevention Objectives

- National HAI Prevention Action Plan 2020 Target Goal
  - Reduce SSI by 30% from 2015 baseline
- CDPH HAI Advisory Committee recommended adoption by California hospitals



# CDC Prevention Recommendations

## Core Care Practices

- Higher levels of scientific evidence
- Demonstrated feasibility

**Standard of practice**

## Supplemental Care Practices

- Some scientific evidence
- Variable levels of feasibility

**Implement in addition to primary strategies when infections persist**



# SSI Core Prevention Strategies

## New or revised, 2017

- Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines
  - Administer such that bactericidal concentration is highest in tissues at time of incision
  - Administer before incision in all cesarean sections
  - In clean and clean/contaminated procedures, do not administer after the incision is closed (includes prosthetic joint arthroplasty) even in the presence of a drain
- Do not apply antimicrobial agents (i.e., ointments, solutions, or powders)) to surgical incision

CDC / HICPAC Guideline for Prevention of SSI, 2017

<https://jamanetwork.com/journals/jamasurgery/fullarticle>

# SSI Core Prevention Strategies

## New or revised, 2017

- Control blood glucose level in all patients during immediate post-operative period (<200mg/dl)
- Maintain perioperative normothermia
- Administer increased FiO<sub>2</sub> in the perioperative period
- Advise patients to shower/bathe with soap or an antiseptic agent at least the night before the operative day
- Perform intraoperative skin preparation with an alcohol-based antiseptic
- Do not withhold transfusion of necessary blood products as a means to prevent SSI

CDC / HICPAC Guideline for Prevention of SSI, 2017

<https://jamanetwork.com/journals/jamasurgery/fullarticle>

# SSI Core Prevention Strategies

## From 1999 CDC guideline; considered practice standards

- Identify and treat remote infections before elective operation
- Do not remove hair. If necessary, use clippers immediately prior to procedure
- Encourage tobacco cessation 30 days prior to surgery
- Ensure skin around incision site is free of gross contamination prior to antiseptic skin preparation
- Perform hand and forearm antisepsis (surgical team)

CDC / HICPAC Guideline for Prevention of SSI, 2017

<https://jamanetwork.com/journals/jamasurgery/fullarticle>

# SSI Core Prevention Strategies

## From 1999 CDC guideline; considered practice standards

- Maintain positive pressure ventilation in OR and adjoining spaces
- Do not perform special cleaning or closing of OR after contaminated or dirty operations
- Sterilize all surgical instruments according to published guidelines and manufacturer's recommendations
- Use immediate-use steam sterilization only on items to be used immediately for emergency when no other option available

CDC/HICPAC Guideline for Prevention of SSI, 2017

<https://jamanetwork.com/journals/jamasurgery/fullarticle>

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CDC/HICPAC Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008  
<https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf>



# SSI Core Prevention Strategies

## From 1999 CDC guideline; considered practice standards

- Wear a surgical mask fully covering nose and mouth during operation and when sterile instruments are exposed
- Wear new, disposable, or hospital laundered head covering for each case. Ensure it fully covers hair on head and facial hair not covered by mask
- Wear sterile gloves if a member of scrub team
- Use liquid penetration resistant surgical gowns and drapes
- Change scrub suits visibly soiled, contaminated, or penetrated by blood or other potentially infectious materials

CDC/HICPAC Guideline for Prevention of SSI, 2017

<https://jamanetwork.com/journals/jamasurgery/fullarticle>

CDC/HICPAC Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008

<https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf>

# SSI Core Prevention Strategies

## From 1999 CDC guideline; considered practice standards

- Adhere to principles of sterile technique
- If drainage is necessary, use a closed suction drain. Place drain in a separate incision distant from the operative incision.
- Protect primarily closed incisions with a sterile dressing for 24-48 hours post-op

CDC / HICPAC Guideline for Prevention of SSI, 2017  
<https://jamanetwork.com/journals/jamasurgery/fullarticle>

# IP 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

# 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](http://www.cdph.ca.gov/hai)



# Adherence Monitoring Tool – OR Observations

Practice	Observe 1		Observe 2		Adherence by Task	
	Yes	No	Yes	No	# Yes	# Obs
OR clean, dust free, good repair, uncluttered.	Yes	No	Yes	No		
OR door closed, only necessary personnel are in the room; traffic limited to necessary staff.	Yes	No	Yes	No		
Appropriate surgical attire is used (tied mask, all hair is covered, no long or artificial nails, no jewelry, no personal belongings, no personal clothing visible, shirts tucked, arms covered).	Yes	No	Yes	No		
Safe injection practices observed (e.g. ports/vial top scrubbed, needles and syringes are used one time).	Yes	No	Yes	No		
Pre-op bathing is performed.	Yes	No	Yes	No		
Appropriate pre-op skin prep is performed (agent, application technique, hair removal).	Yes	No	Yes	No		
All hand hygiene opportunities are successful.	Yes	No	Yes	No		
Sterility maintained (e.g. no breaches in field, instruments and implants are sterile, no immediate use sterilization, appropriate draping).	Yes	No	Yes	No		
# Yes _____ # Observed _____ #Yes/#Observed = % Adherence _____%						

# Are SSI Prevention Core Care Practices Used Routinely in YOUR facility?

- **Preoperative antibiotics:**  
Right drug, right dose, right time (i.e. stopped at close)
- Blood glucose control
- Normothermia
- Increased  $\text{FiO}_2$
- Alcohol-based skin prep
- Pre-night shower or bath
- Treat other infections
- Avoid hair removal; no razors
- Maintain positive pressure; keep OR doors closed
- Hand hygiene
- Surgical attire worn entire time including mask and head cover (over all head and facial hair)
- Clean/disinfect all surfaces between cases
- Avoid flash sterilization
- Sterile dressing for 24-48 hours

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

# 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/](http://www.who.int/patientsafety/safesurgery/en/)

## Questions?

For more information,  
please contact any  
HAI Liaison IP Team member

Or email

[HAIProgram@cdph.ca.gov](mailto:HAIProgram@cdph.ca.gov)