

# Guideline for prevention of surgical site infection

**Editor's note:** *In 1999, the Guideline for the prevention of surgical site infection was published by the National Center for Infectious Diseases, of the U.S. Centers for Disease Control and Prevention. The Guideline provides an overview of surgical site infection (SSI), as well as evidence-based recommendations for the prevention of SSI.*

*The following summary of the Guideline was prepared by the College's Committee on Operating Room Environment (CORE), with assistance from Ronald L. Nichols, MD, FACS, Henderson Professor of Surgery, professor of microbiology and immunology, Tulane University, New Orleans, LA, and Jonathan R. Hiatt, MD, FACS, Los Angeles, CA, the CORE Vice-Chair.*

*The entire Guideline for the Prevention of Surgical Site Infection is available in Infection Control and Hospital Epidemiology, 20:247-278, 1999, or online at <http://www.cdc.gov/ncidod/hip/SSI/SSI.pdf>*

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## Criteria for defining a surgical site infection (SSI)<sup>1</sup>

### Superficial incisional SSI

Infection occurs within 30 days after the operation

and infection involves only skin or subcutaneous tissue of the incision

and at least *one* of the following:

1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.

2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.

3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless incision is culture-negative.

4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

Do *not* report the following conditions as SSI:

1. Stitch abscess (minimal inflammation and discharge confined to the points of suture penetration).

2. Infection of an episiotomy or newborn circumcision site.

3. Infected burn wound.

4. Incisional SSI that extends into the fascial and muscle layers (see deep incisional SSI).

*Note:* Specific criteria are used for identifying infected episiotomy and circumcision sites and burn wounds.<sup>2</sup>

### Deep incisional SSI

Infection occurs within 30 days after the operation if no implant<sup>3</sup> is left in place or within one year if implant is in place and the infection appears to be related to the operation

and infection involves deep soft tissues (e.g., fascial and muscle layers) of the incision

and at least *one* of the following:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.

2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (> 38° C), localized pain, or tenderness, unless site is culture-negative.

3. An abscess or other evidence of infection in-

volving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.

4. Diagnosis of a deep incisional SSI by a surgeon or attending physician.

*Notes:*

1. Report infection that involves both superficial and deep incision sites as deep incisional SSI.

2. Report an organ/space SSI that drains through the incision as a deep incisional SSI.

### Organ/space SSI

Infection occurs within 30 days after the operation if no implant<sup>3</sup> is left in place or within one year if implant is in place and the infection appears to be related to the operation

and infection involves any part of the anatomy (e.g., organs or spaces) other than the incision, which was opened or manipulated during an operation

and at least *one* of the following:

1. Purulent drainage from a drain that is placed through a stab wound<sup>4</sup> into the organ/space.

2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.

3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.

4. Diagnosis of an organ/space SSI by a surgeon or attending physician.

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### References

1. Horan TC, Gaynes RP, Martone WJ, et al: CDC definitions of nosocomial surgical site infections, 1992: A modification of CDC definitions of surgical wound infections. *Infect Control Hosp Epid*, 12(10):606-608, 1992.
2. Gaynes RP, Horan TC: Surveillance of nosocomial infections, in: Mayhall CG (ed): *Hospital epidemiology and infection control*. Baltimore, MD: Williams & Wilkins, 1996, 1017-1031.
3. National Nosocomial Infection Surveillance definition: a nonhuman-derived implantable foreign body (e.g., prosthetic heart valve, nonhuman vascular graft, mechanical heart, or hip prosthesis) that is permanently placed in a patient during surgery.
4. If the area around a stab wound becomes infected, it is not an SSI. It is considered a skin or soft tissue infection, depending on its depth.

## Ranking of recommendations

**Category IA:** Strongly recommended for implementation and supported by well-designed experimental, clinical, or epidemiologic studies.

**Category IB:** Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and strong theoretical rationale.

**Category II:** Suggested for implementation and supported by suggestive clinical or epidemiological

studies or theoretical rationale.

**No recommendation; unresolved issue:** Practices for which insufficient evidence or no consensus regarding efficacy exists.

*Note:* Recommendations denoted with an asterisk (\*) are mandated by U.S. Occupational Safety and Health Administration.

### RECOMMENDATIONS

IA	IB	II	No recommendation
<b>1. PREOPERATIVE</b> <i>a. preparation of the patient</i>			
1. Identify and treat remote site infections and postpone elective operation until infection resolved.  2. Do not remove hair at incision site unless necessary for the operation.  3. If hair is removed, remove immediately prior to operation, using electric clippers.	4. Control blood glucose in diabetics, avoid preop hyperglycemia.  5. Encourage tobacco cessation at least 30 days before operation.  6. Do not withhold blood products to prevent SSI.  7. Require patient to shower or bathe with antiseptic agent on night before operative day.  8. Thoroughly wash and clean at and around the incision site to remove gross contamination before skin prep.  9. Use an appropriate antiseptic agent for skin preparation.  10. Apply preoperative antiseptic skin preparation in concentric circles moving toward the periphery.	11. Minimize preoperative hospital stay.	12. No recommendation to taper or discontinue steroids before operation.  13. No recommendation to enhance nutritional support.  14. No recommendation to apply mupirocin to nares to prevent SSI.  15. No recommendation to provide measures that enhance wound space oxygenation.
<b>1. PREOPERATIVE</b> <i>b. antiseptics for surgical team</i>			
	1. Keep nails short and do not wear artificial nails.  2. Surgical scrub at least two-five minutes (up to elbow) using appropriate antiseptic.  3. Do not touch scrubbed arms on objects. Dry hands with a sterile towel and don a sterile gown and gloves.	4. Clean underneath each fingernail prior to performing the first surgical scrub of the day.  5. Do not wear hand or arm jewelry.	6. No recommendation on nail polish.

**RECOMMENDATIONS**

IA	IB	II	No recommendation
<p><b>1. PREOPERATIVE</b>  <i>c. management of infected surgical personnel</i></p>			
	<p>1. Educate personnel who have signs and symptoms of a transmissible infectious illness to report conditions to their supervisory personnel.</p> <p>2. Develop well-defined policies to govern: (a) personnel responsibility to report illness; (b) work restrictions; and (c) clearance to resume work after an illness. Policies should identify persons who have authority to remove personnel from duty.</p> <p>3. Exclude from duty personnel who have draining skin lesions until infection has been ruled out or has been resolved.</p> <p>4. Do not routinely exclude personnel who are colonized with organisms, such as <i>S. aureus</i> or group <i>A. streptococcus</i>, unless personnel have been linked epidemiologically in the health care setting.</p>		
<p><b>1. PREOPERATIVE</b>  <i>d. antimicrobial prophylaxis</i></p>			
<p>1. Administer prophylactic antimicrobial agent when indicated, based on its efficacy to prevent SSI for a specific operation and published recommendations.</p> <p>2. Administer initial prophylactic antimicrobial agent IV, timed so that concentration is established when the incision is made.</p> <p>3. Before elective colon operations, use mechanical cleansing. Administer non-absorbable oral antimicrobial agents on the day before operation.</p> <p>4. For high-risk C-section, administer prophylactic antimicrobial agent immediately after umbilical cord is clamped.</p>	<p>5. Do not routinely use vancomycin for antimicrobial prophylaxis.</p>		

## RECOMMENDATIONS

IA	IB	II	No recommendation
<b>2. INTRAOPERATIVE</b> <i>a. ventilation</i>			
	<ol style="list-style-type: none"> <li>1. Maintain positive-pressure ventilation in the ORs.</li> <li>2. Maintain at least 15 air changes per hour.</li> <li>3. Filter all air with appropriate filters.</li> <li>4. Introduce all air from ceiling with exhaust near floor.</li> <li>5. Do not use UV radiation in OR to prevent SSI.</li> <li>6. Keep OR doors closed when possible.</li> </ol>	<ol style="list-style-type: none"> <li>7. Consider performing orthopaedic implant operations in ORs supplied with ultra clean air.</li> <li>8. Limit number of personnel entering the ORs.</li> </ol>	
<b>2. INTRAOPERATIVE</b> <i>b. cleaning and disinfection of environmental surfaces</i>			
	<ol style="list-style-type: none"> <li>1. When blood or body fluid soiling occurs during an operation, clean with EPA-approved hospital disinfectant before next operation.*</li> <li>2. Do not perform special cleaning or closing of ORs after class III-IV cases.</li> <li>3. Do not use tacky mats at OR suite entrance or individual rooms.</li> </ol>	<ol style="list-style-type: none"> <li>4. Wet vacuum the OR floor after the last operation with EPA-approved hospital disinfectant.</li> </ol>	<ol style="list-style-type: none"> <li>5. No recommendation on disinfection of OR surfaces or equipment between operations when no visible soiling is observed.</li> </ol>
<b>2. INTRAOPERATIVE</b> <i>c. microbiologic sampling</i>			
	<ol style="list-style-type: none"> <li>1. Do not perform routine environmental sampling (do so only as part of an epidemiologic study).</li> </ol>		
<b>2. INTRAOPERATIVE</b> <i>d. sterilization of surgical instruments</i>			
	<ol style="list-style-type: none"> <li>1. Sterilize all instruments according to published guidelines.</li> <li>2. Flash sterilize only for patient care instruments needed immediately.</li> </ol>		

**RECOMMENDATIONS**

IA	IB	II	No recommendation
<p><b>2. INTRAOPERATIVE</b>  <i>e. surgical attire and drapes</i></p>			
	<ol style="list-style-type: none"> <li>1. Wear surgical mask that fully covers mouth and nose.*</li> <li>2. Wear a cap or hood to fully cover head and face hair.*</li> <li>3. Do not wear shoe covers for prevention of SSI.*</li> <li>4. Wear sterile gloves if a scrubbed surgical team member.*</li> <li>5. Use surgical gowns and drapes that are effective barriers when wet.</li> <li>6. Change scrub suits that are visibly soiled.*</li> </ol>		<p>7. No recommendations on how or where to launder scrub suits, on restricting use of scrub suits to OR suite, or for covering scrub suits when out of OR suite.</p>
<p><b>2. INTRAOPERATIVE</b>  <i>f. asepsis and surgical technique</i></p>			
<ol style="list-style-type: none"> <li>1. Adhere to principles of asepsis when placing IV devices or dispensing IV drugs.</li> <li>2. Assemble sterile equipment and solutions immediately prior to use.</li> </ol>	<ol style="list-style-type: none"> <li>3. Handle tissue gently, maintain effective hemostasis, minimize devitalized tissue, and eradicate dead spaces.</li> <li>4. Use delayed primary closure in heavily contaminated cases.</li> <li>5. If drainage is necessary, use a closed suction drain through a separate incision. Remove drain as soon as possible.</li> </ol>		
<p><b>3. POSTOPERATIVE INCISION CARE</b></p>			
	<ol style="list-style-type: none"> <li>a. Protect with sterile dressing 24-48 hours postoperatively.</li> <li>b. Wash hands before and after any contact with the surgical site.</li> </ol>	<ol style="list-style-type: none"> <li>c. When dressing must be changed, use sterile technique.</li> <li>d. Educate patient and family regarding proper incisional care, symptoms of SSI, and the need to report such symptoms.</li> </ol>	<p>e. No recommendation to cover an incision closed primarily beyond 48 hours, nor on the appropriate time to shower or bathe with an uncovered incision.</p>

**RECOMMENDATIONS**

IA	IB	II	No recommendation
<b>4. SURVEILLANCE</b>			
	<p>a. Use CDC definitions of SSI among surgical inpatients and outpatients.</p> <p>b. For inpatient case-finding, use direct prospective observation, indirect prospective detection, or a combination of both.</p> <p>c. For outpatient case-finding, use a method that accommodates resources and data needs.</p> <p>d. For each patient undergoing an operation chosen for surveillance, record variables shown to be associated with increased SSI risk (e.g., surgical wound class, ASA class, and duration of operation).</p> <p>e. Periodically calculate operation-specific SSI rates stratified by variables shown to be associated with increased SSI risk.</p> <p>f. Report appropriately stratified, operation-specific SSI rates to surgical team members.</p>	<p>g. When post-discharge surveillance is performed for detecting SSI, use a method that accommodates resources and data needs.</p> <p>h. Assign the surgical wound classification upon completion of an operation. A surgical team member should make the assignment.</p>	<p>i. No recommendation to make available to the infection control committee coded surgeon-specific data.</p>