

Surgical site infection (SSI)

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❖ **Definition:** An incisional skin and soft tissue infection or organ/space infection located at the site of recent surgery, typically arising within 30 days postoperatively

❖ **Epidemiology**

- Accounts for ~ 20% of all health care-associated infections
- Most common nosocomial infection among patients undergoing surgery
- Incidence: ~ 2% of all surgical wounds

Etiology – Causative pathogens

- **48–72 hours after surgery:** SSI due to endogenous organisms at the surgical site, e.g., bacteria on the skin (e.g., *S. aureus*) or in the genital or gastrointestinal tracts (e.g., *E. coli*)
 - **> 30 days after surgery:** indolent organisms (e.g., coagulase-negative staphylococci); Most commonly seen in patients with an implanted device or prosthetic
- ❖ Signs and symptoms of surgical site infections:
- Any SSI may cause redness, delayed healing, fever, pain, tenderness, warmth, or swelling.

Etiology – Risk factors

❖ Patient-related factors

- Corticosteroid therapy
- Malnutrition
- Obesity
- Diabetes mellitus
- Older age
- Smoking
- Preexisting infections or microbial colonization (e.g., with *S. aureus*)
- Immunosuppression or altered immune response
- Prolonged preoperative hospital stay

❖ Procedure-related factors

- Suboptimal preparation
- Environmental: inadequate ventilation and increased traffic in the operating room
- High degree of wound contamination (e.g., class III or IV surgical wound)
- Prolonged surgery
- Incorrect surgical technique
- Improper sterile technique or instruments

Surgical wound classification

❖ **Class I (clean)**

- Defined as all of the following:
 - Noninflamed operative wound
 - The respiratory, alimentary, genital, or urinary tracts have not been entered during surgery.
 - Primary wound closure with or without a drain
- Rate of infection: 1–3%

❖ **Class II (clean-contaminated)**

- Noninflamed and uninfected operative wound
- The respiratory, alimentary, genital, and/or urinary tracts have been entered during surgery without contamination.
- Rate of infection: 5–8%

Surgical wound classification

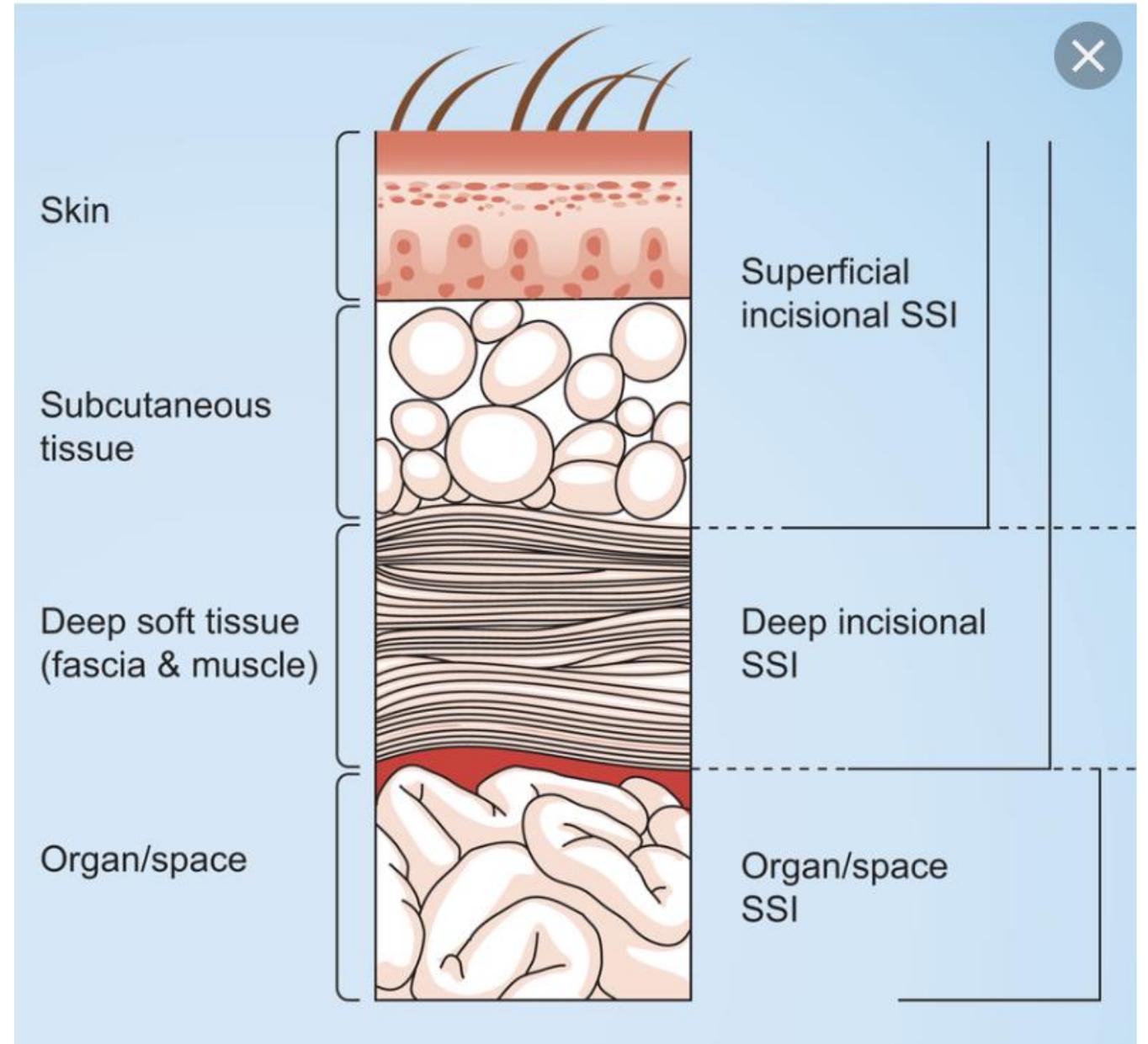
❖ **Class III (contaminated)**

- Fresh, open, and accidental wounds
- Inflamed operative wound without purulent drainage
- Clean or clean-contaminated wound with a break in sterile technique during surgery
- Rate of infection: 20–25%

❖ **Class IV (dirty or infected)**

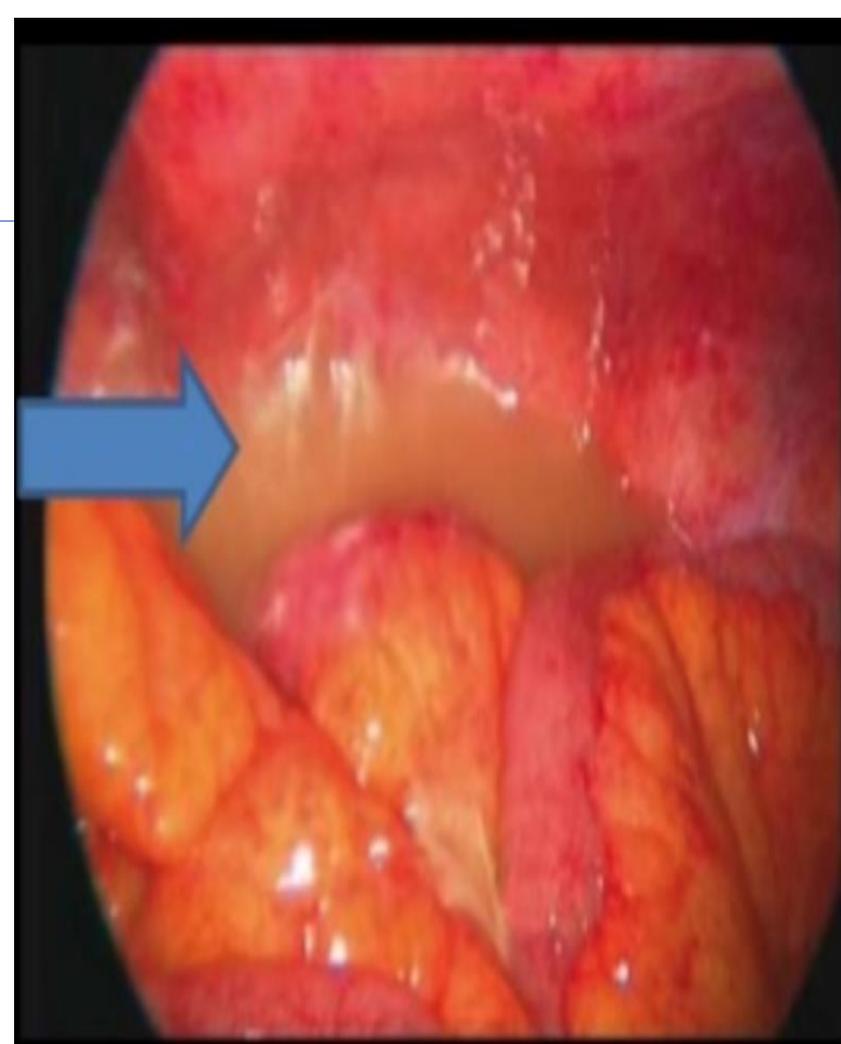
- Old traumatic wounds with evidence of infection, necrotic tissue, and/or visceral perforation
- Inflamed operative wound with purulent drainage
- Rate of infection: 30–40%

CDC* classification of SSI



Classification and clinical features of SSI

	Clinical features of SSIs	Onset	Tissue involvement
Superficial incisional SSI	<ul style="list-style-type: none"> • Purulent discharge from the incision • In some cases, postoperative fever • Localized tenderness, erythema, warmth, and/or swelling 	Within 30 days postoperatively	Skin and subcutaneous tissue at the incision site
Deep incisional SSI	<ul style="list-style-type: none"> • Purulent discharge from deep within the incision • Postoperative fever • Tenderness at the incision site • Wound dehiscence • Necrotizing fasciitis: cloudy gray discharge, possible crepitus of tissue surrounding the wound 	Within 30–90 days postoperatively (In patients with a prosthesis, deep incisional infections may occur up to 1 year postoperatively)	Involves deeper soft tissue (i.e., fascia and muscle layers) at the incision site than superficial incisional SSIs
Organ/space SSI	<ul style="list-style-type: none"> • Purulent discharge from a drain placed within the organ or space, or an abscess • Postoperative fever • Additional features depend on the organs affected. 		Can involve any part of the body deeper than the fascia or muscle layers that was opened or manipulated during surgery



Superficial incisional SSI

Deep incisional SSI

Organ/space SSI

Complications of SSI

- ❖ Wound dehiscence
- ❖ Sepsis
- ❖ Suppressed and delayed wound healing
- ❖ Fistula and Sinus formation
- ❖ Incisional Hernia
- ❖ Poor quality or abnormal scar formation (hypertrophic scar)

Prevention

- ❖ Optimize blood glucose levels.
- ❖ Encourage smoking cessation one month before surgery.
- ❖ Delay elective procedures until all infections, even those remote from the surgical site, have resolved.
- ❖ Adequate skin preparation in the operating room
- ❖ Perioperative antibiotic prophylaxis if required

Diagnostics

❖ laboratory studies

- CBC: leukocytosis
- Inflammatory markers (e.g., ESR, CRP): may be elevated

❖ Microbiological studies

- Wound culture and Gram stain (e.g., for incisional SSI): sample of purulent drainage collected using sterile techniques

❖ Imaging:

targeted study (e.g., ultrasound, CT, MRI) to assess abscess

Empiric antibiotic therapy for SSI

Choose initial empiric antibiotics based on the location of surgery and presence of complications. Antibiotic duration depends on the severity and extent of the infection.

❖ Incisional SSI not involving the genital or GI tracts

- Low risk of MRSA: **cefazolin** OR **oxacillin**
- High risk of MRSA: **vancomycin**, **daptomycin**, OR **linezolid**

❖ Incisional SSI involving GI or genital tracts

- Third-generation cephalosporin (e.g., **ceftriaxone**) PLUS **metronidazole**
- **Levofloxacin** PLUS **metronidazole**
- Carbapenem (e.g., **meropenem**)

Specific local wound infections

- ❖ Tetanus
- ❖ Gas Gangrene
- ❖ Necrotizing Fasciitis

Tetanus

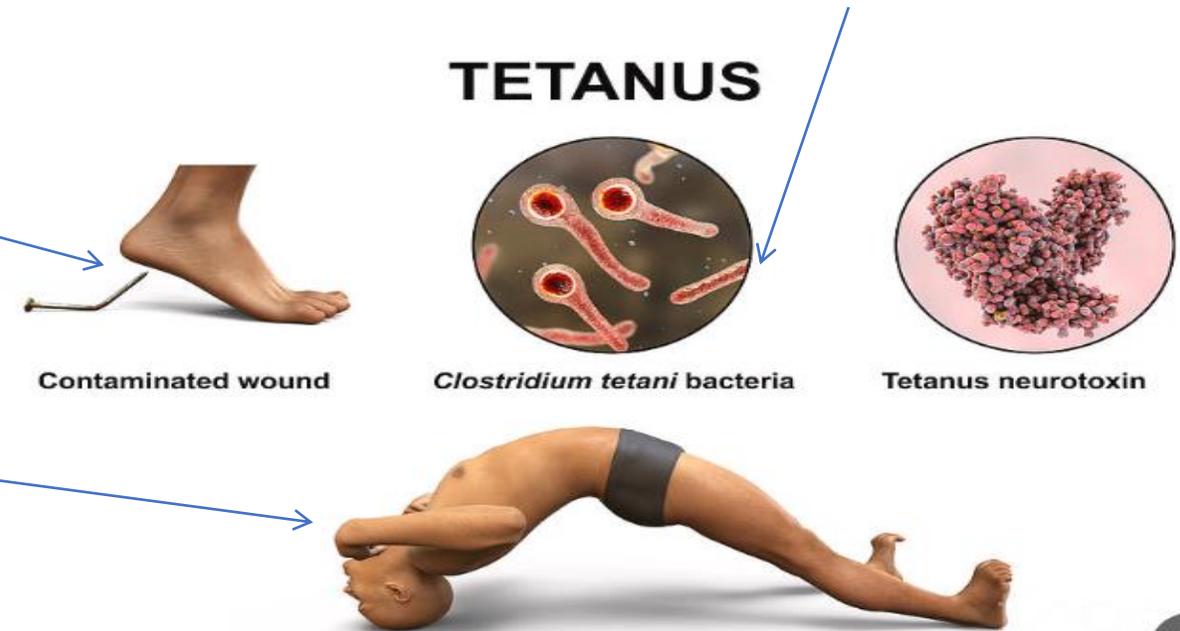
- ❖ Tetanus (lockjaw) is an acute disease caused by neurotoxins from the bacterium **Clostridium tetani**.
- ❖ Route of infection : **penetrating** wounds.
- ❖ **respiratory failure**

❖ Signs and symptoms

- **muscle spasms and rigidity (Opisthotonos)**
- Trismus: lockjaw due to spasms of jaw musculature

❖ Treatment

- tetanus **immunoglobulin**, as soon as possible
- antibiotics



Gas Gangrene

❖ **Gas gangrene is a medical emergency** life-threatening necrotizing tissue infection

❖ **Clostridium perfringens** from a contaminated wound Septic surgical wounds or procedures Deep, penetrating wounds

❖ Signs and symptoms

- Massive edema with skin discoloration
- Sweet and foul-smelling discharge
- Early signs: Fever, Tachycardia
- Late signs: Shock, Multi-organ failure

❖ Treatment

- Surgical exploration and debridement
- Antibiotic therapy: penicillin plus clindamycin or tetracycline



X-Ray: show a characteristic feathering pattern of the soft tissue

Necrotizing Fasciitis

Organisms: mixed microbial flora (commonly **group A Streptococcus**)

Predisposing factor: **immunocompromised** patient e.g. **diabetic** patient

Signs and symptoms

- **Fever**, chills , Loss of sensation
- **Crepitus**: due to production of **methane** and **CO2** by bacteria

- **edema**
- **Erythema** ,
- **well-defined areas of necrosis**,
- **desquamation**



Necrotizing Fasciitis

❖ Treatment

- Surgical debridement (removal of necrotic tissue)
- Obtain deep tissue samples for Gram stain, cultures, and histopathology.
- Systemic broad-spectrum antibiotic