surgical Infection

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Surgical Site Infections (SSIs)

- Postoperative infections presenting at any level
  - Incisional superficial (skin, subcutaneous tissue)
  - Incisional deep (fascial plane and muscles)
  - Organ/space related (anatomic location of the procedure itself) : Intra-abdominal abscesses, empyema, mediastinitis
Surgical Site Infections (SSIs)

- Most common nosocomial infection
- Present anytime from 0-30 days after operation or up to 1 year after implantation foreign material
- 60-80% of SSIs is incisional infection
- Organ/space related SSIs accounting 93% mortality
- Staphylococcus aureus is the most common pathogen
Causes and Risk Factors

- Bacterial factors
  - Virulence: toxin, capsules
  - Bacterial load ($>10^5$): infection become evidence clinically for 5 days or longer after operation
  - Remote site infection
  - Length of preoperative stay
Causes and Risk Factors

- Bacterial factors
  - Duration of procedure
  - Wound class
  - Intensive care unit patient
  - Prior antibiotic therapy
  - Preoperative shaving
Causes and Risk Factors

- Local wound factors
  - Good surgical technique is the best way to avoid SSI

- Patient factors
  - Age, Cigarette smoking
  - Immunosuppression, Steroids, Malignancy
  - Obesity, Diabetes, Malnutrition, Comorbidities
  - Transfusions, Oxygen, Temperature, Glucose control
Surgical Wound Classification

- **Clean** (1-5%) uninfected operative wound, no inflammation, not entered respiratory, alimentary, genital or infected urinary tract

- **Clean-contaminated** (3-11%) entered respiratory, alimentary, genital or urinary tract under controlled

- **Contaminated** (10-17%) major breaks in sterile technique or gross spillage from gastrointestinal tract

- **Dirty** (27%) organisms causing infection were present in operative field before operation
# Surgical Wound Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Procedure type</th>
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<tbody>
<tr>
<td>Clean</td>
<td>Mastectomy, Herniorrhaphy, Thyroidectomy, Neck dissection, Vascular surgeries</td>
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<tr>
<td>Clean / contaminated</td>
<td>Cholecystectomy, Appendectomy, Small bowel resection, Whipple operation, TUR-P</td>
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<tr>
<td>Contaminated</td>
<td>Surgery for inflamed appendicitis, Bile leakage during cholecystectomy, Diverticulitis</td>
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<tr>
<td>Dirty / infected</td>
<td>Drainage abscess, Perforated bowel, Peritonitis</td>
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SSI Risk Scores

- Wound class: contaminated or dirty wound
- ASA: III, IV, V
- Duration of operation > 75th percentile

<table>
<thead>
<tr>
<th>Number of Positive Risk Factors</th>
<th>Risk of SSI (%)</th>
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<tr>
<td>0</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>2</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
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Prevention

- Aseptic and antiseptic technique
- Prophylactic antibiotics
- Surveillance programs
- Focuses on controlling the bacterial factors
Aseptic and Antiseptic Methods

- Environmental and architectural of OR
- Surgical site preparation
- Scrubbed hands and forearms for at least 5 minutes
- Double-gloving
- Instruments should be sterilized
Prophylactic antibiotics

- No substitute for careful surgical technique
- Not indicated for clean wound and no foreign body has been controversial (breast, hernia)
- Started 0.5-1 hr before surgery, no benefit if started after that
- Never use more than 24 hr after elective surgery
Prophylactic antibiotics

- Determinant the procedure is expected to enter
- If anaerobic flora are not expected, cefazolin is the drug of choice
- Clindamycin for patients who are allergic to cephalosporins
Local Wound Related

- Good judgment and surgical technique
  - Vascular supply, Adequate control bleeding
  - Complete debridement, Remove foreign bodies
  - Monofilament, Suture used only when required
  - Close dead space, Close-suction drain system
  - Delayed primary closure, Isolate from environment 48-72 hr
Patient Related

- Correction or control of underlying defect
- Optimizing nutritional status
- Higher partial pressure of oxygen (high FiO$_2$)
- Preoperative warming
- Maintain glucose levels 80-110 mg/dL
Specific Surgical Infections

- Primary principle treating surgical infections is **source control**
  - Drainage of infection, correction of predisposing cause
- Antibiotic treatment and systemic support are only **adjunctive therapies**
**Soft Tissue Infections**

- **Abscess**
  - Necrotic center (pus) without blood supply, surrounded by a vascularized zone of inflammatory tissue
  - Will not resolve unless the pus is drained and evacuated

- **Cellulitis**
  - Intact blood supply and viable tissue
  - Resolves with appropriate antibiotic therapy alone
Soft Tissue Infections
Soft Tissue Infections

- Most common caused by S. aureus often combined with streptococci
- Wound older than 6 hr, significant contamination, necrotic tissue, puncture wound, crush mechanism or avulsion should not be closed
Tetanus

- Caused by Clostridium tetani
- Mortality rate ~ 50% even treated
- Prevented by toxoid and immunoglobulin, not antibiotics
Tetanus

- Tetanus toxoid 0.5 mL IM 3 doses (0, 1, 6 months)
  - Covered for 10 years
  - Given in patients with non-immunized, incomplete, >10 yrs or unknown history
  - Booster single dose if completed immunized 5-10 yrs.

- TAT (TIg) in dirty wound, 3000 u im or sc, test allergy before use
Postoperative Wound Infection

- Usually occur on day 3rd - day 7th
- Painful, red, warmth, tender and purulent discharge from wound
- Stitch off, pus drainage and wet dressing until clean, then resuture (delayed primary closure)
Postoperative Wound Infection
Postoperative Wound Infection
Necrotizing Soft Tissue Infections

- Less common but serious conditions
- Absence of clear local boundaries or palpable limits
- Presence of gas in soft tissue infection implies anaerobic metabolism like gas gangrene
- Most common pathogens: clostridium perfringens, B-hemolytic S. pyogenes
Necrotizing Soft Tissue Infections

- Rapid progressing of soft tissue infection, marked hemodynamic response, failure to respond to conventional nonoperative therapy
- Ecchymoses, bullae, dermal gangrene, extensive edema, crepitus
Necrotizing Soft Tissue Infections
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- Treatment always include debridement, broad-spectrum antibiotics and monitoring and systemic support
Necrotizing Soft Tissue Infections
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Intra-abdominal and Retroperitoneal Infections

- Fever, tachycardia, hypotension, catabolic response, MOF is the cause of death
- Outcome is improved by early diagnosis and treatment
- Treatment consists of cardiorespiratory support, antibiotic therapy, and operative intervention
Intra-abdominal and Retroperitoneal Infections

- Goal of operative intervention is to correct the underlying anatomic problem
- Foreign material and fibrin should be removed, abscess requires drainage (PCD, open)
Retroperitoneal Infections
Retroperitoneal Infections
Intra-abdominal Infections
Intra-abdominal Infections
Prosthesis Device-Related Infections

- Staphylococcus epidermidis
- Intensive antibiotic therapy, removal of infected device under antibiotic cover, replacement with a new uninfected device followed by prolong antibiotic treatment when device is life sustaining
Nonsurgical Infectios in Surgical Patients

- Most common is urinary tract infection
  - Use for specific indications and short durations
  - Strict closed-drainage techniques

- Lower respiratory tract infections
  - Abnormal chest radiographic findings, abnormal ABG
  - Bronchoalveolar lavage diagnose ventilator-associated pneumonia
Nonsurgical Infectios in Surgical Patients

- Catheter infection
  - Erythema, warmth, tenderness, pus at site of insertion
  - Require removal of catheter, if new central line is needed, a new puncture is warranted
  - Routine change of central line not proven to reduce infection rates
Postoperative Fever

- Most febrile postoperative patients are not infected
- Fever in the first 3 days after operation most likely noninfection
- 2 important infectious causes of fever in the first 36 hr. after laparotomy
  - Injury to bowel with intraperitoneal leak
  - B-hemolytic streptococci or clostridial infection
Antimicrobials

- General principles
  - Achieve levels of antibiotic at the site of infection that exceed the minimum inhibitory concentration for the pathogens present
  - Mild infections can handled on outpatient with oral antibiotics
Antimicrobials

- General principles
  - Surgical infections is not a specific duration of antibiotics known to be ideal
  - Clinical improved and normal temperature for 48 hr can switches to oral antibiotics
  - WBC may not have returned to normal
Antimicrobials

- Antibiotic for empiric treatment
  - Coverage the presumed microorganisms
  - Able to reach the site of infection
  - Toxicity should be considered
  - Dosed aggressively
  - Set a time limit for the period for the antibiotic will be given
HIV precaution

- Universal testing
  - Costly and unable to do in every cases
  - Problem of window period

- Universal precaution
  - Avoid direct contact with any body fluid
Good Luck