Suggestions for a better use of antibiotic prophylaxis in surgery at Bach Mai Hospital

Patrick De Mol

Projet de pharmacie clinique
Bach Mai Hospital, Hanoi, Vietnam – 12 November 2015
IMPORTANCE OF SURGICAL SITE INFECTIONS IN VIETNAM

- 2 hospitals in Hanoï: 3 months period of observation
- 697 patients with 10.9% SSI rate:
  - 8.3% for clean wounds,
  - 8.6% for clean-contaminated,
  - 12.2% for contaminated
  - 43.9% for dirty wounds.
- The lowest rate of SSI (2.4%) in obstetric-gynecologic procedures and the highest rate (33.3%) in cardiothoracic operations.
- All patients were treated with prolonged courses of perioperative antibiotics.
- Overall infection control practices were poor as a result of deficient facilities, limited surgical instruments, and a lack of proper supplies for wound care and personal hygiene

Nguyen D, MacLeod WB, Phung DC
Microbiology of surgical site infections and associated antimicrobial use among Vietnamese orthopedic and neurosurgical patient

Cho Ray Hospital. 5-week study period.

702 surgical patients, 80 (11.4%) SSI
  among orthopedic patients 15.2%
  among neurosurgical patients it was 8.3%
Postoperative bacterial cultures performed for 55 (68.8%) of the 80 patients with SSI:. Of 78 cultures, 60 (76.9%) were positive for a pathogen, and 15 (25%) yielded multiple pathogens.

The most frequently isolated pathogens
  \textit{Pseudomonas aeruginosa} (29.5% of isolates),
  \textit{Staphylococcus aureus} (11.5% of isolates),
  \textit{Escherichia coli} (10.3% of isolates).

90% \textit{S. aureus} methicillin resistant,
91% \textit{P. aeruginosa} ceftazidime resistant
38% \textit{E. coli} cefotaxime resistant.

Surgical site infections in Vietnamese hospitals: incidence, pathogens and risk factor (2009)

- 7 hospitals in Vietnam: 3 months period of observation
- 4,413 patients; SSI incidence of 5.5%.
- Risk factors independently associated with SSIs:
  - age ≥ 30 yrs (OR: 1.9),
  - clean-contaminated wound (OR: 1.7),
  - contaminated wound (OR: 1.8),
  - dirty wound (OR: 3.2),
  - duration of surgery > 120 minutes (OR: 1.9),
  - small bowel surgery (OR: 4.0).
- most commonly identified pathogen:
  - *Escherichia coli* (38.7%)
  - *Klebsiella pneumoniae* (16.1%)
Prevention of surgical site infections

• *The patient has to be prepared as well as possible:*
  – good nutrition
  – infections healed
  – as short pre-operative hospital stay as possible
  – no antibiotic before intervention
  – pre operative shower
  – no shaving on the incision site

• *And antibiotic prophylaxis*
Surgical site infection (SSI) antibiotic prophylaxis: objectives

• To prevent implantation of bacteria in the operated tissues during the intervention
  – Need for antibiotic presence at the incision time
  – No need for antibiotic before or after intervention

• SSI prophylaxis is **NOT** a treatment for infection
Origin of surgical site infections

Environment plays a minor role in surgical wounds infection as

the bacteria causing infections are originated

– from the patient: 90%
– from the surgical staff: > 5 %
– from the environment (air, water): < 5 %
Surgical site infection (SSI) antibiotic prophylaxis: indications

1. Clean Surgery

= No traumatic wounds, no inflammation, no technical or septic errors during surgery, and the gastrointestinal, respiratory, and urogenital tracts are intact.

→ No prophylaxis is indicated for clean surgery, as infections occur in less than 2% of cases.
Surgical site infection (SSI) antibiotic prophylaxis: indications

2. Clean contaminated surgery
   = the intervention has had minor technical or septic errors. A minor rupture of the respiratory or uro-genital tract has not resulted in any significant leakage. Absence of any surgical trauma.

   → prophylaxis is recommended during clean contaminated surgery, since infections occur in up to 10% of cases.
Surgical site infection (SSI) antibiotic prophylaxis: indications

3. Contaminated surgery

= Following severe surgical trauma, or related to significant technical and septic errors, or when gastrointestinal tract, bile duct, or urinary tract has ruptured, or there has been an incision in inflamed, non-purulent tissue.

→ Prophylaxis is advised during contaminated surgery, since such infections occur in 20% of patients.
Surgical site infection (SSI) antibiotic prophylaxis: indications

4. Dirty surgery
   = on an infected or long-standing sore or human/animal bite or with the presence of a foreign body, necrotic tissue, pus, a rupture in the intestine, or fracture at the site of the infection.

\[ \text{Treatment with antibiotics (not merely prophylaxis) is indicated in the case of dirty surgery} \]

Prophylaxis is also indicated upon the surgical insertion of a foreign device when the consequences of infection are subject to extremely serious complications.
Timing of antibiotic administration

• Need to obtain effective concentrations in the tissues from incision to closure of the site
• First dose between 1h and 30 min before incision (never > 2 h).
• Most of the time:
  – unique dose
  – additionnal dose: if intervention > 3h or huge blood losses
• Stop antibiotics when surgical wound is closed
• Catheters or drains are not an indication to continue antibiotics
Ideal prophylactic antibiotic

- Narrow spectrum but effective on expected bacteria
- Proved clinical efficacy
- Few secondary effects
- Adapted pharmacocinetiks
- Easy delivery
- Not resistance inducter
- Low cost
## Surgical site infection (SSI) antibiotic prophylaxis:

<table>
<thead>
<tr>
<th>Surgical Service</th>
<th>Routine Pre-op Antibiotic</th>
<th>Penicillin or Cephalosporin Allergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burns</td>
<td>Cefazolin</td>
<td>Clindamycin</td>
</tr>
<tr>
<td>Cardiac</td>
<td>Cefazolin <strong>Plus</strong> Vancomycin</td>
<td>Vancomycin <strong>OR</strong> Clindamycin</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Plus</strong> Gentamicin</td>
</tr>
<tr>
<td>Thoracic</td>
<td>Cefuroxime</td>
<td>Vancomycin <strong>OR</strong> Clindamycin</td>
</tr>
<tr>
<td>Colorectal</td>
<td>Cefazolin <strong>Plus</strong> Metronidazole Or Ertapenem</td>
<td>Gentamicin <strong>Plus</strong> Clindamycin</td>
</tr>
<tr>
<td>Otolaryngology</td>
<td>Cefazolin <strong>Plus or Minus</strong> Metronidazole</td>
<td>Clindamycin <strong>Plus or Minus</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ciprofloxacin</td>
</tr>
<tr>
<td>General Surgery/Endocrine</td>
<td>Cefazolin</td>
<td>Clindamycin <strong>Plus or Minus</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gentamicin</td>
</tr>
<tr>
<td>GU</td>
<td>Cefazolin</td>
<td>Ciprofloxacin <strong>Plus or Minus</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vancomycin</td>
</tr>
<tr>
<td>Hepatobiliary (complicated)</td>
<td>Cefazolin</td>
<td>Tobramycin <strong>Plus</strong> Vancomycin</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>Cefazolin <strong>Plus</strong> Vancomycin (craniotomy or implantation of a device)</td>
<td>Vancomycin</td>
</tr>
</tbody>
</table>
## Surgical site infection (SSI) antibiotic prophylaxis

<table>
<thead>
<tr>
<th>Surgical Service</th>
<th>Routine Pre-op Antibiotic</th>
<th>Penicillin or Cephalosporin Allergy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oncology</td>
<td>Cefazolin <strong>Plus</strong> Metronidazole (GI and pelvic cases only)</td>
<td>Clindamycin (clean surgeries)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gentamicin <strong>Plus</strong> Clindamycin (GI and pelvic) <strong>OR</strong> Vancomycin (clean surgeries)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ciprofloxacin (GI and pelvic)</td>
</tr>
<tr>
<td>Oral/Maxillofacial</td>
<td>Cefazolin</td>
<td>Clindamycin</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>Cefazolin <strong>Plus</strong> Vancomycin (Arthroplasties only)</td>
<td>Vancomycin <strong>OR</strong> Clindamycin</td>
</tr>
<tr>
<td>Orthopedic-Spine</td>
<td>Cefazolin</td>
<td>Vancomycin <strong>OR</strong> Clindamycin</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>Cefazolin</td>
<td>Clindamycin <strong>OR</strong> Vancomycin (if allergic to Clindamycin)</td>
</tr>
<tr>
<td>Gynecology</td>
<td>Cefazolin</td>
<td>Clindamycin</td>
</tr>
<tr>
<td>Plastics, Reconstructive &amp; Hand Surgery</td>
<td>Cefazolin</td>
<td>Clindamycin <strong>OR</strong> Vancomycin</td>
</tr>
<tr>
<td>Vascular</td>
<td>Cefazolin <strong>Plus</strong> Vancomycin (synthetic graft only)</td>
<td>Vancomycin</td>
</tr>
</tbody>
</table>
## Preoperative Dosing of Antibiotics

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>≤80 kg</th>
<th>81–160 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefazolin</td>
<td>1 g</td>
<td>2 g</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>1.5 g</td>
<td>3 g</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>400 mg</td>
<td>600 mg</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>600 mg</td>
<td>900 mg</td>
</tr>
<tr>
<td>Gentamicin*</td>
<td>4 mg/kg</td>
<td>4 mg/kg (max 420 mg)</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>500 mg</td>
<td>1000 mg</td>
</tr>
<tr>
<td>Vancomycin†</td>
<td>20 mg/kg</td>
<td>20 mg/kg (max 2500 mg)</td>
</tr>
</tbody>
</table>
## Preventive antibiotic use in surgery at Bach Maï hospital

### Surgical prophylaxis
- 1st generation cephalosporines
- \( \leq 48 \text{ h} \)
- Few side effects, low selective pressure
- Short IV infusion duration
- Low costs
- If infection, not hidden
- Evidence based
- Few benefits for pharmaceutical companies

### Post surgical treatment
- 3d generation cephalosporines + amikacin
- \( \geq 5 \text{ days} \)
- Renal toxicity, high selective pressure
- Long IV infusion duration
- High costs
- Many infections should appear after discharge
- Empiric based
- High benefits for pharmaceutical companies
Hospital direction

Antibiotic task force

General guidelines approved and signed by each

Infection control
Plan
Surgery
Pharmacy
Clinical pharmacy
Anesthesiology
ICU
Microbiology

Department
Department
Department
/....
Goals of the task force

• Rationalize the use of antibiotics
• Decrease misuse and overuse of antibiotics
• 1st target:
  prevention of surgical site infection
Activities of the task force

• Setting-up of guidelines
• Follow-up of the guidelines
  – Implementation
  – education
  – monitoring
  – Feed back
  – Working load
• Antibiotic consumption
• Surveillance of surgical site infections
• Economic/financial incentives?