

Antimicrobial Use Guidelines

University of Wisconsin Hospital

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Eighth Edition

APPENDIX D: SURGICAL PROPHYLAXIS

The generally accepted principles of antimicrobial prophylaxis in surgery involve five considerations.

- 1) Using antimicrobials for surgical procedures in which prophylactic antimicrobials have been found to be beneficial.
- 2) Timing antimicrobial administration such that the agent is present in the potentially contaminated tissue before the bacteria enter the site (i.e. at the time of surgical incision **and** persisting in tissues throughout the period of potential contamination). Antimicrobials vary in their distribution pharmacokinetics. Some antimicrobials must be given prior to the patient going to the operating room. Other antimicrobials can be administered after the intravenous line is placed in the operating room.
- 3) Limiting the duration of antimicrobial prophylaxis. Studies document that postoperative antimicrobial administration is not necessary for many surgeries.
- 4) Planning the route of antimicrobial administration, for example, using oral antimicrobials for gut decontamination.
- 5) Selecting an antimicrobial which is active against the most common surgical wound pathogens.

| TYPE OF SURGERY | LIKELY PATHOGENS | RECOMMENDED ANTIMICROBIAL REGIMEN | COMMENTS |
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| Clean - Contaminated | | | |
| Head and Neck | Normal flora of the mouth, various streptococci (including aerobic and anaerobic species), <i>Staph aureus</i> , <i>Peptostreptococcus</i> , <i>Neisseria</i> and numerous anaerobic gram-negative bacteria including <i>Porphyromonas (Bacteroides)</i> , <i>Prevotella (Bacteroides)</i> , | Cefazolin 1-2 gm IV 30 min. pre-op or Cefuroxime 1.5 gm IV 30 min. pre-op or Clindamycin 600 mg 30 min. preop Clindamycin 900 mg | If mouth or pharynx is entered a 2 gm dose of cefazolin is recommended for adequate coverage in serum and tissue. |

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| | <i>Fusobacterium</i> and <i>Veillonella</i> . Nasal flora include <i>Staphylococcus</i> , <i>Streptococcus pyogenes</i> , <i>Strep pneumoniae</i> , <i>Moraxella</i> and <i>Haemophilus</i> species | Q8H IV plus gentamicin 1.7 mg/kg IV 30 min. pre-op | For penicillin allergic patients where the reaction is severe enough to warrant avoiding cephalosporins. |
| Major head and neck surgical cases in which mouth or pharynx is entered | | Unasyn® (ampicillin/sulbactam) 1.5 G-3 gm IV 1 hour preop or Cefazolin 1 gm IV one hour preop plus metronidazole 500 mg IV one hour preop | Risk is high for mixed infections of anaerobes, staphylococci and pseudomonas. Also, patients with decreased renal function may need adjustment of gentamicin dose. Risk is high for mixed infections or anaerobes and staphylococci but not pseudomonas |
| Cholecystectomy | <i>Escherichia coli</i> , <i>Klebsiella</i> and <i>enterococcus</i> . Other gram negative bacilli, streptococci and staphylococci are occasionally isolated. Anaerobic bacteria are uncommon, but <i>Clostridium</i> is the most common when isolated. | Cefazolin 1 gm IV 30 min. preop. | Bacteria isolated from bile during surgery are those most likely to be associated with wound infections. |
| Upper Gastroduodenal | Most common are nasopharynx commensals (streptococci, lactobacilli and diphtheroids) . Also <i>E. coli</i> , enterococcus and candida in high risk patients. | Cefazolin 1 gm IV 30 min. preop. | Prophylaxis indicated only for patients with increased pH from the use of H ₂ receptor blockers, |

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| | | | proton pump inhibitors, with gastric obstruction or GI hemorrhage. |
| Colorectal | Enteric gram-negative bacilli, anaerobes with <i>E. coli</i> and <i>Bacteroides fragilis</i> the most common organisms. | <p>Bowel prep (day before surgery) Metoclopramide 10 mg PO 30 min. prior to GI lavage 1.5 L Q1H <u>until clear</u> (max. 4-6 L). When GI lavage is clear, start neomycin 1 gm PO with erythromycin 1 gm PO at 1300, 1400, 2300.</p> <p>Cefmetazole 1-2 gm IV preop</p> <p>(This regimen does <u>not</u> cover <i>Enterococcus</i>)</p> <p>or</p> <p>Gentamicin 1.75 mg/kg IV preop and Metronidazole 500-750 mg IV preop</p> | <p>Metronidazole 750 mg dose may be substituted for erythromycin in erythromycin sensitive patients. NOTE: 50% of trials evaluated demonstrated <5% postop infection rate and 90% of trials evaluated demonstrated <10% postop infection rate with bowel prep alone.</p> <p>Systemic regimens reduce rate of infection beyond that seen with bowel prep as outlined above.</p> <p>If enterococcus is suspected or confirmed. Vancomycin² 1 gm IV would be an alternative in the penicillin sensitive patient (this regimen would cover</p> |

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| | | | <i>Enterococcus</i>). |
| Appendectomy | Anaerobic organisms (especially <i>B. fragilis</i>) and gram negative enteric organisms (predominantly <i>E. coli</i>) <i>Staphylococcus</i> , <i>Enterococcus</i> and <i>Pseudomonas</i> species have also been reported. | <p>Uncomplicated: Cefmetazole 1-2 gm IV preop.</p> <p>Complicated(adult): ampicillin 1-2 gm IV preop and gentamicin and metronidazole (for doses see above)</p> <p>Complicated(children): ampicillin 50 mg/kg IV preop and gentamicin 2 mg/kg IV preop and clindamycin 10 mg/kg IV preop</p> | <p>The incidence of infectious complications following appendectomy is dependent on the condition of the appendix at the time of surgery.</p> <p>Gentamicin levels need to be monitored.</p> |
| Hysterectomy Vaginal | Staphylococci, streptococci, enterococci, lactobacilli, diphtheroids, <i>E. coli</i> , peptostreptococci, <i>Prevotella (Bacteroides)</i> , <i>Porphyromonas(Bacteroides)</i> and <i>Fusobacterium</i> species. | Cefazolin 1 gm IV at induction of anesthesia or Cefmetazole 1-2 gm IV | Postoperative infections are usually polymicrobial with enterococci, aerobic gram negative bacilli, and <i>Bacteroides</i> species isolated most frequently. For procedures greater than 4 hours, cefazolin may be administered. |
| Abdominal | Bacterial contamination associated with this procedure minimal. | Same as above. | |
| Radical | Same as abdominal. | Same as above. | Highest risk hysterectomy procedure. Longer |

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| | | | <p>procedures may predispose patient to higher infection rates without prophylaxis. A bowel prep may be necessary, see the information under colectomy surgery.</p> <p>Increased risk factors such as length of surgery, blood loss, replacement, malignancy, prior radiation therapy, obesity and presence of drains postop.</p> |
| Cesarean section | Vaginal organisms as above if membranes ruptured. Post Cesarean infections include <i>Staph aureus</i> other staphylococci, streptococci and enterobacteriaceae. | Cefazolin 2 gm IV or Cefmetazole 2 gm IV | Highest risk factor is ruptured membranes which allows vaginal organisms to be drawn into the uterus between contractions. Administration of prophylactic antibiotics should not be administered until the cord is clamped to decrease the risk to fetus. |

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| | | | Cefmetazole is needed for <i>Bacteroides fragilis</i> coverage if the uterus may be contaminated by vaginal contents. |
| Clean | | | |
| Cardiothoracic | Staphylococcus epidermidis, Staph aureus, Corynebacterium, enteric gram-negative bacilli. | Cefuroxime 1.5 gm Add vancomycin 1 gm preop (<u>single</u> dose) <u>if</u> prosthetic valve or prosthetic vascular graft is being implanted | Advent of CABG and resultant increased cardiothoracic procedures has shifted the organism spectrum to include gram negative pathogens. |
| Vascular | Staph. aureus (predominant), also gram negative bacilli, coagulase-negative staphylococci and enterococci. | Cefuroxime 1.5 gm at induction of anesthesia Add vancomycin ² 1 gm IV preop (<u>single</u> dose) <u>if</u> implantation of prosthetic valvular graft. | For penicillin allergic patients. If surgery involves the placement of a prosthetic device (<i>Staphylococcus epidermidis</i> becomes the problem organism) then give 1 gm IV one hour preop. |
| Neurosurgery | | | |
| Craniotomy | Staph aureus, coagulase negative staphylococci | Cefazolin 1 gm IV at induction of anesthesia (procedures >3 hours, the dose should be repeated in 8 hours) | Organisms listed represent >85% of postop infections. |
| Cerebrospinal fluid | Staphylococci account for 75- 80% wound infections following shunt procedures, | 1) Cefazolin 1 gm IV at induction of anesthesia as a single | IF MRSA incidence >10% in an |

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| shunt | Gram negative bacteria 1-20%. | dose or Cefuroxime 1.5 gm IV at induction of anesthesia as a single dose 2) Vancomycin ^{1,2} 1 gm IV as a single dose | institution, vancomycin ² is recommended, otherwise it is optional. |
| Orthopedics | | | |
| Total joint replacement | Staph aureus and <i>Staph epidermidis</i> and various streptococci including enterococcus cause >66% of wound infections. Aerobic gram- negative bacteria (<i>E. coli</i> and <i>Proteus mirabilis</i>), diphtheroids, and anaerobes such as peptostreptococci are also found. | Cefazolin ¹ 15 mg/kg IV up to 1-2 gm preop or cefuroxime 1.5 gm IV or Vancomycin ² (15 mg/kg) up to 1 gm preop | Use vancomycin only for severe penicillin allergy. Some clinicians use clindamycin in penicillin-allergic patients. |
| Hip fracture repair | Staphylococci | Cefazolin ¹ 1-2 gm IV preop or cefuroxime 1.5 gm or Vancomycin ² (15 mg/kg) up to 1 gm IV preop | Hip fractures have a high incidence of morbidity with wound infections. Use vancomycin only for severe penicillin allergy. Some clinicians use clindamycin in penicillin-allergic patients. |
| Clean orthopedic procedures (other) | Staphylococci | Minor procedures - None Major procedures - cefazolin 1-2 gm IV preop | |

| Urologic Procedures | | | |
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| TURP | E. coli as well as other gram-negative bacilli and enterococci. | <p>Cefazolin (15 mg/kg) up to 1 gm IV at induction of anesthesia</p> <p>or</p> <p>Gentamicin 80 mg IV preop with ampicillin 500 mg - 1 gm IV preop</p> <p>or</p> <p>ciprofloxacin 400 mg IV preop</p> | <p>The most important measure for prevention of sepsis secondary to TURP is assuring that urine is sterile at the time of surgery. If urine is sterile the role of perioperative prophylaxis is probably of marginal benefit. Continuing antibiotic prophylaxis post TURP is strongly discouraged and will greatly increase the risk of nosocomial UTI with enterococci, resistant gram-negative bacilli, and candida.</p> |
| Dirty | | | |
| Ruptured viscus | Enteric gram negative bacilli, anaerobes (<i>Bacteroides fragilis</i>) and enterococci. | <p>Ampicillin 1-2 gm Q6H and Gentamicin 3-5 mg/kg divided dose Q12H and Metronidazole 500 mg Q8H (5-7 days). Vancomycin² replaces ampicillin in penicillin sensitive patients 15 mg/kg or 1 gm IV</p> | |
| Traumatic wound | Staph aureus Group A | Cefazolin 1 gm IV | Organisms |

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| | streptococci, clostridia | Q8H or cefuroxime 1.5 gm Q12H | may vary depending on source of injury. If wound has been massively contaminated by soil, manure or dirty water, a regimen with activity against <i>P. aeruginosa</i> , <i>S. aureus</i> , and other gram-negative bacilli is recommended. |
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¹ This population is usually elderly and dosages should be adjusted accordingly based on renal function.

² Because vancomycin has a large volume of distribution (0.9 L/kg), administration of the drug should be completed at least 1 hour prior to the surgical incision to assure adequate tissue levels at the time of incision (distribution phase 1-2 hours).

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