

**Bon Secours Richmond
Pharmacy and Therapeutics Committees
Suggested Antibiotics for Prevention of Wound Infection and Sepsis in Adult Surgical Patients¹ 2005**

Cardiac: all with sternotomy, cardiopulmonary bypass, prosthetic valve, pacemaker implant, and other open-heart surgery

Cefazolin 1-2 gm⁹ preop & q8h

Beta lactam allergic: vancomycin² 15 mg/kg preop (up to 2 gm) & q12h or clindamycin 600-900 mg preop and q8h x 1 day

Intranasal mupirocin the evening before, day of surgery, and post-op bid x 5 days for all patients

Gastrointestinal:

Appendectomy:

Uncomplicated: cefoxitin 1-2 gm preop or (cefazolin 1-2 gm⁹ + metronidazole 500 mg preop) or

Beta lactam allergic: Clindamycin 600-900 mg with (gentamicin 1.5 mg/kg or levofloxacin 750 mg or aztreonam 1-2 gm) or
Metronidazole 500 mg with (gentamicin 1.5 mg/kg or levofloxacin 750 mg)

Complicated (gangrenous or abscessed): continue q12h for 3-5 days

Biliary tract (high risk only)⁵ : open and laparoscopic procedures

Cefazolin 1-2 gm⁹ preop ± 1 postoperative dose or cefoxitin 1-2 gm preop or culture based selection or

Beta lactam allergic: clindamycin 600-900 mg preop

Colorectal⁶: operations that open the colon and/or rectum

Oral: neomycin and erythromycin base⁵: 1 gm of each at 19, 18, and 9 hours before surgery

Note: Use metronidazole 500 mg po for erythromycin if allergic to erythromycin

Plus

Parenteral: cefoxitin 1-2 gm⁹ preop or Ampicillin/sulbactam 3 gm preop or (cefazolin 1-2 gm⁹ + metronidazole 500 mg preop)

Beta lactam allergic: Clindamycin 600-900 mg with (gentamicin 1.5 mg/kg or levofloxacin 750 mg or aztreonam 1-2 gm) or
Metronidazole 500 mg with (gentamicin 1.5 mg/kg or levofloxacin 750 mg)

Gastroduodenal (high risk only)⁴: gastric bypass, percutaneous endoscopic gastrostomy, and esophageal

Cefazolin 1-2 gm⁹ preop or cefoxitin 1-2 gm preop

Beta lactam allergic: clindamycin 600-900 mg preop

Genitourinary:

Transrectal Prostate Biopsy:

Ciprofloxacin 500 mg po 12 hours prior to biopsy and repeat 12 hours after biopsy

Urologic (high risk only)⁷:

Cefazolin 1 gm preop or levofloxacin 500 mg preop or

Trimethoprim/sulfamethoxazole 160/800 mg orally or levofloxacin 500 mg orally 2 hours preop

Gynecologic and Obstetric:

Cesarean section (high risk such as active labor or premature rupture of membranes)

Cefazolin 2 gm after cord clamped

Beta lactam allergic: clindamycin 600-900 mg after cord clamped

Vaginal or abdominal hysterectomy:

Cefoxitin 1-2 gm preop or cefazolin 1-2 gm⁹ preop or ampicillin/sulbactam 3 gm preop (repeat if surgery > 4 hours, or blood loss exceeds 1500 ml)

Beta lactam allergic:

(Clindamycin 600-900 mg with gentamicin 1.5 mg/kg or levofloxacin 750 mg or aztreonam 1-2 gm) or (metronidazole 500 mg with gentamicin 1.5 mg/kg or levofloxacin 750 mg), or clindamycin 600-900 mg monotherapy

Dilation and Curettage

Doxycycline 100 mg orally 1 hour before procedure and 200 mg orally after procedure or metronidazole 500 mg orally twice daily for 5 days

Head and Neck: operations involving mucous membranes and deep tissue, entering oral cavity or pharynx:

Cefazolin 2 gm preop & q8h x 1 day

Beta lactam allergic: Clindamycin 600-900 mg and gentamicin 1.5 mg/kg preop, q8h x 1 day

Neurosurgery: craniotomy, CNS shunts, or laminectomy:

Cefazolin 1-2 gm⁹ preop, repeat if surgery > 3 hours, or vancomycin² 15 mg/kg (up to 2 gm) preop

Ophthalmic:

Gentamicin, tobramycin, ciprofloxacin, ofloxacin, or neomycin-gramicidin-polymyxin B multiple 1-2 drops topically

pre-op ± post-op over 2-24 hours, optional tobramycin 20 mg or 100 mg cefazolin subconjunctivally

Orthopedic: insertion of prosthetic joints, hip fracture, internal fixation of closed fracture, & spinal fusion

Cefazolin 1-2 gm⁹ preop & q8h (repeat if operation last longer than 3 hours) or vancomycin² 15mg/kg preop

(up to 2 gm) & q12h or clindamycin 600-900 mg preop & q8h x 1 day

Thoracic: pulmonary

Cefazolin 1-2 gm⁹ preop & q8h

Beta lactam allergic: (vancomycin² 15 mg/kg (up to 2 gm) & q12h +/- gentamicin 1.5 mg/kg) or clindamycin 600-900 mg preop & q8h x 1 day

Vascular:

Lower extremity amputation for ischemia:

Cefazolin 1-2 gm⁹ preop & q8h x 1 day

Beta lactam allergic: vancomycin² 15 mg/kg (up to 2 gm) preop & q12h x 1 day

Vascular (noncardiac): abdominal aortic resection, groin incision, or prosthetic bypass

Cefazolin 1-2 gm⁹ preop & q8h or

Beta lactam allergic: (vancomycin² 15 mg/kg preop (up to 2 gm) & q12h +/- gentamicin 1.5 mg/kg) or clindamycin 600-900 mg preop & q8h x 1 day

When aztreonam, cefazolin, cefotetan, or cefoxitin are ordered 2 gm is recommended for patients weighing > 100 kg.

Repeat intraoperative doses of cefazolin, cefoxitin, cefotetan, and aztreonam are recommended for surgeries lasting longer than 3 hours or when blood loss exceeds 1500 ml.

Footnotes and references are on the reverse side.

Definitions:

Clean Surgical Procedures (primarily closed, elective procedures involving no acute inflammation, no break in technique, and no transection of gastrointestinal, oropharyngeal, genitourinary, biliary or tracheobronchial tracts)

Clean-Contaminated Procedures (procedures involving transection of GI, oropharyngeal, GU, biliary, or tracheobronchial tracts with minimal spillage or with minor breaks in technique; clean procedures performed emergently or with major breaks in technique; re-operation of clean surgery within seven days; or procedures following blunt trauma)

Contaminated Procedures (clean-contaminated procedures during which acute, non-purulent inflammation is encountered or major spillage or technique break occurs; procedures performed within four hours of penetrating trauma or involving a chronic open wound)

Dirty Procedures (procedures performed when there is obvious preexisting infection [abscess, pus, necrotic tissue present]; preoperative perforation of GI, oropharyngeal, biliary, or tracheobronchial tracts; or penetrating trauma greater than four hours old)

Expected infection rates are < 2% for clean, < 10% for clean contaminated, 20% for contaminated, and 40% for dirty wounds, based on intraoperative contamination.

¹Parenteral prophylactic antimicrobials for clean and clean-contaminated surgery can be given as a single intravenous as close to the time of surgical incision as is practical, within 1 hour before surgical incision, and are best administered in the OR at induction or in the preoperative holding area. "On call" dosing is no longer recommended as it may result in premature administration of the antibiotic regimen and insufficient tissue concentrations of drug during the decisive interval. For prolonged operations or massive blood loss, additional intraoperative doses should be given q4-8 hours (1-2 T_{1/2} of the antibiotic) for the duration of the procedure. Duration of therapy: a single dose or up to 24 hours, for prosthetic device surgery 24 hours is recommended. An effective prophylactic regimen should be directed against the most likely infecting organisms, but need not eradicate every potential pathogen. Third and fourth generation cephalosporins (cefotaxime, ceftriaxone, cefoperazone, ceftazidime, ceftizoxime and cefepime) and ciprofloxacin are not recommended for surgical prophylaxis. They are expensive, their activity against staphylococci is often less than that of ceftazidime, their spectrum of activity against aerobic gram-negative bacilli includes organisms rarely encountered in elective surgery, and their widespread use for prophylaxis promotes emergence of resistant microbes.

²For use when methicillin-resistant *S. aureus* or *S. epidermidis* frequently cause wound infections, or for patients who have demonstrated an immediate hypersensitivity reaction to penicillins or cephalosporins. The dose should be adjusted for weight, (15 mg/kg) with a maximum dose of 2 gm, and renal function. Infuse the dose over 2 hours as more rapid administration may cause hypotension. *For procedures in which enteric gram negative bacilli are likely pathogens, such as upper GI tract/groin or lower-extremity vascular/hysterectomy, ceftazidime or another agent with gram-negative activity should be included in the prophylaxis regimen.* If vancomycin is being administered because of concern over MRSA, ceftazidime can be administered in addition. If allergy to cephalosporins is the concern, aztreonam or an aminoglycoside can be administered with vancomycin.

³Antimicrobial therapy for dirty surgery (perforated abdominal viscus, open fracture, or laceration due to animal or human bite) should usually be continued for 5-10 days.

⁴High risk: morbid obesity and when gastric acidity and gastrointestinal motility are diminished by obstruction, hemorrhage, gastric ulcer or malignancy, and use of H₂-blockers or proton pump blocker.

⁵High risk patients: > 70 years old, obstructive jaundice, acute cholecystitis, acute cholangitis, nonfunctioning gallbladder, & common duct stone

⁶After mechanical bowel cleaning the day before surgery

⁷High risk patients only: positive urine culture or culture unavailable, preoperative catheterization or in hospitals where infection rates exceed 20%, prolonged postoperative catheterization

⁸Betalactam allergy: clindamycin with (an aminoglycoside 1.5 mg/kg or levofloxacin 750 mg or aztreonam 1-2 gm) or metronidazole 500 mg with (an aminoglycoside 1.5 mg/kg or levofloxacin 750 mg) to substitute for cefotetan or ceftiofloxacin for the treatment of cephalosporin allergic patients undergoing colonic procedures. Aztreonam should not be used in a two-drug combination with metronidazole because this combination lacks activity against gram-positive cocci and may permit a higher rate of infection caused by *S. aureus*. A mechanical bowel preparation is recommended before surgery.

⁹**Dose adjustment based on weight is recommended for aztreonam, ceftazidime, cefotetan, and ceftiofloxacin: 2 gm is recommended for patients weighing > 100 kg.**

References:

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Recommendation:

- The "Suggested Antibiotics for Prevention of Wound Infection and Sepsis in Surgical Patients 2005" be approved for use by surgeons and anesthesiologists when ordering and administering antibiotics for adult surgical patients.

Summary

- The goal of antimicrobial prophylaxis is to prevent infections of the wound due to organisms most likely to be encountered for the type operation by providing serum and tissue drug levels that exceed, the MICs of the organisms.
- Antimicrobial should be administered as near to the incision time as possible to achieve low SSI rates, within 60 minutes of incision for most antibiotics, except vancomycin and fluoroquinolones when 120 minutes is the goal.
- When a proximal tourniquet is required the entire dose should be administered before the tourniquet is inflated.
- For most operations prophylaxis should end within 24 hours after the operation, with the exception of cardiothoracic surgery.
- Vancomycin and clindamycin are alternatives to cephalosporins for patients with B-lactam allergy when prophylaxis is directed primarily gram-positive cocci (orthopedic with joint replacement, cardiothoracic operations, vascular, and neurosurgical operations with implants).
- The dose of the prophylactic antibiotics should be adjusted for patient weight and administration should be repeated every 2 half-lives intraoperative for the duration of the procedure.
- Aggressive perioperative control of blood sugar with intravenous insulin for patients undergoing cardiac operations reduces SSI rates.
- Antibiotic selection: factors such as cost, drug half-life, safety, and antimicrobial resistance favor the use of older agents with a relatively narrow spectrum. Newer, broad-spectrum agents that are front-line therapeutic agents should be avoided to reduce emergence of resistant strains. The selection and duration of antimicrobial prophylaxis should have the smallest impact possible on the normal bacterial flora of the patient and the microbiologic ecology of the hospital.
- Prophylactic antibiotics should have the following qualities
 - Low toxicity
 - Not be routinely used for treatment of serious infection
 - Have a spectrum of activity that include the microorganism most likely to cause infection
 - Reach useful concentration in relevant tissues during the procedure
 - Be administered for a short duration
 - Be administered in a manner that will ensure it is present in the surgical site at the time of incision