Emory Healthcare Guideline for Antimicrobial Surgical Prophylaxis

This guideline was adapted from the 2022 consensus guidelines[1] from the American Society of Health-System Pharmacists (ASHP), Society for Healthcare Epidemiology of America (SHEA), Infectious Diseases Society of America (IDSA), and the Surgical Infection Society (SIS) as well as the ASHP Guidelines for Antimicrobial Prophylaxis in Surgery[2] and tailored for use at Emory Healthcare by the Committee for Antimicrobial Stewardship of Emory Healthcare (CASE).

Purpose: This guideline incorporates evidence-based recommendations for the choice, timing, and duration of antimicrobial agents used for surgical prophylaxis at Emory Healthcare.

Background: Antimicrobial prophylaxis reduces the incidence of surgical site infections. Prophylaxis is indicated when the risk of infection is significant, or if the risk is low and the consequences are high. Prophylactic antibiotics are not needed for some low-risk clean operations.

Adequate serum and tissue concentrations of antibiotics should be achieved by the time the incision is made and maintained throughout the entire procedure. Antibiotics that can be infused rapidly should be administered within 60 minutes prior to the start of the procedure. Antibiotics that require longer infusion and have longer half- lives, (fluoroquinolones and vancomycin) should be administered within 120 minutes prior to the start of the procedure. Vancomycin infusion should start no less than 30 minutes prior to the start of procedure. In general, one preoperative dose is sufficient, but intraoperative redosing of antibiotics with short half-lives during long procedures is required to ensure adequate levels throughout the procedure. Antibiotics should be re-dosed if there is excessive blood loss (>1500 mL) during the procedure.

Infection is prevented by reducing the amount of bacteria below a critical threshold. The agent selected should be active against major pathogens associated with infections resulting from the procedure in question. This may include *Staphylococcus aureus* from the skin as well as anaerobes and gram-negative bacteria when the bowel is entered.

Postoperative antibiotic administration has not been shown to reduce infection rates, and prolonged postoperative antibiotics increase the risk of acquiring antibiotic resistant pathogens. If postoperative antibiotics are continued, they should be discontinued no later than 24 hours following the operation (48 hours for CABG).

Guideline:

1) <u>Choice of prophylactic antibiotic</u>

a. Prophylactic antibiotics administered should be consistent with consensus guidelines.
b. Cephalosporins are the most commonly used agents because of their antibacterial spectrum and relatively long half-life. With rare exceptions, third generation cephalosporins should not be used because they are less active against *S. aureus* and because their expanded gram-negative coverage usually isn't warranted.
c. Please refer to the Surgical Prophylaxis guidance document.
d. For patients receiving therapeutic antibiotics prior to surgery, please refer to section 8.

2) <u>Allergy to Beta-Lactam Antibiotics</u>

a. Penicillin allergy: Cefazolin and cefuroxime may be used in patients with penicillin allergy labels in the absence of a ***severe*** **allergy such as blistering disorders (erythema multiforme, SJS, TEN), DRESS, hemolytic anemia, hypersensitivity vasculitis, or hepatitis/nephritis associated with penicillin at any time in the patient's history**. If the patient has a history of any of these reactions, all penicillins, cephalosporins, and carbapenems should be avoided due to the unknown risk of a future reaction.
    i. *Hives, edema, rash, or bronchospasm/anaphylaxis, or unknown reactions to penicillins are* **not** contraindications to the use of cefazolin or cefuroxime given the minimal risk of cross-reactivity.

b. **Cephalosporin allergy: Cefazolin and cefuroxime may be used in selected patients with any cephalosporin allergy unless the allergy is to cefazolin or cefuroxime, or the allergy is severe such as IgE mediated anaphylaxis, blistering disorders (erythema multiforme, SJS, TEN), DRESS, hemolytic anemia, hypersensitivity vasculitis, or hepatitis/nephritis.**

c. Alternative agents for patients with severe penicillin allergies or with allergies to cefazolin or cefuroxime are based on the antimicrobial activity profiles of the predominant procedure-specific organisms. These are listed as "Secondary/Alternative Antibiotics" in the associated Surgical Prophylaxis guidance document.

d. For more information, please utilize the "Penicillin Allergy Guidance" section within the Emory Antimicrobial Stewardship app (found on the virtual desktop or within the uCentral app).

3) <u>Vancomycin</u>

a. Vancomycin can be used for prophylaxis for the following indications.
   i. β-lactam allergy: **severe delayed reaction to beta lactam as described above**
   ii. Any known positive MRSA culture or colonization
   iii. Operations involving an area of known infection (i.e. hardware removal, infected vascular grafts) in patient with recent hospitalization or residence in a long-term nursing facility
   iv. Patients on chronic hemodialysis
   v. Implantation of prosthetic material in neurosurgery, spine, or orthopedic surgeries
   vi. Redo orthopedic surgeries involving implant

b. Vancomycin does not have activity against gram negative pathogens.

4) <u>General Antibiotic dosing:</u>

a. Standard prophylactic doses:
   i. Cefazolin: 2 grams for patients ≤ 120kg or 3 grams for patients >120kg
   ii. Cefuroxime: 1.5 grams.

b. Vancomycin and aminoglycoside doses should be weight based
   i. Vancomycin dose - 15 mg/kg rounded up to the nearest 250 mg dose
   ii. Gentamicin dose – 5 mg/kg (with no postoperative doses)

5) <u>Timing of preoperative antibiotics</u>

a. Parenteral antibiotics that can be infused rapidly should be administered in the operating room by anesthesiology service.

b. The antibiotic infusion for antibiotics that can be infused rapidly (such as cephalosporins) should begin no more than 60 minutes prior to the incision. The infusion should typically start at the time of induction of anesthesia, but the time of administration may vary depending on the procedure. Infusion should be completed prior to incision.

c. The decision to give antimicrobial prophylaxis and the administration of the antibiotic prior to incision will be confirmed during the "time out" prior to starting the operation.

d. Vancomycin and fluoroquinolone antibiotics require longer infusion times and have long half-lives; therefore, vancomycin and fluoroquinolones should be started no less than 30 minutes and no more than 120 minutes prior to incision. To accomplish this, the infusion should be started, for most procedures, in the preoperative holding area. To avoid exceeding the 120-minute window for surgeries with long preparatory time, such as CABG, the infusion should begin just prior to transport to the operating room.

e. Ideally, infusion of vancomycin or fluoroquinolones should be completed prior to incision. If this is not feasible, a majority of the antibiotic must be infused prior to incision.

f. When a tourniquet is used, the infusion of the prophylactic antibiotic should be completed before the tourniquet is inflated.

6) <u>Intraoperative re-dosing of prophylactic antibiotics (see appendix III)</u>

a. Re-dosing frequencies for all commonly used agents, and per renal function (including for patients receiving renal replacement therapy in the operating room) can be found in the "Intraoperative Redosing of Surgical Prophylaxis" section within "Pharmacist Medication Guidance" the Emory Antimicrobial Stewardship app (found on the virtual desktop or within the uCentral app).

b. Intraoperative re-dosing of antibiotics may be needed to ensure adequate concentrations during long operations or if there is excessive blood loss (>1500 mL) during the procedure.

c. The intraoperative dosing frequency should be based on the half-life of the antibiotic, with the standard dosing interval being two times the half-life of the antibiotic.
d. The redosing interval should be based on the time the preoperative antibiotic dose was administered and not the time of incision.

7) <u>Postoperative dosing of prophylactic antibiotics</u>

a. Antibiotics after closure of the incision are not recommended as this practice has not been shown to reduce SSI. Post-operative re-dosing of antibiotics has been shown to increase:
    i. Antimicrobial resistance
    ii. *Clostridioides difficile* infection
    iii. Acute kidney injury
b. If postoperative doses are given:
    i. The last dose must be administered within 24 hours of the completion of the procedure. Antibiotics administered for longer periods of time are <u>not</u> prophylactic but are therapeutic and should only be given when infection is documented or suspected.
    ii. For antibiotics administered every 8 hours (e.g. cefazolin and cefuroxime), a maximum of two post-operative doses should be administered. For antibiotics administered every 12 hours (e.g. vancomycin), only 1 post-operative doses should be used.
    iii. Base the time of the first post-operative dose on the time of the previous dose (either pre-operative or intra-operative).

8) <u>Prophylaxis for patients receiving therapeutic antibiotic therapy prior to surgery</u>

a. Other than for fluoroquinolones, vancomycin, or aminoglycosides, pre-operative prophylaxis should be provided based on surgery type, regardless of concurrent infection-directed antibiotics. This recommendation is to ensure antibiotics are given at the appropriate time prior to incision, and so that antibiotics given at the time of surgery have an adequate spectrum of coverage.
    - Additional doses and timing of doses for patients on vancomycin and/or aminoglycosides should be based on their regimen and recent doses. Pharmacy should be contacted to assist with determining when to re-dose vancomycin and aminoglycosides when patients are already therapeutic on these agents prior to surgery.
    - If the patient is already on infection-directed treatment with Ciprofloxacin or Levofloxacin, and a fluoroquinolone is recommended as pre-operative prophylaxis, <u>do not</u> re-dose the fluoroquinolone. Continue dosing at the pre-specified, infection-directed intervals as dictated by renal function.
b. If questions arise regarding additional antibiotic dosing, please contact a clinical pharmacist.

1. Calderwood MS, Anderson DJ, Bratzler DW, Dellinger EP, Garcia-Houchins S, Maragakis LL, Nyquist AC, Perkins KM, Preas MA, Saiman L, Schaffzin JK, Schweizer M, Yokoe DS, Kaye KS. Strategies to prevent surgical site infections in acute-care hospitals: 2022 Update. Infect Control Hosp Epidemiol. 2023 May;44(5):695-720. doi: 10.1017/ice.2023.67. PMID: 37137483

2. Dale W. Bratzler, E. Patchen Dellinger, Keith M. Olsen, Trish M. Perl, Paul G. Auwaerter, Maureen K. Bolon, Douglas N. Fish, Lena M. Napolitano, Robert G. Sawyer, Douglas Slain, James P. Steinberg, Robert A. Weinstein, Clinical practice guidelines for antimicrobial prophylaxis in surgery, *American Journal of Health-System Pharmacy*, Volume 70, Issue 3, 1 February 2013, Pages 195–283, https://doi.org/10.2146/ajhp120568