# Episode 60: Surgical Antibiotic Prophylaxis

On this episode: Dr. Jed Wolpaw and Dr. Andrew Jarrell

Dr. Andrew Jarrell is one of the amazing surgical ICU pharmacists at Johns Hopkins. Use the quiz at the end of this summary as a pre- and post-test!

## What's the point?

- Good to take step back and understand why we're giving antibiotics
- Prevent surgical site infections (SSI)
    - Associated with morbidity and mortality
    - Rates also monitored
    - 2-5% for most surgical pts
    - Up to 10% for higher risk
        - Colorectal
        - Liver transplant

## What factors plays a role in developing SSI?

- Antibiotics
- Infection control
- Surgical technique
- Duration
- Sterilization, preop prep
- Temperature
- Sugar levels
- Medical condition

## Are there guidelines?

- The American Society of Health-System Pharmacists (ASHP), the Infectious Diseases Society of America (IDSA), the Surgical Infection Society (SIS), and the Society for Healthcare Epidemiology of America (SHEA) published a guideline in 2013 that provides a great framework.
- More preferred are locally developed guidelines
    - Local antibiograms
    - SSI rates
    - Institutional

## Timing of antibiotic administration?

- Within 1 hour, before incision

    - Easier with cefazolin
    - Harder with metronidazole, vancomycin
- Antibiotics need to be present at skin at time of incision
    - Time to penetrate skin
- Cephalosporins can be pushed IV and quickly distribute to skin
    - Ideal time frame?
        - 1-2 minutes prior still adequate
        - Not as much data for other drugs
- Metronidazole, fluoroquinolones, vancomycin require longer infusion time
    - 60 minutes
    - Guideline
        - 120 min before incision
        - Some evidence exists that there is enough at skin level as long as 50% are administered at time of incision
        - Up to 30 min OK?
    - Should start in preop area

## Dosing

- Cefazolin 1-gram dose standard
- Larger volume of distribution (Vd)
    - Volume resuscitation
    - Related inflammation
    - Need larger dose of antibiotics, such as 2 grams
- Beta-lactamase
    - Wide window of therapeutic index
    - Can afford to give excess dose
- Obese patients (United States!) → ↑ Vd

## Redosing

- Half-life
    - If shorter: **q1-2 hours**
    - Cephalosporins, normal renal function: **q4 hours**
    - Ampicillin, sulbactam, normal renal function: **q2 hours**
    - Most others won't need because longer half-life
    - Vancomycin >8 hours ago, consider redosing
- Renal function
    - Concerning if creatinine clearance ~ < 60 ml/min
    - Talk to pharmacist!
    - If cephalosporin, probably ok
    - If gentamicin/vancomycin, worried about associated toxicities

- Blood loss
  - Estimated blood loss > 1500 ml regardless of antibiotics
    - Vancomycin: **half-dose**
    - Other cephalosporins: **full dose**
  - Consider Vd
    - Smaller Vd → lose more in blood
- Postop
  - Guidelines don't have firm position against giving postop antibiotics but evidence exists where it shows no benefit. CDC guidelines are against this.
  - Should be limited to < 24 hours postop
  - What if trauma with gross spillage?
    - Prophylaxis with antibiotics, washout
    - Trauma still no need antibiotics > 24 hours postop
  - What about indwelling drains?
    - No evidence for antibiotics
    - Guidelines firmer on this, as well as in CDC

## Antibiotics selection

- Consider like bacteria encountered, select for that without going overboard
- Clean
  - Skin
    - Staph, coagulase negative
      - **Cefazolin**
  - Cardiac, Ortho, Vascular, Neuro
    - Staph, coagulase negative
      - **Cefazolin**
    - Also need strep coverage
  - Beta-lactam (BL) allergy (hives, anaphylaxis)
    - Clindamycin
    - Vancomycin
- Contaminated
  - Skin
    - Staph, strep
  - Head
    - Oral anaerobes
      - Non-Bacteroides fragilis
      - Peptostreptococcus
      - Prevotella
    - Cefazolin/metronidazole
    - Ampicillin/sulbactam

        - Allergies
            - Clindamycin
- GI / biliary
    - Staph, similar to skin
        - Cefazolin has some gram negative (GN) coverage
    - GN rods, anaerobic
        - **Metronidazole**
        - Clindamycin not as good
    - If BL allergy
        - Clindamycin + aminoglycoside or fluoroquinolone
            - Renal function drives this decision (amino)
    - Cefoxitin/cefotetan- switched bc drug shortage
        - Key populations (colorectal)
            - Cefazolin/metronidazole > cefoxitin/cefotetan

## Why not nuke with antibiotics?

- Worried not just about resistance but also adverse effects
    - C.difficile
    - Allergies
    - Renal injury
    - QT prolongation

## Allergy considerations

- How severe?
    - **A**naphylaxis = **A**bsolute contraindication
    - Hives = relative contraindication
        - Consider cephalosporin for penicillin reactions
- Clindamycin is alternative
- Get good preop history about reaction

## Nasal testing for MRSA

- Bacitracin for decolonizing
- Different antibiotic coverage
- Practice at JHU
    - Use vancomycin, especially for higher risk patients
    - Example
        - If colonized + hardware or spinal fusion or joint replacement or VAD insertion
        - Really concerned about hardware
            - Vancomycin + cefazolin

## What should I do if a patient arrives for an operation and is already on antibiotics?

- If active infection, and on piperacillin/tazobactam, these drugs already good coverage for staph, GN, and anaerobes.
    - No need for additional antibiotics
    - Make sure timing of antibiotics is adequate to be active within 1-hour window
- Vancomycin – especially because 1x/day. If within 8 hours of previous dose, no need to re-dose. If > 8 hours, re-dose with half dose.
- Case
    - On pip/tazo q6 hours. Last dose was 2 hours ago. Now in the OR. Recommendations vary, but one pharmacist would give new dose because therapeutic index is forgiving… UNLESS poor renal function on q8 hours.

## Antibiotics for trauma

- Penetrating abdominal injury (eg, knife stab)
    - Assume bowel perforation
    - Cover for GN, anaerobes in bowel
        - Cefazolin + metronidazole
        - Cefoxitin
        - Cefotetan
    - Foreign exposure doesn't change antibiotics
        - Dirt
        - Rusty metal
    - Farm exposure
        - Cover for clostridium because manure
        - Add penicillin, unless on clindamycin
    - Need to keep abdomen open?
        - Controversial - not need to provide coverage. Wounds remain open → potential nosocomial infection. Data not clear, so no compelling reason for one way or another.
- Timing of trauma
    - Early presenting
        - No reason for additional infection
    - Festering trauma then presenting with active infection
        - Treat appropriately, not as prophylaxis
- Open fracture
    - Gustilo type of classification for severity
        - Orthopedic surgeon provides class

        - Size of wound and extensiveness of injury
        - Type 1 to 3
    - Antibiotics differ between type 3 vs not 3
    - Types 1 and 2
        - <10 cm, not extensive soft tissue injury (not clearly defined)
        - **Cefazolin**
        - Allergy: clindamycin
        - Duration: 24 hours postop
    - Type 3
        - >10 cm or extensive soft tissue injury
        - ↑ GN infection per data
        - Add **gentamycin** (study shows)
        - Due to longer time for full repair, may remain open → exposed to nosocomial injury
        - Duration: 72 hours postop or 24 hours post-full closure
- Penetrating head trauma
    - Still open fracture
    - Urgency for vancomycin/cefepime for open head injury
        - Concern is more for **meningitis**
        - Limited choices - need to penetrate blood-brain barrier. Don't want to use it upfront
    - Empirically, cefazolin or cefazolin/gentamycin
    - Sinus involvement
        - **Ceftriaxone** or **ampicillin/sulbactam** for oral anaerobes

## How could we be better about surgical prophylaxis?

- Protocols!
    - Standardize → less opportunity for error
    - Local is key for making right decision for right patient every time
    - Guidelines into EMR or readily available where it will be used
    - Bring in surgical colleagues, anesthesiologists, ID docs, pharmacists. Collaborative approach permits buy-in from key parties, and making the right decision in the first place.

## Quiz yourself!

*Click the question to go to the section of the notes that contains the answer*



Join the conversation! Do you use 1g or 2g? Do you use pharmacists or not? What are some key differences?