Prophylactic Antibiotic Use in Surgery: What do the Data Say?

MIA A. TAORMINA, DO, FACOI
CHAIR, DEPARTMENT OF INFECTIOUS DISEASES – DUPAGE MEDICAL GROUP
ADJUNCT CLINICAL FACULTY – MIDWESTERN UNIVERSITY CCOM
Objectives

- Review the current antibiotic recommendations for prophylaxis in surgical patients
- Discuss current antibiotics available for prophylactic use as well as alternatives in allergic patients
- Be familiar with the continued use of antibiotics in post-surgical patients
- Recap/updates on endocarditis prophylaxis
- Take Home Points
Disclosures

- None
Definitions

- **Prophylaxis**
  - Administration of an antibiotic prior to contamination of previously sterile tissues or fluids
  - Use of antibiotics for dirty/contaminated procedures is not considered prophylaxis – this would be an established infection (i.e., perforated viscus)

- **Presumptive therapy**
  - Administration of an antibiotic when there is a strong possibility of infection

- **Treatment**
  - Administration of antibiotics when infection has been established
Goals of Antibiotic Prophylaxis

- Prevent surgical site infections
- Decrease post-op morbidity and mortality
- Reduce duration of stay and cost of healthcare
- Produce no adverse effects
- Minimize consequences for the microbiome of the patient/hospital
- To choose an antibiotic targeting the most likely pathogens
- Give adequate dosage and repeat the dosing if needed
- Administration for the shortest possible post-op period
Cardiac/Thoracic Surgery

(Gram positives – S. aureus, CoNS, Propionibacterium most likely)

- CABG/Cardiac device insertion/VAD
  - Recommended: cefazolin, cefuroxime
  - Alternate: clindamycin, vancomycin

- Thoracic (lobectomy, pneumonectomy, lung resection, thoracotomy, VATS)
  - Recommended: cefazolin, ampicillin-sulbactam
  - Alternate: clindamycin, vancomycin

- Heart/lung transplant
  - Recommended: cefazolin
  - Alternate: clindamycin, vancomycin

Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery, ASHP Therapeutic Guidelines
GI Procedures

(Coliforms – E.coli, proteus, klebsiella most commonly), staph, strep, enterococcus, anaerobes

- **Gastroduodenal** (bariatric, pancreaticoduodenectomy, antireflux, vagotomy)
  - Recommended: cefazolin
  - Alternate: clindamycin or vancomycin + AG or aztreonam or FQ

- **Biliary tract** (open procedures)
  - Recommended: cefazolin, cefoxitin, ceftriaxone, ampicillin-sulbactam
  - Alternate: clindamycin or vancomycin + AG or aztreonam or FQ or metronidazole + AG or FQ

- **Laporascopic procedures**
  - Low risk – NONE
  - High risk recommended: cefazolin, cefotetan, ceftriaxone, ampicillin-sulbactam
  - High risk alternate: clindamycin or vancomycin + AG or aztreonam or FQ or metronidazole + AG or FQ
Appendectomy
- Recommended: cefoxitin, cefotetan, cefazolin + metronidazole
- Alternate: clindamycin + AG or aztreonam or FQ or metronidazole + AG or FQ

Small intestine/hernia
- Recommended: cefazolin (+metronidazole or cefoxitin or cefotetan if obstructed)
- Alternate: clindamycin + AG or aztreonam or FQ + vanco if mesh

Colorectal surgery
- Recommended: cefazolin + metronidazole, cefoxitin, ampicillin-sulbactam, ceftriaxone + metronidazole, ertapenem
- Alternate: clindamycin + AG or aztreonam or FQ or metronidazole + AG or FQ
Orthopedic surgeries
(Skin flora – S aureus, GNRs, CoNS, B-hemolytic strep)

- Clean operations, spinal procedures, hip fractures, implants, joints
  - Recommended: cefazolin
  - Alternate: clindamycin, vancomycin
Urologic/Gynecologic Surgery
(E. coli, other GNRs, enterococcus)

- Lower tract instrumentation
  - Recommended: FQ, trimethoprim-sulfa, cefazolin
  - Alternate: AG with or without clindamycin
- Clean without entry into urinary tract
  - Recommended: cefazolin (+AG if prosthetic material)
  - Alternate: clindamycin, vancomycin
- Clean with entry into urinary tract
  - Recommended: cefazolin (+AG if prosthetic material)
  - Alternate: FQ, AG with or without clindamycin
- Cesarean section
  - Recommended: cefazolin
  - Alternate: clindamycin + AG
- Hysterectomy
  - Recommended: cefazolin, cefotetan, cefoxitin, ampicillin-sulbactam
  - Alternate: clindamycin or vancomycin + AG or aztreonam or FQ
Controversies/Failures

- Controversies
  - Selection of antibiotics
  - Duration of therapy post-procedure (and pre-procedure?)
  - Development of resistant organisms
  - Role of newer antibiotics

- Failure of prophylaxis?
  - Inadequate timing of antibiotic
  - Failure to re-administer antibiotic during prolonged surgical procedures
Patient Risk Factors

- Extremes of age
- Poor nutritional status
- Obesity
- Tobacco abuse
- Remote body site infections
- Immunocompromised
- Length of hospitalization
- Colonization with microorganisms
Development of Resistance

- MRSA
  - 49.2% of surgical wound infections
  - Also a concern for VRSE, VRSA with rising MICs
- Use of vancomycin prophylaxis is not routinely recommended for any procedure
  - Agent of choice when high rate of surgical site infections >20% in an institution involve MRSA or CoNS
- Universal MRSA screening remains controversial
  - MRSA decolonization pre-op?
Pre-op Screening and Decolonization

- Staph aureus causes 30% of all SSIs in the US
- Colonization with S. aureus in the nares in 1 in 4 patients
  - Those colonized have a 2- to 14-fold increase in risk of SSIs
- Data does support use of intranasal mupirocin to decrease the risk of SSIs in patients colonized with S. aureus
  - Most compelling data in cardiac and orthopedic patients
- Chlorhexadine baths + mupirocin protocol
  - One study found that deep SSIs (MSSA) occurred in 0.9% of treated group vs. 4.4% of placebo group
  - Superficial SSIs less marked
  - Timing of protocol?
Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery were updated in 2013 (previously updated in 1999) and have several key recommendations:

- Optimal time for administration of pre-op antibiotics is within 60min of the first surgical incision
  - Antibiotics with longer infusion times should be started within 120min
- Updates on weight-based dosing and need for repeat dosing in prolonged procedures
  - If a procedure exceeds two half-lives of the drug or if excessive blood loss
- Shortened postoperative course for continued administration of antibiotics
Redosing

- If a short-acting agent is used, antibiotic should be redosed if the procedure is >3 hours
  - Common short half-life agents include ampicillin-sulbactam, cefoxitin, ampicillin, cefazolin
- Consider redosing if prolonged or excessive bleeding, extensive burns
- If patient has renal failure or renal insufficiency, redosing is generally not warranted
Duration Post-Procedure?

- For most procedures – continuation of therapy for 24 hours or less
- Cardiac/cardiothoracic – up to 48 hours
- No data to support the continuation of antimicrobial prophylaxis until removal of drains, catheters, invasive lines are removed
Irrigation? Topical antibiotics?

- Topical antibiotics are usually only routinely used in ophthalmic procedures
  - Some studies regarding “painting” the chest of cardiac patients with vancomycin/gentamicin – data is limited, no significant benefit noted thus far
- Limited data on the use of topical/irrigating/wash antibiotics
Procedures with considerable risk for bacteremia increase the risk of endocarditis in some patients:

- Patients with artificial heart valves
- Patients who have had heart repairs using prosthetic materials (not for coronary artery stents)
- Prior history of endocarditis
- Congenital heart defects (unrepaired or incompletely repaired)
- Heart transplant patients with valvular disease

NOT recommended patients with aortic or mitral valve disease or in patients with hypertrophic cardiomyopathy

NOT recommended in patients with orthopedic implants!
Which Procedures?

- Dental procedures involving deep manipulation of the gums, root canals, tooth extractions
  - NOT for routine dental cleanings
- Procedures involving the upper respiratory tract
- Procedures involving obvious tissue infection
- NOT recommended for routine GI or GU procedures
Take Home Points

- The ideal timing for the first dose of antibiotics in the pre-operative period is within 60min of the first incision
  - Repeat dosing at 3 hours for antibiotics with short half lives
- Most perioperative IV antibiotics can be d/c within 24 hours of the procedure
  - No need to keep them going until all drains, tubes, lines removed as a rule
- Decolonization procedures are reasonable in patients with MRSA colonization in advance of upcoming procedures
- Endocarditis prophylaxis is NOT routinely recommended for atrial or mitral valve disease or in the presence of orthopedic implants
Questions?
mtaorminado@comcast.net
References


  - These guidelines are indorsed by the Infectious Disease Society of America, the Surgical Infection Society, the American Society of Health-System Pharmacists, and the Society for Healthcare Epidemiology of America