Introduction:
Antimicrobial prophylaxis prior to Interventional Radiology (IR) procedures attempts to prevent infection and infection-related morbidity and mortality, thus reducing the duration and cost of healthcare. Agents and duration chosen should attempt to avoid adverse drug events and minimize adverse consequences on both patient’s and the hospital’s normal microbial flora. In order to accomplish this, the selected agent must be active against the most likely pathogens at the site of the surgical procedure, given at appropriate doses and at the appropriate time with regard to the first incision made, be safe and efficacious, and be administered for the shortest duration possible. Patient factors such as medication allergies as well as previous methicillin resistant Staphylococcus aureus (MRSA) must also be considered when selecting the prophylactic antimicrobial.

This guideline was constructed in order to establish PAMC preferred antibiotic prophylaxis regimens prior to IR procedures. It is not intended to, or should, replace clinical judgment.

Timing:
Successful pre-procedure antimicrobial prophylaxis requires adequate concentrations of the agent at the incision site prior to the first incision being made. Thus, prophylactic antibiotics should be administered far enough in advance of the first incision that concentrations may be allowed to exceed the minimum inhibitory concentration (MIC) of potential pathogens.

Most prophylactic antibiotics should be initiated within 60 minutes of the procedure, with the exception of vancomycin, ciprofloxacin, and levofloxacin which should be initiated within 120 minutes of the procedure due to prolonged infusion times with these agents. Additionally, vancomycin should be initiated > 15 minutes prior to incision.

Patients receiving therapeutic antibiotics for pre-existing infection who are taken for an IR procedure may or may not need additional preoperative doses. Specifically, patients who previously received a therapeutic antibiotic for which there is an intra-operative dosing interval listed in Table 2 should have these agents re-dosed at the listed Intra-Operative Re-dosing Interval. Patients who previously received therapeutic doses of any antibiotic without a listed intra-operative redosing interval in any other patient care location prior to transfer to IR should have these agents re-dosed at the recommended Post-Operative Dosing Interval as referenced in Table 2.

Dosing:
Dosing provided in Table 1 and Table 2 represents the surgical prophylaxis doses recommended by the Infectious Diseases Society of America (IDSA), American Society of Health-Systems Pharmacists (ASHP), Surgical Infection Society (SIS), Society for Healthcare Epidemiology of America (SHEA), and...
Society of Interventional Radiology (SIR). These doses are for patients with estimated CrCl >60 mL/min and may need adjustment in patients with renal impairment. Please consult pharmacy (x24974) with questions regarding appropriate antimicrobial doses in patients with renal impairment.

Doses of the following antimicrobials are weight-based:

- **Cefazolin:**
  - Patients <120 Kg = 2 g
  - Patients ≥ 120 Kg = 3 g

- **Vancomycin:**
  - Patients < 100 Kg = 1 gm
  - Patients 100-120 Kg = 1.5 gm
  - Patients >120 Kg = 2 gm

- **Gentamicin:** 5 mg/Kg
  - Based on Actual Body Weight (ABW) if within 120% of IDEAL body weight (IBW).
    - **IBW:**
      - Males: 50 Kg + (2.3 * every inch of height > 60”)
      - Females: 45.5 Kg + (2.3 * every inch of height > 60”)
  - Based on DOSING weight (DW) if ABW is >120% of IBW.
    - **DW = IBW + 0.4(ABW-IBW)**

**Route of Administration:**
All pre-operative antimicrobials listed in Tables 1 and 2 are intended to be given intravenously.

**Duration of Post-Operative Prophylaxis:**
*In general, post-IR antibiotics have not been shown to impact rates of surgical site infections.* Procedures that involve instrumentation of an obstructed viscus, such as biliary or kidney obstruction, in which the risk of postprocedural bacteremia caused by intravasation of organisms into the bloodstream remains present until the organ is adequately drained. In such setting the antibiotic agent used spans the boundary between prophylaxis and treatment, and in such patients, treatment should be continued until satisfactory drainage of the viscus is achieved.

**Pre-procedural MRSA Colonization:**
*Staphylococcus aureus* is the most common pathogen implicated in surgical site infections in the United States. Approximately one in every four patients is colonized with *S. aureus* in the nares, conferring a 2-14 fold increase in risk of development of a surgical site infection. However, screening for methicillin-susceptible *Staphylococcus aureus* (MSSA) is not routinely performed. Nasal swabs are available to screen for the presence of MRSA colonization. Identifying a patient as MRSA colonized is important for proper selection of prophylactic antibiotics.
Historical data for patients with a history of MRSA (both nasal colonization and or MRSA obtained from other cultures) can be found in the patient banner in Epic® under the “INF” section. This banner will say “MRSA” if the patient has a previous history of MRSA, and will roll over from admission to admission. The only time that this tag will disappear is when infection control resolves it when the patient is no longer colonized or infected with MRSA. By clicking on “MRSA” you may view when the tag was added and see any comments left from infection control at the time the tag was initiated.

**Assessment of Beta-lactam Allergy**:  
Approximately 10% of patients in the general population will report a penicillin allergy, most commonly rash. True drug allergy is based on the presence of one or more of the following signs/symptoms:

- Respiratory difficulty
- Hypotension
- Immediate-onset rash or hives.

The likelihood of 1st generation cephalosporin allergy in those with a true penicillin allergy is below 10%.

Patients answering “no” to all of the following questions may be given a cephalosporin despite a reported penicillin allergy:

- Have you ever had a **LIFE-THREATENING** reaction?
- Have you had an **IMMEDIATE** reaction of:
  - **ANAPHYLAXIS** (sudden lowering of blood pressure, wheezing, trouble breathing)
  - **ANGIOEDEMA** (swelling of the throat, tongue, lips, or face)
  - **URTICARIA** (hives, swollen red bumps or patches that occur within 1 hour of the dose administered)
    - **NOTE:** Rashes or itching that appear a few days into treatment are not hives and are not contraindications to cephalosporin use.

If it is determined that the penicillin allergy does not preclude the use of the cephalosporin then the phrase “MD aware of penicillin allergy” should be added to the administration instructions on the cephalosporin order. This will alert pharmacy and avoid unnecessary delays.
<table>
<thead>
<tr>
<th>Indication/Procedure</th>
<th>Potential Pathogens</th>
<th>Pre-op IR/Dose</th>
</tr>
</thead>
</table>
| **Cardiac Device Implantation**<sup>5,6</sup>: e.g. pacemaker and other device implantation. | Most common: *S. aureus*, Coagulase-negative *staphylococcus* | Preferred: Cefazolin 2-3 g*  
**Beta-lactam allergy and/or known MRSA hx:**  
Vancomycin**:  
Weight < 100 Kg: 1 g  
Weight 100-120 Kg: 1.5 g  
Weight >120 Kg: 2 g |
| **Central venous access**<sup>1</sup>: e.g. PICC, PORT, tunneled catheters | Most common: *S. aureus* and *S. epidermidis.* | Routine ABX not recommended  
*If patient is neutropenic (ANC &lt; 1000) AND/OR chemo to be infused through port within 14 days of placement:*  
**Preferred:** Cefazolin 2-3 g*  
**Beta-lactam allergy and/or known MRSA hx:**  
Vancomycin**:  
Weight < 100 Kg: 1 g  
Weight 100-120 Kg: 1.5 g  
Weight >120 Kg: 2 g |
| **Embolization and Chemoembolization**<sup>1</sup>: Hepatic, renal, or splenic embolization/chemoembolization | Most common: *S. aureus*, *Streptococcus sp.*  
Less common: *Corynebacterium*, enteric flora, anaerobes | Preferred: Cefazolin 2-3g* + Metronidazole 500 mg  
**Beta-lactam allergy and/or known MRSA hx:**  
Gentamicin 5 mg/Kg*** + Clindamycin 900 mg |
| **Endograft Placement**<sup>1</sup> | Most common: *S. aureus* and *S. epidermidis.* | Preferred: Cefazolin 2-3 g*  
**Beta-lactam allergy and/or known MRSA hx:**  
Vancomycin**:  
Weight < 100 Kg: 1 g  
Weight 100-120 Kg: 1.5 g  
Weight >120 Kg: 2 g |
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Most Common</th>
<th>Antibiotic Recommendations</th>
</tr>
</thead>
</table>
| **Fluoroscopically guided gastrostomy and gastrojejunostomy tube placement**: | S. aureus and S. epidermidis, Corynebacterium sp., | **“Pull” technique:** Preferred: Cefazolin 2-3 g*  
  Beta-lactam allergy and/or known MRSA hx:  
  Vancomycin**:  
  Weight < 100 Kg: 1 g  
  Weight 100-120 Kg: 1.5 g  
  Weight >120 Kg: 2 g  
  **“Push” technique:** Routine ABX not recommended |
| **GU Procedures**: e.g. Percutaneous nephrostomy tube placement, ureteral stents | Most common: E. coli, Klebsiella sp., Proteus, Enterococcus sp. | Preferred: Cefazolin 2-3 g*  
  Beta-lactam allergy:  
  Gentamicin 5 mg/Kg***  
  +  
  Vancomycin**:  
  Weight < 100 Kg: 1 g  
  Weight 100-120 Kg: 1.5 g  
  Weight >120 Kg: 2 g  
  NOTE: No prophylaxis recommended for routine tube exchange in uninfected patients. |
| **Inferior vena cava filter placement**: | Most common: S. aureus and S. epidermidis. | Routine ABX not recommended |
| **LE superficial venous insufficiency treatment**: e.g. Varicose veins | Most common: S. aureus and S. epidermidis. | Routine ABX not recommended |
| **Liver and Biliary**: i.e. Biliary drainage | Most common: Enterococcus sp, Bacteroides sp., Viridans group Streptococci, Clostridium sp., P. aeruginosa, E. coli, Klebsiella | Preferred: Cefazolin 2-3 g*  
  Beta-lactam allergy:  
  Gentamicin 5 mg/Kg***  
  +  
  Vancomycin**:  
  Weight < 100 Kg: 1 g  
  Weight 100-120 Kg: 1.5 g  
  Weight >120 Kg: 2 g |
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Common Pathogens (and less common if applicable)</th>
<th>Image-Guided Biopsies (except Transrectal)</th>
<th>Image-Guided Transrectal Approach Biopsies (i.e., Prostate biopsy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous biopsy¹</td>
<td>More common: <em>S. aureus</em> and <em>S. epidermidis</em></td>
<td>All Image-Guided Biopsies EXCEPT Transrectal Approach: Routine ABX not recommended</td>
<td>Preferred: Ciprofloxacin 500 mg PO BID starting one day prior to the procedure. <em>NOTE: Ciprofloxacin should be continued for a total of 4 days</em></td>
</tr>
<tr>
<td></td>
<td>Less common: (transrectal approach) <em>Enterococcus</em> spp., Enteric gram-negative bacilli, <em>B. fragilis</em>, other anaerobes</td>
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<tr>
<td>Percutaneous vertebroplasty¹</td>
<td>Most commonly: <em>S. aureus</em>, <em>S. epidermidis</em>, and <em>Streptococci</em></td>
<td>Preferred: Cefazolin 2-3 g*</td>
<td></td>
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<tr>
<td></td>
<td>Beta-lactam allergy and/or known MRSA hx:</td>
<td></td>
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<tr>
<td></td>
<td><em>Vancomycin</em>*:</td>
<td></td>
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<tr>
<td></td>
<td>Weight &lt; 100 Kg: 1 g</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Weight 100-120 Kg: 1.5 g</td>
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<tr>
<td></td>
<td>Weight &gt;120 Kg: 2 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transjugular Intrahepatic</td>
<td>More common: <em>S. aureus</em> and <em>S. epidermidis</em>, <em>Corynebacterium</em> sp., <em>Enterococcus</em> sp., Biliary pathogens, enteric GNRs, anaerobes</td>
<td>Preferred: Cefazolin 2-3 g*</td>
<td></td>
</tr>
<tr>
<td>Portosystemic Shunt (TIPS)¹</td>
<td>More commonly</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preferred: Cefazolin 2-3 g*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beta-lactam allergy and/or known MRSA hx:</td>
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<tr>
<td></td>
<td><em>Vancomycin</em>*:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight &lt; 100 Kg: 1 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight 100-120 Kg: 1.5 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight &gt;120 Kg: 2 g</td>
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<td></td>
</tr>
<tr>
<td>Uterine Artery Embolization (UAE)¹</td>
<td>More common: <em>S. aureus</em> and <em>S. epidermidis, streptococcus sp.</em></td>
<td>Preferred: Cefazolin 2-3 g*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less common: <em>E. Coli</em></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Preferred: Clindamycin 900 mg + Gentamicin 5 mg/Kg***</td>
<td></td>
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</tr>
</tbody>
</table>
### Vascular Interventions:
- Angiography, angioplasty, Thrombolysis, arterial closure device placement, stent placement

### Most common:
- *S. aureus, S. epidermidis.*

### Routine ABX not recommended

*If repeat intervention within 7 days:*

#### Preferred:
- **Cefazolin 2-3 g**

**Beta-lactam allergy and/or known MRSA hx:**
- **Vancomycin**
  - Weight < 100 Kg: 1 g
  - Weight 100-120 Kg: 1.5 g
  - Weight >120 Kg: 2 g

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**¥** Doses provided assume estimated CrCl >60 ml/min

**Ω** Doses provided in this table are for ADULT patients (See table 2 for pediatric dosing)

*Cefazolin dosing: actual body weight (ABW) <120 Kg = 2 g / ABW ≥120 Kg = 3 g

**Vancomycin dosing is based on actual body weight. In emergent cases where it is not possible to start vancomycin ≥15 min prior to procedure, clindamycin 900 mg IV may be substituted.

***Gentamicin dosing is based on dosing weight (DW) if ABW is >20% above IBW. (Note: When given as a single preoperative, prophylactic dose the risk of toxicity associated with gentamicin administration is very low.)

- **IBW male = 50 Kg + (2.3 * every inch > 60” in height)
- **IBW female = 45.5 Kg + (2.3 * every in >60” in height)
- **DW = IBW + (0.4*(ABW-IBW))**
<table>
<thead>
<tr>
<th>Drug</th>
<th>Recommended ADULT Surgical Prophylaxis Dose¹</th>
<th>Recommended PEDIATRIC Surgical Prophylaxis Dose¹</th>
<th>Recommended Intra-operative Re-dosing Interval¹</th>
<th>Recommended Intra-Operative Dosing Interval for End Stage Renal Disease (ESRD)³</th>
<th>Recommended Post-Operative Dosing Interval³</th>
<th>Adult Max dose per 24 hour period³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin/Sulbactam</td>
<td>3 gm</td>
<td>50 mg/kg (Ampicillin component)</td>
<td>2 hrs</td>
<td>N/A</td>
<td>q6hrs</td>
<td>12 gm</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>2 gm</td>
<td>30 mg/kg</td>
<td>4 hrs</td>
<td>N/A</td>
<td>q8hrs</td>
<td>12 gm</td>
</tr>
<tr>
<td>Cefazolin</td>
<td>Weight &lt;120 Kg: 2 gm</td>
<td>30 mg/kg</td>
<td>4 hrs</td>
<td>N/A</td>
<td>q8hrs</td>
<td>12 gm</td>
</tr>
<tr>
<td></td>
<td>Weight ≥120 Kg: 3 gm</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>1.5 gm</td>
<td>50 mg/kg</td>
<td>4 hrs</td>
<td>N/A</td>
<td>q8hrs</td>
<td>6 gm</td>
</tr>
<tr>
<td>Cefoxitin</td>
<td>2 gm</td>
<td>40 mg/kg</td>
<td>2 hrs</td>
<td>N/A</td>
<td>q6hrs</td>
<td>12 gm</td>
</tr>
<tr>
<td>Ceftriazone</td>
<td>2 gm</td>
<td>50-75 mg/kg</td>
<td>N/A</td>
<td>N/A</td>
<td>q24hrs</td>
<td>2 gm</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>400 mg</td>
<td>10 mg/kg</td>
<td>8 hrs</td>
<td>N/A</td>
<td>q12hrs</td>
<td>800 mg</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>900 mg</td>
<td>10 mg/kg</td>
<td>6 hrs</td>
<td>6 hrs</td>
<td>q8hrs</td>
<td>1800 mg</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>5 mg/kg (dose based on dosing weight)</td>
<td>2.5 mg/kg (dose based on dosing weight)</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>500 mg</td>
<td>10 mg/kg</td>
<td>N/A</td>
<td>N/A</td>
<td>q24hrs</td>
<td>N/A</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>500 mg</td>
<td>15 mg/kg</td>
<td>N/A</td>
<td>N/A</td>
<td>q8hrs</td>
<td>N/A</td>
</tr>
<tr>
<td>Piperacillin/</td>
<td>3.375 gm</td>
<td>Infants 2-9 months: 80 mg/kg (piperacillin component)</td>
<td>2 hrs</td>
<td>4 hrs</td>
<td>q6hrs</td>
<td>18 gm</td>
</tr>
<tr>
<td>Tazobactam</td>
<td></td>
<td>Children &gt;9 months and &lt;40 kg: 100 mg/kg (piperacillin component)</td>
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</tr>
<tr>
<td>Vancomycin</td>
<td>15 mg/kg (dose based on actual body weight)</td>
<td>15 mg/kg (dose based on actual body weight)</td>
<td>N/A</td>
<td>N/A</td>
<td>q12hrs</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Notes:
- The maximum pediatric dose should not exceed the usual adult dose.
- If patient has received therapeutic antibiotics in a separate patient care location prior to transfer to OR, future therapeutic dosing/intra-operative redosing should be performed at the above listed Intra-operative Re-dosing Interval. If there is not a listed intra-operative re-dosing interval in the above table, then antibiotics should be re-dosed intra-operatively at the listed Post-Operative Dosing Interval as indicated.
- Above doses, re-dosing intervals, and post-operative dosing intervals assume normal renal function (CrCl >60 ml/min). Adjustments may be necessary in patients with impaired renal function. Please consult pharmacy as questions arise.
- For Gentamicin pre-operative dosing: dosing weight = IBW + 0.4(actual weight – IBW)
References: