

Bloodstream Infections

Central line-associated bloodstream infection (CLABSI)

Diagnosis

- If there is more than minimal erythema or ANY purulence at the exit site, the catheter is likely infected. It should be removed and replaced at a different site.
- Two sets of blood cultures should be drawn with AT LEAST one (and preferably both) from peripheral sites. Blood cultures drawn through non-tunneled catheters are more likely to yield contaminants. One set of cultures may be drawn through a catheter if it is tunneled.
- The utility of cultures of the catheter itself is not well defined, and should ONLY be sent when there is a clinical suspicion of infection, NOT routinely when lines are removed. They MUST be accompanied by two sets of blood cultures obtained as detailed above.
- Technique: The exit site should be cleaned with alcohol. The catheter should be grasped a few centimeters proximal to the exit site. A 5 cm segment of catheter including the intradermal segment just distal to the insertion site should be cut off with sterile scissors and placed in a sterile container.
- In instances where the blood and catheter are cultured at the same time and the blood cultures are negative but the catheter culture is positive, antibiotics are generally not recommended, even for patients with valvular heart disease or immunosuppression.
- The exception is patients whose catheter tips grow *S. aureus* and have negative blood cultures. These patients should receive 5–7 days of antibiotics.
- All patients should be followed closely, and repeat cultures should be sent if clinically indicated.
- When a catheter-associated BSI is associated with catheter dysfunction, consider the possibility of suppurative thrombophlebitis.

Management

- Antibiotics should generally be withheld in febrile patients with intravenous catheters and no other clear source of infection pending the results of blood cultures. Exceptions include immunosuppressed or critically ill patients, patients with valve replacement or other hardware in place, or instances where there is purulence at the catheter site.

Empiric treatment - immunosuppressed or critically ill patients

- Vancomycin (see dosing section) **AND**
 - Cefepime 1 g IV q8h **OR** Piperacillin/tazobactam 4.5 g IV q6h] \pm Gentamicin (see dosing section)
- OR**
- PCN allergy: Ciprofloxacin 400 mg IV q8h \pm Gentamicin (see dosing section)

Empiric treatment - gram-positive cocci in clusters in 2 or more sets of blood cultures

- Vancomycin (see dosing section)

Treatment Notes:

- **Microbiology:** Most common pathogens: coagulase-negative staphylococci, Enterococci, *S. aureus*, gram-negative bacilli, *Candida*
- **Catheter salvage:**
 - Catheter removal is STRONGLY recommend for infections with *S. aureus*, yeast, and *Pseudomonas*, as the chance of catheter salvage is low and the risks of ongoing infection can be high.
 - Infected catheters should never be exchanged over a wire.

- Catheters associated with tunnel infections CANNOT be salvaged and must be removed.
- Catheter salvage can be considered in CLABSI caused by coagulase-negative staphylococci if the patient is clinically stable.
- When catheter salvage is attempted, antibiotics should be given through the infected line.
- Duration of treatment for catheter salvage is similar to duration of treatment when the catheter is removed.
- Antibiotic lock therapy, in which an antibiotic is infused into the catheter and left in place, can be considered in the treatment of tunneled catheter infections due to less virulent pathogens such as CoNS. Infectious Diseases consult is advised.

Coagulase-negative staphylococci (CoNS)

NOTE: Single positive cultures of CoNS should NOT be treated unless they are confirmed by follow-up cultures, the patient is immunosuppressed and/or critically ill, or the patient has implanted hardware such as prosthetic valves. In these cases, treatment can be started but repeat cultures should be sent PRIOR to initiation of therapy to confirm the diagnosis

- Vancomycin (see dosing section)

Change to

- Oxacillin 12g/24h if susceptible (preferred to vancomycin)

Duration:

- 5-7 days if catheter removed (preferred)
- 10-14 days if catheter salvage attempted

Staphylococcus aureus

- Vancomycin (see dosing section)

Change to

- Oxacillin 12g/24h if susceptible (preferred over vancomycin if susceptible)

OR

- Non-anaphylactic PCN allergy: Cefazolin 2g IV q8h

OR

- Anaphylactic PCN allergy or MRSA: Vancomycin (see dosing section)

Treatment Notes:

- Remove central lines. Relapse rates are unacceptably high with line retention.
- Vancomycin is inferior to oxacillin or cefazolin for treatment of MSSA. Do not choose vancomycin solely due to convenience of dosing (such as in dialysis patients).
- All patients with *S. aureus* bacteremia should have an echocardiogram to rule out endocarditis. Clinical suspicion and physical exam findings do not correlate with echocardiographic findings of endocarditis in *S. aureus* bacteremia (Fowler JACC1997)
- Transthoracic echo (TTE) is acceptable ONLY if the study can adequately view the left-sided valves; most experts recommend transesophageal echo (TEE) in all patients with *S. aureus* bacteremia.
- “Valve thickening, cannot rule out endocarditis” should not be interpreted as meeting Duke criteria for a vegetation. Such patients should not receive empiric treatment for endocarditis without other compelling evidence.
- 14 days is the minimum duration of therapy for *S. aureus* bacteremia and should only be considered if endocarditis or other metastatic infection have been ruled out. Treatment must be parenteral.
- Linezolid should not be used to treat *S. aureus* bacteremia as monotherapy.

Enterococcus faecalis

NOTE: Can be contaminants. Draw repeat cultures to confirm before starting treatment. 99% of *E. faecalis* isolates at UCLA are susceptible to Ampicillin, which should be used unless the patient has a PCN allergy.

- Ampicillin 2 g IV q4h ± Gentamicin 1 mg/kg IV q8h (see treatment notes below)
OR
- PCN allergy: Vancomycin (see dosing section) ± Gentamicin 1 mg/kg IV q8h (see treatment notes below)

Duration: 10-14 days

Enterococcus faecium

NOTE: Can be contaminants. Draw repeat cultures to confirm before starting treatment. The majority (77%) of *E. faecium* blood isolates at UCLA are resistant to vancomycin. If the isolate happens to be susceptible to ampicillin or vancomycin, these agents should be used preferentially at the doses listed above for *E. faecalis* bacteremia.

- Linezolid 600 mg IV/PO q12h

OR

- Quinupristin/dalfopristin 7.5 mg/kg q8H

Treatment Notes

- Consider echocardiogram if there is persistent bacteremia >3 days on appropriate antibiotics.
- Do not use gentamicin if the lab reports no synergy with gentamicin; doing so increases the risk of nephrotoxicity without clinical benefit.
- If synergy is present, gentamicin must be added to ampicillin or vancomycin for the treatment of endocarditis; however the addition of gentamicin does not appear to change outcomes in CLABSI due to *Enterococcus* in the absence of endocarditis if the catheter has been removed.
- Do not use gentamicin with linezolid or quinupristin/dalfopristin given the lack of supportive evidence for synergy.
- Enterococcal endocarditis should not be treated with monotherapy. Infectious Disease consultation is advised for all cases of Enterococcal endocarditis.

Gram-negative bacilli

- Cefepime 1 g IV q8h
OR
- Piperacillin/tazobactam 4.5 g IV q6h
OR
- PCN allergy: Ciprofloxacin 400 mg IV q8h

NOTE: These are anti-pseudomonal doses. Lower the doses if *Pseudomonas* is NOT recovered and organisms are not susceptible to agents with a narrower spectrum of activity (Piperacillin/tazobactam 3.375 g IV q6h, or Cefepime 1 g IV q12h, or ciprofloxacin 400 mg IV q12h).

Duration: 10-14 days

Treatment Notes

- Catheters are less commonly the source of the infection; however, most advocate catheter removal if the catheter is the source
- Gram-negative endocarditis is extremely rare. Routine echocardiography is not advised unless there is high clinical suspicion of endocarditis.