# Table 1: Treatment of Catheter-Related Bloodstream Infection Page 1 of 2 (Algorithm)

Catheter-related bloodstream infection (CRBSI) suspected Fever >38° C, chills +/- hypotension, ▲ WBC count, no apparent source for the CRBSI except the catheter 1 Transthoracic echocardiogram Perform clinical assessment (TTE) should be performed first. If Identify if source of infection is a location other than catheter: lung, negative, a TEE is required to exclude gastrointestinal, bladder, skin (feet), abdominal, or AVF/AVG the possibility of endocarditis (ideally Identify if metastatic infection in bones/joints or heart valves. performed 5 - 7 days after initiation Perform echocardiogram1 if organism is staphylococcus aureus, of antibiotics). viridans streptococcus, &/or enterococcus. Perform echocardiogram regardless of organism if clinical suspicion In centres where a TEE is not of endocarditis OR an artificial valve is present. available, recommend empiric Perform bone scan if clinical suspicion of bone/joint involvement. treatment for endocarditis with 6 weeks of antibiotic therapy. Obtain cultures Obtain 2 sets of 2 blood cultures from catheter at least 5 min apart (7.5 -10 mL each bottle) Culture from the most purulent aspect of the exit site if discharge present or suspicious Other cultures as indicated (e.g., sputum, wound, urine) Start empiric antibiotics Vancomycin 25 mg/kg IV x 1 dose +/- Gentamicin 2 mg/kg IV x 1 dose (add if acutely ill or hemodynamically unstable or if suspect gram neg infection); if allergy to gentamicin, use cefTAZidime 2 g IV x 1 dose The type and frequency of antibiotics If patient is acutely ill or hemodynamically unstable: needs to consider the local context, Give antibiotics, remove catheter and admit. Send catheter tip for including antibiotic susceptibility and culture if catheter is removed. experience with catheter related If patient looks well: infections. Give antibiotics, leave catheter in situ, lock with antibiotic lock solution targeting gram (+) organisms, & follow-up with results of culture. Once results of culture are known, adjust antibiotics based on sensitivity results & lock with antibiotic lock solution if catheter left in situ (see next page of algorithm) If clinical assessment reveals any of the following, remove the catheter & insert a new one at a new site (if able, leave out x 48 hrs): Clinical signs & symptoms of sepsis (acutely ill or hemodynamically unstable) If culture negative at 72 hrs, consider Temperature remains above 38°C in last 48 hrs stopping antibiotics. If ongoing fever, Recent catheter-related infection (with same catheter) investigate for other potential Presence of exit site or tunnel infection sources of infection Uncuffed catheter On immunosuppressant medications Presence of prosthetic heart valve Notify the Vascular Access Team for all VA infections (especially bloodstream infections).

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# Table 1: Treatment of Catheter-Related Bloodstream Infection Page 2 of 2 (Algorithm)

If clinical assessment reveals any of the following, remove the catheter & insert a new one at a new site (if able, leave out x 48 hrs)

- Clinical signs & symptoms of sepsis (acutely ill or hemodynamically unstable)
- Temperature remains above 38°C in last 48 hrs
- Recent catheter-related infection (with same catheter)

- Presence of exit site or tunnel infection
- On immunosuppressant medications

Uncuffed catheter

Presence of prosthetic heart valve

If culture positive, adjust antibiotics based on sensitivity results

#### Staphylococcus aureus

#### Catheter & Locking Solution:

 Remove catheter and replace at new site<sup>1</sup>

#### Systemic Antibiotics:

- Consider ID consult
- For methicillin-resistant (MRSA) or If methicillin-sensitive (MSSA) & severe beta-lactam allergy<sup>2</sup>, vancomycin:
- Loading dose: 25 mg/kg IV
- Maintenance dose: 500 mg IV if <70 kg or 750 mg IV if ≥70 kg at end of HD
- Monitor vancomycin level prior to second maintenance dose & adjust to target (15 – 20 mg/L)
- For methicillin-sensitive (MSSA):
- Inpatient: cloxacillin 2g IV q4h
- Outpatient: ceFAZolin 2g IV post HD

#### Treatment duration:

- Uncomplicated (resolution of fever and bacteremia within 72 hrs and no intravascular hardware): Treat 3 weeks from first negative blood culture
- Complicated (prolonged fever and bacteremia or septic thrombus): Treat <u>4 weeks</u> from first negative blood culture
- Metastatic complication (osteomyellitis, endocarditis): Treat <u>6 – 8 weeks</u> from first negative blood culture. Consider ID consult

Enterococcus faecalis (below does not apply to E. faecium due to high resistance rates)

#### Catheter & Locking Solution:

- If clinical assessment negative for all above parameters, leave catheter in and use antibiotic lock solution post HD x 3 weeks (doses are final concentrations):
- Vancomycin 2.5 mg/mL + heparin 2500 units/mL
   If clinical assessment positive for any above
- parameter, remove catheter and replace at new site<sup>1</sup>

#### Systemic Antibiotics:

Outpatients or severe beta-lactam allergy:

- Vancomycin:
  - Loading dose: 25 mg/kg IV
  - Maintenance dose: 500 mg IV if <70 kg or 750 mg if ≥70 kg IV at end of HD
  - Monitor vancomycin level prior to second maintenance dose & adjust to target (15 – 20 mg/ L)

### Inpatients:

Ampicillin 2 g IV q12h (post-HD on dialysis days)

#### Treatment duration:

- Treat 2 weeks from first negative blood culture
- Extend to <u>3 weeks</u> if catheter not removed
- If endocarditis is present or suspected:
- Extend treatment to <u>6 weeks</u>
- For synergy, may add cefTRIAXone 2g IV q12 h for 6 weeks if on ampicillin. If severe beta-lactam allergy<sup>2</sup>, use gentamicin 1 mg/kg IV post HD x 2 wks. Monitor gentamicin level prior to third dose & adjust to target (<2 mg/L). Suggest weekly audiogram testing
- If VRE is <u>isolated</u>, give daptomycin 10 mg/kg IV qHD (3x/wk minimum) or linezolid 600 PO/IV BID. Consult ID
- Note: Past VRE-positive swab does not predict that Enterococcus isolated will be VRE

#### Viridans Group Streptococcus

#### Catheter & Locking Solution:

 Remove catheter and replace at new site<sup>1</sup>

#### Systemic Antibiotics:

- Inpatients:
- cefTRIAXone 2 g IV Q24h
   Outpatients or severe betalactam allergy<sup>2</sup>, vancomycin:
- Loading dose: 25 mg/kg IV
- Maintenance dose: 500 mg IV if <70 kg or 750 mg IV if ≥70 kg at end of HD
- Monitor vancomycin level pre second maintenance dose & adjust to target 15
   – 20 mg/L

#### Treatment duration:

- Treat <u>2 weeks</u> from first negative blood culture
- Extend to <u>3 weeks</u> if catheter is not removed/replaced
- If endocarditis is present or suspected, treat <u>4 – 6 weeks</u> from first negative blood culture

### Coagulase-negative Staphylococcus (CoNS)

## Catheter & Locking Solution: If clinical assessment negative for all above parameters:

- Leave catheter in and use antibiotic lock solution post HD x <u>3 week</u>s (doses are final concentrations):
- If methicillin-sensitive, ceFAZolin 5 mg/mL + heparin 2500 units/mL
- If methicillin-resistant, vancomycin 2.5 mg/mL + heparin 2500 units/mL

If clinical assessment positive for any above parameter:

 Remove catheter and replace at new site.<sup>1</sup>

#### Systemic Antibiotics:

- For methicillin-resistant CoNS, or severe beta-lactam allergy<sup>2</sup> and methicillin-sensitive CoNS, vancomycin:
  - Loading dose: 25 mg/kg IV
  - Maintenance dose: 500 mg if <70 kg or 750 mg IV if >70 kg at end of HD
- Monitor level pre second maintenance dose & adjust to target (15 – 20 mg/L)
- If methicillin-sensitive CoNS, ceFAZolin 2 g IV post HD

If catheter is removed/replaced, treat with antibiotics for <u>2 weeks</u> from first negative blood culture. Extend to <u>3 weeks</u> if catheter is not removed/replaced

#### Gram negative bacteria

#### Catheter & Locking Solution:

If clinical assessment negative for all above parameters:

- Leave catheter in and use antibiotic lock solution post HD x 3 weeks (doses are final concentrations):
- cefTAZidime 5 mg/mL + heparin 2500 units/mL (if sensitive).
- If severe beta lactam allergy<sup>2</sup>: gentamicin 1 mg/ mL + heparin 2500 units/mL

If clinical assessment positive for any above parameter:

Remove catheter and replace at new site<sup>1</sup>

#### Systemic Antibiotics:

- cefTAZidime 2g IV post HD (see note below)
- If severe beta lactam allergy<sup>2</sup> or organism identified in the NOTE below:
- ciprofloxacin 500 750 mg PO or 400 mg IV q24h administered post-HD on dialysis days; OR
- gentamicin:
- Loading dose: 2 mg/kg IV
- Maintenance dose: 1.5 mg/kg IV post-HD
- Monitor level prior to second maintenance dose & adjust to target (<3.5 mg/L). Weekly audiogram testing

If catheter is removed/replaced, treat with antibiotics for <u>2 weeks</u> from first negative blood culture. Extend to <u>3 weeks</u> if catheter is not removed/replaced

NOTE: cefTAZidime is not recommended as the sole antibiotic for inducible beta-lactamase producing organisms (Serratia, Pseudomonas, Acinetobacter, Morganella, Citrobacter, and Enterobacter) or extended spectrum beta-lactamase (ESBL) producing organisms. If any of these organisms are present, consider admitting to hospital and using susceptible alternate antibiotics.

Note: If the culture is positive for a fungus (usually Candida spp.), remove catheter and replace at a different site. Consider consulting ID and initiate appropriate antimicrobial treatment and continue for at least 2 weeks following line removal.

Draw repeat cultures 1 week after completion of antimicrobial therapy to ensure eradication of the organism

<sup>1</sup> Creating a new tunnel in the same site may be a preferred option for some patients.

<sup>2</sup> ceFAZolin, cefTRIAXone and cefTAZidime can be safely administered to patients with penicillin allergy including anaphylaxis. DO NOT administer if delayed skin reaction to any beta lactam (e.g., drug reaction with eosinophilia and systemic symptoms. Stevens-Johnson syndrome, toxic epidermal necrolysis).

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