

Prevention, Treatment, & Monitoring of VA Related Infection in HD Patients

(Approved March 13, 2008)



Vascular Access Guideline

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1.0 Scope

VA related infections are a leading cause of morbidity, mortality, and costs in hemodialysis (HD) patients. This guideline provides recommendations for prevention, management, and monitoring of VA related infections (AV fistulas (AVFs), AV grafts (AVGs), and catheters).

Related Guidelines (BC, Canada, or United States):

- BC Provincial Renal Agency:
 - Cannulation of AV Fistulas and Grafts, 2007.
 - Insertion and Removal of Tunneled Permanent HD Catheters, 2006.
 - BC Recommendations for VA for Patients with HD as Primary Modality, 2005.
 - Selection of Permanent HD Access and Order of Placement, 2007.
- Canadian Association of Nephrology Nurses and Technologists (CANNT). Recommendations for Central Venous Catheter Management in HD Patients (recommendations 3, 6, & 7), 2006.
- Canadian Society of Nephrology Guidelines. Chapter 4: Vascular Access, 2006.
- Centre for Disease Control (US), Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients, April 27, 2001.
- Centre for Disease Control (US), Guidelines for the Prevention of Intravascular Catheter-Related Infections, Aug 9, 2002.
- National Kidney Foundation. KDOQI Clinical Practice Guidelines and Clinical Practice Recommendations for 2006 Updates. Guidelines 2, 3, 7, & 8, 2006.

2.0 Recommendations & Rationale

Recommendation 1: For several reasons, which include the risk of infection, the order of preference for HD access for patients requiring chronic hemodialysis is AV fistula, then AV graft, then catheter (evidence).

A **Fistula First** philosophy is paramount and every effort should be made to create a native AV fistula (AVF) for patients requiring chronic hemodialysis access.

Of the three types of accesses, AVFs have the lowest rates of thrombosis and infection and require the fewest interventions, resulting in the longest access survival rate. A Canadian study of 184 bloodstream infections in 133,158 dialysis treatments demonstrated an infection rate of 0.2/1,000 dialysis procedures for AVFs, with an increase of 2.5 times for AVGs, 15.5 times for tunneled, cuffed catheters, and 22.5 times for uncuffed catheters (Taylor et al, 2002). In the US, the combined infection rate for permanent accesses for local and bacteremic infections is reported to be 1% - 4% for primary AVFs and 11% - 20% for AVGs during their expected periods of use (K/DOQI, 2006, S261). Catheter infection rates are much higher and highly dependent upon duration of use. Significant variation in rates was observed amongst centres, even when controlling for types of access used, which suggests opportunities for improvement. The preferred order of access creation is AVF, then AVG, then central venous catheter.

While not a preferred access, indications for the use of central venous catheters (CVCs) include:

- permanent hemodialysis (HD) access when no other access options exist
- when a fistula or graft is maturing
- when a peritoneal dialysis (PD) tube is planned or healing
- when a live donor transplant is scheduled
- when the anticipated duration of therapy is <6 months

If a central venous catheter is required, the preferred one is a tunneled, cuffed catheter. Uncuffed catheters should only be used in hospitalized patients and for as short a time as possible (maximum of 2 – 3 weeks). Plans to discontinue or convert uncuffed catheters to tunneled, cuffed catheters need to be in place if the use is anticipated to be >2 - 3 weeks. Tunneled, cuffed catheters are associated with lower rates of infection and higher blood flow rates than uncuffed catheters.

Uncuffed femoral catheters should be only used in bed bound patients and for up to one week (K/DOQI, S198). Femoral, uncuffed catheters have very high rates of infection (and dislodgement), with more than 10% being infected by one week (K/DOQI, 2006, S199 and S255).

Recommendation 2: Prevent vascular access related infections through:

All Vascular Accesses:

- (1) Use of standard precautions and aseptic technique in caring for HD patients.***
- (2) Education of patients about the prevention of infection.***

AV Fistulas and Grafts:

- (3) Prior to initiating dialysis, ensure the access limb is washed with anti-bacterial soap or scrub and water.***
- (4) When cannulating an AVF or AVG, use clean gloves (changed just prior to needling) and appropriate cleaning procedure (circular motion inside to outside and allow to dry thoroughly prior to needling) and solution. Preferred solutions in order of priority are:***
 - 2% chlorhexidine/70% isopropyl alcohol (tincture)¹***
 - 2% chlorhexidine with 4% or no alcohol (aqueous) or 10% amuchina (use one of these if concern re alcohol due to sensitivity or impact on skin or graft/catheter).***
 - 10% povidone iodine (use if sensitivity to chlorhexidine, alcohol, and/or amuchina)***
- (5) Not cannulating red or excoriated sections on the fistula or graft.***

Catheters:

- (6) When inserting or assisting with insertion of a central venous catheter (CVC):***
 - Use maximal sterile barrier precautions (staff: cap covering all hair, mask covering mouth and nose, sterile gown, and sterile gloves; patient: sterile drape draped from head to toe with a small opening for catheter insertion).***
 - Cleanse the insertion site with an appropriate solution and allow to dry thoroughly prior to catheter insertion. Preferred solutions in priority order:***
 - 2% chlorhexidine/70% isopropyl alcohol (tincture)²***
 - 2% chlorhexidine with 4% or no alcohol (aqueous) (use one of these if concern re alcohol due to sensitivity or impact on skin or graft/catheter).***
 - Place tunneled cuffed CVCs in the right internal jugular vein whenever possible.***
 - Review the necessity of the CVC at every HD visit and removing unnecessary lines as soon as possible.***
- (7) When connecting, disconnecting, and locking CVCs:***
 - Use a mask (staff and patient) and eye protection or face shield (staff) for connect and disconnect procedures.***

¹ Note: Recommendations in this document re the use of chlorhexidine are for children > 2 years of age; the literature makes no recommendations for infants < 2 years of age (unresolved issue; MMWR, 2002, p. 14).

² See footnote 1.

- *Use clean gloves, friction, and an appropriate solution to cleanse the connection between the catheter hub and cap. Preferred solutions are the same as for cannulating AV fistulas and grafts.*
- *Maintain a clean, “no touch”³ field during connect and disconnect procedures;*
- *Cap all ports when not in use.*
- *Do not use HD catheters for blood drawing or applications other than HD except during dialysis or under emergency circumstances (consult a nephrologist).*
- *Replace disposable or reusable transducers and slush devices every 72 hours.*

(8) When caring for the exit-site:

- *Check the exit-site dressing every HD treatment.*
- *Use sterile gauze or sterile, transparent dressing (gauze is preferred if patient is diaphoretic or the site is bleeding, oozing, or showing any signs of infection, or the skin is compromised, gauze dressing is preferred; otherwise either dressings are acceptable).*
- *Change transparent dressings weekly and gauze dressings every HD treatment; change either type of dressing if damp, loosened, or soiled.*
- *Use a mask (staff and patient) and eye protection or face shield (staff) for dressing change procedures.*
- *Cleanse the exit site using clean gloves, a circular motion (exit-site outward to cover a diameter of 10 cm), and an appropriate solution. Preferred solutions are the same as for cannulating AV fistulas and grafts.*

Key Points & Discussion: Standard Precautions & Aseptic Technique in Caring for All HD Patients

Standard precautions apply in the care of all HD patients, with particular note to the following:

- Limit the performance of vascular access related procedures and dressing changes to trained dialysis staff or caregivers.
- Don clean gloves prior to disinfecting and needling an AVF or AVG, prior to disinfecting and connecting or disconnecting HD lines to a catheter, and prior to changing a catheter dressing. In terms of the use of sterile versus nonsterile gloves, the evidence is inconclusive.
- Wear a gown when patient is at high risk for transmitting pathogenic bacteria (e.g., infected skin wound with drainage that is not contained by dressings). Also, trying to dialyze such patients at a station with as few adjacent stations as possible (e.g., at the end or corner of the unit).
- Use disposable equipment and supplies *or* equipment and supplies which are dedicated to a single patient. If not possible, develop procedures to clean and disinfect equipment and supplies prior to transporting to a common clean area or using on another patient (CDC, 2001, 20-21).

³ “No touch” refers to the ends of the catheter as it is important to keep these sterile.

- Use single-dose medications *or* medications which are dedicated to a single patient and left at the HD station. If not possible and multiple dose medication vials are used, prepare individual patient doses in a clean (centralized) area away from dialysis stations and deliver separately to each patient. Do not carry multiple dose medication vials from station to station. Do not use common medication carts to deliver medications to patients (CDC, 2001, 20-21).
- Use external venous and arterial pressure transducer filters/protectors for each patient treatment to prevent blood contamination of the dialysis machines' pressure monitors. Change filters/protectors between each patient treatment, and do not reuse them. Internal transducer filters do not need to be changed routinely between patients (CDC, 2001, 20-21).
- Clean and disinfect the dialysis station (chairs, beds, tables, machines, etc.) between patients (CDC, 2001, 20-21).

Key Points & Discussion: Educating Patients about the Prevention of Infection

All Accesses:

- Preventing infections.
- Personal hygiene and careful handwashing.
- When coming to dialysis treatment, wear clothing that enables easy viewing of the access.
- Recognizing and acting on the signs of local and systemic infection.
- Whom to call in case of questions or concerns.

AV Fistulas and AV Grafts:

- Washing a fistula or graft area carefully with soap and water daily.

Catheters:

- Wearing a mask when your catheter is being accessed or dressing being changed.
- Taking a shower (and the importance of keeping a catheter dressing dry).
- What to do if a catheter dressing is soiled or becomes dislodged.
- Technique in handling a catheter line (i.e., minimize manipulation, etc).

Key Points & Discussion: Preparing and Cannulating AVFs and AVGs

- Prior to initiating dialysis, ensure the access limb is washed with anti-bacterial soap or scrub and water using friction (usually done by the patient prior to coming to the HD unit; accentuates the benefits of the chlorhexidine used prior to cannulation).
- Prior to cannulating, don clean gloves and cleanse the site using a cleansing solution and circular motion. Cleanse from inside to outside. See recommendation for preferred solution. References: K/DOQI, 2006, S207; Nursing 2006, p 60.
- After cleansing the skin, allow skin to dry thoroughly (alcohol based solutions dry quickly; amuchina and povidone iodine takes 2+ min). (K/DOQI, 2006, S202)
- If the skin is touched by the patient or staff after the skin has been cleansed but before the cannulation procedure is complete, re-clean the site and change gloves.

Key Points & Discussion: Inserting or Assisting with Inserting CVCs

- Use maximal barrier precautions when inserting CVCs. For the provider and staff assisting, this includes strict compliance with handwashing, wearing a cap covering all hair, mask covering mouth and nose, sterile gown, and sterile gloves. For patients, it means covering the patient from head to toe with a head to toe sterile drape, with a small opening for catheter insertion (Safer Healthcare Now, Dec 2005, IHI, Implementing the Central Line Bundle, MMWR, 2002, p.6). In two studies, the odds of developing a central line infection increased if maximal barrier precautions were not used (Mermel, LA, et al, 1991 and Raad, II, et al, 1994).
- Catheter insertion is the most common infection route for uncuffed CVCs (Nursing 2006, p. 59). Keeping equipment ready stocked in a cart for central line placement has been shown to facilitate the use of maximal barrier precautions (IHI, Implementing the Central Line Bundle).
- Cleanse skin with an antiseptic prior to catheter insertion. See recommendation for preferred solution. References: MMWR, 2002, p. 6; K/DOQI, 2006, S207; Nursing 2006, p 60.
- After cleansing the skin, allow skin to dry thoroughly (alcohol based solutions dry quickly; povidone iodine takes 2+ min). (K/DOQI, 2006, S202)
- Whenever possible, place tunneled cuffed catheters in the right internal jugular vein (most direct route to the right atrium, lower risk for complications, and maximizes potential sites for permanent accesses). Try not to use the subclavian (high risk for stenosis which excludes the possibility of upper-extremity permanent access) or femoral vein (high rate of infection). Do not place on same side as a maturing permanent access (K/DOQI, 2006, S188 & 189; MMWR, 2002, p. 17).
- No conclusive evidence exists to support scheduled replacement of catheters except those in the femoral area (K/DOQI, 2006, S272).
- Some evidence exists to support the use of uncuffed, antimicrobial-impregnated catheters in patients with acute kidney injury where the anticipated dwell time is >5 days at sites where catheter-related infection rates continue to be high after other strategies have been employed (MMWR, 2002, p. 16; Nursing 2006, p. 62). This evidence is based on studies of patients with acute kidney injury in the critical care setting. Currently, there is insufficient data to recommend the use of these catheters and further studies are needed to determine the optimal role of these catheters in the context of dialyzing patients with acute kidney injury.
- No recommendations have been cited for the use (or not) of impregnated catheters in children (MMWR, 2002, p. 17).

Key Points & Discussion: Connecting, Disconnecting, and Locking HD Lines and Catheters

- Use a mask (staff and patient) and eye protection or a face shield (staff) during catheter connect, disconnect, and locking procedures (CSN Guidelines, 2006, 518; K/DOQI Guidelines, 2006, S201 & S206). Hub manipulation is the most common source of infection in tunneled, cuffed catheters; hub manipulation can trigger an infection in uncuffed catheters as well (Nursing 2006, p. 59).

- Prior to connecting or disconnecting HD lines from catheters, cleanse connection between the catheter hub and cap using friction and two disinfectant swabs. Use one swab to cleanse the catheter connection up the catheter for 10 cm and the other to cleanse the hub connection site and cap (K/DOQI, 2006, S207). See recommendations for preferred solutions.
- Maintain a sterile field to connect and disconnect the HD line to the catheter. Never touch the open end of the catheter. Do not drop a connection site once it is cleaned.
- Cap all ports when not in use (MMWR, 2002, p. 15).
- Do not use HD catheters for blood drawing or applications other than HD except during dialysis or under emergency circumstances (consult a nephrologist) (MMWR, 2002, p. 17).
- Some studies suggest success in *preventing* catheter-related infections with the inclusion of an antibiotic or antimicrobial solution with the anticoagulant lock solution (aka antibiotic/antimicrobial/anticoagulant lock). Of the solutions cited in the literature as having utility, vancomycin, aminoglycoside, and high concentration (30%) citrate solutions are available in Canada: (K/DOQI, 2006, S180). Despite the studies, the current consensus is that the use of *prophylactic* antibiotic/antimicrobial locks is not recommended in most situations. Special circumstances may apply such as their use in patients with a long-term cuffed, tunneled catheter or port with limited available access options and with a history of multiple catheter-related infections despite optimal maximal adherence to aseptic technique (MMWR, 2002, p. 17).

Key Points & Discussion: CVC Dressings and Care of Exit-Sites

- Check the exit-site dressing at every HD treatment for inflammation and/or signs of infection (K/DOQI, 2006, S201; CSN, 2006, S18).
- Use sterile gauze or sterile, transparent dressing to cover the catheter site. If the patient is diaphoretic, or if the site is bleeding, oozing, or showing any signs of infection, or the skin is compromised, gauze dressing is preferred (MMWR, 2002, p. 14).
- No agreement yet on the use (or not) of chlorhexidine sponge dressings to reduce the incidence of infection (MMWR, 2002, p. 18). If used, do not use in neonates <7 days or of gestational age <26 weeks (MMWR, 2002, p. 18).
- No agreement yet on the use (or not) of sutureless securement devices (MMWR, 2002, p. 18).
- Use a mask (staff and patient) and eye protection or a face shield (staff) during dressing changes. (CSN Guidelines, 2006, 518; K/DOQI Guidelines, 2006, S201 & S206).
- Change transparent dressings weekly and gauze dressings at every HD treatment. In addition, change both types when the catheter is replaced, or when the dressing becomes damp, loosened, or soiled (MMWR, 2002, p. 14). In pediatric patients, the risk of dislodging the catheter needs to be weighed against the benefits of changing the dressing (MMWR, 2002, p. 17).
- Tunneled catheter sites that are well healed may not require dressings (MMWR, 2002, p. 14).

- After removing the old dressing, change gloves and cleanse the exit-site using a cleansing solution and circular motion. Cleanse from the exit-site outward to cover an area 10 cm in diameter. See recommendation for preferred solutions. References: MMWR, 2002, p. 6; K/DOQI, 2006, S207; Nursing 2006, 36 (4), p 60.
- Some studies support the application of a thin film of povidone-iodine, mupirocin, or polysporin triple ointment at the exit site prior to putting on the dressing, particularly in *Staphylococcus aureus* carriers (K/DOQI, 2006, S256, Lok et al, 2003; Jindal et al, 1999). While the CSN guidelines recommend the use of dry gauze dressings and povidone iodine (Grade C), mupirocin (Grade C), or polysporin triple ointment (grade A) (CSN, 2006, S18), the K/DOQI guidelines note the studies but do not make recommendations around the use (or not) of such ointments (K/DOQI, 2006). Despite the studies, the current consensus of the working group is that the use of *prophylactic* antibiotic/antimicrobial ointment is not recommended in most situations. Special circumstances may be appropriate such as their use in patients with long-term cuffed, tunneled catheters, a history of multiple *Staph aureus* catheter-related infections, and very limited available access options.
- If the skin is touched by the patient or staff after the skin has been cleansed but before the dressing procedure is complete, re-clean site and change gloves.

Recommendation 3: Recognize and treat vascular access related infections using evidence-based protocols for AVFs, AVGs, and catheters.

AV Fistulas

Although infections of AVFs are rare, any episode is potentially fatal. Infection may be local at the puncture site, inclusive of the AVF (e.g., anastomotic infection, abscess formation, infected thrombus, or infected aneurysm), or systemic.

Clinical signs include:

- Local signs: tenderness, erythema (redness), warmth, edema, indurations, local serous or purulent discharge, repeated puncture site bleedings, abscess +/- hematoma
- Systemic signs: fever and chills, positive blood and/or wound culture, elevated C-reactive protein (CRP), and increased white blood cell (WBC) count.
- Even in the absence of local signs, infection may be present, especially in cases of unexplained sepsis, leukocytosis or fever.

Treatment includes:

- Local infection at the puncture site: incision/drainage of abscess and 2-3 weeks of topical and/or oral antibiotics.
- All other infections: IV antibiotics and surgical consult (and possible surgery).
 - Start empiric antibiotics (gram positive and negative coverage): Vancomycin 25 mg/kg IV post HD x 1 dose +/- gentamicin 2.0 mg/kg IV post HD x 1 dose (add gentamicin if acutely ill or hemodynamically unstable or if suspect gram negative infection). If allergy to gentamicin, use ceftazidime 2 g IV post HD x 1 dose.
 - Once results of culture are known, adjust antibiotics based on sensitivity results.

- Type of antibiotic and dosage: See Appendix 1 (use same antibiotics and dosages to treat AVF/AVG infections as catheter infections).
- Duration of antibiotic therapy: Duration of antibiotic therapy is usually 6 weeks for infected AVFs and AVGs (may be shorter if the AVF or AVG is surgically removed).
- Once results of culture are known, adjust antibiotics based on sensitivity results.
 - Type of antibiotic and dosage: See Appendix 1 (use same antibiotics and dosages to treat AVF/AVG infections as catheter infections).
 - Duration of antibiotic therapy: Duration of antibiotic therapy is usually 6 weeks for infected AVFs and AVGs (may be shorter if the AVF or AVG is surgically removed).

After resolution of an extensive infection, a new AVF can be constructed and the risk of re-infection is very low. A new AVF can be created in the same arm if there are suitable vessels remaining.

AV Grafts

AVGs have higher rates of infection than AVFs. The clinical signs of AVG infection are similar to those for AVFs. Infections may be local but not involving the graft, in the graft, or systemic. **Important to note is that old clotted grafts may be a silent source of infection.**

Treatment includes:

- Local infection not involving the graft: topical and/or oral antibiotics until clear.
- All other infections: IV antibiotics and surgical consult (likely resection of the infected graft segment or the entire graft, depending upon the extent).
 - IV antibiotic protocol and duration is the same as per AVFs.
 - If the graft is infected or has been removed, use a catheter for dialysis until another permanent access is in place. After resolution of the infection, resume use of the existing AVG or construct a new AVF or AVG on the other arm.

Catheters

Catheters have the highest rate of infection of all types of vascular accesses. Infections may be at the exit site, within the tunnel (if tunneled catheter), and/or systemic (i.e., in the bloodstream and known as catheter-related bacteremia).

Clinical signs include:

- Exit-site infection with no bacteremia: redness, inflammation, tenderness, and exudate within 2 cm of the catheter exit site. If a tunneled catheter, signs of infection do not extend along the subcutaneous tract. Exudate culture is positive and blood culture negative. No systemic symptoms.

- Tunnel infection with no bacteremia: redness, inflammation, and tenderness from the catheter exit site along the subcutaneous tract of a tunneled catheter. Tunnel culture is positive and blood culture negative. No systemic symptoms.
- Catheter-related bacteremia (CRB): bacteremia/fungemia (fever $>38^{\circ}$ C, chills, +/- hypotension, elevated WBC count) where there is no apparent source for the CRB except the catheter. Culture of the surface of the catheter (tip, subcutaneous segment, and/or hub) and/or the skin is positive for the same organism as the blood culture. Approximately 70% of pathogens are gram positive (staphylococcus aureus is most common) and 30% gram negative. Complications include endocarditis, septic arthritis, epidural abscess, septic emboli, osteomyelitis, and sepsis syndrome/shock.

Treatment includes:

Uncuffed Catheters:

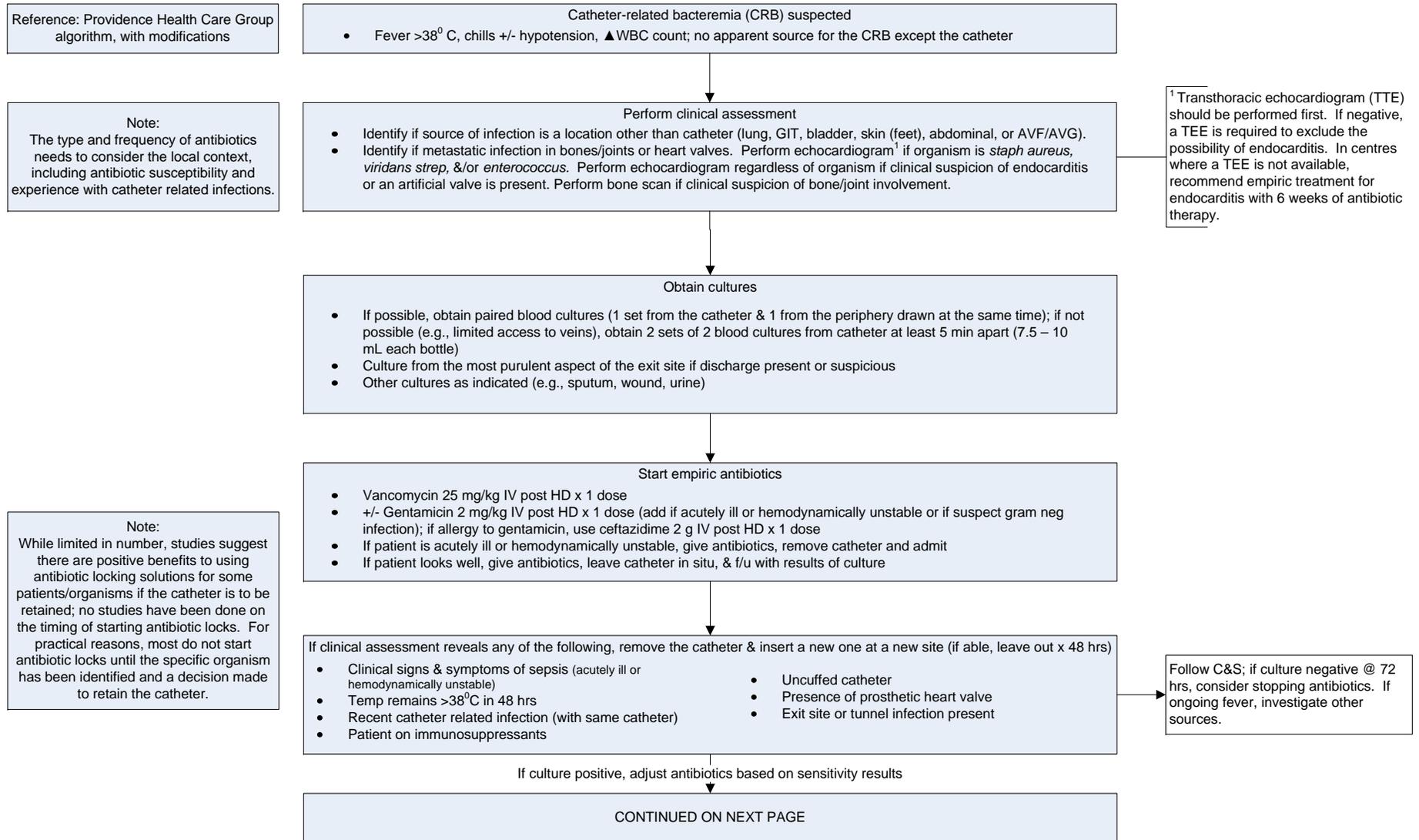
- For any type of infection, remove the catheter and move to another site (preferably after a 48 hour rest). If bacteremia is present, see Appendix 1 for antibiotic protocol.

Tunneled, Cuffed Catheters:

- Exit site infection with no bacteremia: Topical and/or oral antibiotics and proper exit site care. Replacement of catheter is not usually required.
- Tunnel infection with no bacteremia: See Appendix 1 (same as for catheter-related infection with bacteremia).
- Catheter-related infection with bacteremia (positive blood culture): see Appendix 1.

Appendix 1: Protocol for Treatment of Catheter-Related Bacteremia

Page 1 of 2 (Algorithm)



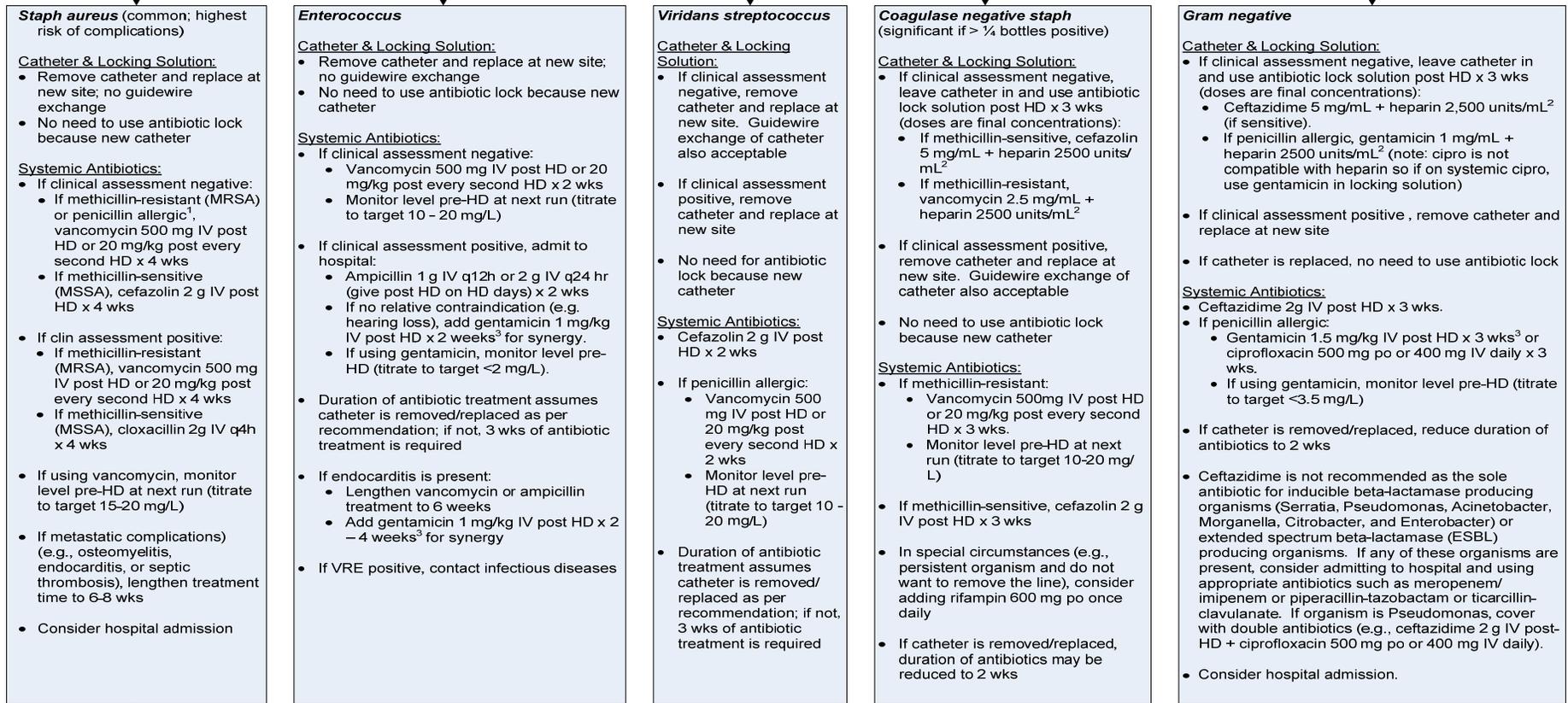
Appendix 2: Protocol for Treatment of Catheter-Related Bacteremia

Page 2 of 2 (Algorithm)

While this algorithm indicates IV antibiotics are given "post HD," local practice will determine whether IV antibiotics are given during the last portion of HD or after HD is complete.

If culture positive, adjust antibiotics based on sensitivity results

All medication dose recommendations are for patients of average weight. Patients who are higher than average weight may require higher doses than specified (unless the specified dose is weight based)



Repeat blood culture 1 wk after completion of antibiotic therapy

Note: If the culture is positive for a fungus (usually *Candida* spp.), remove catheter and replace at a different site. Initiate appropriate antimicrobial treatment and continue for at least 2 weeks following line removal. Draw repeat cultures 1 week after antimicrobial completion to ensure eradication of the organism

- Take history to confirm allergy and consider penicillin skin testing. Use of vancomycin should be restricted to patients with true penicillin allergies because beta-lactam antibiotics are more effective than vancomycin in treating *staph aureus* infections.
- There is no consensus in the literature about the optimal concentration of heparin in lock solutions. Most studies used higher concentrations of heparin; no studies compared the use of higher vs lower concentrations. Heparin concentration for lock solutions will be determined by each HA upon consideration of safety concerns and current practice.
- The risk for ototoxicity with gentamicin increases with duration, especially after 7 – 10 days of use. Weekly audiogram tests are recommended.

Recommendation 4: Establish province-wide surveillance systems to monitor VA related infections.

Definitions:

Infection rate: Laboratory confirmed access-related infections in chronic HD pts during a specified time period sorted by access type.

Access-related infections are identified in PROMIS as:

- Blood culture positive
- Exit site positive (AVF, AVG, or catheter)
- Catheter tip positive

If blood and an exit site and/or catheter tip cultures are positive for same patient, infection is counted as a blood infection.

If both exit site and catheter tip cultures are positive for same patient, catheter is counted as exit site infection.

If patient has an infection and has both a catheter and a fistula/graft in place, infection is counted as a catheter infection.

The denominator (months of fistula/graft/catheter access) is based on accumulated months of having the access whether the access is in active use or not. If patient has a catheter and fistula/graft in place, catheter and fistula/graft months are accumulated.

Table 1 outlines the provincial definition and target for VA related infection rate.

Table 1: Provincial Indicators for VA Related Infections

Indicator:	Laboratory confirmed access-related infections in chronic HD pts during a specified time period sorted by access type.
Definition:	<ul style="list-style-type: none"> • Numerator: # of lab confirmed access related infections (blood, catheter tip, exit site) in chronic HD pts with a specified type of access during a specified time period. • Denominator: # of months with specified type of access during a specified time period.
Targets:	<ul style="list-style-type: none"> • AVFs: ≤ 0.01 episodes per 12 HD months in which AVFs were used (≤ 0.1 episode per patient year) • AVGs: ≤ 0.1 episodes per 12 HD months in which AVGs were used (≤ 1 episode per patient year) • Catheters: ≤ 0.5 episodes per 12 HD months in which AVGs were used (≤ 5 episode per patient year) <p>Source: CSN Guidelines, 2006.</p>

Note: Target infection rates outlined in the 2006 K/DOQI Update are as follows:

- AVFs: <1% during use-life of the access
- AVGs: <10% during use-life of the access
- Tunneled catheters: <10% at 3 months and <50% at 1 year

3.0 References

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4.0 Sponsors

This provincial guideline was developed to support improvements in the quality of vascular access care delivered to patients with chronic kidney disease in BC. Based on

the best information available at the time it was published, the guideline relies on evidence and avoids opinion-based statements where possible. When used in conjunction with pertinent clinical data, it is a tool health authorities and health professionals can use to develop local guidelines.

Developed by a Vascular Access Working Group of multidisciplinary care providers from across BC, the guideline was approved by the Provincial Vascular Access Services Team and the BC Provincial Renal Agency Medical Advisory Committee. It has been adopted by BCPRA as a provincial guideline.

5.0 Effective Date

- March 13, 2008.
- This guideline is based on scientific evidence available at the time of the effective date; refer to www.bcrenalagency.ca for most recent version.

6.0 Appendices