



PRACTICE RECOMMENDATIONS

Intravascular Dialysis Catheter Care to Prevent Central Line-Associated Blood Stream Infections in Adults

Background

Hemodialysis (HD) units provide treatment for multiple patients in an environment where opportunities exist for transmission of infectious agents via contaminated devices, equipment and supplies, environmental surfaces, or hands of personnel. Furthermore, patients receiving HD are immunosuppressed, increasing susceptibility to infection.¹

Vascular access infections in HD patients are common and can be severe; infection is the second leading cause of death in Chronic Kidney Disease patients. Catheter use is the most common factor contributing to bacteremia in these patients. The relative risk in patients with dialysis catheters is sevenfold that associated with arteriovenous fistula (AV) fistulas.¹ The primary risk factor for access infection is access type: HD catheters are highest risk and if possible, should be avoided in favour of AV fistulas and grafts.¹ Infection prevention must be considered the first rule of vascular access maintenance.²

Early infection is usually related to contamination during handling procedures and/or implantation. Later infection (after 90 days) is mainly due to endoluminal contamination leading to microbial biofilm formation. Strict aseptic technique is essential to prevent bacteremia.³

DEVELOPED BY:

IPAC Canada Dialysis Interest Group

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Practice Recommendations

Comprehensive Strategies for Prevention of Catheter-Related Infections:

1. Education and Training

Catheter dressing changes and manipulation place the patient at risk for infectious complications. Additionally, infection rates increase when catheters are managed by inadequately trained staff.² All dialysis staff responsible to change dressings and manipulate catheters must be trained in procedures, and their competence reviewed annually and on hire.^{2, 4, 14} Other strategies for safe patient care include:

- application of Routine Practices;
- hygienic conditions of insertion;
- practice patterns of the unit; and
- patient's hygiene.³

Patients should be educated about:

- importance of hand hygiene;
- maintaining dressing integrity;
- appropriate site preparation;
- vascular access care;

- risks related to catheter use;
- recognizing signs of infection;
- need to report exit site problems; and
- instructions for access management when away from the dialysis unit.^{5,14}

2. Hand Hygiene and Aseptic Technique

Do not use hand rubs that do not contain alcohol or that contain concentrations lower than 60%.¹⁵ Aseptic technique is the purposeful prevention of transfer of microorganisms from the patient's body surface to a normally sterile body site or from one person to another by keeping the microbe count to an irreducible minimum.¹⁵

Perform hand hygiene either by washing hands with antiseptic soap and water, or with a waterless alcohol-based hand rub (ABHR). Information regarding the appropriate techniques for hand hygiene is available in the IPAC Canada Hand Hygiene Practice Recommendations.⁹ Include hand hygiene as part of the checklist for central line placement. Glove use does not preclude the need for hand hygiene.

Hand hygiene should be performed²:

- before and after palpating catheter insertion sites; palpation after antiseptic application should only occur if aseptic technique is maintained;
- before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter;
- when hands are obviously soiled or if contamination is suspected;
- before donning and after removing gloves;¹³ and
- during catheter connect and disconnect procedures, and dressing changes. To maintain aseptic technique staff and patients must wear a procedure or surgical mask and face shield.

3. Maximal Sterile Barrier Precautions for Central Venous Catheter (CVC) Insertion

CVC insertion should be observed by a trained staff person who has received appropriate education to ensure aseptic technique is maintained. At insertion⁷:

- Use a catheter checklist to ensure adherence to infection prevention practices and document compliance with hand hygiene and aseptic technique. Empower personnel to stop the procedure if breaches in maximal barrier precautions or aseptic technique are observed. An example of an insertion checklist can be found at: <http://www.cdc.gov/HAI/pdfs/bsi/checklist-for-CLABSI.pdf>.
- Use maximal sterile barrier precautions, including a surgical mask, cap, sterile gown, and sterile gloves by all those involved in the procedure. Cover the patient with a large sterile drape during catheter insertion.¹³

4. Skin Preparation and Catheter Site Dressing Regimens

Staff must ensure catheter site care is compatible with the catheter material.¹²

Prepare clean skin site with a chlorhexidine gluconate (CHG) solution greater than 0.5% with 70% alcohol (2% in 70% alcohol is recommended) prior to catheter insertion and dressing changes. For patients with sensitivities or suspected contraindications to CHG (i.e., allergy, hypersensitivity), povidone-iodine can be used as an alternative.⁸ Apply using a back-and-forth friction scrub for at least 30 seconds,¹³ according to manufacturers' instructions.

Allow solution to dry before puncturing the site; do not blot solution.^{2,4} Insertion site dressings should be¹¹:

- sterile;
- capable of moisture prevention;
- able to allow visible inspection;
- cost-effective;
- easy to apply and fix to the insertion site; and
- easy to remove.

Dressings:

- Use a 2% CHG in 70% alcohol solution for dressing changes in patients > 2 months of age.⁴
- Transparent dressings or gauze are both appropriate, except when the exit site is oozing, or the patient is diaphoretic, which require gauze until resolved.
- Change *transparent dressings* and perform site care every 7 days or more frequently if the dressing is soiled, loose, or damp.
- Change *gauze dressings* every 3 days or more frequently if the dressing is soiled, loose, or damp.⁷

5. Selection of Catheters and Sites

Catheters should be used only when other options (fistulas then prosthetic grafts) are not available.² Consider construction of a primary fistula after failure of every AV access.

For acute dialysis (less than 7 days), use short-term catheters.² Long-term catheters or dialysis port catheter systems are preferred for permanent access. Tunnelled catheters are suggested for temporary access > 3 weeks and during maturation of a primary AV fistula. Patients who have exhausted all other access options may require permanent access via tunnelled cuffed catheters.

- Place the access distally in the upper extremities; confirm placement with imaging.
- Avoid placing long-term catheters on the same side as a maturing AV access.
- The right internal jugular vein is the preferred site.
- Catheters should not be placed in the subclavian vessels because of the risk for stenosis.
- At each HD session, experienced personnel should examine the exit site/port cannulation site for proper position and absence of infection before opening and accessing the site.

Maintain catheter lumens as sterile. Never allow the lumen and tip to remain open to air. Place a cap or syringe on/within the lumen while maintaining a clean field under the catheter connectors.²

Nurses shall wear gloves during all connect and disconnect procedures,² as well as when checking the exit site dressing.¹² Only access the port using sterile devices. Clean gloves may be used during all port-to-port connections/disconnections (“no touch” technique) only if the techniques used prevent transfer of organisms to another body site or another patient. Clean gowns must be changed between patients.⁶

Monitor catheter site visibly and check for inflammation during dressing changes.

6. Catheter Securement Devices

Catheter-related bloodstream infections (CR-BSI) can occur when bacterial skin flora migrate through the percutaneous entry site. Use a sutureless securement device to stabilize the catheter, avoiding disruption around the catheter entry skin site.⁴

7. Antimicrobial/Antiseptic Impregnated Catheters, Cuffs, and Dressings

Consider the use of catheters impregnated with antiseptics (e.g., chlorhexidine- silver sulfadiazine) or antimicrobials (e.g., minocycline-rifampin) AND/OR CHG--containing sponge dressings for CVCs in the following circumstances:

- patient populations/units with a rate higher than the institutional goal, despite compliance with basic prevention practices;
- patients with limited venous access and a history of recurrent infection; and
- patients at heightened risk for severe sequelae from an infection (e.g., patients with recently implanted intravascular devices).^{7,8}

In patients whose catheter is expected to remain in place > 5 days, consider the use of an impregnated catheter if the infection rate is not decreasing, even after successful implementation of a comprehensive strategy (including at minimum, inserter education, maximal sterile barriers, and >0.5% CHG in alcohol for skin asepsis) to reduce infection rates.⁴

8. Antibiotic/Antiseptic Ointments and Locks

Use povidone iodine/bacitracin/neomycin/polymyxin B ointment at the hemodialysis catheter exit site after catheter insertion, and at the end of each treatment, only when the manufacturer indicates it does not interact with the catheter material. Additionally, for patients with a history of recurrent *S. aureus* CR-BSI, use povidone iodine or polysporin ointment at the insertion site.^{7,8}

Mupirocin is contraindicated due to the risk of developing mupirocin resistance,^{4,7,8} as well as damage to polyurethane catheters.⁷

Current literature regarding locks is controversial. To prevent potential development of organism resistance from leakage of the lock solution into the bloodstream, antimicrobial locks should only be used as a preventative strategy⁷:

- when there is limited venous access and a history of recurrent infection, and
- in patients at heightened risk for severe sequelae from an infection.

9. Needleless Intravascular Catheter Systems

Use a needleless system to access IV tubings.⁴ Split septum valves are preferred over mechanical valves which are associated with an increased risk of infection.

Accessing the catheter:

- Scrub connectors and access ports with CHG/alcohol or 70% alcohol to minimize risk of contamination.
- Access ports only with sterile devices.^{4,7}
- Change needleless components and caps no more frequently than every 72 hours, or according to manufacturers' recommendations.⁴
- All system components must be compatible to minimize leaks and breaks.⁴

10. Performance Improvement

Performance improvement is a set of processes used to improve outcomes. Objective indicators of performance are essential to know how effective a process is, and whether performance is improving or worsening. Programs must consider how to integrate performance improvement into the processes, as well as how to actively share results with front-line staff.¹⁴

Suggestions:

- Use bundled multifaceted performance improvement initiatives.
- Assess performance and outcome measures.
- Conduct monthly surveillance for catheter-related bloodstream infections and other related dialysis events:
 - Audit: Routine hand hygiene audits
 - Vascular access care confirming adherence to recommended procedures
- Share results with front-line clinical staff.¹⁴
- Incorporate efforts to reduce catheters (e.g., patient education, a vascular access coordinator) by identifying barriers to permanent vascular access placement and catheter removal.¹⁴

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Contacts

Principal Author: Molly Blake (E-mail: mblake@wrha.mb.ca)

The original position statement was developed by the following IPAC Canada Dialysis Interest Group members:

Co-Chair: Molly Blake (IPAC-Manitoba)

Co-Chair: Anne Augustin

Members: Faith Stoll (IPAC –Nova Scotia); Debbie Lam Li (IPAC-Southern Alberta); Kim Munro (IPAC-Vancouver Island)

References

1. Centers for Disease Control and Prevention. Recommendations for preventing transmission of infections among chronic hemodialysis patients 2001. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5005a1.htm>.
2. National Kidney Foundation. 2006 updates: Clinical practice guidelines and recommendations. Available at: http://www.kidney.org/professionals/kdoqi/pdf/12-50-0210_JAGDCPGuidelines-VAOct06SectionCofC.pdf.
3. Canaud, B, Chenine, L, Henriot, D, & Leray, H. Optimal management of central venous catheters for hemodialysis. Contributions to Nephrology 2008; 161: 39-47.
4. Centers for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter-related infections 2011. Available at: <http://www.cdc.gov/hicpac/BSI/BSI-guidelines-2011.html>.
5. Fluck, R, & Kumwenda, M. Vascular access for haemodialysis 2011. Available at: <http://www.renal.org/Clinical/GuidelinesSection/VascularAccess.aspx>.
6. Association for Professionals in Infection Control and Epidemiology. Guide to the elimination of infections in hemodialysis 2010. Available at:

http://www.apic.org/Resource_/EliminationGuideForm/7966d850-0c5a-48ae-9090-a1da00bcf988/File/APIC-Hemodialysis.pdf.

7. Society for Healthcare Epidemiology of America/ Infectious Diseases Society of America. Strategies to prevent central line–associated bloodstream infections in acute care hospitals. *Infection Control and Hospital Epidemiology* 2008; 29 Supplement 1: S22-30 and 2012 update. Available at: http://www.jstor.org/stable/10.1086/676533#full_text_tab_contents.
8. Massachusetts Department of Public Health. Prevention and control of healthcare-associated infections in Massachusetts. Part 1: Final recommendations of the Expert Panel 2008. Available at: <http://www.patientcarelink.org/uploadDocs/1/Betsy-Leham.pdf>.
9. IPAC Canada. IPAC Canada Position Statement: Hand Hygiene 2008. Available at: <http://www.ipac-canada.org/pdf/handhygiene.pdf>.
10. Ronco, C, & Mishkin, G, (eds). Disinfection by sodium hypochlorite: Dialysis applications. *Contributions to Nephrology* 2007; 154.
11. BC Renal Agency. Central venous catheter (CVC): Initiation of dialysis 2008. Available at: http://www.bcrenalagency.ca/sites/default/files/documents/files/CVC-Initiation-of-Dialysis-Aug_2011.pdf.
12. Safer Healthcare Now! Prevent central line infections: Getting started kit 2012. Available at: <http://www.patientsafetyinstitute.ca/en/toolsResources/Pages/CLI-resources-Getting-Started-Kit.aspx>.
13. Centers for Disease Control and Prevention. Collaborative interventions 2011. Available at: <http://www.cdc.gov/dialysis/prevention-tools/>.
14. Boyce, J. Prevention of central line associated bloodstream infections in hemodialysis patients. *Infection Control and Hospital Epidemiology* 2012; 33(9): 936-944.
15. Public Health Agency of Canada. Routine practices and additional precautions for preventing the transmission of infection in healthcare settings 2012. Available at: http://publications.gc.ca/collections/collection_2013/aspc-phac/HP40-65-2012-eng.pdf.