

Hemodialysis Central Venous CVC (CVC): Flushing & Locking

Updated October 4, 2024



Vascular Access Guideline

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This procedure is posted on the BC Renal website – Health Professionals - Vascular Access - Resources – Central Venous Catheter Guidelines: www.bcrenal.ca/health-professionals/clinical-resources/vascular-access.

1.0 Practice Standard

This guideline applies to In-centre and Community Dialysis Units (CDUs) in the majority of situations. If a site-specific protocol differs from this guideline, the site-specific protocol will take precedent.

This guideline does not apply to patients who are dialyzing at home.

Skill Level (Nursing): Specialized

1. *Nurses* who have completed the required hemodialysis (HD) specialty education and who provide nursing care in a BC In-Centre and/or Community Dialysis Unit; and/or
2. *Nurses* working in critical care who are trained in Continuous Renal Replacement Therapy (CRRT), Sustained Low Efficiency Dialysis (SLED) and plasma exchange; and/or
3. *Nurses* who have received training in central venous (CVC) care and maintenance working in intensive care, acute care, ambulatory care, or home care settings.

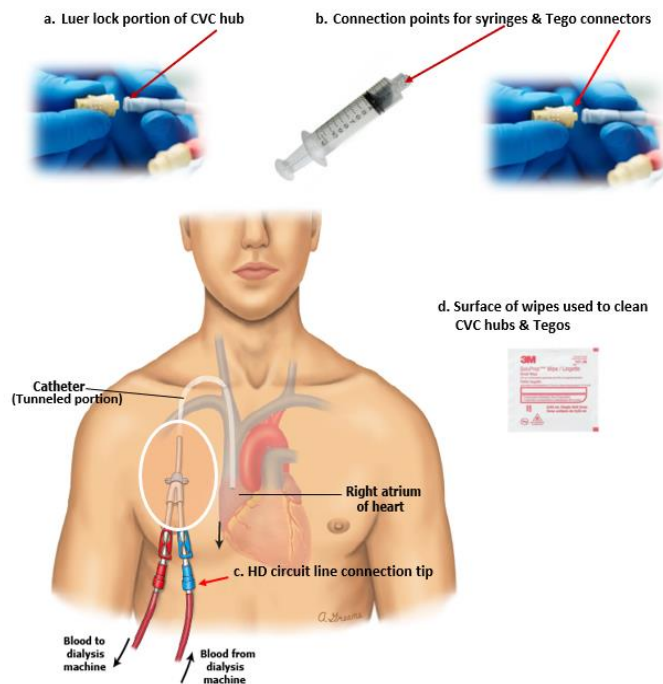
Need to Know:

1. Air embolus is a potential catastrophic complication of CVCs and the relative risk while accessing a CVC is high. Ways to reduce the risk:
 - a) Use needle-less HD connectors (e.g., Tego®) at all times for all patients dialyzing with a CVC.
 - b) Clamp CVC limbs prior to flushing/connect/disconnect procedures (rationale: in case connector becomes loose or damaged).
2. Tips for needle-less HD connectors:
 - Do not use needles to access connectors.
 - Access the connector straight on, not at an angle.
 - When injecting normal saline through the connector, leave a minimal amount of fluid in the tip of the syringe to avoid reflux or rebound effect.
 - Grasp the base of the connector and fully unthread luer lock when disconnecting from the connector.
3. Prior to patient contact, perform hand hygiene. Don appropriate PPE based on the patient’s need for isolation precautions or the risk of exposure to body fluids. Refer to BCR guideline [Prevention of Disease Transmission in HD Units](#).

4. Sterility of “key parts” must be maintained when flushing and locking CVCs.

4.1 “Key parts include:

- a) Luer lock portion of CVC hubs
- b) Sterile connection points for syringes and connectors
- c) HD circuit arterial & venous line connection tips
- d) Surface of antiseptic wipes used to clean CVC hubs and connectors



4.2 Aseptic non-touch technique may be used IF sterility of “key parts” can be maintained.

4.3 Sterile supplies are used as needed to maintain sterility of “key parts.” Do not open supplies in advance of the procedure.

4.4 Aside from handwashing, the single most important way to prevent infection is to scrub the hub/connector (connection surface and sides), clamp and limb using a friction scrub for a full 30 seconds. Allow the antiseptic to air dry completely.

After the initial 30 second scrub and prior to each connection, wipe the connector with an antiseptic wipe to lubricate and prevent damage to the connector. Use a new antiseptic wipe each time.

5. Recommended antiseptic for cleansing CVC clamps and limbs, connectors and CVC hubs:

2% chlorhexidine (CHG) with 70% alcohol

- Application time: 30 seconds

OR

70% alcohol

- Application time: 30 seconds

NOTES:

1. *Application time (contact time) is important to ensure the antiseptic contact time is long enough to achieve the desired “kill” time).*
2. *After applying the antiseptic, allow to air dry completely.*
 - *Adequate dry time allows the antiseptic to work AND, if using CHG, reduces the risk of CHG sensitivity and sensitization.*
 - *Amount of dry time depends on amount used, presence or absence of hair, humidity, body site, etc.*
 - *Dry time for preparations without alcohol is longer.*
3. *If skin is sensitive to chlorhexidine, utilize an alternative antiseptic until the sensitivity resolves. Assuming no previous anaphylactic reaction to chlorhexidine, consider a second trial after sensitivity resolves, ensuring adequate dry time after application.*
4. *DO NOT use normal saline:*
 - *As the primary cleaning solution as it does not have antimicrobial properties.*
 - *To rinse off the skin/CVC after applying an antiseptic. Antiseptics have residual antimicrobial action which lasts beyond the initial application.*
5. *Use single-use antiseptic preparations when available.*

2.0 Equipment

- Personal protective equipment (gloves, gown, mask/eye protection)
- Clean gloves
- Sterile drape/gauze (or sterile 4x4)
- 4 x 10 mL or 2x 20 mL sterile syringes prefilled with normal saline (for flushing)
- 2 sterile syringes filled with prescribed locking solution

- Antiseptic wipes (several)
- 2x5 or 2x10 mL sterile syringes (for aspiration)
- 2x10 mL sterile syringes (optional, for irrigation)
- If connectors due for change:
 - a. 2 connectors (one per lumen)
 - b. Sterile gloves (see #4 under “need to know”)
- Locking agent labels
- Tape

Note: To prevent contamination, do not open supplies until needed.

3.0 Assessment & Interventions

Preparation:

1. Gather supplies. Perform hand hygiene.
2. Place patient in a comfortable position and expose the CVC access site. Perform hand hygiene.
3. Don clean gloves.
4. Place clean or sterile pad (as per KDOQI, 2020) under CVC limbs.
5. Unwrap the gauze covering the CVC limbs and discard. Check that the cuff of the CVC is not visible. Doff gloves.

Cleanse connectors, clamps, and limbs:

6. Perform hand hygiene, don clean gloves.
7. Using antiseptic wipe, scrub each connector (connection surface and sides), clamp, and limb using a friction scrub for a full 30 seconds. Allow the antiseptic to air dry completely.
 - Un-clamp, move clamp, clean under clamp segment, and re-clamp.
 - Use a new antiseptic wipe for each connector/clamp/limb.
8. Place CVC limbs/connectors on a fresh, dry, sterile 4x4 drape/gauze. Allow to dry.

If scheduled for connector change:

9. Lift the CVC. Ensure clamps are closed.
10. Remove connector with gloved hand. Using an antiseptic wipe, scrub the sides (threads) and end of the hub thoroughly using a friction scrub for a full 30 seconds. Allow to air dry. Attach a new connector.
11. Repeat steps 9 and 10 on the other side.

Withdraw blood and locking solution, assess patency, and flush lumens:

12. Starting with the arterial port side (or venous port side, if indicated):
 - a) Ensure clamp on CVC limb is closed.
 - b) Cleanse CVC limbs and connector with antiseptic wipe. Discard wipe.
 - c) Attach a sterile empty 5 or 10 mL syringe to connector.

- d) Open clamp on CVC limb.
- e) Aspirate 3 – 5 mL blood and locking solution.
- f) Close clamp. Remove syringe and discard.

If no resistance is felt, and pre-dialysis bloodwork is ordered, draw blood using unit protocol.

- g) If no resistance is felt with aspiration of blood and locking solution:
 - i. Ensure clamp on CVC limb is closed.
 - ii. Cleanse connector with antiseptic wipe. Discard wipe.
 - iii. Attach a sterile 10 mL syringe to connector.
 - iv. Open clamp on CVC limb.
 - v. Irrigate (i.e., aspirate, then flush) lumen 3 times while continuing to assess patency.
 - vi. Close clamp. Remove syringe and discard.
 - vii. Cleanse connector with antiseptic wipe. Discard wipe.
 - viii. Attach a sterile 10 or 20 mL pre-filled NS syringe to connector.
 - ix. Open clamp on CVC limb and flush lumen with a turbulent flushing technique. Repeat if using 10 mL syringe (total: 20 mL per lumen).
 - x. Close clamp. Leave syringe attached to the connector until it is replaced with the dialyzer tubing connector.

Note: Steps 12g(i - vi) are optional.

- h) If resistance is felt with aspiration of blood and locking solution:
 - i. Ensure clamp on CVC limb is closed.
 - ii. Cleanse connector with antiseptic wipe. Discard wipe.
 - iii. Attach a sterile 10 mL NS syringe to connector.
 - iv. Open clamp on CVC limb.
 - v. Irrigate (i.e., aspirate, then flush) the lumen while assessing patency. Close clamp. Remove syringe and discard.
 - vi. If patency is established, flush lumen:
 - Cleanse connector with antiseptic wipe. Discard wipe.
 - Attach a sterile 10 or 20 mL pre-filled NS syringe to connector.
 - Open clamp on CVC limb and flush lumen with a turbulent flushing technique. Repeat if using 10 mL syringe (total: 20 mL per lumen).
 - Close clamp. Leave syringe attached to the connector until it is replaced with the dialyzer tubing connector.
 - vii. If resistance continues, consider replacing the connector and see if flow improves.
 - viii. If patency cannot be established, contact MD and/or follow HA-specific protocols.

13. Repeat with venous lumen and hook up to dialysis machine.

Note: If line is not in use, refer to unit-specific protocol for frequency of flushing.

Instill locking solution:

14. Starting with the arterial port side (or venous port side, if indicated):

- Ensure air is purged out of prefilled syringes.
- Cleanse connector with an antiseptic wipe.
- Connect sterile syringe with prescribed locking solution to connector.
- Slowly instill locking solution. Immediately close the clamp while continuing to exert pressure on syringe plunger. The amount of locking solution is determined by the volume printed on the CVC + overfill (0.3 mL overfill includes 0.1 mL for connector). Remove syringe.

15. Repeat step 16 on the opposite port side.

Label and wrap:

16. Wrap CVC limbs together with a 4x4 gauze and secure with tape to outside of dressing.

17. Attach a label with the locking solution and lumen volume to the gauze wrap.

4.0 Patient Education & Resources

1. Do not open your CVC (if part of the home HD program, doctor or nurse will provide specific instructions). Both the end caps and clamps of the CVC should be kept tightly closed. Only a dialysis nurse or physician should open or remove the caps or clamps.
2. Notify kidney doctor (nephrologist) or dialysis unit for any of the following:
 - Redness, warmth, or pain along the CVC.
 - Oozing or drainage from CVC exit site.
 - Noticeable swelling or itching around CVC or neck.
 - Feverish and any of the above symptoms.
 - Part of the CVC that is outside the skin seems to be getting longer.
 - Shortness of breath, coughing, chest pain, low blood pressure, wheezing.
 - CVC is accidentally pulled and there is bleeding around the exit site.
 - Sutures fall out of a recently inserted CVC.

Patient Resources (BCR Website):

- [Your CVC](#)

5.0 Documentation

- Document procedure and patient response as per site-specific protocol.

6.0 References

The following references were considered in the development of this guideline.

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7.0 Sponsors

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For information about the use and referencing of BCR provincial guidelines/resources, refer to www.bcrenal.ca.