# Hemodialysis: Accessing a Central Venous Catheter (CVC) with and without Tego Connectors

### Site Applicability:

All PHC Renal Program Hemodialysis (HD) units (In-centre and Community Dialysis Units)

### Practice Level:

**Specialized:** Nurses who have completed the required education, and provide nursing care in PHC Renal Program HD unit perform this procedure.

### Need to Know:

**Clinical Indication:**

Patients with CVC may need to use this type of vascular access for HD treatments.

The HD CVC may be accessed by the code/trauma team or used in trauma or emergent situation when all other attempts for vascular access have been exhausted.

1. Sterile technique must be maintained when accessing the patient's vascular system.
2. During connect and disconnect procedures using the HD CVC, both staff and patients should wear a mask. As well, nurses must wear either goggles or a face shield for protection from blood splatters. Manipulating the HD CVC and accessing the patient's bloodstream should be performed in a manner that avoids contamination.
3. If the patient's clothing compromises accessing their HD CVC, or maintaining a sterile field, the patient should don a patient gown prior to initiating HD.
4. HD CVCs are available in variable lengths. The volume of each lumen of the HD CVC is stamped on the lumens or lumen clamps. Prior to initiating HD, the lock solution (i.e. sodium citrate 4% or alteplase/heparin) must be withdrawn and discarded prior to flushing.
5. Antiseptic CHG / alcohol wipes and swabs (2% chlorhexidine gluconate and 70% isopropyl alcohol) are used to clean all HD CVCs and exit sites. Antiseptic CHG wipes and swabs without isopropyl alcohol (2% w/o chlorhexidine gluconate) may be used if the patient has a documented sensitivity or allergy to alcohol 70%.

   An approved antiseptic agent may be used if the patient has a documented sensitivity or allergy to chlorhexidine gluconate and/or isopropyl alcohol (i.e. 10% povidone iodine)
6. Air embolus is a potential catastrophic complication of HD that can lead to death.
7. The risk of an air embolus while accessing a CVC for HD is very high.
8. To prevent an air embolus from occurring, **the HD CVC lumens must never be left unattended and open to the air**. The lumen clamps must be closed when they are not being used to access the

patient's bloodstream.

9. Open take-off technique is followed when discontinuing HD.

**Need to Know: (Tego specific)**

1. Clean technique is followed unless Tego connectors are due to be changed which in this case sterile technique should be followed.
2. Nurses and patients are not required to wear a surgical mask unless Tego connectors are due to be changed. However, nurses must wear either goggles or a face shield for protection from blood splatters. Nurses wear non-sterile gloves when accessing Tego connectors. Manipulating the HD CVC and accessing the patient's bloodstream should be performed in a manner that avoids contamination.
3. When attaching Tego connectors, turn it clockwise to connect to the HD CVC lumens, until it stops – **do not** over tighten. To remove, turn Tego connectors counterclockwise.
4. Tego connectors are changed weekly.
5. Alcohol 70% swabs are used to disinfect all Tego connectors. Repeat cleaning if tip is inadvertently contaminated. Tego connectors are disinfected with an alcohol swab between connections.
6. When attaching to Tego connectors, turn syringe, vacutainer, or blood tubing clockwise onto Tego connectors, until it stops – **do not** over tighten. To disconnect, turn syringe, vacutainer, or blood tubing counterclockwise.

# Procedures

## Initiating HD

### A. Attaching or changing Tego connectors

**Equipment & Supplies:**

1. Pre-filled syringe with 0.9% Normal Saline (NS) without preservatives – 20 mL (2) or 10 mL (4)
2. Sterile 10 mL luer lock syringe (4)
3. alcohol swab (8)
4. garbage receptacle
5. HD CVC Scrub Tray
6. mask (2)
7. personal protective equipment (PPE)
8. Antiseptic CHG wipe (2% chlorhexidine gluconate and 70% isopropyl alcohol) (5)
9. sterile gloves
10. tape
11. Tego connector (2)

**Procedure:**

| Steps | Rationale |
|---|---|
| 1. Follow B-00-12-10043– Hemodialysis CVC Dressing Change for proper steps in performing a dressing change. | |
| 2. Take 1 antiseptic CHG wipe and scrub the catheter lumens. Discard wipe. | To disinfect the catheter lumens. Friction scrub will provide the best quality of cleaning. |
| 3. With your non-dominant hand, lift the HD CVC lumen by holding it in the middle. | |
| 4. Take another antiseptic CHG wipe and scrub the arterial lumen including the red end cap/Tego connector that will be removed. Discard wipe. | To disinfect the catheter lumen. Friction scrub will provide the best quality of cleaning. |
| 5. Repeat step 4 for the venous lumen. | |
| 6. Discard the 4x4 gauze that the catheter lumens were set down on and set catheter lumens on the new 4x4 gauze and sterile drape. | |
| 7. Ensure clamps on HD CVC lumens are closed. | Ensuring that the catheter clamps are closed will prevent an air embolus. |
| 8. Remove the Tego connector/red end cap with gloved hand. Clean in circular motion around the arterial lumen hub with a new antiseptic CHG wipe. Discard wipe. | To disinfect the catheter lumen hub. Friction scrub will provide the best quality of cleaning. |
| 9. Attach the new Tego connector to the arterial lumen. | |
| 10. Repeat steps 8 and 9 for the venous lumen. | |
| 11. Wipe the tip of the Tego connector on the arterial lumen with an alcohol swab. Discard alcohol swab. Attach a 10 mL luer lock syringe to the Tego connector. | To make sure that the area is disinfected before accessing it. |
| 12. Open arterial lumen clamp and withdraw 5 mL of blood (10 mL if bloodwork is required). Close arterial lumen clamp. | To remove lock solution and blood clots from the catheter. |

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| 13. Detach the 10 mL syringe from the arterial lumen. Discard the syringe and contents. Wipe the tip of the Tego connector with an alcohol swab. Attach a new 10 mL syringe to the Tego connector. | |
| 14. Repeat steps 11 to 13 for the venous lumen. | |
| 15. With a 10 mL syringe attached, open arterial lumen clamp and check for adequate blood flow using a "withdraw and instill motion." Close clamp. | Adequate blood flow is necessary to obtain a maximum pump speed during HD. |
| 16. Detach the 10 mL syringe from the Tego connector on the arterial lumen. Wipe the tip of the Tego connector with an alcohol swab. Discard alcohol swab. Attach the 20 mL NS syringe. Flush the arterial lumen using a "push/pause" method (i.e. short repetitive pushes on syringe plunger). Close clamp. Do not force NS flushes. | Push/pause method of flushing increases the turbulence within the catheter lumen during the flush, thereby making the flush more effective. |
| 17. Repeat steps 15 and 16 for the venous lumen. | |
| 18. Detach the 20 mL syringe from the Tego connector on the arterial lumen and discard. Wipe the tip of the Tego connector with an alcohol swab. Discard the alcohol swab and connect arterial line. | |
| 19. Prime circuit with blood as per procedure for initiating HD. | |
| 20. Repeat step 18 for the venous lumen and venous line. Ensure connections are secured. | A loose connection could result in air entering the circuit or the patient's blood stream. |
| 21. Turn blood pump on at 100-150 mL/min and observe arterial and venous pressures. | |
| 22. Unless contraindicated, increase blood pump speed to 200 mL/min. and record blood pump speed and arterial and venous pressures on the HD log. | Record arterial and venous pressures at a blood pump speed of 200 mL/min provides baseline data regarding catheter patency and thrombus formation. |
| 23. Secure lines to patient bed/chair with tape and/or clamps. | |
| 24. Adjust HD parameters to obtain maximum HD adequacy. | |

### B. With Tego connectors

**Equipment & Supplies:**

1. Pre-filled syringe with 0.9% Normal Saline (NS) without preservatives – 20 mL (2) or 10 mL (4)
2. Sterile 10 mL luer lock syringe (4)
3. alcohol swab (8)
4. blue pad
5. garbage receptacle
6. PPE
7. Antiseptic CHG wipe (2% chlorhexidine gluconate and 70% isopropyl alcohol) (3)
8. Tape

**Procedure:**

| Steps | Rationale |
|---|---|
| 1. Wash hands. | |
| 2. Place blue pad or drape under the catheter. | |
| 3. Take 1 antiseptic CHG wipe and scrub the HD CVC. Discard wipe. | To disinfect the HD CVC. Friction scrub will provide the best quality of cleaning. |
| 4. With your non-dominant hand, lift the catheter by holding it in the middle. | |
| 5. Take another antiseptic CHG/alcohol wipe and scrub the arterial lumen including the Tego connector. Discard wipe. | To disinfect the catheter lumen. Friction scrub will provide the best quality of cleaning. |
| 6. Repeat step 4 for the venous lumen. | |
| 7. Wipe the Tego connector tip with an alcohol swab. Discard alcohol swab. Attach a 10 mL luer lock syringe to the Tego connector on the arterial lumen | To make sure that the area is disinfected before accessing it. |
| 8. Open arterial lumen clamp and withdraw 5 mL of blood (10 mL if bloodwork is required). Close arterial lumen clamp. | To remove lock solution and blood clots from the catheter. |
| 9. Detach the 10 mL syringe from the arterial lumen. Discard the syringe and its contents. Wipe the Tego connector tip with an alcohol swab. Discard the alcohol swab. Attach a new 10 mL luer lock syringe to the Tego connector on the arterial lumen. | |

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| 10. Repeat steps 7 to 9 for the venous lumen. | |
| 11. With a 10 mL syringe attached, open arterial lumen clamp and check for adequate blood flow using a "withdraw and instill motion." Close arterial lumen clamp. | Adequate blood flow is necessary to obtain a maximum pump speed during HD. |
| 12. Remove the 10 mL syringe attached on the arterial lumen. Attach a 20 mL NS syringe. Flush the arterial lumen using a "push/pause" method (i.e. short repetitive pushes on the syringe plunger). Close arterial lumen clamp. Do not force NS flushes. | "Push/pause" flush technique increases the turbulence within the catheter lumen during the flush, thereby making the flush more effective. |
| 13. Repeat steps 11 and 12 for the venous lumen. | |
| 14. Remove the 20 mL syringe from the Tego connector on the arterial lumen and discard. Wipe the Tego connector tip with an alcohol swab. Discard alcohol swab and connect arterial blood line. | |
| 15. Prime circuit with blood as per procedure for initiating HD. | |
| 16. Repeat step 14 for the venous lumen and venous blood line. Ensure connections are secured. | A loose connection could result in air entering the circuit or the patient's blood stream. |
| 17. Turn blood pump on at 150 mL/min and observe arterial and venous pressures. | |
| 18. Unless contraindicated, increase blood pump speed to 200 mL/min. Record arterial and venous pressures and blood pump speed on the HD log. | Record arterial and venous pressures at a blood pump speed of 200 mL/min provides baseline data regarding catheter patency and thrombus formation. |
| 19. Using a dry 4x4 gauze, wrap catheter connections and secure with tape. Secure lines to patient bed/chair with tape and/or clamps. | To prevent pulling of catheter and possible line separation. |
| 20. Adjust HD parameters to obtain maximum HD adequacy. | |

### C. Without Tego connectors

**Equipment & Supplies:**

1. Pre-filled syringes with 0.9% Normal Saline (NS) without preservatives – 20 mL (2) or 10 mL (4)
2. Sterile 10 mL luer lock syringe (4)
3. garbage receptacle
4. HD CVC Scrub Tray
5. mask (2)
6. PPE
7. Antiseptic CHG/alcohol wipe (2% w/v chlorhexidine gluconate and 70% w/v isopropyl alcohol) (3)
8. sterile gloves
9. tape

**Procedure:**

| Steps | Rationale |
|---|---|
| 1. Follow B-00-12-10043– Hemodialysis CVC Dressing Change for proper steps in performing dressing change. | |
| 2. Take 1 antiseptic CHG/alcohol wipe and scrub the catheter. Discard wipe. | To disinfect the catheter. Friction scrub will provide the best quality of cleaning. |
| 3. With your non-dominant hand, lift the catheter by holding it in the middle. | |
| 4. Take another antiseptic CHG/alcohol wipe and scrub the arterial lumen including the red end cap that will be removed. Discard wipe. | To disinfect the catheter lumen. Friction scrub will provide the best quality of cleaning. |
| 5. Repeat step 4 for the venous lumen. | |
| 6. Discard the 4x4 gauze that the catheter lumens were set down and set catheter lumens on the sterile drape. | |
| 7. Ensure catheter clamps are closed. | Ensuring that the catheter clamps are closed will prevent an air embolus. |
| 8. Remove the red end cap with gloved hand. Clean the arterial lumen hub with a new antiseptic CHG/alcohol swab. Discard wipe. | |
| 9. Attach a 10 mL luer lock syringe on the arterial lumen. | |

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| 10. Open arterial lumen clamp and withdraw 5 mL of blood (10 mL if bloodwork is required). Close arterial lumen clamp. | To remove blocking agent and blood clots from the catheter. |
| 11. Detach the 10 mL syringe from the arterial lumen. Discard the syringe and its contents. Attach a new 10 mL luer lock syringe on the arterial lumen. | |
| 12. Repeat steps 8 to 11 for the venous lumen. | |
| 13. With a 10 mL syringe attached, open arterial lumen clamp and check for adequate blood flow using a "withdraw and instill motion." Close arterial lumen clamp. | Adequate blood flow is necessary to obtain a maximum pump speed during HD. |
| 14. Remove the 10 mL syringe attached on the arterial lumen. Attach a 20 mL NS syringe. Flush the arterial lumen using a "push/pause" method (i.e. short repetitive pushes on the syringe plunger). Close arterial lumen clamp. Do not force NS flushes. | "Push/pause" flush technique increases the turbulence within the catheter lumen during the flush, thereby making the flush more effective. |
| 15. Repeat steps 13 and 14 for the venous lumen. | |
| 16. Remove the 20 mL from the arterial lumen and discard. Connect arterial blood line. | |
| 17. Prime circuit with blood as per procedure for initiating HD. | |
| 18. Repeat step 16 for the venous lumen and venous blood line. Endure connections are secured. | A loose connection could result in air entering the circuit or the patient's blood stream. |
| 19. Turn blood pump on at 150 mL/min and observe arterial and venous pressures. | |
| 20. Unless contraindicated, increase blood pump speed to 200 mL/min. Record arterial and venous pressures and blood pump speed on the HD log. | Record arterial and venous pressures at a blood pump speed of 200 mL/min provides baseline data regarding catheter patency and thrombus formation. |
| 21. Using a dry 4x4 gauze, wrap catheter connections and secure with tape. Secure lines to patient bed/chair with tape and/or clamps. | To prevent pulling of catheter and possible line separation. |
| 22. Adjust HD parameters to obtain maximum HD adequacy. | |

## Discontinuing HD

### A. With Tego connectors

**Equipment & Supplies:**

1. Pre-filled syringes with 0.9% Normal Saline (NS) without preservatives – 20 mL (2) or 10 mL (4)
2. Pre-filled 5 mL syringes of Sodium Citrate 4% (2)
3. alcohol swab (4)
4. HD CVC Off Tray
5. PPE
6. Antiseptic CHG/alcohol wipe (2% chlorhexidine gluconate and 70% isopropyl alcohol) (3)

**Procedure:**

| Steps | Rationale |
|---|---|
| 1. Wash hands. | |
| 2. Prepare Sodium Citrate 4%/lock solution and NS for instillation. | |
| 3. Discontinue HD as per protocol. | |
| 4. Clamp arterial and venous blood lines and arterial and venous lumens. | To prevent leakage of fluids/air embolus. |
| 5. Prepare HD CVC Off Tray. | |
| 6. Place drape underneath the catheter and lumens. | |
| 7. Take 1 antiseptic CHG/alcohol wipe and scrub the catheter. Discard wipe. | To disinfect the catheter. Friction scrub will provide the best quality of cleaning. |
| 8. Repeat step 7 for the arterial and venous lumens. | |
| 9. Ensure port clamps are closed. Disconnect arterial line from arterial port. Wipe the Tego connector tip with an alcohol swab. Discard the alcohol swab. | Ensuring port clamps are closed prevent air embolus. |
| 10. Attach 20 mL syringe with NS to arterial lumen. Open clamp and flush lumen using a “push/pause” method (i.e. short repetitive pushes on the syringe plunger). Close clamp. | “Push/pause” flush technique increases the turbulence within the catheter lumen during the flush, thereby making the flush more effective. |

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| 11. Remove empty NS syringe from arterial lumen and discard. Attach Sodium Citrate 4%/lock solution syringe to arterial lumen. Instill Sodium Citrate 4%/lock solution and immediately close the clamp while continuing to exert pressure on syringe plunger. | The amount of Sodium Citrate 4%/lock solution instilled is determined by the volume printed on the CVC lumens. Instill the printed volume amount, plus 0.3 mL for overflow.<br><br>Positive pressure locking technique |
| 12. Repeat steps 9 to 11 on venous lumen. | |
| 13. Attach medication label to both lumens. | The label will alert medical or nursing personnel that the catheter contains Sodium Citrate 4% or specified lock solution. |
| 14. Wrap catheter lumens together with 4x4 gauze and secure with tape. | To promote patient comfort. |
| 15. Connect arterial and venous blood lines to female ports on the circuit. | To prevent blood/fluids from leaking out of the open ends of the HD blood lines. |

### B. Without Tego connectors

**Equipment & Supplies:**

1. Pre-filled syringes with 0.9% Normal Saline (NS) without preservatives – 20 mL (2) or 10 mL (4)
2. Pre-filled 5 mL syringes of Sodium Citrate 4% (2)
3. HD CVC Off Tray
4. mask (2)
5. PPE
6. Sterile gloves
7. red caps (2)
8. Antiseptic CHG/alcohol wipe (2% chlorhexidine gluconate and 70% isopropyl alcohol) (5)

**Procedure:**

| Steps | Rationale |
|---|---|
| 1. Wash hands. | |
| 2. Prepare Sodium Citrate 4%/lock solution and NS for instillation. | |
| 3. Discontinue HD as per protocol. | |

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|---|---|
| 4. Clamp arterial and venous blood lines and arterial and venous lumens. | To prevent leakage of fluids/air embolus. |
| 5. Prepare HC CVC Off Tray. | |
| 6. Place drape underneath the catheter and lumens. | |
| 7. Take 1 antiseptic CHG/alcohol wipe and scrub the catheter. Discard wipe. | To disinfect the catheter. Friction scrub will provide the best quality of cleaning. |
| 8. Repeat step 7 for the arterial and venous lumens. | |
| 9. Ensure port clamps are closed. Disconnect arterial line from arterial port. Take 1 antiseptic CHG/alcohol wipe and scrub the arterial port hub. Discard the antiseptic CHG/alcohol wipe. | Ensuring port clamps are closed to prevent air embolus and exsanguination. |
| 10. Attach 20 mL syringe with NS to arterial lumen. Open clamp and flush lumen using a "push/pause" method (i.e. short repetitive pushes on the syringe plunger). Close clamp. | "Push/pause" flush technique increases the turbulence within the catheter lumen during the flush, thereby making the flush more effective. |
| 11. Remove empty NS syringe from arterial lumen and discard. Attach Sodium Citrate 4%/lock solution syringe to arterial lumen. Instill Sodium Citrate 4%/lock solution and immediately close the clamp while continuing to exert pressure on syringe plunger. | The amount of Sodium Citrate 4%/lock solution instilled is determined by the volume printed on the CVC lumens. Instill the printed volume amount, plus 0.3 mLfor overflow.<br><br>Positive pressure locking technique |
| 12. Attach a red cap to the end of the arterial lumen. | |
| 13. Repeat steps 9-12 on venous lumen. | |
| 14. Attach medication label to both lumens. | The label will alert medical or nursing personnel that the catheter contains Sodium Citrate 4% or specified blocking agent. |
| 15. Wrap catheter lumens together with 4x4 gauze and secure with tape. | |
| 16. Connect arterial and venous blood lines to female ports on the circuit. | To prevent blood/fluids from leaking out of the open ends of the HD blood lines. |

**Documentation:**

1. Document procedure and patient response in Cerner (in IView – Adult Lines and Devices – HD CVC) or HD log.
2. Document Tego connector change, exit site, dressing, adequacy of blood flow from each lumen, and the dosage and volume of Sodium Citrate/lock solution instilled in IView.
3. Document the date to change Tego connectors in IView.

**Patient and Family Education:**

1. Explain procedure and rationale to the patient. Educate the patient regarding:
    - The potential harm of air entering the extracorporeal circuit.
    - Signs of symptoms of air embolism and need to seek immediate medical attention. Signs and symptoms of air embolism include:
        - sensation of air rushing into the circulation (e.g. hearing the “sound of a train” or “rushing air”)
        - chest pain, dyspnea, shortness of breath, coughing, cyanosis, and visual disturbances
        - neurological deficits such as confusion, coma, and hemiparesis
        - loss of consciousness, convulsions, or death
2. Contact HD unit if patient notices any of the following:
    - any drainage, redness, swelling, or pain around the catheter exit site
    - excessive bleeding from the catheter exit site
    - chills or fever
    - If the Tego connector becomes loose of falls off, ensure the catheter remains clamped and contact the HD unit as soon as possible. Urgent care is required due to the risk of infection or air entering the blood stream.
    - If the catheter has partially or completely been pulled out, apply pressure over the site with clean gauze and seek medical attention.
    - If any of the portions of the catheter develops a hole, leak, or partial separation, ensure the catheter is clamped off between your body and the problem area. The catheter clamp is moveable and can be slid up the body of the catheter. If necessary, the catheter may be kinked with your fingers to occlude the catheter. Seek medical attention to help prevent serious injury. Call 911.
3. Between HD treatments ensure that:
    - The catheter clamp is closed. If the clamp opens, close it immediately.
    - The catheter should only be used for HD treatments, unless authorized by the nephrologist.
    - Tego connectors are secure and should only be removed by nurses who have specialized education and training.
    - The dressing is dry and in place and the exit site is clean and dry. Do not remove the dressing. If

the dressing falls off, replace it with a new dressing.

- Avoid any activities that may irritate or cause harm to the catheter.
- Do not shower or submerge your catheter in water. Hot tubs should be avoided.
- For non-cuffed catheters, the stitches must remain in place for as long as you have the catheter.
- For cuffed catheters (Permcaths), the neck suture is removed in 7 days. The exit site sutures are removed once the catheter is healed (approximately 6 to 8 weeks).

**Related Documents and Resources:**

1. B-00-12-10043 – Hemodialysis: Central Venous Access Dressing
2. B-00-12-10044 – Hemodialysis: Flushing and Capping Central Venous Catheters
3. B-00-11-10191 – Hand Hygiene (Corporate Policy)
4. B-00-07-13026 – Gloves
5. B-00-07-13027 – Face Protection: Masks, Goggles and Face Shields – infection Control
6. B-00-07-13033 – Gowns and Protective Apparel
7. B-00-07-13038 – Spills: Blood and Body Fluids
8. Occupational Health and Safety – Cytotoxic Handling

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**Persons/Groups Consulted:**

Renal Clinical Practice Group

**Developed By:**

Clinical Nurse Leader/Educator (Vascular Access), PHC Renal Program

Nurse Educator, PHC Renal Program

**Revised By**

Nurse Educator, PHC Renal Program

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