

# Hemodialysis: Cannulation of an Arteriovenous (AV) Fistula or Graft

## Site Applicability:

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

## Skill Level:

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

## Need to Know:

1. Cannulation of an access places the HD patient at risk for bacterial contamination. The process of cannulation has the potential of introducing bacteria directly into the patient's bloodstream. Bloodstream infections increase the morbidity and mortality rates in end stage renal disease patients. A clean technique should be used with all cannulation procedures.
2. Providence Health Care (PHC) does not generally supply Emla cream, a topical anesthetic. It may be prescribed and provided by the Provincial Renal Agency (PRA). Emla cream needs to be applied over potential needle insertion sites for one hour before cannulation. Patients usually apply Emla to their arm and then wrap the sites with "Saran wrap" until they arrive at the HD unit. Patients should wash the Emla cream off their arms before settling into their station. Refer to PHC-PH481 (Topical Anesthetic Orders for easing cannulation pain in Chronic HD Patients) for further information on Emla cream application.
3. A local anesthetic (2% lidocaine hydrochloride or 0.5% bupivacaine hydrochloride) may be used to ease cannulation pain.
4. In determining the blood flow (i.e. arterial or venous) in a loop graft, a recirculation test is performed. The recirculation test reading will be zero if the needles are placed correctly. A bubble test can also be performed to determine the blood flow. Each side of the loop graft is cannulated. The ends of the two needles are joined by a recirculating device. The direction where the bubble traveled is the venous side.
5. SoluPrep wipes (2% w/v chlorhexidine gluconate and 70% w/v isopropyl alcohol) are used to clean all AVF and AVG needle sites. SoluPrep wipes without isopropyl alcohol (2% w/v chlorhexidine gluconate) may be used if the patient is allergic to alcohol.  
An approved antiseptic agent may be used if the patient is allergic to chlorhexidine gluconate and/or isopropyl alcohol.
6. Tegaderm is used to secure the needle. Micropore tape may be used if patient is allergic to

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Tegaderm. Mepore may be used if patient is allergic to both Tegaderm and micropore tape.

- 7. *The maximum number of cannulation attempts at any one session is four (total for both arterial and venous sites) unless ordered otherwise by a physician.***

## Procedure

### Equipment & Supplies:

1. 1 inch micropore tape
2. 2x2 gauze (2)
3. 6x7 cm Tegaderm (2)
4. 10 mL syringe (2)
5. needles (gauge size depends on the diameter of the vein) (2)
6. non-sterile glove (2)
7. SoluPrep wipe (2% w/v chlorhexidine gluconate and 70% w/v isopropyl alcohol) (2)
8. tourniquet
9. local anesthetic – optional
10. 1 mL insulin syringe 28 gauge needle – optional

### Assessment:

1. Visual inspection
  - a. signs and symptoms of infection
  - b. presence of edema, bruising
  - c. presence of collateral vessels
  - d. presence of aneurysms and pseudoaneurysms
  - e. assess for steal syndrome
2. Auscultation
  - a. Check for the presence of bruit.
  - b. Check along the course of the central outflow vein for the presence of a bruit. Bruit should diminish in intensity the further away you listen from the anastomosis. The presence of a high-pitched bruit distal from the anastomosis may be an indication of a possible stenosis.
3. Palpation
  - a. Check the anastomosis for the presence of a thrill.
  - b. For an AVF, apply a tourniquet and identify by palpation the areas that appear to be dilated enough for needle insertion.
  - c. Identify areas where needle placement may be problematic (immature vessels, bends and

- dips in the vessel that could contribute to high venous and/or arterial pressures).
- d. Identify areas that are hard or swollen due to possible hematomas.
  - e. assess for steal syndrome

### Steps:

Steps	Rationale
1. Have patient clean arm with antibacterial soap, if possible.	To reduce risk of infection
2. Assess AVF or AVG for potential insertion sites <ol style="list-style-type: none"> <li>a. Arterial needles can either be antegrade (towards the heart) or retrograde (towards the anastomosis)</li> <li>b. Venous needles should always be antegrade unless otherwise specified</li> </ol>	<p>Important to rotate sites. Rotating sites prolongs the life span of an access and slows the development of aneurysms and skin breakdown.</p> <p>Avoid aneurysms, bruises, narrow vessels and contours in the vessel</p> <p>Needles should be a minimum of 2 inches apart (from tip to tip) to avoid recirculation</p> <p>Arterial needle should be a minimum of 2 cm away from the anastomosis site (the weakest point of the access)</p>
3. Wash hands and put on non-sterile gloves. Sterile gloves and a mask should be used if the patient is allergic to all cleaning agents.	Reduces the risk of bacterial contamination
4. Clean needle insertion sites, one at a time, in a back and forth up and down motion (waffle technique) 2 inches in diameter with the appropriate cleaning agent. Air dry for 1 minute.	<p>Once cleaned, avoid touching needle insertion sites to prevent contamination.</p> <p>Air drying allows bacteriostatic action to occur.</p>
5. Instill 0.1 mL of local anesthetic intradermally at the needle insertion sites using a 1 mL insulin syringe (optional).	Emla cream may be used as an alternative to injectable anesthetic.
6. Apply pressure to dilate the vessel above cannulation sites. <ol style="list-style-type: none"> <li>a. tourniquet</li> <li>b. digital</li> <li>c. manual</li> </ol> <p>AVGs do not need pressure to be applied unless it is "mushy" on palpation.</p>	<p>Facilitates needle insertion by dilating vessel</p> <p>Prevents unnecessary trauma to vessel intima</p>

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7. Pull skin taut in opposite direction of the needle insertion over vessel but below needle insertion site.	<p>Compresses peripheral nerves</p> <p>Facilitates smooth puncture of skin and there is less surface area contacting cutting edge of the needle</p> <p>Precise incisions heal faster than jagged cuts</p> <p>Better stabilization of the vessel</p>
8. Hold needle by the “wings.” Insert needle at an approximately 25 degree angle for AVF and at a 45 degree angle for AVG.	<p>Steeper angles of insertion increase the risk of infiltrating the underside of the vessel.</p> <p>Deep AVFs may need to be cannulated at a steeper angle.</p> <p>Needle hubs may be rotated at 180 degrees so the cutting edge is facing down, either immediately or after advancement, if there is a problem with the blood flow.</p>
9. Release pressure (tourniquet)	Minimizes discomfort for the patient
10. Check outflow and inflow with a 10 mL syringe by drawing back 3 to 4 mL of blood and then flushing it back into the needle.	To check for needle position within the vessel
<p>11. Secure needle at the same angle as insertion. A 2x2 gauze may be placed under the wings of the needle if necessary, then apply appropriate anchoring material over the wings of the needle.</p> <p><b>Note:</b> If using tape to anchor the needle, use the butterfly technique to secure the wings of the needle. Slide a segment of tape under the wings of the needle. Crisscross the tape over the wings. A segment of tape should then be applied over the wings, perpendicular to the patient’s arm.</p>	<p>Prevents needle dislodgement</p> <p>Pressing the needle shaft flat against the skin moves the needle out of the desired position within the vessel and can reduce flow.</p>
12. Check outflow and inflow as in step 10.	To check for needle position within the vessel
13. Repeat steps 7 to 13 for the second needle insertion	

### Patient and Family Education:

Instruct patient to:

1. Never pick scabs near the AVF / AVG.

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2. Wash the AVF / AVG area with soap and water daily.
3. Never allow anyone to take the blood pressure, bloodwork, or insert an IV on arm or leg where the AVF / AVG is located.
4. Avoid keeping AVF / AVG limb bent for long periods.
5. Not wear tight fitting clothing or wear watchbands around the access limb.
6. Not carry purses or shopping bags over the access area.
7. Avoid heavy lifting with access arm.
8. Remember to protect AVF / AVG when participating in sports.
9. Remove the dressings from access site no sooner than 6 hours after HD treatment is completed. Leave the dressings on until the next morning, if possible.

**Documentation:**

## HD log

1. Document any assessment findings that are unusual or not within the normal parameters.
2. Document any change in the vascular access from the previous HD treatments.
3. Document any problems with the needle placement.
4. Initiate HD at a blood pump speed of 200 mL/min. Record arterial and venous pressures after 5 minutes. Maximize the blood pump speed until arterial and venous pressures reach but do not exceed 250 mmHg.

**Related Documents and Resources:**

1. [First Time Cannulation of an Arteriovenous Fistula and Using a Central Venous Catheter](#)
2. ICS5032 – Hand Washing
3. ICS5033 – Gloves
4. ICS5034 – Face Protection
5. ICS5040 – Gowns and Protective Apparel
6. ICS5045 – Spills: Blood and Body Fluids
7. Occupational Health and Safety – [Cytotoxic Handling](#)

**References:**

1. American Nephrology Nurses Association (2017). *Contemporary Nephrology Nursing: Principles and Practice*. A. J. Janetti Inc.; Pitman, NJ.
2. Canadian Association of Nephrology Nurses and Technicians (2015). Nursing recommendations for the management of vascular access in adult hemodialysis patients. *CANNT Journal* Volume 25,

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3. Daugirdas, J., Blake, P., and Ing, T. (Eds). (2014). *Handbook of Dialysis. Fifth Edition*. Lippincott, Williams, & Wilkins: New York, NY.
4. National Kidney Foundation. K/DOQI Clinical Practice Guidelines for Vascular Access. (2006). *American Journal of Kidney Disease* 37:S137-S181, 2001 (suppl 1).
5. Williams, J. (2018). Rope ladder cannulation of AV fistula and grafts. *Vascular Access Guidelines*. BC Provincial Vascular Access Service Team.

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