Arteriovenous (AV) Fistula or Graft (non-Hemodialysis): Cannulation with IV catheter, Connect to IV infusion, Removal of IV Catheter

Site Applicability:

SPH and MSJ Acute Care

Applicable for patients **not** on hemodialysis (HD) and access is required for **non-HD indications** (i.e. only for IV fluids, IV medications).

Skill Level:

Specialized: RNs who have completed the required education can perform this procedure.

NOTE – Use of ultrasound for assessment and cannulation is a separate and advanced skill.

Requirements

A topical (EMLA™ cream) or local anesthetic (1% or 2% lidocaine hydrochloride or 0.5% bupivacaine hydrochloride) may be used to ease cannulation pain. These must be ordered by the MRP.

Need to Know:

1. An arterio-venous fistula (AVF) is a surgically-created connection or passageway between an artery and a vein. An AVF causes extra pressure and extra blood to flow into the vein, making it grow large and strong. The larger vein provides easy, reliable access to blood vessels. An arterio-venous graft (AVG) is a looped, plastic tube that connects an artery to a vein.

   An AV fistula or graft:

   - Provides good blood flow.
   - Lasts longer than other types of access.
   - Is less likely to become infected or cause blood clots than other types of vascular access.

2. Assessment and care / maintenance includes:
   a. Assessment for signs of infection or problems with blood flow before each access and treatment.
   b. Keeping the access site clean at all times.
   c. Using the access site only as directed / ordered.
   d. Being careful not to bump or cut the access.
   e. Checking the **thrill** in the access every day. The thrill is the rhythmic vibration a person can feel over the AVF access – it is also described as a “rumbling” **sensation** that you can feel.
   f. Checking for the **bruit** is also an option for assessing function and patency of an AVF. A bruit is an audible vascular sound associated with turbulent blood flow. Although usually heard

with the stethoscope, such sounds may occasionally also be palpated as a thrill (see previous). Also described as a "rumbling" **sound** that you can hear.

g. Watching for and reporting signs of infection, including redness, tenderness, or pus.

3. Potential complications to assess for include:
   A. Infection
   B. Thrombosis
   C. Bleeding
   D. Wound-related complications
   E. Venous insufficiency
   F. Needle/catheter displacement
   G. Malfunction of access
   H. STEAL syndrome - due to lower distal blood supply, resulting from deviation of arterial blood that is directed to AVF and usually manifested by limb cooling, pain, pallor, muscle fatigue and reduction or absence of distal pulses.
4. Cannulation of an AVF or AVG places the patient at risk for bacterial contamination. A strict aseptic technique is used with all cannulation procedures.
5. Appropriate skin site prep is required with a 2% chlorhexidine gluconate (CHG) and 70% isopropyl alcohol solution. Prep solution must be allowed to dry for full antiseptic effect on the skin. If patient has documented and confirmed sensitivities to the routine skin prep, alternative options such as CHG without alcohol and povidone iodine may be used.
6. For this non-HD indication, the AVF or AVG will be cannulated with a short IV catheter such as the Nexiva™ IV catheter. A small-gauge can be used for IV fluids – a 22 g x 1" catheter can be used for routine use. A 20g x 1"/ 1.25" may also be considered.
7. If the AVF/AVG is too deep in the tissue and not easily palpated, **ultrasound** may be used to find the vessel and the appropriate area to cannulate and a longer IV catheter may be required depending on depth on assessment. *Education and competency required for use of ultrasound.
8. ***The maximum number of cannulation attempts at any one session is four (unless ordered otherwise by a MRP.***
9. A sterile, adhesive, transparent dressing (e.g. Tegaderm™) is used to secure the Nexiva™ catheter in place for duration of IV infusion. Micropore™ tape may be used if patient is sensitive to Tegaderm™. Alternative options for sterile adhesive cover dressing may be used – consult Nurse Educator or Clinical Nurse Specialist for IV Therapy.
10. IV fluids and medication administration can be administered via gravity infusion and / or via electronic infusion pump (i.e. Alaris™ CareFusion pump).
11. Bloodwork can be drawn from a patent AVF. Blood sampling can be done from the AVF on a "fresh" access with the IV catheter drawn on initial cannulation, no discard required.
    Flush post bloodwork with minimum 10 mL NS (ok for 20 mL). Blood sampling from an AVF with an IV catheter insitu that has already been used for infusion, can cause hemolysis of the blood sample and lab results may not be accurate.

12. Once the AVF is accessed, the IV catheter can remain insitu until the infusion and / or medication administration is completed.
    It is recommended the IV catheter be removed in-between infusions/medications. The risk for clots/occlusion, infection and vessel damage increases if the IV catheter remains insitu for more than 24 hours.

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 pseudo- aneurysms
    e. assess for symptoms of Steal Syndrome – pallor of limb

2. Palpation
    a. Check the anastomosis for the presence of a thrill. Refer to 2.e. in Need to Know section above.
    b. 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 - limb cooling, pain, muscle fatigue and reduction or absence of distal pulses.

3. Auscultation
    a. Check for the presence of bruit. Refer to 2.f. in Need to Know section above.
    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.

4. If unable to palpate easily, use ultrasound to locate vessel, vessel path and appropriate location to cannulate on vessel. *Education and competency required for use of ultrasound.

I. Procedure – Cannulation and connecting to IV tubing for IV therapy

Equipment & Supplies:

1. Non-sterile gloves for assessment and palpation
2. Sterile gloves for cannulating
3. Mask

4. Eye protection (i.e. goggles)
5. Dressing tray
6. Skin prep (2% CHG and 70% isopropyl alcohol) –
    - e.g. Chloraprep™ 3 mL applicator OR SoluPrep™ x 2 swabsticks
7. IV catheter – e.g. #20g x 1" Nexiva™ catheter for routine use (can use #22 g, or 1.25")
8. Tegaderm™ dressing – 3M1685
9. Pre-filled NS 10 mL syringe x 2
10. Topical or local anesthetic – optional with 3 mL syringe and needle for intradermal injection or EMLA cream
11. IF ULTRASOUND used: Sterile gel, sterile probe cover (probe cover sleeve or Tegaderm large dressing). Can use USGPIV Start Kit (sterile package)
12. IV tubing – gravity or pump, primed and ready for infusion
13. IV fluids, medication as ordered and required

Steps	Rationale
1. Clean limb with AVF / AVG with antibacterial soap, if possible. • Clip body hair (DO NOT SHAVE) at site and surrounding area if necessary.	To clean area of any visible dirt or debris and reduce risk of infection. Hair removal with clippers necessary for proper site cleaning and for adhesive dressing to adhere to skin to stabilize/secure catheter.
2. Assess AVF or AVG for potential insertion sites • Look for intact skin areas; do not cannulate where skin is broken or compromised. • Use ultrasound if necessary and available.	Important to rotate sites. Rotating sites prolongs the life span of an access and slows the development of aneurysms and skin breakdown. Avoid aneurysms, bruises, narrow vessels and contours in the vessel.
3. Perform hand hygiene and put on mask and gloves • NOTE – for ultrasound-guided access, sterile gloves, gel and probe cover required.	Reduces the risk of bacterial contamination
4. Clean needle insertion sites using CHG / alcohol cleaning solution (swab sticks or applicator) – use gentle friction, covering large area and allow to completely dry (approximately 3 minutes)	Once cleaned, avoid touching needle insertion sites to prevent contamination. Air drying allows bacteriostatic action to occur.

5. OPTIONAL - Instill 0.5 – 1 mL of local anesthetic intradermally at the needle insertion sites using a small-bore needle.	Topical anesthetic cream (e.g. EMLA cream) may be used as an alternative to injectable anesthetic – but NOTE: must be applied and allowed to contact with skin area for approximately 60 minutes prior to cannulation for full effectiveness.
6. Apply pressure to dilate the vessel above cannulation sites. • digital • manual • tourniquet (arm only) AVGs do not need pressure to be applied unless it is "mushy" on palpation. If using ultrasound, ensure tourniquet is loosely applied and away from area where probe has skin contact.	Facilitates needle insertion. Prevents unnecessary trauma to vessel intima.
7. Pull skin taut in opposite direction of the IV catheter and needle insertion over vessel but below insertion site.	Compresses peripheral nerves Facilitates smooth puncture of skin and there is less surface area contacting cutting edge of the needle Precise incisions heal faster than jagged cuts Better stabilization of the vessel
8. Insert IV catheter with needle at an approximately 25 degree angle for AVF and at a 45 degree angle for AVG. • With ultrasound, ensure probe is covered appropriately, ensure adequate gel at skin and use "ARROW" guide on probe for needling into skin. • Determine angle of needle insertion based on depth of vessel. • Look for needle tip in centre of vessel (looks like a bright star).	Steeper angels of insertion increase the risk of infiltrating the underside of the vessel. Deep AVFs may need to be cannulated at a steeper angle.
9. Release pressure (tourniquet) – if used.	Minimizes discomfort for the patient.

10. Assess for free-flowing blood return into integrated IV tubing of IV catheter set. • THREAD CATHETER into place. • Remove needle /stylet and leave catheter in place.	To check for needle position within the vessel and patency.
11. Secure catheter 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. **Note:** Can tape to anchor the catheter, use the butterfly technique to secure the wings of the needle. Slide a segment of tape under the wings of the catheter. Crisscross the tape over the wings. A segment of tape should then be applied over the wings, perpendicular to the patient's arm.	Prevents catheter dislodgement Pressing the catheter shaft flat against the skin moves the needle out of the desired position within the vessel and can reduce flow.
12. Secure and apply with sterile adhesive transparent dressing.	
13. Attach pre filled syringe with NS and flush AVF with approximately 10 mL to ensure patency.	
14. Remove NS syringe, attach IV tubing. Administer IV fluids, medication as ordered/required.	
15. Document in Cerner.	

Procedure – Removal of IV catheter from AVF / AVG

Equipment & Supplies:

- Non-sterile gloves
- Mask
- Eye protection (i.e. goggles)
- Sterile 4x4
- Tegaderm™ - small 3M1624 OR other sterile adhesive dressing

Steps	Rationale
1. Perform hand hygiene and put on mask, eye protection and non-sterile gloves.	

2. Ensure IV fluids, medication infusion is complete. Clamp off IV tubing and on IV catheter.	
3. Detach IV tubing and attach PF syringe with NS and flush AVF with 10 mL of NS.	To maintain patency.
4. Remove adhesive dressing and proceed to pull out IV catheter from AVF / AVG in one motion. Have folded 4x4 gauze ready to apply manual pressure once catheter removed.	Ensure catheter is removed with full length INTACT.
5. Apply manual pressure with gauze for 5 to 10 minutes to ensure hemostasis at site.	
6. Secure and cover gauze with sterile adhesive dressing (i.e. Tegaderm™) to secure – keep on for 24 hours. Can remove after 24 hours. Keep surrounding skin area clean and healthy – consider use of skin barrier to protect skin (i.e. Cavilon™ or SkinPrep™).	
7. Document in Cerner.	

Documentation for Insertion and Removal of Catheter:

In CERNER:

1. iView > Adult Lines - Devices > Arteriovenous Fistula / Graft
2. ADD: new Dynamic Group **ON INSERTION ONLY, this should happen only once.
    - Make sure of the correct: Site > Type > Laterality
    - For routine care and maintenance daily or subsequent admission, ensure you are using the correct Dynamic Group.
3. Activity: OTHER >> Type free-text: “Accessed for IV Infusion”
4. Patency: Palpable thrill, Audible bruit
5. Site condition: No complications
6. Anesthetic: Lidocaine (or EMLA, whichever is applicable)
7. Cannulation type: Single needle
8. Needle type: OTHER >> PIVC Nexiva #20 g 1”
9. Venous gauge: 22 or 20 x length (1” or 1.25” or 1.75”)
10. Problems with Needle Insertion: Ultrasound used (*if applicable)
11. Dressing condition: Dry, Intact
12. Fistula / Graft Care / Action: OTHER

(Free Text) "**Access** for infusion" OR "**De-access**, catheter removed INTACT"

13. Document any problems with the needle placement: OTHER as above

III. Care and maintenance - IV infusion through cannulated AVF / AVG

Ongoing assessment during IV infusion:

1. Flush IV catheter with minimum 10mL NS before hooking up to IV infusion.
2. Ensure catheter is secured under adhesive dressing. Keep dressing dry and intact.
3. Ensure secure and closed connections with access device (IV catheter) and IV tubing (infusion pump).
4. Keep IV tubing from kinking or pulling from patient or pump.
5. Monitor patient for pain, discomfort (hot or cold sensation), tingling or site swelling (infiltration).
6. If blood is noted in the IV tubing closest to patient, access the lowest port of IV tubing to flush out with minimum 10 mL NS. This may occur due to kinking of the tubing or the infusion rate is too low to keep the AVF from backing up with blood.
7. Do not take blood pressure, do bloodwork, or insert an IV on limb (arm or leg) where the AVF / AVG is located.
8. Avoid keeping AVF / AVG limb bent for long periods.
9. With lower limb AVF / AVG, limit ambulation and try to keep patient in bed or stretcher as much as possible for duration of infusion to prevent thrombosis/DVT.

Documentation for IV infusion (if any issues during infusions):

In CERNER:

1. iView > Adult Lines - Devices > Arteriovenous Fistula / Graft
2. Ensure correct Dynamic Group
3. Activity: "Assessment" or "OTHER" >> Type free-text: Complication (*or whatever the issue is)
4. Site condition: **was it a site issue? Bleeding? Pain?
5. Dressing condition: *8was it a dressing issue? Dressing came off?
6. Fistula / Graft Care / Action: OTHER **free text issue
7. Document any problems: OTHER as above

Patient and Family Education:

Provide information to patient – assess need for interpreter.

Instruct patient to:

8. Wash the AVF / AVG area with soap and water daily using gentle friction to not cause skin breakdown.
9. Not pick scabs near or on the AVF / AVG.

10. Not wear tight fitting clothing or wear watchbands around the access limb.
11. Not carry purses or shopping bags over the access area.
12. Avoid keeping AVF / AVG limb bent for long periods.
13. Avoid heavy lifting with access arm.
14. Not allow anyone to take the blood pressure, bloodwork, or insert an IV on limb (arm or leg) where the AVF / AVG is located.
15. Always protect AVF / AVG when participating in sports.
16. Remove the dressings from access site no sooner than 6 hours after catheter is removed. Leave the dressings on until the next morning, if possible.

Related Documents and Resources:

1. B-00-11-10191 - Hand Hygiene Policy
2. B-00-07-13026 – Gloves – Infection Control
3. B-00-07-13027 – Face Protection: Masks, Goggles and Face Shields – Infection Control
4. B-00-07-13033 – Gowns and Protective Apparel
5. B-00-07-13038 – Spills: Blood and Body Fluids
6. Occupational Health and Safety – Cytotoxic and Hazardous Drugs - Handling

References:

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2. American Nephrology Nurses Association (2017*). Contemporary Nephrology Nursing: Principles and Practice.* A. J. Janetti Inc.; Pitman, NJ.
3. Canadian Association of Nephrology Nurses and Technicians (2015). Nursing recommendations for the management of vascular access in adult hemodialysis patients. CANNT Journal Volume 25, Supplemental 1.
4. Daugirdas, J., Blake, P., and Ing, T. (Eds). (2014). *Handbook of Dialysis. Fifth Edition.* Lippincott, Williams, & Wilkins: New York, NY.
5. Williams, J. (2018). Rope ladder cannulation of AV fistula and grafts. *Vascular Access Guidelines*. BC Provincial Vascular Access Service Team.

Persons/Groups Consulted:

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First Released Date:	07-SEP-2021
Posted Date:	25-APR-2022
Last Revised:	25-APR-2022
Last Reviewed:	25-APR-2022
Approved By:	PHC
	Professional Practice Standards Committee
Owners:	PHC
	Parenteral Therapy/IV Therapy