

Entity	University of Minnesota Medical Center, Fairview University of Minnesota Amplatz Children's Hospital
Department	Laboratory/Nursing
Laboratory	Acute Care
Section	Collection
Category	Provision of Care

Subject	BLOOD COLLECTION FROM VASCULAR ACCESS DEVICE (VAD)
----------------	---

Purpose Ensure consistent technique to prevent infection, air embolism, catheter occlusion, or damage to the VAD.

Policy Vascular access devices provide long-term or short-term access for collection of blood specimens without the necessity for multiple venipunctures. Manipulation of the vascular access device requires strict adherence to protocol to ensure asepsis and prevent damage to the device, and to be able to recognize signs of potential complications and take appropriate action. Only specifically trained personnel may perform specimen collection from these devices. See [VAD P & P](#)

Procedure: 1. Identify the Patient

All patients must be positively identified before the specimen collection is performed.

a. For inpatients, the patient's ID band must exactly match the full name and identification number on the request forms and/or specimen label or a match must be performed using barcode technology.

b. For outpatients, ask the patient to state his or her full name and birthdate.

2. Identify the Catheter and Medications Infusing

a. Blood collection from a 10 french or larger size catheter (for example: Quinton/Davol) will be identified and performed by nursing personnel on all inpatients.

b. Dialysis catheters may not be accessed and used for blood sampling without a signed order from a nephrologist including which lumen to use. *If there is an order to use the dialysis catheter, blood collection will be performed by nursing personnel.*

c. Blood collected from lines locked with greater than or equal to 1000 unit/mL heparin will be identified and performed by nursing personnel.

d. Blood collection from a pressure monitor lumen will be performed by nursing personnel.

e. Blood collection from arterial lines will be performed by nursing personnel.

f. *Blood collections involving infusions of: Flolan® (epoprostenol), nipride, dobutamine, dopamine, epinephrine, nitroglycerin, Primacor® (milrinone), Remodulin® (treprostinil) and lidocaine will be identified and performed by nursing personnel.*

- Do not stop infusion of Flolan® (epoprostenol). Collection by venipuncture recommended.*

g. *Blood collections involving narcotic drips on patients less than 15 kilograms will be identified and performed by nursing personnel.*

h. Nursing personnel will evaluate all infusions before identifying collection as a laboratory collection.

- i. Evaluate infusing solutions for appropriateness of **collection from the lumen** and VAD:
 - Do not collect cyclosporine or tacrolimus levels from lumens used to infuse **these medications**.
 - Do not collect glucose from a lumen infusing a high concentration of glucose.
 - Avoid saline flushes if amphotericin B is infusing. (Abelcet, Ambisome, Liposomal Amphotericin)
 - Avoid saline and heparin flushes if synercid is infusing. (Orange alert stickers may be present.)
 - Avoid saline flushes if GCSF (Filgrastim) is infusing.
 - Avoid lumens previously flushed with or running heparin, lepirudin, hirudin or Argatroban if collecting coagulation testing.
 - Avoid lumens previously flushed with citrate if collecting chemistry testing (calcium, ionized calcium, pH, glucose).
 - Avoid lumens used for hyperalimentation (TPN, Lipids) to decrease infection and contaminated specimen risk.
 - If patient is receiving blood products, wait a minimum of five minutes after the infusion is completed before collecting the specimen.
 - Avoid lumen used to administer drug if collection sample to determine that drug level (aminoglycosides, Vancomycin for example)
 - Avoid lumens used to administer cytotoxic medication
 - **If there is any question regarding solutions infusing, consult the patient's RN before proceeding.**
3. Identify the Blood Drawing Lumen
 - a. 1st Option: Lumen with IV infusion and stopcock in place
 A 3-way stopcock is used when a patient has a continuous IV infusion and requires multiple blood collections. The stopcock allows for the IV to remain closed during the blood collection procedure, thus decreasing the risk of infection. A stopcock should be placed and used for the rare collection necessary from a lumen with a cytotoxic medication infusion to reduce potential employee exposure.
 - b. 2nd Option: Dormant Port
 - 1) Add on device (e.g. MicroCLAVE®) should be present for specimen collection through a dormant port. Do not remove the add on device and attach the syringe or adapter directly to the lumen's hub.
 - 2) For inpatients, refer to the physician orders, Venous Access Record (VAR), Electronic Medical Record or policy [Use of Normal Saline for flushing Vascular Access Devices \(VAD\)](#) for flushing solution dosage.
 - 3) For outpatients, refer to [Outpatient Protocol](#) for flushing solution guidelines.
 - 4) Dialysis catheters may be heparin locked with 1000 unit/mL of heparin. This therapeutic dose should not be injected into the patient prior to blood collection. If utilizing the mixing (push/pull) method or a pre-flush, always withdraw 3 mL of heparin prior to start of procedure.
 - c. 3rd Option: Port with IV infusion directly attached (no stopcock)
 - 1) After stopping the IV infusion and before disconnecting, vigorously scrub the IV tubing junction for 15 seconds with an alcohol wipe and allow to air dry. Carefully disconnect the IV tubing from the add on device and maintain IV tubing sterility. *The exposed end of the IV tubing must be capped to maintain sterility.* If sterility of the IV tubing is compromised it must be changed. Do not attempt to clean the IV tubing male luer end. **Avoid placing disconnected IV on bedding during collection.**

- 2) Vigorously scrub the add on device for 15 seconds with a new alcohol wipe maintaining sterility and allow to air dry.
- 3) Proceed with the specimen collection.
- 4) After infusing the normal saline post-flush, vigorously scrub the add on device for 15 seconds with a new alcohol wipe while maintaining sterility, allow to air dry and then reconnect.

NOTE: Nursing staff are encouraged to place a stopcock to the last available port any time they are connecting an IV and anticipate multiple blood collections.

4. Assemble Supplies– Recommend working on a clean surface.

- Gloves (non-sterile)
- Clean paper towel for work surface
- Alcohol prep pads
- Add on device, MicroCLAVE® (only necessary if replacement needed)
- Blood tubes (checked against specimen collection requirements)
- Evacuated tube holder/adaptor
- Normal Saline (NS) flushes
- Protective tip or cap if needed for disconnected IV.
- 10 mL luer lock syringe without needle (use 10 mL syringes or syringes with a diameter comparable to a 10 mL syringe to minimize pressure on the catheter)
- Multi-sample transfer set if required
- Appropriate flushing solution per protocol

5. Perform Hand Hygiene and Put on Gloves

CAUTION: Always wear gloves and observe Standard Precautions when collecting biological specimens.

6. Shut Off IV Infusion(s) to All Lumens After Proper Evaluation

All infusions except Flolan must be stopped prior to blood collection to prevent dilution/contamination by these fluids.

- a. Lab Personnel: If the IV infusion is being gravity fed and catheter clamps are not available, stop the flow by clamping the IV tubing with a rubber-shod forceps. *Do not use flow-modulating (roller) clamp attached to IV tubing to shut off the IV.*
- b. **Before stopping any pump, assess status of IV solutions and number of pumps programmed so all infusions are restarted appropriately.** If the IV infusion is regulated by an automatic pump, stop the pump as follows:

Type of Pump	Directions to Stop Pump
Sigma Spectrum	Press “stop” to stop infusing pump.
Syringe Infusion	Do not stop (because of slow rate of infusion).

7. Prepare the Lumen

- a. Clamp all lumen(s). Use attached clamps or rubber tipped Kelly. Exception: Do not directly clamp the valved catheters (Groshong or PASV) – use of an extension set with slide clamp is recommended. Otherwise clamp the IV tubing.
- b. If a stopcock is present, turn stopcock to position that occludes all openings.
- c. Vigorously scrub exterior of add on device for 15 seconds with alcohol wipe, maintaining sterility and allow to air dry.

Attach syringe to port.

- 1) **Before any pre-flush or mixing (push/pull) method, heparin lock solutions should be aspirated if possible to minimize the amount of heparin received by the patient.**
 2. **If therapeutic heparin dosing contamination is a possibility and the collection includes coagulation testing a venipuncture should be the first choice collection method. If this is not possible, use a 20 mL saline pre-flush. Withdraw a minimum of 5 mL blood and fluid to comply with Clinical & Laboratory Standards Institute (CLSI) guidelines in step e. below. Consult with nurse on patients less than 15 kilograms.**
 - 3) **If TPN or lipid contamination is a possibility, and the collection includes chemistry and hematology testing, flush the line with a dose of 5 mL saline and withdraw a minimum of 5 mL blood and fluid in step e below.**
 - 4) **If dormant port heparin contamination is a possibility and the collection includes coagulation testing a venipuncture should be considered. If this is not possible, aspirate the dormant port heparin, flush with 20 mL saline, and withdraw a minimum of 5 mL blood and fluid in step e below.**
 - 5) **If collecting from a heparin locked dialysis catheter (Quinton/Davol), aspirate 3 mL waste and discard. These catheters are often locked with 1000 unit/mL heparin that should not be injected into the patient.**
 - 6) **For the rare collection necessary from a lumen with cytotoxic medication, preflush with 5 mL normal saline to reduce potential employee exposure.**
- d. Open stopcock or unclamp as needed to syringe and lumen.
- e. Withdraw 3-5 mL of fluid and blood from the lumen. If the line does not draw easily, reposition the patient, (or ask patient to take deep breath or cough) and reattempt to withdraw. If the line still does not draw easily, flush the line with an initial dose of 5-10 mL saline to reposition the line in vivo and withdraw 3-5 mL of fluid and blood from the lumen.
- f. Turn stopcock to position that occludes all openings or place clamp as appropriate. Remove syringe and discard into biohazardous disposal container. Exception: For patients requiring minimal blood loss, personnel can use the mixing (push/pull) method. The discard-reinfusion method is patient care unit specific.
8. Collect the Specimen
- a. Using an evacuated (Vacutainer) system:
 - 1) Attach the evacuated tube holder/adaptor to add on device. Maintain sterility of adapter.
 - 2) Open stopcock or unclamp as needed to evacuated tube adapter and lumen.
 - 3) Insert sampling tube(s) into evacuated tube holder and fill to desired level of blood volume.
 - 4) Perform collection in recommended order. Refer to "Order of Collection" table in step 9.
 - 5) Turn stopcock to occlude all openings or clamp as appropriate before tube holder removal.
 - b. Using a syringe system when collecting non-vacuum tubes:
 - 1) Attach syringe to add on device. Maintain sterility.
 - 2) Open stopcock or unclamp.

- 3) Fill syringe to desired blood volume.
- 4) Turn stopcock to occlude all openings or clamp as appropriate before syringe removal.
- 5) Refer to “Order of Collection” table in step 9 and transfer the specimen to the collection tube(s) using one of the following methods:
 - Attach the syringe to a multi-sample transfer set. Insert the blood culture/collection tube(s), allow the vacuum to fill, and gently invert tube(s) 5-10 times. Do not fill the tube by injecting the needle through the stopper.
 - Remove plastic cap on microtainer tubes and slowly expel the blood down the side of the tube. Securely replace cap and gently invert tubes 5-10 times.

c. Using the mixing (push/pull) method

Use mixing method if requested by RN or if the patient requires minimal blood loss. Caution: Do not use the mixing method if the line has a sluggish blood return or any other signs of partial withdrawal occlusion exist.

- 1) Attach a 10 mL syringe to add on device. Open stopcock or unclamp. Withdraw and reinfuse 6 mL for adult or 4 mL for pediatric patients a total of 4 times. It is important to completely empty the syringe each time. Example:

Pediatric	withdraw 4 mL	reinfuse 4 mL	Adult	withdraw 6 mL	reinfuse 6 mL
	withdraw 4 mL	reinfuse 4 mL		withdraw 6 mL	reinfuse 6 mL
	withdraw 4 mL	reinfuse 4 mL		withdraw 6 mL	reinfuse 6 mL
	withdraw 4 mL	reinfuse 4 mL		withdraw 6 mL	reinfuse 6 mL

- 2) If the line does not draw easily, reposition the patient (or ask patient to take a deep breath or cough) and reattempt to withdraw/infuse. If the line still does not draw easily, flush the line with an initial dose of 5-10 mL saline to reposition the line in vivo and re-attempt the mixing technique.
- 3) Close stopcock or clamp as appropriate.
- 4) Detach empty syringe and attach evacuated system or syringe. Complete collection.

d. Using the discard re-infusion method

For neonates see patient care unit specific policy.

9. Recommended Order of Tube Collection

- a. Fill collection tubes in recommended order to prevent false results, e.g., contamination with another tube’s additive, or activation of clotting process prior to fill.
- b. Invert tubes containing additive 5-10 times to mix.
- c. The following order of draw is recommended for both evacuate tubes and syringe transfer of blood to multiple tubes.

ORDER OF COLLECTION		
1 st	Blood, Fungal, AFB Culture	Aerobic, anaerobic or mycobacterial 13A bottles, or Yellow/black fungal culture tube
2 nd	Coagulation	Light blue (3.2% buffered citrate) tube
3 rd	ESR	Black tube for EST at some sites
4 th	Serum	Red/black or gold (gel) tube, Red (plain) tube
5 th	Heparin	Green (Na heparin) tube Green (Li heparin) tube
6 th	EDTA	Purple (EDTA) tube
7 th	NaF	Gray (NaF + K-Oxalate) tube
8 th	ACD	Yellow (ACD, Solution A or B) tube
9 th	Blood Gas	Dry heparin syringe
10 th	Trace Metal	Dark blue (nonadditive or EDTA) tube

10. Clear the Lumen

- a. The post-flush will clear the catheter of blood, helping to prevent cells from adhering to the inner surface of the catheter and clotting, which could lead to catheter occlusions.
 - Attach syringe containing normal saline post-flush to add on device. Refer to the physician orders, the Venous Access Record, Electronic Medical Record, [Use of Normal Saline for flushing Vascular Access Devices \(VAD\)](#), or Outpatient Laboratory Standing Orders for amount of normal saline flush solution to be administered.
 - Open stopcock or unclamp as necessary to syringe and lumen. Flush the lumen with normal saline using a push pause technique. Do not “bottom out” saline syringe.
 - Using positive pressure at the end of the flush, turn stopcock to position that occludes all openings or clamp as appropriate. Remove the nearly empty syringe.
- b. Administer heparin, citrate, or normal saline if dormant port was used.
 - Attach syringe containing appropriate locking solution. Refer to the physician orders, the Venous Access Record, Electronic Medical Record, or Outpatient Laboratory Standing Orders for the locking solution and amount to be administered.
 - Unclamp catheter clamp of dormant port as appropriate.
 - Inject the locking solution and maintain positive pressure during the clamping step below. Do not “bottom out” syringe.
 - Reclamp catheter of dormant port as appropriate.
 - Remove nearly empty syringe and discard.
 - Clean add on device with alcohol wipe.

11. Add on Device Replacement

- a. Replace as needed.
- b. Add on device replacement protocol:
 - Prime the new add on device with saline while inverting to expel air and maintaining sterility.
 - Swing stopcock arm off to add on device being replaced or confirm that clamp is placed on dormant port (exception: valved catheters).
 - Vigorously scrub junction of add on device and catheter hub or stopcock for 15 seconds with a new alcohol wipe and allow to air dry.
 - Remove add on device. Vigorously scrub port or stopcock opening with new alcohol wipe for 15 seconds, maintaining sterility and allow to air dry.
 - Replace add on device, maintaining sterility.

12. Restart IV Infusion(s)

- a. Open the stopcock to IV and lumen.
- b. Unclamp any non-dormant lumen(s) that were clamped for blood collection procedure.
- c. If the IV infusion is being gravity fed, restart the flow by unclamping the IV tubing.
- d. If the IV infusion is regulated by an automatic pump, restart all infusing pumps as follows:

Type of Pump	Directions to Restart Pump
Sigma Spectrum Pump	Press "RUN". Press "Yes" after assessing clamps, kinks, drops.

13. Label the Specimen Containers
Apply the labels to the containers at the bedside. Check the name on each label to verify again that the name on the label matches the patient's name. Record initials and time or tech I.D. on the labels.
14. Handle Blood According to Specimen Requirements
Handle blood specimens according to specimen requirement, e.g. place specimen tube on ice, at 37°C, or protect from light as needed. Remove air from blood gas syringe.
15. Prepare the Specimen Containers for Transport to the Lab
Transport the labeled blood specimen containers to the laboratory using a sealed specimen transport bag.
16. Record Flushing and Locking Solution Administration
For inpatients, record flushing and locking solution administration on patient's Venous Access Record (VAR) or in the Electronic Medical Record.
For outpatients, record flushing and locking solution administration per outpatient protocol.
17. Recognize the Signs of Potential Complications
Notify nurse immediately if signs of potential complications are encountered. For signs of potential complications with central venous access devices, please see [Table 7, complications](#).

Quality Assurance: Any technique deviating from the outlined procedure must be brought to the attention of the laboratory and nursing leadership for approval.

Examples of Devices: For examples of VAD devices, please see [Examples of Devices](#).

- Supplies:
1. Syringe, 10 mL, sterile leur lock, w/o needle I-Manage #003383
 2. Syringe tip, I-Manage #194360
 3. Add on Device, MicroCLAVE® I-Manage # 801003
 4. 10 mL – 0.9% sodium chloride single-use flush syringe, I-Manage #170678. Store at room temperature. Stable unopened until expiration date on label.
 5. 5 mL – 0.9% sodium chloride single-use flush syringe, I-Manage #170676. Store at room temperature. Stable unopened until expiration date on label.
 6. Heparin, 10 and 100 unit/mL, single-use 5 mL syringe, Pharmacy. Store at room temperature. Stable unopened until expiration date on label.
 7. Heparin, 1000 unit/mL, Pharmacy. Store at room temperature. Stable unopened until expiration date on label. Vial stable for 30 days at room temperature after opening. Label vial with date opened. Located with patient's medications.
 8. Citrate Phosphate Dextrose (possibly ordered on patients with heparin intolerance), Pharmacy. Store at 2-8°C. Located with patient's medications. Stable for 24 hours after

opening. Follow VAR or Electronic Medical Record for directions. Label vial with date opened.

- References:
1. Cardinal, Pierre, et al: The effect of sodium citrate in arterial catheters on acid-base and electrolyte measurements. Critical Care Medicine, Official Journal of the Society of Critical Care Medicine 2000; 28:1388-1392.
 2. Hinds, Pamela et al: Comparing the results of coagulation tests on blood drawn by venipuncture and through heparinized tunneled venous access devices in pediatric patients with cancer. Oncology Nursing Forum 2002; 29.3.
 3. Olson, John et al: College of American Pathologists conference XXXI on laboratory monitoring of anticoagulant therapy. Archives of Pathology and Laboratory Medicine 1998; 122: 782-798
 4. SM Nettina. Ed, Lippincott Manual of Nursing Practice. Philadelphia: Lippincott, 1996:59-60.
 5. CLSI. Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard – Sixth Edition. CLSI document H3-A6 Wayne, PA: Clinical and Laboratory Standard Institute, 2007.
 6. NCCLS. Collection, Transport, and Processing of Blood Specimens for Testing Plasma-Based Coagulation Assays; Approved Guideline –Fourth Edition. NCCLS document H21-A4 [ISBN 1-56238-521-6]. NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087-1898 USA, 2003.
 7. NCCLS. Control of Preanalytical Variation in Trace Element Determinations; Approved Guideline. NCCLS document C36-A (ISBN 1/56238-332-9). NCCLS, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania 19087 USA, 1997.
 8. Policies and Procedures for Infusion Nursing, 3rd Edition. Infusion Nursing Society, 2006.
 9. VAD P&P, Fairview System Policy Code S:PC-2103, 2008.

File Location	Acutecare\Web_Intranet\Collection\EPC4200_vad	
Original Date	3/91	Original Author(s): J Gillen
Reviewed	8/04; 11/04; 1/08; 9/08; 11/08, 11/09, 11/10, 1/11, 11/11	Last Reviewed/Approved by: N Young-Dixon, M Petty
Revised	8/00, 4/02, 11/03, 9/05; 2/06; 5/06, 1/07, 9/08, 11/08, 1/11, 11/11	Last Revised/Approved by: N Young-Dixon, M Petty, Nursing Practice Council
Medical Director Approval	10/03, 12/10, 1/11, 12/11	John Eckfeldt
Effective Date	12/23/11	