



## *Nursing Professional Development*

---

# *Central Venous Access Device (CVAD) Access, Care and Maintenance*

## *Resource Manual*

*Quality, Patient Safety & Interprofessional Practice  
April 2019*

---



*Together...supporting quality care*



## Table of Contents

Certification Criteria .....	2
Introduction .....	3
Anatomy: Types of CVADs and Insertion Sites.....	4
Tunneled.....	5
Port-a-Caths.....	5
Non-tunneled .....	6
Peripherally Inserted (PICCs).....	7
Access and Care of CVADs:	
Guidelines .....	8
Daily Assessments .....	8
Procedures:	
Accessing a CVAD: Initiating an IV Infusion/Flushing.....	9
Drawing Blood Samples.....	10
Dressing and Cap Change .....	11
Accessing an Implanted Port .....	12
Potential Complications and Interventions .....	14
References.....	15
Appendix A Certification Checklists.....	16
Appendix B CVAD Access, Care and Maintenance Certification Test.....	19

## Certification Criteria

Registered Nurses at Quinte Healthcare Corporation (QHC) will be certified to access and maintain percutaneous central catheters and peripherally inserted central catheters (PICC's) once they have completed the following:

1. Attendance at a theory session focused on Central Venous Access Device (CVAD) access and maintenance.
2. Achieve a minimum of 80% on the Central Venous Access Device Access, Care and Maintenance certification test (Appendix B).
3. Supervision by a certified nurse who has achieved and maintained competence in this skill.
4. Completion of the skills checklist for each supervised attempt. (Appendix A).

## Continuing Competence

It is strongly recommended that certified nurses review all skills related to the care and maintenance of central lines on an ongoing basis to ensure continued competence. If at any time the nurse feels additional review/retraining is required, it is the responsibility of that nurse to seek additional education/resources from the manager, or clinical educator/delegate to ensure continued competence related to CVAD care and maintenance. Nurses are professionally responsible for ensuring that they have the requisite knowledge, skill and judgment necessary to provide safe and effective infusion therapy (CNO, 2002).

---

## Introduction

What is a Central Venous Access Device (CVAD)?

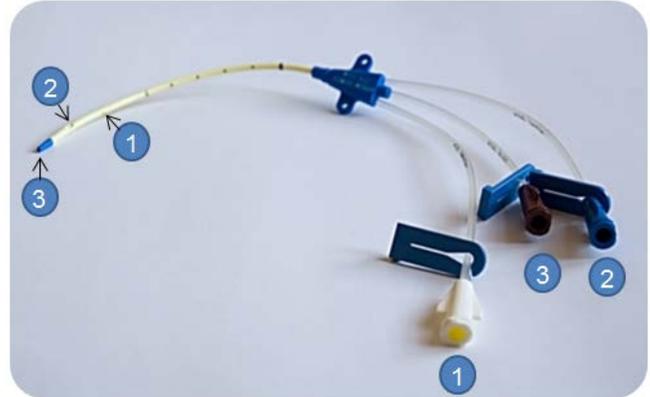
1. A central venous catheter that is inserted **centrally** through the subclavian, internal jugular, or femoral vein, or **peripherally** through the basilic or cephalic vein (peripherally inserted central catheter: PICC).
2. Central Lines may be **tunneled** or **non-tunneled**, which refers to how the line is inserted.
3. A **tunneled** catheter is one in which a tunnel is made surgically through the subcutaneous tissue, then the catheter is inserted through the tunnel and into the vein. They have a Dacron cuff which the skin adheres to and heals over to provide a seal, decreasing the risk of infection. A portion of the catheter extends out of the skin. Port-a-caths are surgically inserted and the device is entirely below the skin, allowing patients to swim and bathe without risk of infection. Tunneled catheters are normally placed when longer-term therapy is required.
4. **Access** and **maintenance** of tunneled central catheters and port-a-caths are within the scope of practice for certified nurses at QHC. However, due to the fact that tunneled catheters and port-a-caths are surgically inserted, nurses do not remove them.
5. **Non-tunneled** catheters are generally used for shorter term and/or emergency treatment. They are inserted directly into the vein and threaded into the superior vena cava from the point of insertion, including PICC lines, femoral, external and internal jugular and subclavian central lines. A venous introducer sheath (Cordis) is a large bore single lumen central line usually placed in the internal jugular vein. At QHC a Cordis is most commonly utilized as a sheath to introduce a transvenous pacer wire. A Cordis can also be used for introduction of a pulmonary artery catheter, and can be used as a large bore central line in trauma patients for rapid large volume fluid infusion.
6. **Access, maintenance** and **removal** of non-tunneled central catheters and PICCs are within the scope of practice for certified nurses at QHC.
7. For **all** central catheters, the distal end of the catheter is positioned in the lower one third of the superior vena cava, except a femoral central catheter whose tip is advanced into the inferior vena cava.

## Anatomy: Types of CVADS and Insertion Sites

### LUMENS

CVADs may be single lumen or they may have multiple lumens. Multiple lumen catheters are labeled and color coded to indicate where they exit at the end of the catheter as follows:

1. **Proximal** (White port) - first opening on the catheter tip, closest to the hub
2. **Medial** (Blue port) - middle opening on the catheter tip
3. **Distal** (Brown port) - opening at the very end of the catheter (ideal for CVP monitoring and blood draws)



Each lumen will allow for separate infusions at the same time.



Single-Lumen



Double-Lumen



Triple-Lumen

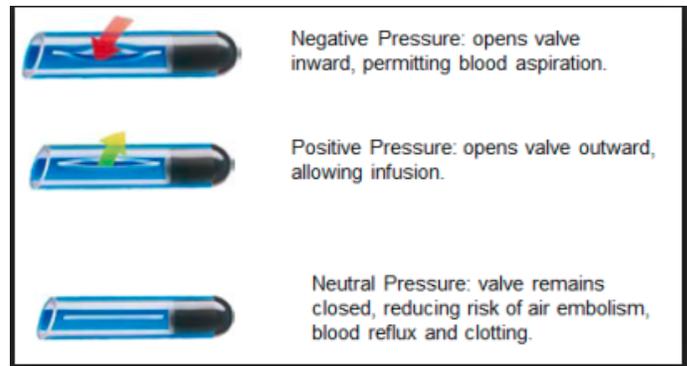
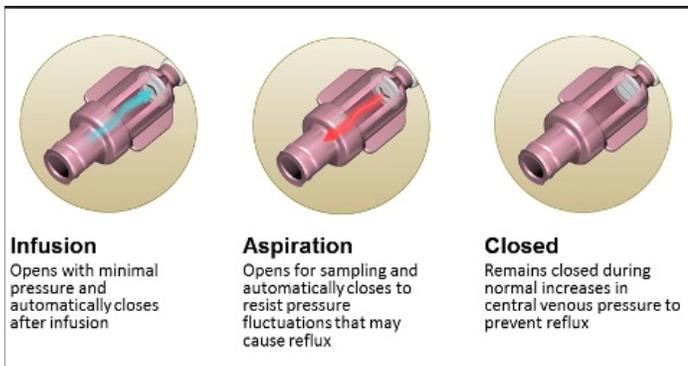
### VALVED or NON-VALVED

CVAD catheters may be valved or non-valved.

**Valved CVADs** - Depending on the type, the valve may be located within the hub of the catheter (PAS-V valve) or at the tip of the catheter (Groshong valve).

PAS-V – valve in hub

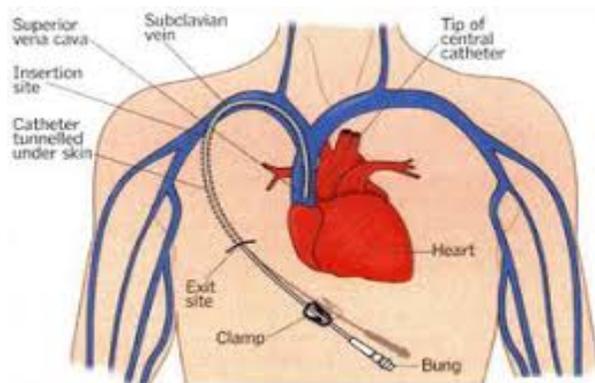
Groshong – valve in distal tip



### Non-Valved CVADs

**Non-valved catheters must be clamped at all times when not in use to prevent reflux of blood into catheter.** Never cut the clamps off of a CVAD. A set of Kelly forceps must be kept at the bedside of patients with an internal jugular (IJ), subclavian or femoral CVAD in case of accidental line breakage to prevent hemorrhage.

## Tunneled CVADs

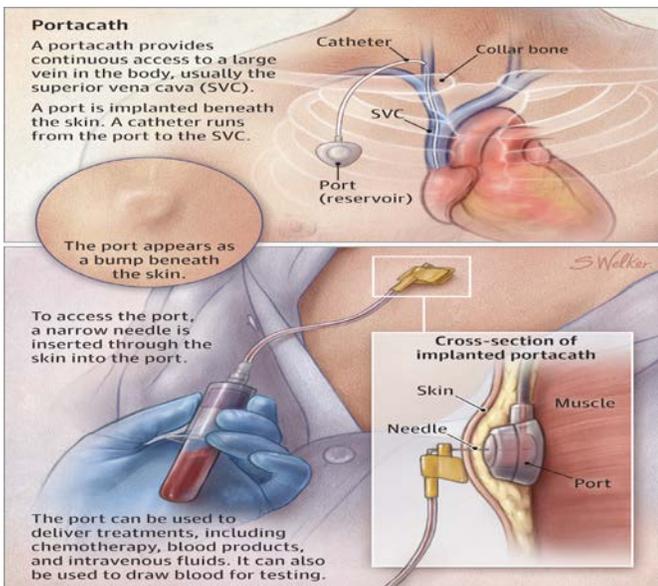


A tunneled central line is inserted through a short 6-8cm tunnel made surgically into the subcutaneous tissue, through which the catheter is inserted and advanced to the entrance of the subclavian or jugular vein. From there, the catheter tip is advanced until it sits in the lower 1/3 of the superior vena cava. Tunneled CVADs may be single, double or triple lumen and may be valved or non-valved. Tunneled CVADs have an antimicrobial dacron or collagen cuff located along the catheter sheath about 5 cm from the exit site. The skin heals around this cuff to stabilize the catheter and to provide a barrier to microorganisms entering the site. Once the cuff has healed into place, the sutures can be removed (at approximately 21 days post insertion) and at that time a dressing is no longer required.

## Implanted - Port-a-Caths

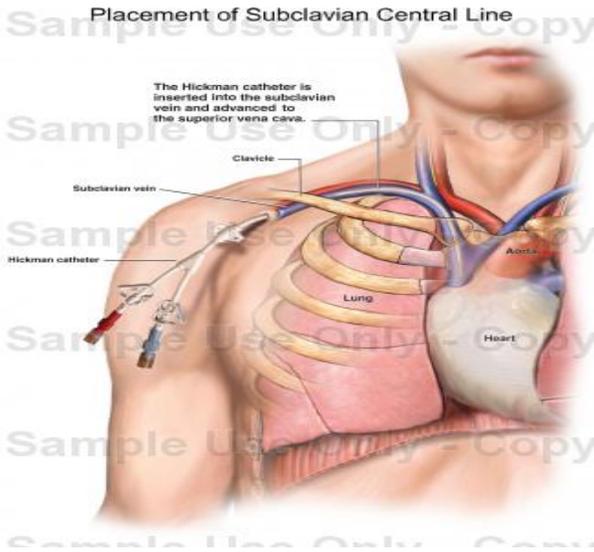


Ports can be single or double lumen (if double lumen, each port is accessed separately) and may be valved or non-valved. The self-sealing septum can generally withstand up to 2000 needle punctures (dependent upon manufacturer and needle gauge used). Implanted ports are inserted for intermittent long-term infusion therapies, including chemotherapy, TPN, transfusions and antibiotics. Port-a-Caths are surgically inserted into a subcutaneous pocket in the chest wall. The catheter is tunneled into the vein, usually the cephalic, external jugular or subclavian vein. A non-coring gripper needle is required to access a port-a-cath so the self-sealing septum is not damaged.



**Port-a-caths must be heparinized between uses to ensure occlusion of device does not occur.**

## Non-Tunneled CVADs



Non-tunneled central lines may be inserted **centrally** or **peripherally** (PICCs).

Non-tunneled **central** lines are inserted directly into a large central vein, either the jugular, subclavian or femoral vein. Sites for **peripherally** inserted central catheters (PICCs) include the basilic or cephalic veins in the forearm.

Regardless of whether the central line is placed via a central or peripheral insertion site, the tip of the catheter sits in the lower 1/3 of the superior vena cava. Centrally placed CVADs are indicated for acute care emergency treatment and short term therapies (usually less than 1 month), whereas peripherally placed CVADs are utilized for longer term intermittent therapies such as chemotherapy, long term antibiotics, TPN or recurring infusions of blood, IVIG or Iron, for example, or when a patient has poor peripheral site access during a hospitalization.

### Common Insertion Sites

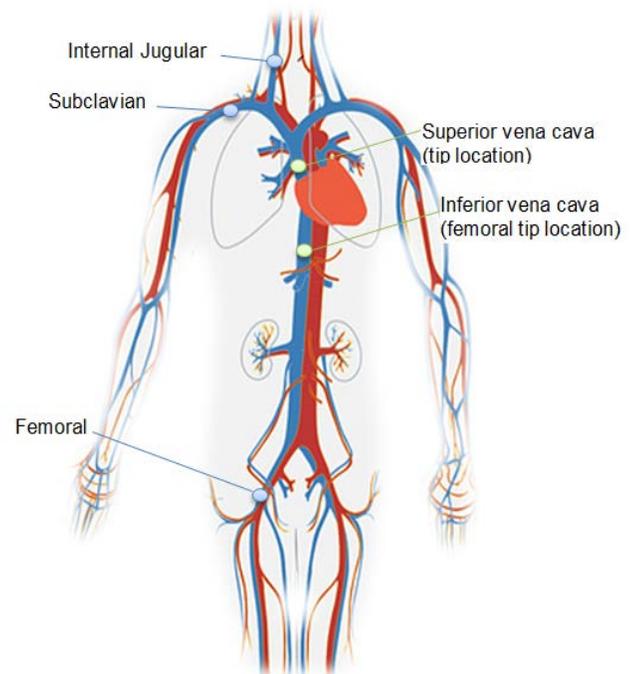
**External Jugular Vein:** On the side of the neck the external jugular is easily recognized. This vein connects to the subclavian vein along the center of the clavicle. If a venous sheath introducer (Cordis) has been placed in the Jugular vein for critically ill patients who require large volume fluid infusions or a transvenous pacer wire, the Cordis **must** have a continuous IV infusion maintained at all times.

***A Cordis must have a minimum of 30 mL/hr. running at all times and cannot be clamped off.***

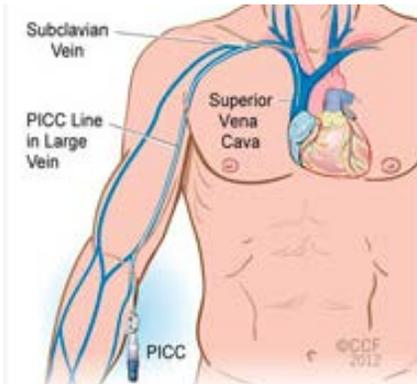
**Internal Jugular Vein:** The internal jugular vein initially descends behind and then to the outer side of the internal and common carotid arteries. It then joins the subclavian vein at the base of the neck.

**Subclavian Vein:** The subclavian vein is a continuation of the axillary vein and extends from the outer edge of the first rib to the inner end of the clavicle. Here it enters the inner jugular vein to form the innominate vein.

**Femoral Vein:** The femoral vein is a continuation of the popliteal vein upward toward the external iliac vein. Femoral central line tip will sit in the inferior vena cava. CVADs are sometimes inserted here when other options are limited or in emergency situations. It is a site that is at high risk for infection and mal-positioning or migration.



## Peripherally Inserted Central Catheter (PICC)



A PICC line is inserted for patients requiring alternate IV access and/or medium-term (longer than 7 days to several months) infusion therapies such as chemotherapy, antibiotics or TPN. PICC lines are inserted into the cephalic or basilica vein above the antecubital fossa. A PICC line is placed under fluoroscopy and therefore certified for use upon placement. PICC lines must be flushed regularly when not in use and following each access of the line to maintain patency. PICCs may be single, double or triple lumen. All lumens of the PICC should be turbulently flushed each time access or infusion is complete to ensure ongoing patency.

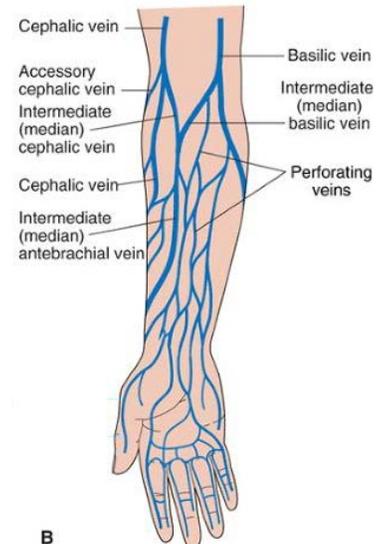
### Common Insertion Sites

PICCs are commonly placed at or above the antecubital space in the following veins:

**Cephalic vein:** The cephalic vein ascends along the outer edge of the biceps muscle to the upper aspect of the arm. It terminates in the axillary vein just below the clavicle.

**Basilic vein:** The basilic is larger than the cephalic vein. It passes up the arm in a straight path along the inner side of the biceps muscle. The basilic vein terminates in the axillary vein.

**Medial-cubital vein:** The medial cubital vein runs along the anterior surface of the arm and is often visible in the antecubital area. It creates interface between the cephalic and basilic veins and often forms a 'Y' with one branch going to the basilic vein (called the median cubital basilic) and the branch going to the cephalic vein (called the median cubital cephalic).



PICCs that are power injectable are clearly marked "power injectable" and have a maximum flow rate printed on the catheter lumen or hub itself. They can be power injected by a trained radiologic technologist, MD or RN. Power PICCs allow for the infusion of contrast dye under pressures that are greater than those of a normal IV infusion.



The PowerPICC line by BARD Access Systems.

---

## ACCESS AND CARE OF CVADs

### Guidelines

- To prevent central line infection, always use aseptic technique when accessing a CVAD
- A Kelly clamp should be kept at the bedside of all patients who have a jugular, subclavian or femoral central line.
- Never leave the catheter uncapped. Always apply a sterile cap.
- A Cordis (Venous Introducer Sheath) requires an infusion (minimum rate 30 mL/hr) at all times.
- Flushing each lumen of the central line with 20 mL NS following each access, medication administration and blood draw is vital to ensuring continued patency of the line
- All CVADs including PICCs not in use, must be flushed every 7 days. Always re-evaluate the need for a CVAD if not being used.
- The CVAD & infusion tubing must be securely taped to prevent catheter from migrating in or out.
- Applying a metal clamp (e.g. Kelley®) to a CVAD may cause damage, such as leaking or tearing of the catheter & should never be used outside of an emergency situation.
- Never use acetone or tape remover on or near the catheter; these can dissolve the catheter.
- Keep all sharp objects away from the catheter; no scissors or pins on or near the CVAD.
- Blood pressure measurements should be avoided on limbs with PICCs.

### Daily Assessments

When caring for a patient with a CVAD perform the following **assessments every shift**:

1. Assess insertion site: Inspect the site for bleeding, exudate, leakage, redness. Upper limbs should be compared for temperature and edema when PICCs are in place.
2. Assess catheter tubing: assess for migration, malposition, kinks, and cracks.
3. Assess dressing: inspect that the securement and dressing is dry and intact and the change due date is clearly visible.
4. Review for ongoing need or potential removal of the CVAD.

## Procedure

### Accessing a CVAD: Initiating an IV Infusion/Flushing a CVAD

Procedural Step	Rationale
1. Gather equipment <ul style="list-style-type: none"> <li>• Clean gloves</li> <li>• 70% alcohol swabs x 2</li> <li>• 10 mL sterile syringe</li> <li>• 10 mL NS pre-filled syringe x 2</li> </ul>	<ul style="list-style-type: none"> <li>• To prevent central line infection, proper aseptic technique must be used when accessing</li> <li>• 70% isopropyl alcohol is an effective cleaning agent with a dry time of 5-10 seconds during which killing of bacteria continues</li> </ul>
2. Perform hand hygiene before donning gloves	<ul style="list-style-type: none"> <li>• Hand hygiene is performed prior to donning PPE to reduce the number of microorganisms on the care providers skin that could potentially be transmitted to the central line during the procedure</li> </ul>
3. Confirm you have the correct patient by performing the 2 Patient Identifier process.	<ul style="list-style-type: none"> <li>• 2 Patient Identifier Process is a Required Organizational Procedure (ROP) and ensures the right care is provided to the right patient at the right time</li> </ul>
4. Explain procedure to the patient	<ul style="list-style-type: none"> <li>• Information provided reduces patient anxiety</li> </ul>
5. Cleanse the lock cap on the end of the central line by vigorously scrubbing cap with alcohol swabs for 10 seconds each and allow to dry	<ul style="list-style-type: none"> <li>• Scrubbing mechanism prevents microorganisms from being introduced into the line when accessing the line</li> </ul>
6. Attach 10 mL syringe, gently aspirate blood and discard syringe in biohazard container. If no blood return, begin troubleshooting for mechanical versus thrombotic occlusion. If not able to resolve occlusion, inform MRP.	<ul style="list-style-type: none"> <li>• Aspirate for blood return confirms patency of the central line</li> <li>• A non-patent central line should be unblocked as soon as possible and will require a physician's order to administer Cathflo (for thrombotic occlusion).</li> </ul>
7. Once patency has been established, flush central line with 20 mL NS using a pulsing technique	<ul style="list-style-type: none"> <li>• A pulsing technique creates a turbulent movement of solution through the catheter lumen to remove fibrin and other residue from the tip of the catheter</li> </ul>
8. Connect IV tubing. *If only accessing central line for blood draw, or when flushing post medication infusion, or if locking the central line after an IV infusion has been completed, use the 20 mL NS turbulent flush technique, untwisting and removing the syringe while injecting the last 1-2 cc of NS to create a positive pressure within the cap and close clamp on line	<ul style="list-style-type: none"> <li>• Positive pressure technique prevents the backflow of blood into the catheter and is important when central line is used intermittently or is not in use for periods of time to prevent thrombotic occlusion</li> <li>• Non-valved CVADs should be clamped with in-line clamp when not in use</li> </ul>
Document the following: <ul style="list-style-type: none"> <li>• Date and time infusion was initiated</li> <li>• Solution type, volume and rate</li> <li>• Which lumen was accessed (if multiple)</li> </ul>	<ul style="list-style-type: none"> <li>• Documentation provides an accurate and timely reflection of the care provided</li> </ul>

## Drawing Blood Samples from a CVAD

Procedural Step	Rationale
1. Gather equipment: <ul style="list-style-type: none"> <li>• Alcohol swabs x 2</li> <li>• 10 mL syringe</li> <li>• 10 mL NS pre-filled syringe x 2</li> <li>• Vacutainer adaptor for blood draws</li> <li>• Vacutainers</li> <li>• Clean gloves</li> </ul>	
2. Confirm you have the correct patient by performing the 2 patient identifier process	<ul style="list-style-type: none"> <li>• 2 Patient Identifier Process is a Required Organizational Procedure (ROP) and ensures the right care is provided to the right patient at the right time</li> </ul>
3. Explain procedure to patient	<ul style="list-style-type: none"> <li>• Providing information decreases patient anxiety</li> </ul>
4. Perform hand hygiene and don clean gloves	<ul style="list-style-type: none"> <li>• Adherence to infection control guidelines and the 4 moments of hand hygiene decreases risk of central line infection</li> </ul>
5. Stop IV infusion (if running) and disconnect from PICC line.	
6. Cleanse cap with alcohol swabs x 2 for 10 seconds each. Flush PICC line with 20 mL NS. Wait for at least one minute.	<ul style="list-style-type: none"> <li>• To prevent microorganisms from entering the central line</li> <li>• Lab results will be inaccurate if hemodilution of the sample occurs</li> </ul>
7. Attach vacutainer adaptor. Obtain a 5 mL volume of blood using syringe or clear discard vacutainer and discard in biohazard container	<ul style="list-style-type: none"> <li>• Blood aspiration confirms central line patency. A waste of 5 mL is required to ensure lab results are accurate</li> </ul>
8. Obtain blood samples being sure to tilt the vacutainer slightly during filling. Fill vacutainers according to the correct order of draw	<ul style="list-style-type: none"> <li>• Blood enters vacutainer too quickly or shoots directly into the vial causes hemolysis of the sample</li> <li>• <b>Order of draw for accurate lab results</b></li> </ul>
9. Detach vacutainer adaptor and wipe away any blood remaining on the cap with an alcohol swab.	
10. Flush all lumens of central line with 20 mL NS using a pulsing, turbulent flush. Resume IV infusion. If IV infusion is no longer required, be sure to use positive pressure technique to lock central line	<ul style="list-style-type: none"> <li>• Turbulent 20 mL NS flush per each lumen of central line is required following all access/medication administration/blood withdrawals to ensure continued patency of the line</li> </ul>
11. Label blood samples at the bedside confirming correct 2 patient identifiers	<ul style="list-style-type: none"> <li>• Labeling of specimens at the bedside is a ROP and QHC Policy for Specimen Handling.</li> </ul>
Document the following: <ul style="list-style-type: none"> <li>• Specimen(s) collected</li> <li>• Flushing and patency of lumens</li> <li>• IV infusion restarted</li> </ul>	

### Dressing and Cap Change

Procedural Step	Rationale
1. Gather equipment: <ul style="list-style-type: none"> <li>• Chlorhexidine solution</li> <li>• 10 mL NS pre-filled syringe x 2</li> <li>• New, sterile luer lock positive displacement caps for each lumen of central line</li> <li>• New, sterile tegaderm dressing</li> <li>• Sterile gloves, dressing tray, face mask</li> </ul>	<ul style="list-style-type: none"> <li>• During cap and dressing changes the insertion site and lumens will be open for a short period of time, potentially allowing organisms to enter the central line system</li> <li>• Strict sterile technique is observed during this procedure to prevent central line acquired blood stream infection (CLABSI) and/or sepsis.</li> </ul>
2. Confirm you have the correct patient by performing the 2 patient identifier process	<ul style="list-style-type: none"> <li>• 2 Patient Identifier Process is a Required Organizational Procedure (ROP) and ensures the right care is provided to the right patient at the right time</li> </ul>
3. Explain procedure to patient	<ul style="list-style-type: none"> <li>• Providing information decreases patient anxiety</li> </ul>
4. Stop IV infusion (if running) and disconnect from PICC line. Close clamps on each lumen of catheter	<ul style="list-style-type: none"> <li>• Ensures no backflow of blood or entry of air into the line will occur when cap is removed</li> </ul>
5. Remove old dressing working from the edges toward the center while gently stabilizing central line insertion site.	<ul style="list-style-type: none"> <li>• To ensure line is not pulled out during dressing removal</li> </ul>
6. Perform hand hygiene and put on face mask and sterile gloves.	<ul style="list-style-type: none"> <li>• Adherence to infection control guidelines prevent central line infection</li> </ul>
7. Cleanse insertion site and surrounding tissue well with chlorhexidine soaked gauze for at least 60 seconds using a circular scrubbing motion. Allow to dry completely (up to 2 min drying time) before placing new dressing	<ul style="list-style-type: none"> <li>• Allowing skin to dry prior to placing new occlusive dressing prevents moisture beneath dressing which leads to bacterial growth and skin breakdown</li> </ul>
8. Use anchoring device (steristrips) and paper tape that comes with tegaderm. Be sure to write date on paper tape before applying to tegaderm dressing	<ul style="list-style-type: none"> <li>• Proper securement of central line is important to prevent accidental removal</li> <li>• Dating dressing change will indicate date of next required (q7days)</li> </ul>
9. Cleanse cap(s) and distal end of each lumen of central line (5-8 cm) with chlorhexidine soaked gauze for 60 seconds and allow to dry completely	<ul style="list-style-type: none"> <li>• To prevent microorganisms from entering the central line</li> <li>• Drying time allows for optimal bactericidal action</li> </ul>
10. Use sterile gauze to grip old cap and remove	<ul style="list-style-type: none"> <li>• Maintaining sterile technique during procedure decreases risk of infection</li> </ul>
11. Ensure priming of new cap with NS. Fill the dead space left at the end of the central line with one drop of NS and screw on new cap. Maintain sterile technique throughout.	<ul style="list-style-type: none"> <li>• The small amount of dead space at the end of the lumen when the old cap is removed may cause an air embolus if not filled with NS</li> </ul>
12. Unclamp lines, flush with 20 mL NS using turbulent flush technique.	<ul style="list-style-type: none"> <li>• Turbulent flush technique prevents catheter occlusion</li> </ul>
Document the following: <ul style="list-style-type: none"> <li>• Date and time of dressing and cap change</li> <li>• Site inspection and patency of the line</li> </ul>	

### Accessing an Implanted Port

Procedural Step	Rationale
1. Gather equipment: <ul style="list-style-type: none"> <li>• Chlorhexidine solution</li> <li>• Non-coring gripper needle</li> <li>• Extension set and positive displacement luer lock cap</li> <li>• 10 mL NS pre-filled syringe</li> <li>• Face mask</li> <li>• Sterile gloves and dressing tray</li> </ul>	<ul style="list-style-type: none"> <li>• Strict sterile technique is observed when accessing port-a-cath central lines. Many organisms live on the skin and could be introduced into the port device when the gripper needle punctures the skin if thorough sterile skin cleansing techniques are not observed</li> <li>• Face masks protect the patient who is most often immune-compromised</li> </ul>
2. Confirm you have the correct patient by performing the 2 patient identifier process	<ul style="list-style-type: none"> <li>• 2 Patient Identifier Process is a Required Organizational Procedure (ROP) and ensures the right care is provided to the right patient at the right time</li> </ul>
3. Explain procedure to patient. Perform hand hygiene and don sterile gloves.	<ul style="list-style-type: none"> <li>• Providing information decreases patient anxiety</li> <li>• Adherence to infection control and hand hygiene guidelines prevents central line infection</li> </ul>
4. Prepare dressing tray, adding chlorhexidine and gripper needle, sterile syringe, extension set and luer lock cap and 10 mL NS syringe. Prime extension set and gripper needle with NS. Leave syringe attached.	<ul style="list-style-type: none"> <li>• Prime extension set and gripper needle with sterile NS to prevent air embolism when device is attached to port</li> </ul>
5. Cleanse a 10 to 13 cm area of skin over port area with chlorhexidine soaked gauze using a scrubbing motion for 60 seconds. Allow to air dry completely (up to 2 min)	<ul style="list-style-type: none"> <li>• To prevent microorganisms from entering the central line</li> <li>• Drying time prevents bacterial growth and prevents skin breakdown</li> </ul>
6. With non-dominant hand stabilize the port using thumb and first two fingers forming a “C” around the port.	<ul style="list-style-type: none"> <li>• Stabilizing the port allows for ease and accuracy of insertion of gripper needle into the center of the septum</li> </ul>
7. With dominant hand grasp gripper needle and hold at a 90 degree angle. Firmly insert the needle in a continuous motion, through the skin and septum of port device.	
8. Pull back on syringe and gently aspirate 5 mL blood. Remove syringe and discard waste in biohazard container.	<ul style="list-style-type: none"> <li>• Blood withdrawal verifies device is patent and removes heparin from the device. A 5 mL waste ensures all heparin is removed and does not get into patient’s circulation or alter lab sample results</li> </ul>
9. If blood return is not apparent, troubleshoot for blockage. Try a gentle push/pull technique to aspirate blood. If still unsuccessful, try gently advancing needle further into the septum. Attempt aspiration of blood. If still unsuccessful, obtain new supplies and try reinserting a new gripper needle	<ul style="list-style-type: none"> <li>• If no blood return, begin troubleshooting for mechanical versus thrombotic occlusion. If not able to resolve occlusion, inform MRP.</li> </ul>

<p>10. Once blood return/patency has been established and discard 5 mL has been completed, proceed with obtaining lab samples if required. Label blood samples at the bedside of the patient ensuring 2 patient identifiers are correct. If initiating a medication or fluid infusion, flush the port with 20 mL NS and then connect infusion to extension set</p>	<ul style="list-style-type: none"> <li>• Labeling of specimens at the bedside is a ROP and QHC Policy for Specimen Handling</li> <li>• Turbulent 20 mL NS flush ensures the port is patent. Should any swelling occur around the site, the port should not be utilized for infusion</li> </ul>
<p>11. If gripper is being left in place for infusion, secure gripper needle with a translucent opaque dressing such as a large tegaderm</p>	<ul style="list-style-type: none"> <li>• Securing the gripper needle to the skin will prevent accidental dislodgement during infusion</li> </ul>
<p>12. Once infusion is complete, flush port with 20 mL NS using turbulent, pulsing technique</p>	<ul style="list-style-type: none"> <li>• Turbulent 20 mL NS flush is required following all access/medication administration/blood withdrawals to ensure continued patency of the line</li> </ul>
<p>13. Prepare for heparinizing of port. Gather a syringe with 3-5 mL of heparin 100 u/mL, in a 10 mL syringe. Obtain a second nurse or ask patient to assist with removal of gripper needle by securing the port with a “C” clamp technique. Inject the heparin into the port through the extension set and gripper needle. The patient or second nurse stabilizes the port while the gripper needle is withdrawn and the last 0.5 mL of heparin is injected. Dry the site with sterile gauze once gripper needle is removed. A dressing may be required following gripper removal</p>	<ul style="list-style-type: none"> <li>• The port must be locked with a positive pressure technique to prevent back up of blood into the device. The pulsing injection of heparin into the port while the gripper needle is being gently withdrawn creates the positive pressure displacement required</li> <li>• The patient may withdraw the needle while the nurse stabilizes the port site and injects the final amount of heparin into the port – ask the patient their comfort level and what their normal technique is</li> </ul>
<p>Document the following:</p> <ul style="list-style-type: none"> <li>• Flushing and patency of port</li> <li>• Specimen(s) collected</li> <li>• IV infusion, blood or medication delivered</li> <li>• Heparinizing of port post-procedure</li> </ul>	

### Potential Complications Associated with CVAD Access/Maintenance

Problem	Signs / Symptoms	Interventions
<b>Occlusion</b>	Unable to aspirate blood or to flush catheter or slow, sluggish blood return	<p>Assess cause to determine if occlusion is mechanical (catheter kink or malposition), precipitate buildup (medications) or thrombus (fibrin sheath or blood clot)</p> <p>Reposition arm and try aspiration again</p> <p>Have patient turn head to opposite direction, raise arm above head while gently aspirating and try gentle push/pull technique</p> <p>If unsuccessful, alert physician. Order will be required for instillation of cathflo (for fibrin clot) or other solution for medication precipitate or removal of PICC line</p>
<b>Inflammation/Phlebitis</b>	Pain, redness, swelling at the insertion site	<p>Use strict sterile technique for dressing changes</p> <p>Remove dressing and apply sterile, warm moist compress to the site and assess site frequently</p> <p>Monitor patient for increased temperature or increased heart rate which may indicate sepsis</p> <p>Notify Physician of s/s of infection</p>
<b>Septicemia</b>	Chills, fever or hypothermia (especially in elderly patients), altered level of consciousness, general weakness, tachycardia, tachypnea	<p>Stop infusions through central line and notify Physician immediately of signs/symptoms of infection/sepsis</p> <p>If central line is the suspected source of infection, initiate peripheral IV site and ensure when central line is removed, the catheter tip is sent for culture</p> <p>Initiate antibiotics and IV fluids as ordered</p>
<b>Embolism</b>	<p>May be air, blood or catheter fragment embolism</p> <p>Sudden chest pain, dyspnea, tachycardia, potentially decreased oxygen saturation, cyanosis</p> <p>If it is a catheter fragment, the catheter will not be intact upon removal</p>	<p>To treat air embolism/blood clot embolism: Place patient on left side and trendelenburg position, administer 100% oxygen via non-rebreathe mask, notify Physician immediately</p> <p>To prevent catheter breakage during a removal, never continue to pull if resistance occurs</p> <p>If piece of catheter remains inside arm, apply tourniquet at highest point around upper arm – tight enough to occlude venous blood flow but not arterial (check for presence of radial pulse)</p> <p>Place patient in high fowler’s position and contact physician immediately</p>

## References

- Bard Access Systems, I. (2016). *PowerPICC® Catheter | Nursing PICCs | Bard Access Systems. Bardaccess.com*. Retrieved 20 September 2016, from <http://www.bardaccess.com/products/nursing/powerpicc>
- College of Nurses of Ontario (CNO). (2008). *Documentation*. Toronto, ON.
- College of Nurses of Ontario (CNO), (2002). *Professional Standards*. Toronto, ON.
- Infusion Nurses Society. (INS). (revised 2016). *Infusion Therapy Standards of Practice*. Northwood, MA.
- Peripherally Inserted Central Catheter Learning Package*. (2013). Retrieved 19 September 2016, from [http://www.nygh.on.ca/cerner/bt/files%5CCONTENT\\_Day\\_3%5CPICC%202013%5CPICC%20Learning%20Package,%20revised%20June%202013.1.pdf](http://www.nygh.on.ca/cerner/bt/files%5CCONTENT_Day_3%5CPICC%202013%5CPICC%20Learning%20Package,%20revised%20June%202013.1.pdf)
- Perry, A.G. & Potter, P.A. (2018). *Clinical nursing skills and techniques* (9<sup>th</sup> ed.). St. Louis, Missouri: Elsevier. Pp. 785-798.
- Registered Nurses Association of Ontario. (2005, April, revised 2008). *Care and maintenance to reduce vascular access complications*. Toronto: RNAO.
- Regional CVAD Committee, written by Vallee, K. (2006, February). *Central venous access devices. Nursing CVAD review: Care and Maintenance of CVADs. For the adult client/patient population*. (Rev.ed.).

### Appendix A

<b>COMPETENCY CHECKLIST FOR ACCESSING CVADs: IV Infusion, Drawing Blood, Flushing</b>			
	Yes	No	Comment
1. Collect appropriate equipment			
2. Wash hands. Apply clean gloves.			
3. Performs 2 patient identifier process.			
4. Explain the procedure to the patient.			
5. Use aseptic technique and swabs cap (s) of lumens with alcohol swabs x 2 for 10 seconds each.			
6. Use 10 mL syringe to aspirate for blood/check for patency. Checks all lumens for patency when accessing central line and flushes lumen not in use with 20 mL NS using turbulent flush technique.			
7. If no blood return, can articulate proper procedure to assess for mechanical or thrombotic occlusion. Articulates how to troubleshoot and resolve mechanical occlusion. Is aware that a physician order is required for administration of alteplase for suspected thrombotic occlusion.			
8. If drawing blood samples, attaches blood collection holder to lumen securely. Uses clear discard tube to withdraw 5mL blood as waste and discards in biohazard container. Collects blood samples as needed, following order of draw. Flushes with 20 mL NS following collection using turbulent flushing and positive pressure locking technique. Labels specimens at bedside to ensure compliance with specimen collection policy.			
8. If initiating an IV infusion, flushes lumen being accessed with 20 mL NS using turbulent flush technique. Observes for signs of extravasation including swelling or leaking around insertion site. If no signs of extravasation, connects IV tubing properly and checks the connection is secure before initiating infusion. PSI of infusion should be checked.			
10. Ensures set of Kelly clamps and occlusive dressing are at the bedside of patients with central lines. Articulates that clamp may be used in case of accidental cutting or breaking of the central line. Occlusive dressing will be needed in case of accidental removal of central line to prevent hemorrhage and air embolism.			
11. When infusion is completed, flush both lumens with 20 mL NS using turbulent flush and lock technique.			
12. Remove and discard gloves. Perform hand hygiene.			
Document: <ul style="list-style-type: none"> <li>• Specimen collection</li> <li>• Date,time and type of infusion/medication administered</li> <li>• Insertion site appearance</li> </ul>			

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

On Completion Present this Form to Your Manager

### Appendix A

<b>COMPETENCY CHECKLIST FOR ACCESSING CVADs: Dressing and Cap Change</b>			
	Yes	No	Comment
1. Collect appropriate equipment. Articulates that positive displacement caps must be used with all central lines and cap and dressing change is sterile procedure.			
2. Washes hands. Applies clean gloves.			
3. Performs 2 patient identifier process. Explains procedure to patient. Positions patient in supine/trendelenburg position if patient can tolerate, to decrease risk of air embolism during cap change.			
4. Use sterile technique, prepares dressing tray with new caps and chlorhexidine. Caps primed with NS and sterility of tip of caps maintained.			
5. Removes old dressing carefully, working from outer edges toward center, while securing central line by pressing lightly over insertion site.			
6. Inspect skin around insertion site for signs of infection. Discards gloves and old dressing. Performs hand hygiene and applies sterile gloves (and mask if patient immunocompromised).			
7. Cleanses skin with chlorhexidine soaked gauze using a scrubbing motion and cleansing a 7-10 cm area around insertion site. Allows site to completely dry (up to 2 min).			
8. Applies new tegaderm dressing. Labels dressing with date of dressing change. Ensures central line is secure at insertion site.			
9. Swabs cap (s) and distal 5cm of lumens with chlorhexidine soaked gauze for 60 seconds. Allows to air dry. Ensure clamps on each lumen are locked prior to removing old caps. Uses dry sterile 2x2 gauze to remove old caps and place away from sterile field of dressing tray.			
10. Uses primed caps with syringe attached to fill dead space at end of central line. Connects caps and ensures they are securely fastened.			
11. Use 10 mL syringe to check each lumen for patency by withdrawing blood. Flushes each lumen with 20 mL NS using turbulent flushing and locking technique. Closes clamps on each lumen if not accessing lumen for infusion at that time.			
12. Remove and discard gloves. Perform hand hygiene.			
Document: <ul style="list-style-type: none"> <li>• Date and time of dressing and cap change</li> <li>• Site appearance</li> </ul>			

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

On Completion Present this Form to Your Manager

### Appendix A

<b>COMPETENCY CHECKLIST FOR ACCESSING CVADs: Implanted Ports Access and Heparinizing</b>			
	Yes	No	Comment
1. Collects appropriate equipment. Articulates that accessing port-a-caths is a sterile procedure. Sterile gloves and face mask are required. Performs hand hygiene.			
2. Performs 2 patient identifier process. Explains procedure to patient. Positions patient in high fowlers if possible, if unable to tolerate, a 45 degree angle for head of bed.			
3. Use sterile technique, prepares dressing tray with chlorhexidine. Gripper needle and extension set primed with NS and sterility of gripper needle maintained. Leaves syringe attached to extension set.			
4. Dons face mask and sterile gloves. Cleanses a 7-10cm area of skin around port site with chlorhexidine soaked gauze using a scrubbing motion. Cleanses for at least 60 seconds. Allows skin to completely dry (for 2 minutes). Articulates that drying time allows optimal bactericidal action.			
5. Demonstrates correct technique to insert gripper needle by stabilizing the port with non-dominant hand in “C” clamp and inserts needle with dominant hand at 90 degree angle.			
6. Checks for patency and needle placement by aspirating blood. Articulates that heparin must be withdrawn from the port, so a 5 mL discard is necessary. 5 mL waste discarded in biohazard.			
7. If unable to aspirate blood from port, articulates knowledge of how to check for patency (re-attempt port access with new gripper needle) and to troubleshoot for mechanical or thrombotic occlusion. (Tries push/pull technique, has patient raise arm and cough while attempting to gently aspirate). If not successful, articulates knowledge to inform physician and to not use port for infusion at that time.			
8. If lab samples are required, ensure that order of draw is followed. Specimens are to be labeled at patient bedside.			
9. If IV infusion is required, applies large tegaderm dressing and ensures gripper needle is held securely in place.			
10. If not maintaining an infusion, flushes with 20 mL NS prior to heparinizing port. Heparinizing of port is completed with proper technique (3-5 mL of 100u/mL heparin injected, with the last 0.5 mL injected slowly as gripper needle is withdrawn to maintain positive pressure). Requires help of patient or second nurse to stabilize port and to remove gripper needle and nurse injects heparin solution.			
12. Remove and discard gloves. Perform hand hygiene.			
Document: <ul style="list-style-type: none"> <li>• Date and time of access, specimen collection and/or infusion</li> <li>• Patency of port and Heparinizing of port</li> <li>• Patient tolerance of procedure</li> </ul>			

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

Date: _____	Time: _____	Nurse Preceptor: _____
-------------	-------------	------------------------

On Completion Present this Form to Your Manager

---

**Appendix B****CVAD Access, Care and Maintenance Certification Test**

Read the following and circle the answer you feel best answers the question or best completes the sentence.

1. The tip of a CVAD device inserted via the chest wall or upper limb should ideally be placed in the:
  - a. lower one third of the superior vena cava
  - b. lower one third of the inferior vena cava
  - c. lower one third of the basilic vein
  - d. anywhere in the subclavian vein
  
2. PICC lines are suitable for which of the following?
  - a. Long term vascular access for blood sampling
  - b. Chemotherapy
  - c. Long term antibiotic administration
  - d. TPN
  - e. All of the above
  
3. When blood sampling from an adult with a central line, a discard volume of \_\_\_\_ must be drawn pre-sample, with a \_\_\_\_ post-sample flush.
  - a. 5mL, 10mL
  - b. 5mL, 20mL
  - c. 10mL, 10mL
  - d. 20mL, 10mL
  
4. If the catheter appears infected, do all of the following EXCEPT:
  - a. Swab discharge and send for culture and sensitivity
  - b. Send catheter tip for culture and sensitivity
  - c. Assess patient for signs of systemic infection
  - d. Leave the site open to air to assist drainage
  
5. Percutaneous central lines are only placed in a femoral vein when:
  - a. The patient requests it
  - b. An emergency situation requires it
  - c. A PICC line is not available
  - d. A transverse pacemaker is required
  
6. Chest pain, shortness of breath and cyanosis are signs of:
  - a. A localized PICC-related infection
  - b. Pinch-Off Syndrome
  - c. A venous thrombosis
  - d. An embolism

- 
7. CVADs can be valved or non-valved.
- True
  - False
8. A client/patient is assessed and it is determined there is a need for a CVAD. It is also expected that the need will be for less than 3 months. Ideally, consideration should be given to:
- an implanted port
  - a PICC
  - a tunnelled catheter
  - a non-tunnelled catheter
9. When accessing a CVAD, always use at least a \_\_\_\_\_ - sized syringe.
- 5mL
  - 3mL
  - 10mL
  - 20mL
10. How long should you wait after stopping a continuous infusion, before drawing a blood sample?
- 2 minutes
  - 1 minute
  - 5 minutes
  - 15 seconds
11. Acetone may be used to remove adhesive glue from a CVAD.
- True
  - False
12. When locking an implanted port, the concentration of heparin most commonly ordered for an adult patient is:
- 10u/mL
  - 100u/mL
  - 1000u/mL
  - none of the above
13. A transparent film dressing on a PICC insertion site is usually changed every:
- 24 hours
  - 48 hours
  - 7 days
  - 10 days
14. The type of needle required to access an Implanted Port is a:
- 20-gauge IV needle
  - Non-Coring needle
  - Groshong needle
  - 25-gauge butterfly needle

- 
- 15.** A patient with a PICC line complains of a swishing noise in his ear when the line is flushed. This could be an indication:
- that the tip of the catheter has migrated into the jugular vein
  - that the CVAD is patent and is being thoroughly flushed.
  - of a CVAD-associated infection.
  - of a pulmonary embolus.
- 16.** Which nursing intervention is most appropriate if the patient has accidentally pulled out their PICC?
- Prepare to administer CPR.
  - Apply a pressure dressing to the insertion site.
  - Ask the client/patient to do the Valsalva manoeuvre.
  - All of the above.
- 17.** When not in use, an Implanted Port must be flushed every:
- month
  - 8 weeks
  - 7 days
  - 2 weeks
- 18.** A turbulent, pulsating flush method is used when flushing a CVAD because it:
- reduces the PPSI pressure on the catheter.
  - reduces the risk of pneumothorax.
  - eliminates the need for a heparin flush.
  - helps to dislodge fibrin and medication residue from the internal lumen.
- 19.** Implanted ports have a number of advantages including:
- #1 - lower risk of CVAD-related infection
  - #2 - ability to withstand repeated access
  - #3 - enhanced body image
  - #4 - easily removed by trained nurses, upon completion of therapy course
- 1 and 4
  - 1, 2 and 3
  - 2, 3 and 4
  - all of the above
- 20.** Swelling and burning are evident around an implanted port during infusion or flushing. This is an indication of:
- infiltration
  - cardiac tamponade
  - pulmonary embolus
  - none of the above