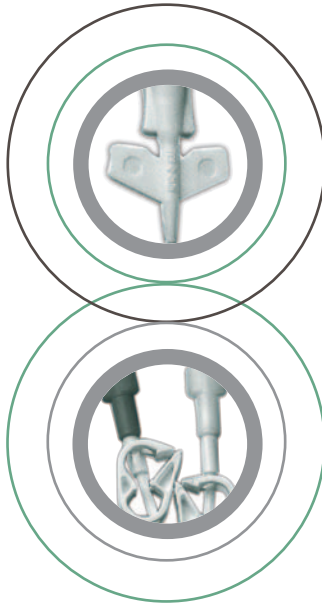




**RADPICC®**  
SILICON

• and **Per-Q-Cath® plus**

# Peripherally Inserted Central Venous Catheters (PICC)



**Nursing Procedure Manual**

**BARD**

**Bard Access Systems**

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# **Table Of Contents**

	Page
<b>Introduction</b> .....	1
Description	
Placement	
Indications for Use	
Contraindications	
Warnings	
Cautions/Precautions	
Possible Complications	
<b>Catheter Irrigation</b> .....	8
Routine Maintenance	
After Blood Aspiration	
Blood Sampling After TPN	
Flushing Guidelines For Small Patients	
<b>Blood Withdrawal/Aspiration</b> .....	10
Hub-To-Hub Technique	
Needle or Needless Adapter Through Injection Cap Technique (vacuum blood collection system)	
<b>Injection Cap Change</b> .....	13
<b>PICC Dressing Change</b> .....	15
<b>Clearing Occluded Catheters</b> .....	18
For Suspected Blood or Fibrin Occlusion	
<b>Troubleshooting Guide.</b> .....	21
I. Aspiration Difficulties	
II. Inability to Aspirate or Infuse a 3 Fr. PICC	
III. Bleedback in Catheter	
IV. Catheter Occlusion	
V. Catheter Damage	
VI. Air in Line	
VII. Fluid Leakage From Catheter Exit Site	



# Introduction

## ***Description***

A family of single and dual lumen peripherally placed central catheters made from specially formulated and processed medical grade materials, in a tray with accessories for reliable long (greater than 30 days) or short (less than 30 days) term vascular access.

The silicone RadPICC and Per-Q-Cath PICC have the following features:

- Soft, medical grade silicone
- Depth markings
- Single or dual lumen

**Silicone RadPICC®  
and Per-Q-Cath®  
Plus Single Lumen  
PICC Features**



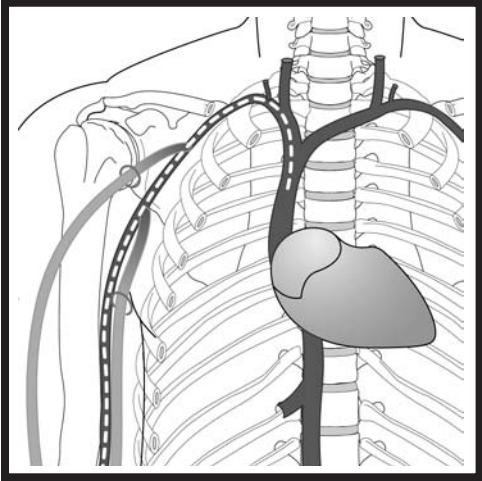
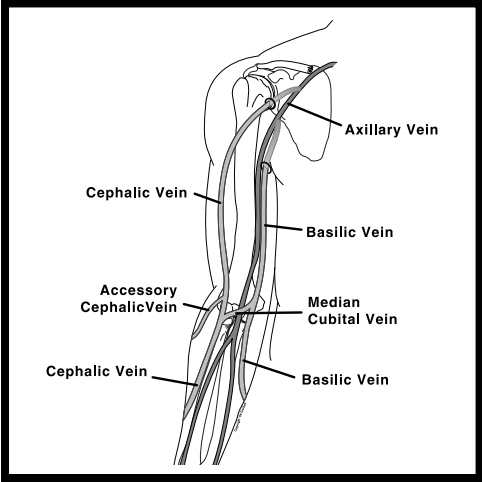
**Silicone RadPICC®  
and Per-Q-Cath®  
Plus Dual Lumen  
PICC Features**



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**Placement:**

The catheter is placed into one of the large antecubital veins and threaded into the superior vena cava above the right atrium.



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## **Indications for Use**

The silicone **RadPICC** and **Per-Q-Cath Plus PICC** are indicated for short or long term peripheral access to the central venous system for intravenous therapy and blood sampling. For blood therapy, it is recommended that a 4 french or larger catheter be used.

## **Contraindications**

The device is contraindicated whenever:

- The presence of device related infection, bacteremia, or septicemia is known or suspected.
- The patient's body size is insufficient to accommodate the size of the implanted device.
- The patient is known or is suspected to be allergic to materials contained in the device.
- Past irradiation of prospective insertion site.
- Previous episodes of venous thrombosis or vascular surgical procedures at the prospective placement site.
- Local tissue factors will prevent proper device stabilization and/or access.

## **Warnings**

- Povidone-iodine is the antiseptic suggested for use with silicone catheters and components. Acetone solutions and tincture of iodine should not be used as they affect the performance of the silicone catheter. 10% acetone/70% isopropyl alcohol swabsticks used for skin preps and dressing changes should not adversely affect the catheter if left to dry completely before catheter insertion dressing change.
- Intended for Single Patient Use. **DO NOT REUSE.** Bard Access Systems products are single use devices and must never be re-implanted. Any device that has been contaminated by blood must not be reused or re-sterilized.
- This is not a right atrium catheter. Avoid positioning the catheter tip in the right atrium. Placement or migration of the catheter tip into the right atrium may cause cardiac arrhythmia, myocardial erosion or cardiac tamponade. The risk of these complications may be more likely in neonatal patients.
- After use, this product may be a potential biohazard. Handle and discard in accordance with accepted medical practice and applicable local, state, and federal laws and regulations.

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- When the dilator and guidewire are withdrawn from the sheath, place a finger over the sheath opening to minimize blood loss and risk of air aspiration. The risk of air embolism is reduced by performing this part of the procedure with the patient performing the Valsalva maneuver or by attaching a syringe or injection cap to the dilator to reduce blood flow while trimming the catheter.
  - Do not use the catheter if there is any evidence of mechanical damage or leaking. Damage to the catheter may lead to rupture, fragmentation, possible embolism, and surgical removal.
  - If signs of extravasation exist, discontinue injections. Begin appropriate medical intervention immediately.
  - The fluid level in the catheter will drop if the catheter connector is held above the level of the patient's heart and opened to air. To help prevent a drop in the fluid level (allowing air entry) while changing injection caps, hold the connector below the level of the patient's heart before removing the injection cap.
  - Small syringes can generate very high internal pressures with little manual force. The back pressures from an occlusion may not be felt when using a small syringe until the damage to the catheter has occurred.
  - To avoid catheter rupture, during occlusion clearing process, do not force entire amount of thrombolytic solution into catheter if strong resistance is felt.

## ***Cautions***

- Carefully read and follow all instructions prior to use.
- Federal (U.S.A.) law restricts this device to sale by or on the order of a physician.
- Never use force to remove the stylet. Resistance can damage the catheter. If resistance or bunching of the catheter is observed, stop stylet withdrawal and allow the catheter to return to normal shape. Withdraw both the catheter and stylet together approximately 2 cm and reattempt stylet removal. Repeat this procedure until the stylet is easily removed. Once the stylet is out, advance the catheter into the desired position.
- Only qualified healthcare practitioners should insert, manipulate, and remove this catheter.

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- For those unfamiliar with the procedure, published studies and a video are available from **Bard Access Systems** depicting insertion and maintenance techniques.
  - When trimming the catheter, do not cut the stylet.
  - Do not advance the guidewire past the axilla without fluoroscopic guidance.
  - The catheter must be secured in place to minimize the risk of catheter breakage and embolization.
  - For further information or questions, please call 800-443-3385.

## **Precautions**

- Only medical practitioners licensed by law, trained and experienced in proper positioning of catheters in the central venous system using percutaneous entry (Seldinger technique) should place this catheter.
- Follow Universal Precautions when inserting and maintaining the catheter.
- Follow all contraindications, warnings, cautions, precautions, and instructions for all infusates as specified by its manufacturer.
- Use aseptic techniques whenever the catheter lumen is opened or connected to other devices.
- Precautions are intended to help avoid catheter damage and/or patient injury.

### ***I. Prior to beginning placement procedure, do the following:***

- Examine the package carefully before opening to confirm its integrity and that the expiration date has not passed. The device is supplied in a sterile package and is non-pyrogenic. Do not use if package is damaged, opened or the expiration date has passed. Sterilized by ethylene oxide. Do not resterilize.
- Inspect kit for inclusion of all components.
- Flush the catheter with sterile normal saline or heparinized saline prior to use. Catheter stylet must be wetted prior to stylet repositioning or withdrawal.

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## ***II. During placement.***

- Do not allow device contact with sharp instruments. Mechanical damage may occur. Use only smooth edged, atraumatic clamps or forceps.
- Do not perforate, tear, or fracture the catheter when using a stylet.
- Do not use the catheter if there is any evidence of mechanical damage or leaking.
- Do not bend the catheter at sharp angles during implantation as this can compromise patency of the catheter.
- Do not place suture around the catheter. Sutures may damage the catheter or compromise catheter patency.
- Do not cut the stylet.
- Do not advance the guidewire into superior vena cava except under x-ray or fluoroscopy. Assure proper tip position in order to prevent erosion or perforation of central venous system.

## ***III. After placement, observe the following precautions to avoid device damage and/or patient injury:***

- **WARNING!** Do not use the device if there is any evidence of mechanical damage or leaking. Damage to the catheter may lead to rupture, fragmentation and possible embolism and surgical removal.
- Accessories and components used in conjunction with this device should incorporate luer lock connections.
- **WARNING!** If signs of extravasation exist, discontinue injections. Begin appropriate medical intervention immediately.
- **DO NOT USE A SYRINGE SMALLER THAN 10 CC.** Infusion pressure greater than 25 psi (172 kPa) may damage blood vessels and viscus and is not recommended.
- Tip position should be verified by x-ray and monitored on a routine basis.

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## **Possible Complications**

The potential exists for serious complications including the following:

- Air Embolism
- Bleeding
- Brachial Plexus Injury
- Cardiac Arrhythmia
- Cardiac Tamponade
- Catheter Erosion Through the Skin
- Catheter Embolism
- Catheter Occlusion
- Catheter-related Sepsis
- Endocarditis
- Exit Site Infection
- Exit Site Necrosis
- Extravasation
- Fibrin Sheath Formation
- Hematoma
- Intolerance Reaction to Implanted Device
- Laceration of Vessels or Viscus
- Myocardial Erosion
- Perforation of Vessels or Viscus
- Phlebitis
- Spontaneous Catheter Tip Malposition or Retraction
- Thromboembolism
- Venous Thrombosis
- Ventricular Thrombosis
- Vessel Erosion
- Risks Normally Associated with Local or General Anesthesia, Surgery and Post Operative Recovery



## **Catheter Irrigation**

### **I. Purpose:**

To maintain catheter patency.

### **II. Routine Maintenance**

For intermittent use, flush the catheter with sterile heparinized saline every 12 hours or after each use. Usually, one ml per lumen is adequate.

#### **A. Supplies:**

- Isopropyl alcohol and/or povidone iodine wipes
- 10cc syringe filled with 5cc of sterile heparinized saline with attached 1 in. needle or needleless adapter
- Sterile gloves

#### **B. Procedure:**

1. Wash hands thoroughly.
2. Apply sterile gloves.
3. Clean injection cap with alcohol and/or povidone iodine wipes.

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4. Insert needle or needleless adapter on syringe filled with 5cc sterile heparinized saline into injection cap.
  5. Inject sterile heparinized saline.

**Note:** Infuse last 0.5cc as the needle or needleless adapter is withdrawn from injection cap. This helps prevent a vacuum which could pull a small amount of blood into tip of catheter and cause catheter occlusion.

### **III. After Blood Aspiration for any reason, or when blood is observed in the catheter:**

**Note:** If blood is aspirated prior to infusion of medications (to verify venous placement), catheter should be irrigated with 10cc of sterile normal saline prior to attaching medication syringe, IV, or infusion pump tubing. Failure to do so may result in an occluded catheter, leading to difficulty in aspirating in the future.

#### **A. Supplies:**

- Isopropyl alcohol and/or povidone iodine wipes
- 10cc syringe filled with 10cc of sterile normal saline with attached 1 in. needle or needleless adapter
- Sterile gloves.

#### **B. Procedure:**

1. Wash hands thoroughly.
2. Apply gloves.
3. Follow routine maintenance procedure, **except use 10cc sterile normal saline** and flush to clear blood from catheter.
4. If unable to flush all blood residue out of the injection cap, replace it after blood sampling per Injection Cap Change procedure or per agency protocol.

### **IV. Prior to blood sampling when infusing TPN:**

1. Follow routine maintenance procedure, **except use 20cc sterile normal saline** and flush to clear TPN from catheter.

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## V. Flushing guidelines for small patients:

Use the same procedure as used for normal-sized adults with the following exceptions:

1. Use 2cc sterile heparinized saline for routine maintenance every 12 hours; or after IV administration of TPN, IV fluids, or medications.
2. Use 3cc sterile heparinized saline after blood aspiration for any reason, or when blood is observed in the catheter.

**Note:** This amount is insufficient to clear blood from an injection cap. The injection cap should be changed following blood withdrawal.



## Blood Withdrawal / Aspiration

### I. Purpose:

- A. To obtain blood samples for laboratory evaluation, eliminating the need for peripheral vein punctures.
- B. To assist in the verification of venous placement prior to administration of hypertonic or vesicant solutions.

**Note:** If you encounter difficulties with blood withdrawal, see Troubleshooting Guide-Aspiration Difficulties.

### II. Hub-To-Hub Technique (syringe):

#### A. Supplies:

- 3 - 10cc syringes
- 1 in. needle or needleless adapter
- Sterile heparinized saline
- Isopropyl alcohol wipes and/or povidone iodine wipes
- Blood specimen tubes
- Injection cap
- Sterile gloves

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## **B. Procedure:**

1. Wash hands thoroughly.
2. Apply sterile gloves.
3. Draw up 10cc of sterile heparinized saline in syringe and set aside.
4. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter. Apply catheter clamp if applicable.
5. Remove injection cap/I.V. tubing from catheter hub.
6. Clean catheter hub with alcohol and/or povidone iodine wipes.
7. Attach an empty 10cc syringe to catheter hub.
8. Slowly pull back syringe plunger 1-2cc, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5cc of blood.
9. Disconnect syringe and discard.

**Note:** Saline in catheter dilutes specimen and may alter lab values.

10. Attach an empty 10cc syringe and aspirate per step 8 to withdraw amount of blood needed for testing.
11. Disconnect syringe and attach sterile heparinized saline-filled syringe.
12. Flush the catheter with 10cc sterile heparinized saline. (See Catheter Irrigation Procedure)
13. Disconnect syringe and clean catheter hub with alcohol and/or povidone iodine wipes.
14. Attach new injection cap per Injection Cap Change procedure or attach sterile I.V. tubing to hub of catheter.
15. Attach 1 in. needle or needleless adapter to blood sample syringe to transfer to blood collection tubes.

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### III. Needle or Needleless Adapter Through Injection Cap (Vacuum Blood Collection System or Syringe):

*(May use 10cc syringe with attached needle or needleless adapter in place of vacuum blood collection system)*

#### A. Supplies:

- Vacuum blood collection device
- 2 - 10cc syringes with attached 1 in. needle or needleless adapter
- Sterile heparinized saline
- Isopropyl alcohol wipes and/or povidone iodine wipes
- Blood specimen tubes
- Sterile gloves

#### B. Procedure:

1. Wash hands thoroughly.
2. Apply sterile gloves
3. Draw up 10cc of sterile heparinized saline in syringe and set aside.
4. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter. Apply catheter clamp if applicable.
5. Clean injection cap with alcohol and/or povidone iodine wipes.
6. Insert needle of empty 10cc syringe or needleless adapter into injection cap.
7. Slowly pull back syringe plunger 1-2cc, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5cc of blood.

**Note:** A vacuum collection specimen tube may be used to withdraw the discard sample, but be sure to use one with at least a 5cc capacity.

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8. Remove syringe from injection cap and discard.
  9. Clean injection cap with alcohol and/or povidone iodine wipes.
  10. Insert vacuum blood collection system needle or needleless adapter into the injection cap. Push blood specimen tube into vacuum collection device sleeve so that rubber stopper is pierced.
  11. Blood needed for specimen will flow into specimen tube. Change tubes as needed for required tests.
  12. Remove vacuum blood collection system and sleeve from injection cap.
  13. Clean injection cap with alcohol and/or povidone-iodine wipes.
  14. Insert needle or needleless adapter and sterile heparinized saline-filled syringe and flush catheter with 10cc of sterile heparinized saline. (See Catheter Irrigation Procedure)
  15. If unable to flush all blood residue out of the injection cap, attach a new sterile injection cap per Injection Cap Change procedure or per agency protocol.



## **njection Cap Change**

### **I. Purpose:**

To minimize potential for infection from overuse of injection cap.

### **A. Frequency:**

- Every seven days (about 18 needle insertions) or per agency protocol.
- When the cap has been removed for any reason.
- Anytime the cap appears damaged, is leaking, blood is seen in the catheter without explanation, or blood residue is observed in the cap.

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- After blood withdrawal through the injection cap or per agency protocol.

**B. Supplies:**

- New sterile injection cap
- Alcohol wipes and/or povidone-iodine wipes
- 1 syringe
- Tape
- 10cc syringe filled with 5cc of sterile heparinized saline with attached 1 in. needle or needleless adapter
- Sterile gloves

**C. Procedure:**

1. Wash hands.
2. Apply sterile gloves.
3. Using aseptic technique, open injection cap package and prefill injection cap with sterile heparinized saline.
4. Hold catheter hub below the level of the patient's heart to prevent "manometer effect" or fluid drop in the catheter. Remove old injection cap.
5. Clean outside of catheter hub with alcohol wipe and/or povidone iodine wipes.
6. Remove tip protector from new injection cap. Twist cap clockwise onto catheter hub.
7. Irrigate the catheter with 5cc sterile heparinized saline following the Catheter Irrigation procedure or per agency protocol. (See Catheter Irrigation procedure).
8. Secure catheter hub and injection cap per agency protocol.



# ICC Dressing Change

## I. Purpose:

To prevent external infection of the central venous catheter.

## II. Frequency:

Change dressing 24 hours after initial insertion, moving to dressing changes every seven days thereafter, and PRN if dressing is loose, damp, or soiled. This procedure may be modified to reflect more frequent changes per agency protocol.

### A. Supplies:

- 3 - Isopropyl alcohol swabsticks
- 3 - Povidone iodine swabsticks
- Packet povidone iodine or antibiotic ointment (optional)
- 10 x 12 cm transparent dressing
- Sterile gloves

### B. Procedure:

1. Wash hands thoroughly.
2. Apply sterile gloves.
3. Carefully remove old dressing, starting at the catheter hub and moving toward the insertion site. Avoid tugging on the catheter, or using of scissors or other sharp objects near the catheter.
4. Inspect the catheter exit site for swelling, redness, or exudate. Notify physician if problem observed.
5. Wash hands thoroughly.
6. Apply sterile gloves.

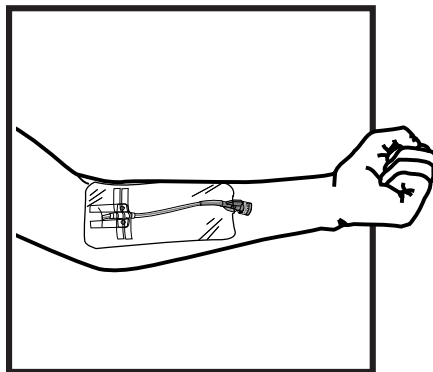
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7. Clean the catheter exit site with alcohol swabstick starting at the exit site and spiral outward until a circle at least 2 inches in diameter has been prepped.

**Note:** Do not return to the catheter exit site with the same swabstick.

8. Repeat Step 7 with the remaining 2 swabsticks.
9. Allow the alcohol to air dry completely before moving to Step 10.
10. Clean the catheter exit site with a povidone iodine swabstick starting at the exit site and spiral outward until a circle at least 2 inches in diameter has been prepped.

**Note:** Do not return to the catheter exit site with the same swabstick.

11. Repeat Step 10 with the remaining 2 swabsticks.
12. Allow povidone iodine to dry at least 2 minutes.
13. (Optional) apply a small amount of povidone iodine or antibiotic ointment to the catheter exit site and all suture sites.
14. Apply the transparent dressing over the exit site, catheter tubing and hub.



- 
15. Tape over the winged connector for added securement, if desired.

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# Clearing Occluded Catheters

## I. Purpose:

To restore patency to a catheter with an occlusion.

## A. Supplies:

- Sterile injection cap
- Thrombolytic solution per agency protocol
- 10cc syringe
- 10cc sterile heparinized saline-filled syringe with attached 1 in. needle or needleless adapter
- Isopropyl alcohol wipes/ and or povidine-iodine wipes
- Sterile gloves

## B. Procedures:

1. Wash hands.
2. Apply sterile gloves.
3. Remove injection cap.
4. Attach an empty 10cc syringe and attempt to aspirate. If aspiration is successful: a. Withdraw clots and flush catheter with 10 ml sterile heparinized saline. b. Apply new cap. If aspiration is unsuccessful, proceed to step 5.
5. Obtain a physician's order for the use of thrombolytic solution to of declot the catheter.

**Note:** Cautions contained in the package insert for all thrombolytic solutions should be observed.

6. Draw up enough thrombolytic solution into a 10cc syringe to equal the internal volume of the catheter.

**Note:** Volume may be reduced if catheter length was modified at time of insertion.

7. Aseptically attach the thrombolytic solution-filled syringe to the catheter hub. Slowly and gently inject

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the thrombolytic solution into the catheter using a push-pull motion to achieve maximum mixing.

**Warning:** To avoid catheter rupture, during occlusion clearing process, do not force entire amount of thrombolytic solution into catheter if strong resistance is felt.

8. Leave 10 ml syringe attached to catheter. Follow manufacturer's recommendations or agency protocol regarding dwell time.
9. After manufacturer's recommended dwell time has elapsed, attempt to aspirate the drug and residual clot. If unsuccessful, repeat thrombolytic solution instillation.
10. When patency is restored, aspirate 5 ml of blood to assure removal of all drug and clots.
11. Remove blood-filled syringe. Attach a 10cc syringe filled with sterile heparinized saline. Flush catheter to verify patency. (See Catheter Irrigation procedure).
12. Attach sterile, heparinized saline-filled injection cap.
13. Secure catheter hub and injection cap per agency policy.

**Note:**

- For suspected lipid deposition occlusion when the thrombolytic solution does not clear the blockage, a sterile ethanol 70% solution may be instilled and left in place for 1 hour. Follow procedure for thrombolytic solution.
- For suspected calcium and phosphate precipitation when the thrombolytic solution does not clear blockage, a sterile 0.1% N hydrochloric acid solution may be instilled in the catheter and left in place for one hour. Follow procedure for thrombolytic solution.

This may help to clear the catheter of calcium-phosphate or other drug precipitates. Sodium bicarbonate may also be used for precipitates that are soluble in a basic solution.

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# Troubleshooting Guide

## I. Aspiration Difficulties

### A. Possible Causes

1. Failure to flush according to Catheter Irrigation procedure, resulting in lumen obstruction.
2. Catheter opening may suck up against vein wall during aspiration.
3. Blood clot, fibrin sheath, or particulate matter may obstruct the catheter during aspiration.
  - A clot or other obstruction in the catheter lumen can produce a one-way valve effect. During infusion, the catheter wall expands slightly and allows fluid to flow around the obstruction. During aspiration, the catheter wall contracts slightly, tightening down around the obstruction and prevents aspiration.
  - Fibrin sheaths usually begin to form within a few days after the insertion of a central venous catheter. When the sheath has grown enough to extend to the tip of the catheter, it may be pulled into and obstruct the catheter opening when aspiration is attempted, but offer no resistance to infusion.
4. Kinked catheter outside or inside the body.
  - Suture constriction at the catheter exit site.
  - Catheter may be curled or kinked within the vessel or under the dressing.
5. Malposition of catheter tip (e.g., jugular vein, outside of vein).

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## **B. Possible Solutions**

1. Visually check catheter for any exterior kinks or constricting sutures. If sutures are present, removal may release the constriction and allow aspiration.
2. Move patient's arm, shoulder and head to see if a change in position will allow aspiration.
3. If no resistance to infusion is felt, attempt to flush with 10cc sterile normal saline. Then pull back gently on syringe plunger 2-3cc, pause and proceed with aspiration.
4. If resistance to infusion is felt, check for signs of extravasation. If present, notify physician of possible catheter leakage. If not present, see Step 5.
5. Attempt to aspirate with a 20cc syringe to create greater vacuum.
6. If resistance to aspiration is still present, obtain physician's order for a chest x-ray or dye study to determine catheter position and status.
7. If studies indicate occlusion is due to a blood clot or drug precipitate, obtain physician's order regarding the use of a thrombolytic or other solution to clear catheter.

### **Note:**

- If the catheter tip is not in the superior vena cava, it should be repositioned.
- If the catheter tip is out of the vein, it should be replaced.

## **II. Inability to Aspirate or Infuse through a Single Lumen PICC**

### **A. Possible Causes**

1. Catheter is kinked or bent.
2. Catheter Occlusion.

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## **B. Possible Solutions**

1. Visually check catheter for any exterior kinks, or constricting sutures. If sutures are present, removal may release the constriction and allow aspiration.
2. Move patient's arm, shoulder and head to see if a change in position will allow aspiration.
3. If no resistance to infusion is felt, attempt to flush with 10cc sterile normal saline. Then pull back gently on syringe plunger 2-3cc, pause and proceed with aspiration.
4. If resistance to infusion is felt, check for signs of extravasation. If present, notify physician of possible catheter leakage. If not present, see Step 5.
5. Attempt to aspirate with a 20cc syringe to create greater vacuum.
6. If resistance to aspiration is still present, obtain physician's order for a chest x-ray or dye study to determine catheter position and status.
7. If studies indicate occlusion is due to a blood clot or drug precipitate, obtain physician's order regarding the use of a thrombolytic or other solution to clear catheter.

## **III. Bleedback in Catheter**

### **A. Possible Causes**

1. Migration or placement of catheter tip in the internal jugular vein or vessel other than the superior vena cava, or coiling of catheter in a vein may position the catheter tip where blood may be forced into the catheter.
2. Placement of the catheter in the right atrium or ventricle:
  - Contractions of the heart muscle can force blood into the catheter.
  - Impingement of catheter tip on the tricuspid valve, heart wall, or apex of the heart can force blood into the catheter.

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## B. Possible Solutions

1. Attempt to aspirate clot out of lumen.
2. If no resistance to aspiration is felt, flush with 10cc sterile normal saline. If resistance is felt, see Step 3.
3. Obtain physician's order and instill a thrombolytic or other solution per Clearing Occluded Catheters procedure to clear lumen and valve of blood clots or precipitates.
4. Obtain physician's order for chest x-ray or dye study to determine catheter position.

### Note:

- Check for radiopaque tip to verify if it is still in place. If not, reposition with the tip in the superior vena cava per agency protocol.
- If malpositioned, coiled or kinked, catheter should be repositioned until tip is in the superior vena cava. If unable to reposition for some reason, obtain physician's order to remove and replace the catheter.

## IV. Catheter Occlusion

### A. Possible Causes

1. Blood clot completely obstructing lumen.
2. Drug precipitate or lipid deposition completely obstructing lumen.
3. May be kinked, coiled or damaged.
4. Visually check catheter for any exterior kinks or constricting sutures. If sutures are present, removal may release the constriction and allow aspiration.

### B. Possible Solutions

1. Attempt to aspirate blood clot.
2. Visually check catheter for any exterior kinks or constricting sutures. If sutures are present, removal may release the constriction and allow aspiration.

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3. Move patient's arm, shoulder and head to see if a change in position affects ability to infuse.
  4. Obtain physician's order to instill a thrombolytic or other solution per Clearing Occluded Catheters procedure or agency protocol.
  5. Obtain physician's order for a chest x-ray or dye study to determine position of the catheter.

**Note:**

- If the catheter tip is not in the superior vena cava, the catheter should be repositioned or replaced.
- If the catheter tip is not in the vein, the catheter should be replaced.

## **V. Catheter Damage**

### **A. Possible Causes**

1. Repeated clamping.
2. Contact with a sharp object.
3. Rupture from attempt to irrigate an occluded catheter with a small syringe (i.e., smaller than 10cc syringe)

**Precaution:**

- DO NOT USE A SYRINGE SMALLER THAN 10 CC. Infusion pressure greater than 25 psi (172 kPa) may damage blood vessels and viscus and is not recommended.

### **B. Possible Solutions**

1. Determine the site of damage and the size and type of catheter.
2. When repairing, always fold the catheter between the patient and the damaged area and tape it together, or clamp the catheter between the patient and the damaged area with a smooth-edged, atraumatic clamp.
3. Always use a 10cc syringe or larger when infusing into the catheter.

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## **VI. Air in Line**

### **A. Possible Causes**

1. Hole in catheter.
2. Injection cap not prefilled with sterile normal saline.
3. Infusion runs dry.
4. Loose connections (e.g., injection cap, IV tubing).
5. “Manometer effect” - holding the catheter connector end above the level of the heart while it is open to the air allows air to enter the blood stream.
  - Silicone has an open matrix which allows water vapor and gases to diffuse through the membrane.
  - The amount of diffusion that takes place depends on many factors. Therefore, not all patients with silicone catheters will demonstrate this phenomenon.
  - Air remains in the catheter’s external segment. It does not extend below the level of the skin. Air can be aspirated once a week when routine flushing is done. There is no danger of air embolism from silicone permeability.

### **B. Possible Solutions**

1. Check catheter for leakage by flushing well with sterile normal saline.
2. Prefill injection cap with sterile heparinized saline before attaching it to the catheter.
3. Check for loose connections (e.g., injection cap, IV tubing).
4. Perform procedures requiring catheter to be opened to the air with the connector end below the level of the patient’s heart.

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## VII. Fluid Leakage from Catheter Exit Site

### A. Possible Causes

1. Catheter punctured by sharp object (e.g., scalpel, suture needle, trocar) just prior to placement.
2. Catheter ruptured from attempting to irrigate an occluded catheter with a small syringe (i.e., smaller than 10cc).

#### Precaution:

- DO NOT USE A SYRINGE SMALLER THAN 10 CC. Infusion pressure greater than 25 psi (172 kPa) may damage blood vessels and viscus and is not recommended.
3. Catheter may have become encapsulated by a fibrin sheath which prevents infused fluid from entering the venous system. The fluid will then take the path of least resistance, flowing back along the outside of the catheter to the skin exit site.
  4. Central vein thrombosis or tumor growth occluding the vein can cause infused fluid to flow back along the outside of the catheter to the skin exit site.

### B. Possible Solutions

1. Infuse 10cc of sterile normal saline and watch for signs of fluid extravasation under the skin.
2. Obtain physician's order for a dye study through the catheter to determine path of fluid flow.
3. Remove the catheter if a leak is discovered inside the body. Please report such incidents to **Bard Access Systems** (800-443-5505 -Field Assurance Dept.).

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**References:**

*Dennis, William E., and Larson, Willard D., "Permeation and Silicone Elastomers", Dow Corning Corporation, Medical Products Business, Technical Service & Development, Midland. MI.*

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**WARNING:** An issued or revision date for these instructions is included for user's information. In the event two years have elapsed between this date and product use, the user should contact **Bard Access Systems** to see if additional product information is available.

Please consult product labels and inserts for any indications, contraindications, hazards, warnings, cautions, and instructions for use.

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# BARD

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