

Bard Access Systems, Inc.

How to Care For Your



Power. Saline. One.*



Nursing Guide

BARD

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INTRODUCTION

Product Description

A family of peripherally inserted central catheters made from specially formulated and processed medical grade materials. Each PowerPICC SOLO* catheter has a kink resistant, reverse tapered design. Catheters are packaged in a tray with accessories for reliable long (greater than 30 days) or short (less than 30 days) term vascular access.

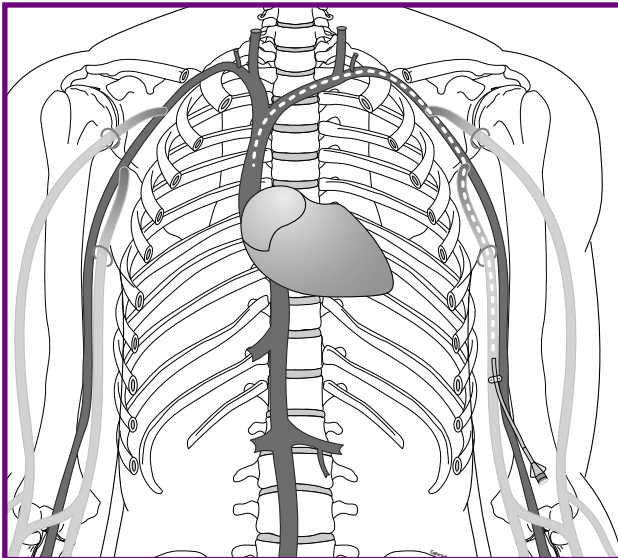
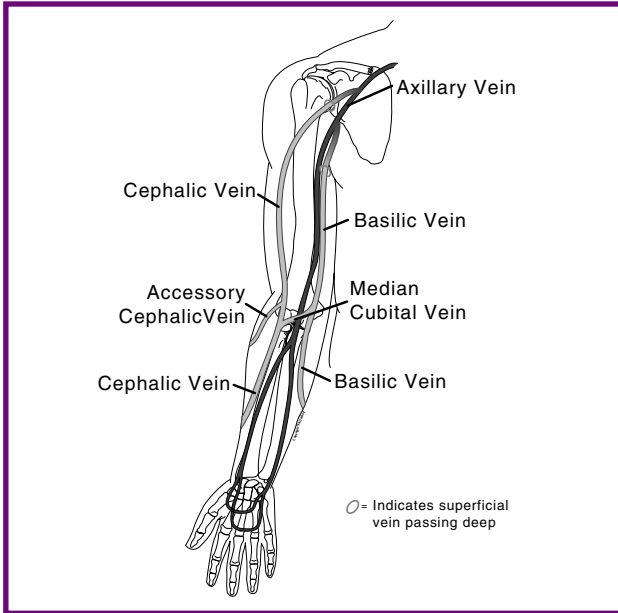
PowerPICC SOLO* catheters have the following features:

- Soft, medical grade polyurethane
- Proximal valve
- Radiopaque catheter body
- Depth markings
- StatLock* catheter stabilization device compatible
- Power injection capability
- CVP monitoring



PLACEMENT

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



POWERPICC SOLO* CATHETER VALVE FUNCTION

The PowerPICC SOLO* catheter valve controls the flow of fluids to provide clamp-free infusion therapy. Positive pressure into the catheter (gravity, pump, syringe) will open the valve, allowing fluid infusion. When negative pressure (aspiration) is applied, the valve opens allowing for the withdrawal of blood into a syringe.

INDICATIONS FOR USE

The PowerPICC SOLO* catheter is indicated for short or long term peripheral access to the central venous system for intravenous therapy, power injection of contrast media, and allows for central venous pressure monitoring. For blood sampling, infusion, or therapy use a 4 French or larger catheter. The maximum recommended infusion rate is 5 ml/sec for power injection of contrast media. For central venous pressure monitoring, it is recommended that a catheter lumen of 20 gauge or larger be used.

NEW IMPORTANT INFORMATION:

Recommended Flushing/Maintenance Procedure(s)

The catheter should be maintained in accordance with standard hospital protocols. Recommended catheter flushing/maintenance is as follows:

1. Flush the catheter after every use, or at least weekly when not in use. Use a 10 ml or larger syringe.
2. Flush the catheter with a minimum of 10 ml of 0.9% sodium chloride, using a "pulse" or "stop/start" technique. Use of heparinized saline to lock each lumen of the catheter is optional.
3. Disconnect the syringe and attach a sterile end cap to the catheter hub and tighten securely.
4. Prior to blood sampling when infusing TPN, follow routine maintenance procedure except use 20 ml saline and flush to clear TPN from the catheter.
5. If resistance is met when flushing, no further attempts should be made. Further flushing could result in catheter rupture with possible embolization. Refer to institutional protocol for clearing occluded catheters.

NOTE: When injecting or infusing medications that are incompatible, you should always flush the catheter with a minimum of 10 ml saline before and after each medication.

NOTE: When maintained in accordance with these instructions, the PowerPICC SOLO* catheter does not require the use of heparinized saline to lock the catheter lumens. However, use of heparinized saline will not adversely effect the catheter and may be necessary based on patient status or use of alternate flushing and locking techniques.

Caution: Always remove needles or syringes slowly while injecting the last 0.5 ml of saline.

Caution: Use aseptic techniques whenever the catheter lumen is opened or connected to other devices.

Caution: The PowerPICC SOLO* catheter is designed for use with needleless injection caps or “direct-to-hub” connection technique. Apply a sterile end cap on the catheter hub to prevent contamination when not in use. **Use of a needle longer than 1.6 cm may cause damage to the valve.**

Warning: Alcohol should not be used to lock, soak or de clot polyurethane PICCs because alcohol is known to degrade polyurethane catheters over time with repeated and prolonged exposure.

Power Injection Procedure

Warning: PowerPICC SOLO* catheter indication for power injection of contrast media implies the catheter’s ability to withstand the procedure, but does not imply appropriateness of the procedure for a particular patient. A suitably trained clinician is responsible for evaluating the health status of a patient as it pertains to a power injection procedure.

1. Remove the injection/needleless cap from the PowerPICC SOLO* catheter.
2. Attach a 10 ml or larger syringe filled with sterile normal saline.
3. Aspirate for adequate blood return and vigorously flush the catheter with the full 10 ml of sterile normal saline.
Warning: Failure to ensure patency of the catheter prior to power injection studies may result in catheter failure.
4. Detach syringe.
5. Attach the power injection device to the PowerPICC SOLO* catheter per manufacturer’s recommendations.

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6. Contrast media should be warmed to body temperature prior to power injection.
Warning: Failure to warm contrast media to body temperature prior to power injection may result in catheter failure.
 7. Use only lumens marked "Power Injectable" for power injection of contrast media.
Warning: Use of lumens not marked "Power Injectable" for power injection of contrast media may cause failure of the catheter.
 8. Complete power injection study taking care not to exceed the flow rate limits. Do not exceed the maximum flow rate of 5 ml/sec.
Warning: Exceeding the maximum flow rate of 5 ml/sec, or the maximum pressure of power injectors of 300 psi, may result in catheter failure and/or catheter tip displacement.
Warning: Power injector machine pressure limiting feature may not prevent over-pressurization of an occluded catheter, which may cause catheter failure.
 9. Disconnect the power injection device.
 10. Replace the injection/needleless cap on the PowerPICC SOLO* catheter.
 11. Flush the PowerPICC SOLO* catheter with 10 ml of sterile normal saline, using a 10 ml or larger syringe. Use of heparinized saline to lock each lumen of the catheter is optional.

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.

ChloroPrep* Solution One-Step Applicator Contraindications

- Do not use in children less than 2 months of age because of the potential for excessive skin irritation and increased drug absorption.
- Do not use on patients with known allergies to chlorhexidine gluconate or isopropyl alcohol.
- Do not use for lumbar puncture or in contact with meninges.
- Do not use on open skin wounds or as a general skin cleanser.

Warnings

General Warnings

- When using alcohol or alcohol containing antiseptics with polyurethane PICCs, care should be taken to avoid prolonged or excessive contact. Solutions should be allowed to completely dry before applying an occlusive dressing. Chlorhexidine gluconate and/or povidone iodine are the suggested antiseptics to use.
- Alcohol should not be used to lock, soak or de clot polyurethane PICCs because alcohol is known to degrade polyurethane catheters over time with repeated and prolonged exposure.
- 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.
- Do not wipe the catheter with acetone based solutions or polyethylene glycol containing ointments. These can damage the polyurethane material if used over time.
- Intended for Single Patient Use. DO NOT REUSE. The PowerPICC SOLO* catheter is a single use device and should never be re-implanted.
Reuse carries with it the attendant concern of cross-infection regardless of the cleaning or sterilization method. Re-sterilization of incompletely cleaned devices may not be effective. Any device that has been contaminated by blood must not be reused or re-sterilized.
- 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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- 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.
 - CVP monitoring should always be used in conjunction with other patient assessment metrics when evaluating cardiac function.

Placement Warnings

- If the artery is entered, withdraw the needle and apply manual pressure for several minutes.
- Place a finger over the orifice of the sheath 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 until the catheter is inserted into the sheath.
- 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.

Power Injection Warnings

- Exceeding the maximum flow rate of 5 ml/sec, or the maximum pressure of power injectors of 300 psi, may result in catheter failure and/or catheter tip displacement.
- Failure to ensure patency of the catheter prior to power injection studies may result in catheter failure.
- Failure to warm contrast media to body temperature prior to power injection may result in catheter failure.
- Use of lumens not marked "Power Injectable" for power injection of contrast media may cause failure of the catheter.
- Power injector machine pressure limiting feature may not prevent over-pressurization of an occluded catheter, which may cause catheter failure.
- PowerPICC SOLO* catheter indication for power injection of contrast media implies the catheter's ability to withstand the procedure, but does not imply appropriateness of the procedure for a particular patient. A suitably trained clinician is responsible for evaluating the health status of a patient as it pertains to a power injection procedure.

Sherlock* Tip Location System Warnings

(Applicable to kits with Sherlock* TLS Stylet)

- Ensure that the stylet tip does not extend beyond the trimmed end of the catheter. Extension of the stylet tip beyond the catheter end, combined with kinking and excessive forces may result in vessel damage, stylet damage, difficult removal, stylet tip separation, potential embolism and risk of patient injury.

ChloroPrep* Solution One-Step Applicator Warnings

- Flammable, keep away from fire or flame.
- Do not use with electrocautery procedures.
- For external use only.
- When using this product keep out of eyes, ears, and mouth. May cause serious or permanent injury if permitted to enter and remain. If contact occurs, rinse with cold water right away and contact a physician.
- Stop use and ask a doctor if irritation, sensitization, or allergic reaction occurs. These may be signs of a serious condition.
- Keep out of reach of children. If swallowed, get medical help or contact a poison control center right away.

Precautions

General Precautions

- Sterilized by ethylene oxide. Do not re-sterilize.
- 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.
- Only qualified health care practitioners should insert, manipulate and remove these devices.
- Follow Universal Precautions when inserting and maintaining the catheter.
- Follow all contraindications, warnings, cautions, precautions and instructions for all infusates, including contrast media, as specified by their manufacturer.
- Precautions are intended to help avoid catheter damage and/or patient injury.
- To minimize the risk of catheter breakage and embolization, the catheter must be secured in place.

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- Always remove needles or syringes slowly while injecting the last 0.5 ml of saline.
 - Acetone and tincture of iodine should not be used.
 - Use aseptic techniques whenever the catheter lumen is opened or connected to other devices.
 - 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.
 - Inspect kit for inclusion of all components.
 - Flush the catheter with sterile normal saline prior to use. Catheter stylet must be wetted prior to stylet repositioning or withdrawal.
 - Accessories and components used in conjunction with this device should incorporate luer lock connections.
 - DO NOT USE A SYRINGE SMALLER THAN 10 ml. Prolonged infusion pressure greater than 25 psi may damage blood vessels or viscus.

Precautions Related to Device Placement Procedure

- The PowerPICC SOLO* catheter features a reverse-taper catheter design. Placement of larger catheters at or below antecubital fossa may result in an increased incidence of phlebitis. Placement of the PowerPICC SOLO* catheter above antecubital fossa is recommended.
- Avoid placement or securement of the catheter where kinking may occur, to minimize stress on the catheter, patency problems or patient discomfort.
- Do not cut stylet.
- Do not advance the guidewire past the axilla without fluoroscopic guidance or other tip locating methods.
- If the guidewire must be withdrawn while the needle is inserted, remove both the needle and wire as a unit to prevent the needle from damaging or shearing the guidewire.
- 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.
- Avoid accidental device contact with sharp instruments and mechanical damage to the catheter material. Use only smooth-edged atraumatic clamps or forceps.

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- Avoid perforating, tearing or fracturing the catheter when using a guidewire.
 - Do not use the catheter if there is any evidence of mechanical damage or leaking.
 - Avoid sharp or acute angles during implantation which could compromise the patency of the catheter lumen.
 - The PowerPICC SOLO* catheter is designed for use with needleless injection caps or “direct-to-hub” connection technique. Apply a sterile end cap on the catheter hub to prevent contamination when not in use. **Use of a needle longer than 1.6 cm may cause damage to the valve.**

Sherlock* Tip Location System Precautions

(Applicable to kits with Sherlock* TLS Stylet)

- Temporary disruption of the cardiac rhythm device may occur if the Sherlock* TLS stylet passes within 1 cm of the cardiac rhythm device. Use care if placing the Sherlock* TLS stylet on the same side as the cardiac rhythm device.
- Do not cut stylet.
- Federal law restricts this device to sale by or on the order of a physician.
- The detector identifies the position of the stylet tip. Ensure that the stylet tip remains inside and within 1 cm from the end of the catheter tip. Failure to do so could result in catheter malposition.
- Never use excessive force to remove the stylet as it may damage the device.

CATHETER IRRIGATION PROCEDURE

Purpose:

To maintain catheter patency.

Routine Maintenance (every 7 days; after IV administration of TPN, IV fluids or medications)

Flushing

1. Flush the catheter after every use, or at least weekly when not in use. Use a 10 ml or larger syringe.
2. Flush the catheter with a minimum of 10 ml of 0.9% sodium chloride, using a “pulse” or “stop/start” technique. Use of heparinized saline to lock each lumen of the catheter is optional.
3. Disconnect the syringe and attach a sterile end cap to the catheter hub and tighten securely.
4. Prior to blood sampling when infusing TPN, follow routine maintenance procedure except use 20 ml saline and flush to clear TPN from the catheter.
5. If resistance is met when flushing, no further attempts should be made. Further flushing could result in catheter rupture with possible embolization. Refer to institution protocol for clearing occluded catheters.

NOTE: When injecting or infusing medications that are incompatible, you should always flush the catheter with a minimum of 10 ml saline before and after the medication.

NOTE: When maintained in accordance with these instructions, the PowerPICC SOLO* catheter does not require the use of heparinized saline to lock the catheter lumens. However, use of heparinized saline will not adversely affect the catheter and may be necessary based on patient status or use of alternate flushing and locking techniques.

Caution: Always remove needles or needleless caps slowly while injecting the last 0.5 ml of saline.

Caution: Use aseptic technique whenever the catheter lumen is opened or connected to other devices.

Caution: The PowerPICC SOLO* catheter is designed for use with a needleless injection caps or “direct-to-hub” connection technique. Apply a sterile end cap on the catheter hub to prevent contamination when not in use. **Use of a needle longer than 1.6 cm may cause damage to the valve.**

Warning: Alcohol should not be used to lock, soak or declot polyurethane PICCs because alcohol is known to degrade polyurethane catheters over time with repeated and prolonged exposure.

Supplies:

- Isopropyl alcohol, povidone-iodine wipes, or CHG swabstick
- 10 ml syringe filled with 5 ml of sterile 0.9% sodium chloride (normal saline)

Procedure:

1. Swab the top of the injection cap with alcohol pad, povidone-iodine wipes, or CHG swabstick for at least three seconds or according to facility protocol.
2. Discard the alcohol pad/povidone-iodine wipe/CHG swabstick. Be careful not to touch the opening of the injection cap after swabbing.
3. Insert the syringe directly into the injection cap and turn clockwise.
4. Inject saline, infusing last 0.5 ml as the syringe is withdrawn from the injection cap. (This helps prevent a vacuum which can pull a small amount of blood into tip of catheter.)

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 10 ml of 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.

Supplies:

- Isopropyl alcohol and/or povidone-iodine wipes/CHG swabstick
- 10 ml syringe filled with 10 ml of sterile 0.9% sodium chloride (normal saline)

Procedure:

1. Follow routine maintenance procedure, except use 10 ml normal saline and flush to clear blood from catheter.

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2. If unable to flush all blood residue out of the injection cap, replace it after blood sampling per injection cap change procedure (per agency policy).

Prior to blood sampling when infusing TPN:

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

Flushing guidelines for small patients:

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

1. Use 2 ml normal saline for routine maintenance (every 7 days; or after administration of IV fluids or medications).
2. Use 3 ml normal saline after blood aspiration for any reason, when blood is observed in the catheter, or after IV administration of TPN.

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

BLOOD WITHDRAWAL / ASPIRATION PROCEDURE

Purpose:

To obtain blood samples for laboratory evaluation, eliminating the need for peripheral vein punctures.

To verify venous placement prior to administration of hypertonic or vesicant solutions.

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

Hub-To-Hub Technique (Syringe):

Supplies:

- 3 – 10 ml syringes
- Sterile 0.9% sodium chloride (normal saline)
- Isopropyl alcohol wipes/povidone-iodine wipes / CHG swabstick
- Blood specimen tubes
- Injection cap

Procedure:

1. Wash hands thoroughly.
2. Draw up 10 ml of normal saline in syringe and set aside.
3. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter.
4. Remove injection cap/I.V. tubing from catheter hub.
5. Clean catheter hub with alcohol, povidone iodine wipe, or CHG swabstick
6. Attach an empty 10 ml syringe to catheter hub.
7. Pull back syringe plunger 0.5 ml, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5 ml of blood.
8. Disconnect syringe and discard/reinfuse, according to hospital protocol. (saline in catheter dilutes specimen and may alter lab values).
9. Attach an empty 10 ml syringe and aspirate per step 7 to withdraw amount of blood needed for testing.
10. Disconnect syringe and attach saline-filled syringe.
11. Flush the catheter with 10 ml normal saline using "push/pause" technique.

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12. Disconnect syringe and clean catheter hub with alcohol, povidone-iodine wipe, or CHG swabstick.
 13. Attach new injection cap per injection cap change procedure or attach sterile I.V. tubing to hub of catheter.
 14. Transfer to blood collection tubes per hospital policy.

Needleless Adapter Through Injection Cap

(Vacuum Blood Collection System or Syringe):

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

Supplies:

- Vacuum blood collection device
- 2 – 10 ml syringes
- Sterile 0.9% sodium chloride (normal saline)
- Isopropyl alcohol wipes/povidone-iodine wipes / CHG swabstick
- Blood specimen tubes

Procedure:

1. Wash hands thoroughly.
2. Draw up 10 ml of normal saline in syringe and set aside.
3. Stop any I.V. fluids infusing through the catheter, including another lumen of the catheter.
4. Clean injection cap with alcohol and/or povidone iodine wipe or CHG swabstick
5. Attach empty 10 ml syringe to injection cap.
6. Pull back syringe plunger 0.5 ml, pausing for 2 seconds to allow blood to come into catheter. Slowly continue to aspirate 5 ml 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 5 ml capacity.

7. Remove syringe from injection cap and discard/reinfuse, according to hospital protocol.
8. Clean injection cap with alcohol, povidone iodine wipe, or CHG swabstick.
9. Attach vacuum blood collection system to injection cap. Push blood specimen tube into vacuum collection device sleeve so that rubber stopper is pierced.
10. Blood needed for specimen will flow into specimen tube. Change tubes as needed for required tests.

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11. Remove vacuum blood collection system and sleeve from injection cap.
 12. Clean injection cap with alcohol, povidone-iodine wipe, or CHG swabstick.
 13. Attach saline-filled syringe and flush the catheter with 10 ml of normal saline.
 14. If unable to flush all of the blood residue out of the injection cap, attach a new sterile injection cap per injection cap change procedure (per agency policy).

INJECTION CAP CHANGE PROCEDURE

Purpose:

To minimize potential for infection from overuse of injection cap.

Frequency:

- Every seven days (about 18 uses) or per agency policy.
- When the injection cap has been removed for any reason.
- Anytime the injection cap appears damaged, is leaking, blood is seen in the catheter without explanation or blood residue is observed in the injection cap.
- After blood withdrawal through the injection cap (per agency policy).

Supplies:

- New sterile injection cap
- Alcohol wipes / povidone-iodine wipe / CHG swabstick
- 10 ml syringe filled with 5 ml of sterile 0.9% sodium chloride (normal saline)

Procedure:

1. Wash hands.
2. Using aseptic technique, open injection cap package and prefill injection cap with normal saline.
3. Hold the hub of the catheter below the level of the patient's heart (prevents "manometer effect" or fluid drop in the catheter) and remove the old injection cap.
4. Clean the outside of the catheter hub with an alcohol wipe and/or povidone-iodine wipe or CHG swabstick.
5. Remove the tip protector from the new injection cap and twist clockwise onto the catheter hub.
6. Irrigate the catheter with 5 ml normal saline following the Catheter Irrigation Procedure (per agency policy).

PICC DRESSING CHANGE PROCEDURE

Purpose:

To prevent external infection of the central venous catheter.

Frequency:

Every seven days and PRN if dressing is loose or damp.

Chlorhexidine gluconate is the suggested antiseptic to use. Acetone and tincture of iodine should not be used. 2% Chlorhexidine gluconate/ 70% isopropyl alcohol swabsticks may be used for dressing changes. Povidone-iodine may also be used as an antiseptic.

Supplies:

- 1 Each - CHG applicator
- 2 Each - 2 in. x 2 in. gauze – optional
- 1 Each - 10 cm x 12 cm transparent dressing
- 2 Pair - Sterile gloves

Procedure:

1. Wash hands thoroughly.
2. Put on sterile gloves.
3. Carefully remove old dressing and discard. Avoid tugging on the catheter, use of scissors or other sharp objects near the catheter.
4. Inspect the catheter exit site for swelling, redness, or exudate. Notify physician if a problem is observed.
5. Remove and discard gloves.
6. Repeat thorough hand wash.
7. Put on sterile gloves.
8. Clean the catheter exit site with the CHG applicator per manufacturer's directions for use.
9. Remove and discard gloves.
10. Fold a 2 in. x 2 in. gauze in half and place it under the catheter hub (if desired).
11. Apply the transparent dressing, over the exit site, and catheter tubing.
12. Attach additional securement per institutional policy avoiding the placement of tape directly on the polyurethane catheter material.

CLEARING OCCLUDED CATHETERS PROCEDURE

Purpose:

To restore patency to a catheter with an occlusion.

Supplies:

- 1 - Sterile injection cap
- Thrombolytic solution
- 1 – 10 ml syringe
- 1 – 10 ml syringe filled with 10 ml normal saline
- Isopropyl alcohol wipes
- Sterile gloves

Procedure:

1. Wash hands.
2. Put on sterile gloves.
3. Remove injection cap, attach an empty 10 ml syringe and attempt to aspirate. If aspiration is successful, withdraw clots and flush catheter with 10 ml normal saline. Replace cap. If aspiration is unsuccessful, proceed to step 4.
4. Obtain physician's order for the use of thrombolytic solution to declot the catheter. Note: Cautions contained in medication package insert should be observed.
5. Draw up enough thrombolytic solution into a 10 ml syringe to equal the internal volume of the catheter (volume may be reduced if catheter length has been cut).
6. Aseptically attach the thrombolytic solution filled syringe to the catheter hub. Slowly and gently inject the thrombolytic solution into the catheter using a push-pull motion to achieve maximum mixing. To avoid catheter rupture, do not force entire amount into catheter if strong resistance is felt.
7. Leave 10 ml syringe attached to catheter. Do not attempt to aspirate for 30-60 minutes.
8. After 30 minutes, attempt to aspirate the drug and residual clot. If unsuccessful, repeat thrombolytic instillation.
9. When patency is restored, aspirate 5 ml of blood to assure removal of all drug and clots.
10. Remove blood-filled syringe and replace it with a 10 ml syringe filled with normal saline. Flush catheter to verify patency.
11. Attach sterile, saline-filled injection cap.

12. Attach additional securement per institutional policy avoiding the placement of tape directly on the polyurethane catheter material.

Note: For suspected calcium and phosphate precipitation when 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. The solution is then aspirated and the catheter flushed with normal saline.

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 with aspiration.
3. Blood clot, fibrin sheath, or particulate matter obstructing catheter.
 - 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 preventing aspiration.
 - Fibrin sheaths usually begin to form within a few days after the insertion of a central venous catheter. When it has grown enough to extend to the tip of the catheter, it may be pulled into and obstruct the catheter valve when aspiration is attempted, but offer no resistance to infusion.
4. Kinked catheter outside or inside the body.
 - Suture constriction at the catheter skin exit site.
 - Catheter may be curled or kinked within the vessel, or under the dressing.
5. Malposition of catheter tip (i.e. jugular vein, outside of vein).

B. Possible Solutions

1. Visually check catheter for any exterior kinks, or constricting sutures. If sutures are present, their 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 10 ml normal saline. Then pull back gently on syringe plunger 0.5 ml, pause and proceed with aspiration.
4. If resistance to infusion is felt, check for signs of extravasation. If present, notify physician of possibility of catheter leakage. If not present, see step 5.
5. Attempt to aspirate with a 20 ml syringe (creates greater vacuum).

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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 thrombolytic or other solution to clear catheter.
 - 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. 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. Catheter tip may not be within vein.
5. If sutures were used during the placement of the catheter, they can tighten and restrict flow.

B. Possible Solutions

1. Attempt to aspirate blood clot.
2. Inspect patient for presence of sutures around the catheter. If sutures are present, they should be removed.
3. Move patient's arm, shoulder and head to see if position change affects ability to infuse.
4. Obtain physician's order and instill thrombolytic solution or other solution per Clearing Occluded Catheters Procedure.
5. Obtain physician's order for a chest x-ray or dye study to determine the position of the catheter.

III. Catheter Damage

A. Possible Causes

1. Contact with a sharp object.
2. Rupture from attempt to irrigate an occluded catheter with a small syringe (i.e. 1 or 3 ml syringe)
 - Small syringes can generate very high internal pressures with very little force. The back pressure from an occlusion may not be felt when using a small syringe until damage to the catheter has occurred.

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3. Rupture from attempts to power inject through an occluded catheter.

B. Possible Solutions

1. 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.

IV. Air in Line

A. Possible Causes

1. Hole in catheter.
2. Injection cap not prefilled with normal saline.
3. Loose connections (injection cap, IV tubing).
4. "Manometer effect" – holding the catheter connector end above the level of the heart while it is open to the air creates a manometer effect. Air will not enter the blood stream unless the valve has been propped open.

B. Possible Solutions

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

V. Fluid Leakage from Catheter Exit Site

A. Possible Causes

1. Catheter punctured by sharp object (i.e. scalpel, suture needle, scissors) just prior to placement.
2. Catheter ruptured from attempt to irrigate an occluded catheter with a small syringe (i.e. 1 ml or 3 ml syringe).
 - Small syringes can generate very high internal pressures with very little manual force. The back pressure from an occlusion may not be felt when using a small syringe until the damage to the catheter has occurred.

-
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. Rupture from attempts to power inject through an occluded catheter.
 5. 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. Slowly infuse 10 ml of normal saline and observe 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 or outside the body. Please report such incidents to Bard Access Systems, Inc. (800-443-5505 - Field Assurance Dept.).

ChloroPrep* Solution One-Step Applicator Active Ingredients

- Chlorhexidine gluconate 2% w/v...antiseptic
- Isopropyl alcohol 70% v/v...antiseptic

Inactive Ingredients

- USP purified water

For further information or questions regarding ChloroPrep* One-Step Applicator call:
1-800-523-0502 (8 a.m.-5 p.m. CST)

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, Inc.** to see if additional product information is available.

Revised Date: March 2009.

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