PICC Care and Maintenance

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• **Types:**

Valved:

• Bard - Groshong - valve at distal tip
  -Solo - valve at proximal hub - Power PICC

• Angio Dynamic (Navilyst) - Vaxcel
  -Xcela (Power PICC)

  - Bioflo (Power PICC) & endexo

All 3 of these are valved at the proximal hub – PASV
• Studies have shown that valved PICCs decrease the incidence of infections and occlusions; this leads to cost savings due to a decrease in procedures secondary to these complications.
Non-Valved or Clamped:

• Cook
• Bard
• Angio Dynamic (Navilyst) – Power PICC

Sizes:
• 3 Fr single lumen
• 4 Fr single lumen
• 5 Fr single & dual lumen
• 6 Fr triple lumen – some have CVP capability
Choosing the Right PICC:

• A PICC is often the central venous access device (CAVD) of choice due to the lower incidence of infection as compared to percutaneous subclavian and internal jugular catheters. There is no risk of pneumothorax with a PICC insertion procedure. PICCs are also indicated for short-term infusions for patients with limited venous access and for IV therapies that will continue over long periods of time.
**Size:** The smallest size possible for the type of treatment

- 3 Fr for pediatrics
- 4 & 5 Fr for IV access, chemotherapy, and long-term antibiotics
- 5 Fr dual lumen for TPN, multiple infusions, and ICU patients
- 6 Fr triple lumen for some ICU patients
Not all valves are the same
There are fewer complications, such as occlusions, with single lumen PICCs. There are fewer complications with a right arm entry as the distance to the vena cava is shorter, but sometimes the use of the left arm is necessary in cases such as patients having had a Rt mastectomy, patients who have received radiation to the Rt side, those with Rt arm lymphedema or fistulas.

The side and size is carefully chosen for each patient.
Vessels of Choice:

• Basilic

• Cephalic

PICCs are placed with the tip terminating at the junction of the superior vena cava and the right atrium. Placement is confirmed with a chest x-ray.
Benefits to Patients:

• Successful completion of infusion therapy

• Reduction of venipunctures

• Reduction of infections

• Ability to receive treatment at home
Complication

• **Air embolus**
  Hypotension, lightheadedness, confusion, tachycardia, anxiety, chest pain, shortness of breath

• **Catheter embolus**
  Shortness of breath, confusion, pallor, lightheadedness, tachypnea, hypotension, anxiety, unresponsiveness, shorter catheter measurement on removal than inserted length

• **Arterial puncture** (during insertion)
  Bright red blood, pulsatile bleeding at insertion site, retrograde flow in IV tubing, can be verified by arterial blood gas test on sample aspirated from PICC
• **Cardiac arrhythmia**
  Irregular pulse, palpitations, atrial or ventricular arrhythmia on cardiac monitor

• **Nerve injury or irritation**
  Shooting "electric shock sensation" of pain down arm during insertion, numbness, tingling, weakness of extremity, paralysis

• **Inability to advance catheter to desired tip termination**
  Catheter will not advance
• **Catheter malposition (can occur during insertion, or after insertion)**

Patient hears gurgling sound during flushing of catheter (internal jugular tip malposition), arm or shoulder pain, headache, swelling in neck, dyspnea, discomfort during infusion, absence of blood return, leaking at insertion site, arm swelling, back discomfort, chest pain or tenderness, arrhythmia symptoms

• **Infection**

Fever, chills, tachycardia, fatigue, muscle aches, weakness, hypotension, erythema, swelling at site, induration, purulent drainage at site, elevated white blood cell count
Care and Maintenance:
The importance of diligent care and maintenance is to ensure that the PICC will stay in working order for the duration of the patient’s needs or treatments.

- **Phlebitis**
  Erythema, pain at access site, streak formation, palpable venous cord, purulent drainage

- **Difficult removal of PICC**
  Resistance met at any point during removal of catheter

- **Thrombus formation**
  Any device inserted into the vascular system increases the risk of thrombus formation
Care and Maintenance:

• The importance of diligent care and maintenance is to ensure that the PICC will stay in working order for the duration of the patient’s needs or treatments. A PICC can stay in place for up to a year.
Reasons for Blocked PICCs:

• Blood reflux into catheter
• Drug precipitate
• Lipid occlusion
• Poor catheter maintenance
• Hyper-coagulable states
• Increased intrathoracic pressure
Occlusions

- **Mechanical** – check the entire infusion circuit and catheter for clamps, kinks.

- **Chemical** – assess infusates for potential interactions or precipitation.
  - Prevent chemical occlusions with proper flushing and attention to incompatibilities.
  - You may be able to clear precipitation occlusion with instillation of solution to dissolve precipitate. Solution depends upon infusate.
• Thrombotic

• Non-thrombotic
To prevent occlusion, follow your hospital policy for flushing. Regular flushing of a PICC is required to prevent or delay catheter occlusion from drug precipitate or fibrin formation.

• Wash your hands and put on clean gloves

• Scrub the end cap, using good aseptic technique, using 2% chlorhexadine. Cap should be scrubbed for no less than 15 seconds for it to be fully effective.

• Connect 10cc syringe normal saline, draw back 1-2 mls, and check for blood return.
• Flush with 10-20cc normal saline before and after drug administration and before after blood sampling; use a start/stop method known as a turbulent flush. This flushing helps clear the walls of the PICC more efficiently then a straight flush.

• If using a non-valved PICC, close the clamp during the last ml. For a valved PICC, disconnect syringe after flushing.

• VALVED PICC - when not in use, only need to be flushed every 7 days or as per hospital policy
Never use smaller than a 10cc syringe for flushing. The catheter is designed to deliver 25psi.

A smaller syringe could lead to rupture of the catheter or possible catheter embolus.

- 10cc syringes delivers approx. 25psi
- 5cc syringe delivers approx. 60psi
- 2cc syringe delivers approx. 120psi
Dressing /Cap/Securement Device Change: follow hospital policy

• Wash hands and wear clean gloves

• Should be done every 7 days or per hospital policy

• Clear occlusive dressing such as Tegaderm

• When removing old dressing, pull toward the insertion site securing the catheter. Remove securement device making sure PICC line stays in place.
• Clean around insertion site with chlorhexadine sponges and let dry completely.

• Apply new securement device and new dressing.

• Remove old cap.

• Scrub the hub for 15 seconds, let dry completely, and replace with new cap. A neutral clear microclave has become the cap of choice as it has a less risk of infection. You can visualize blood in cap. Caps should always be changed with the presence of blood.

• Any cap or dressing that is soiled or has blood present should be changes ASAP
- Flat, smooth, swabbable surface.
- Split-septum, a preferred design feature for connectors.
- Minimal deadspace (also referred to as residual volume) of 0.04 mL allows for lower flush volumes.
- Clear housing permits visual confirmation of flush after use with medications or blood.
Teaching for Patients:

• Keeping patients informed decreases anxiety about their lines.

• Cover when showering.

• Do not carry heavy objects.

• Avoid blood sampling and blood pressure on that arm.

• Wear loose clothing.

• Report a soiled dressing to nurse.

• Report any signs of redness or pain to nurse
**Activity:**

- avoid lifting heavy objects
- avoid using crutches
- avoid B/Ps on that arm
- avoid blood sampling from that arm
Malposition of PICC:

• Keeping alert for signs of malposition and assuring blood return is important. Malposition can occur upon PICC insertion or later, due to changes in intrathoracic pressure or catheter migration. It is essential that the distal tip termination be confirmed by chest x-ray immediately after insertion and prior to device use, as malposition can lead to serious complications.
Potential causes of malposition

- Flushing without using push-pause technique
- Power injection during CT scan
- Proximal tip termination after insertion (may increase risk)
- Extreme intra-thoracic pressure changes from coughing, vomiting, Valsalva
• If PICC becomes malpositioned you may be able to reposition with a “power flush.” Flushing a catheter rapidly with 10 mL NS causes catheter motion, may flip catheter back into place.

• If tip malpositioned in internal jugular or subclavian, sit patient upright and flush 10 mL straight in without pausing. Repeat 2-3 times.
• If catheter tip is in azygous vein, turn patient to his right side, and then power flush several times.

• If catheter becomes malpositioned in contralateral subclavian, sit patient up. Have patient hold contralateral arm up above head, power flush several times.

• If flushing does not reposition catheter, consult diagnostic imaging for troubleshooting, or consider over the wire exchange, considering risk/benefit analysis.
Checking for blood return:

- Blood return is essential. A physician’s order to use without blood return is not acceptable. This does not protect the patients from harm. It is an international standard that blood return is essential.
• All CVCs must have a blood return to be usable

• If unable to aspirate blood, you must fix the problem or remove the catheter

• It is important to quantify the definition of blood return for your facility. A tinge of blood is inadequate. An option is to only count as blood return if able to aspirate at least 3 mL continuously.
• Using aseptic technique, scrub the end cap with 2% chlorhexadine swab.

• With a 10cc syringe of normal saline, flush with 5-10 mls, draw back 1-2 mls, and wait for blood return, then flush with 10-20 cc normal saline.

• Follow hospital policy regarding no blood return. If patient complains of chest discomfort or noise [gurgling] in ear, check for malpositioning (chest x-ray).

• Measure the outer length of catheter.

• Make sure catheter is secured in place
Troubleshooting Blood Return Issues

• Always flush with 5-10 mL of NS before aspirating, using pulsing (stop-start) flush.

• If unable to aspirate blood the catheter tip may have migrated. Consider CXR or reconfirm with ECG waveform (if you have device that can trace intra-cavitary ECG using saline column only).

• If tip is properly positioned, fibrin is the likely culprit. Cathflo can be used to resolve this.
Dealing with Occlusions: Follow your hospital policy

- If unable to get blood return, gently flush with 5-10 mls normal saline and try again
- Reposition patient
- Make sure line isn’t clamped or kinked
- Check dressing site
- Chest x-ray to check for positioning
- If unable to troubleshoot catheter, notify physician and refer to your policy for management of occluded lines.
• Never leave a lumen occluded, even if you no longer need that lumen

• Use Cathflo per manufacturer DFU to clear occlusion
Preventing Infection:

100% staff compliance with infection prevention measures is essential for preventing life-threatening CRBSI

- Strict aseptic technique should be use during insertion and care of PICC.
- Sterile technique should be used for insertions.
- Good hand washing should be use when caring for a PICC.
- Use gloves when caring for PICCs.
- SCRUB THE HUB - End caps should be scrubbed for 15 seconds prior to accessing the PICC; use alcohol or 2% chlorhexadine.
• Make sure chlorhexadine is dry before applying dressing.

• Use a clear microclave.

• Troubleshoot occluded lines immediately.

• Multi-lumen PICCs should not have one port left occluded.

• Valved PICCs have a lower incidence of infection due to less chance of reflux of blood into the lumen.
• Regular dressing and cap change (as per hospital policy)

• Soiled or wet dressing changed ASAP

• Blood-stained dressings changed ASAP

• Damaged catheters should be replaced ASAP.

• Good flushing is essential.

• Clear dressing such as Tegaderm should be used.

• Change securement devices on a regular base (as per hospital policy).
Valve was removed from patient and placed in sterile container.

Valve tapped on the edge of the agar dish with the hub over the edge and then the valve was placed hub side down on the left side of the agar dish.

Valve was then cleaned with alcohol wipe and let dry and then placed on the right side of the dish hub side down.

After two days growth

Areas where hub was placed on agar dish

Not Cleaned with Alcohol

Cleaned with Alcohol

Timothy Royer, BSN, CRNI
Watch for Signs of DVT:

• Arm swelling

• Arm pain

• Distension of neck veins
If a CR-Venous Thrombus develops, between the catheter and vessel wall, it may:

- Lead to complete blockage of the vein
- Be a life-threatening condition
- Have potential complications including, but not limited to, pulmonary embolism
Thrombosed Vein
• Notify physician if DVT is suspected. Notify physician if any PICC complications are suspected. Early intervention is important to protect the integrity and life of the PICC.

• The American college of Chest Physicians Evidence-based Clinical Practice Guidelines 8.1 recommends not to remove a working catheter that is still functioning and needed, as there is no benefit. It recommends starting the patient on parental antithrombotic therapy and oral warfarin, and stop the parental when the INR has been at least 2.0 for 24 hours and continue the warfarin for at least 3 months
Blood Draws: follow hospital policy

Technique for drawing blood:

- Attach 10cc normal saline syringe.

- Draw back 1-2mls, get blood return, and flush PICC.

- With empty syringe, draw back 1-2 mls; pause.

- Withdraw 5cc, and discard blood.

- With another empty syringe, draw back required blood.

- Flush with 2 -10cc syringes of normal saline, using a start/stop flush, creating a good turbulent flush.
Documentation Following Insertion:

- Date
- Flush
- Blood return
- Length, both internal and external, at time of insertion
- Exit site
- Dressing
- Information card for patient
Removal of PICCs:

• Wash hands and put on clean gloves

• Remove dressing and securement device carefully

• Cleans area with 2% chlorhexadine

• Gently pull catheter 2.5 cm at a time, parallel to the skin, with slow even pressure

• If resistance is felt, stop and reposition arm and try again
• If there is still resistance, apply warm compress to relieve possible vasospasm

• Do not pull vigorously as this could cause catheter breakage

• Hold pressure to site until bleeding stops, and apply occlusive dressing

• Measure length of catheter

• If unable to remove, contact physician
Strange Occurrences – Radiating Pain

Patient did well with PICC insertion, but after a few days patient calls and reports having tingling or pain in affected hand or arm. What is your response?
Radiating Pain

Median Nerve
Strange Occurrences – Radiating Pain

Response:

The patient needs to have the PICC removed and possibly replaced in a different site. The vein in which a PICC is inserted is often very close to a nerve. While the inserter may have avoided the nerve during insertion, subsequent symptoms of nerve involvement suggest local inflammation that is causing nerve compression. Condition should resolve rapidly with removal of catheter, and may worsen if PICC is not removed.
Strange Occurrences 2 - Drainage

Patient has continuous clear drainage at site, not affected by infusion. The CXR shows catheter tip in lower SVC. Dressing is being changed several times per day, with no resolution. Patient is having no weeping of skin anywhere else. Drainage occurs only at site of insertion.
Strange Occurrences 2

What is that?
Strange Occurrences 2

A lymph node!

Consider the possibility that the PICC was inadvertently inserted through a lymph node, and the result is lymph drainage around the catheter.

Remove the PICC and replace in a different site. This will not stop draining.
Appropriate Care Protects Your Patient

We all have a duty to do everything according to evidence, standards of practice, and policy. Sometimes, even when you do everything right, things go wrong. How you react affects the patient outcomes.

*However, sometimes everything comes out just perfect...*
Discussion on PICCs in a small hospital setting:

• Starting a PICC program in a small hospital setting is possible. There must be nurses interested in inserting or assisting with insertions. There must be a process set-up to trouble shoot problem lines and to work closely with community nurses. Training is available from companies that supply PICCs.