



GUIDELINE

SUBJECT: PICC Line Insertion and Management in NICU

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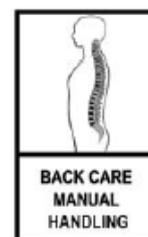
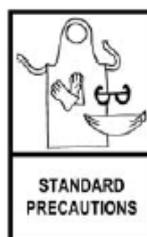
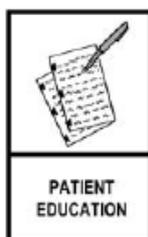
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Disclaimer:

It should be noted that this document reflects what is currently regarded as a safe and appropriate approach to care. However, as in any clinical situation there may be factors that cannot be covered by a single set of guidelines, this document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgment to each individual presentation.

S.W.P.



Rationale:

The survival of Extremely Low Birth Weight (ELBW) neonates and critically sick neonates within the NICU has increased the need for reliable vascular access to provide parenteral nutrition and medications. The umbilical venous catheter has a limited indwelling time, hence the need for a Peripherally Inserted Central Catheter (PICC) line.

Outcomes:

- **Successful placement of PICC line in an optimal position confirmed by radiographic examination**
- **Safe infusion of Parenteral Nutrition (PN) and other hyperosmolar solutions**
- **Reduced need for peripheral intravenous (IV) cannulation**
- **All precautions will be taken to ensure the safe administration of infusions to prevent contamination of lines as well as ensuring patency and preservation of lines insitu**

Indications:

Patient criteria for PICC line placement may include the following:

- Premature neonates, usually with a birth weight <1500 grams due to the delay in establishing full enteral feeds
- Infants requiring more than 5-7 days of IV access
 - Infections requiring a prolonged course of antibiotics e.g. meningitis
 - Gastrointestinal/surgical disorders e.g. necrotizing enterocolitis, gastroschisis or omphalocele
 - Severe respiratory insufficiency
 - Congenital cardiac conditions
- Infants requiring infusion of fluids or medications which are hyperosmolar or have irritant properties (e.g. dopamine, dobutamine, calcium gluconate)
- Infants with inadequate or difficult peripheral venous access

Each patient will be assessed individually prior to insertion of PICC line, weighing the risk-benefit ratio for the procedure

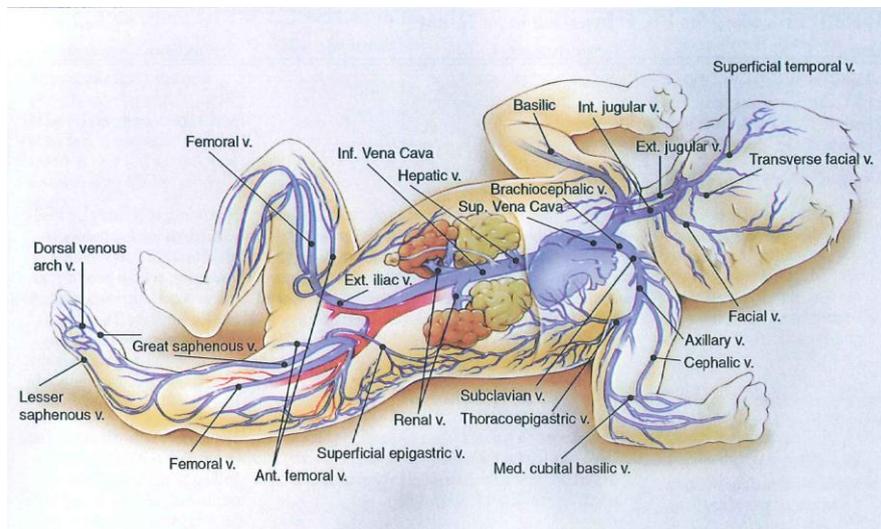
Contraindications:

There are no absolute contraindications, however relative contraindications are:

- Skin infection at the insertion site
- Ongoing bacteremia or fungal infection

Insertion sites for PICC lines:

1. Antecubital veins: basilic or cephalic veins
2. Saphenous veins
3. Scalp veins: temporal and posterior auricular veins
4. Axillary veins



Major veins used for PICC placement

Guideline for Practice: National Association of Neonatal Nurses 2007

Insertion Variations:

1. Breakaway needle: needle is inserted into vein and catheter advanced through it. The needle is then retracted, split and removed.
2. Metal introducer is inserted into the vein, the catheter is advanced through it. The introducer is removed and the catheter is placed in to infusion line hub
3. IV cannula: not recommended unless desperate as the cannula cannot be removed from the line.

Catheter Insertion Tips:

Remember always feed the catheter slowly and carefully (patience is definitely a virtue here). The inner layer of vein can be damage which can lead to thrombosis.

Tip 1: Feed in small increments

Feed with $\frac{1}{4}$ cm increments usually and $\frac{1}{2}$ cm if catheter has a guide wire. Feeding too much can cause catheter to buckle and cause vessel irritation with subsequent phlebitis.

Tip 2: Flush to dilate vessel and open valves

Venous valves can offer resistance to insertion, flushing will dilate vessel and open valves.

Tip 3: Milk the vein

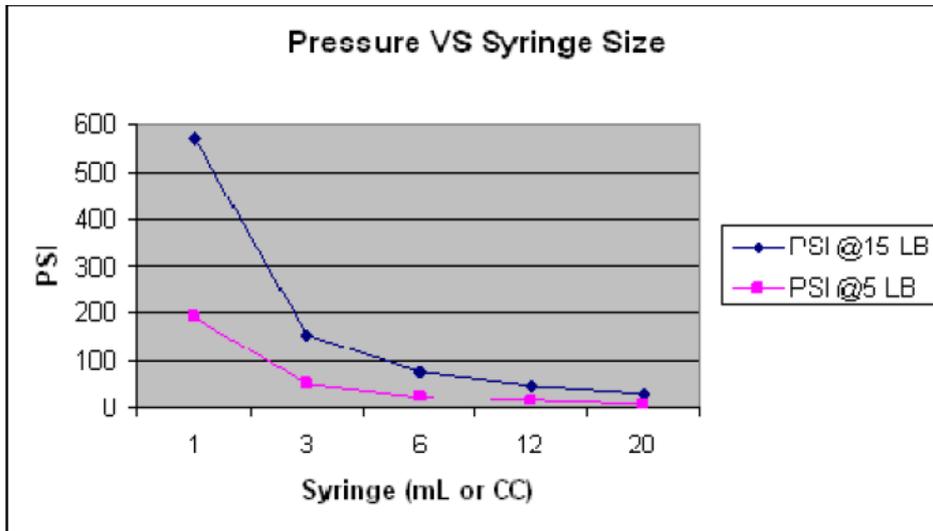
Massage the vein towards the heart to empty it of blood and allow it to refill. This also helps in further threading the catheter.

Tip 4: Manipulate the position/limb of the patient

Elevating the arm or pelvis and gently moving the limb in different directions will help advance a catheter that is stuck at the shoulder or groin.

Flushing:

Warning: Use only 10 ml syringes for flushing. Smaller syringes can generate very high pressures that may rupture the catheter even if it is not occluded.



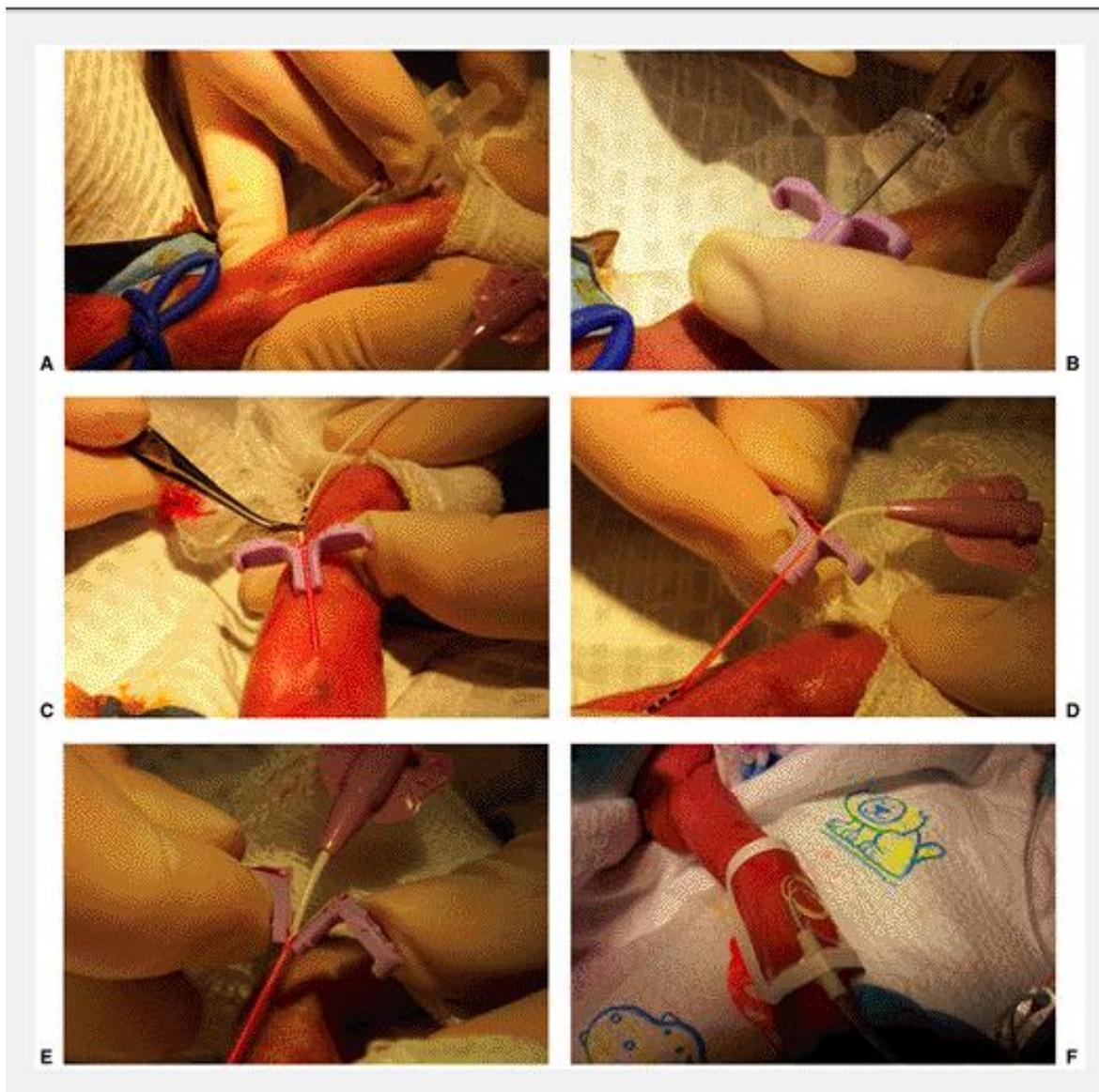
Guide to pressure exerted by differing syringe sizes in PICC lines
Tyco Healthcare/Kendall. 2010

Equipment:

1. PICC line there are two sizes available – Vygon™ 24g (for use in infants >1000g) and Premcath™ 28g (for use in infants <1000g) both of which come with introducers and stylets
2. PICC line insertion pack which contains – 2 drapes (75x45cm), 1 blue plastic prep forcep, 2 tape measures, Tegaderm™ dressing (4x4cm), 10ml syringe, tourniquet, 4 ball gauze swabs, 2 drape towels, 1 fenestrated transparent drape, 1 pair scissors, 1 pair forceps (straight), 1 pair forceps (curved), 5 gauze squares, 2 gallipots (60ml), 1 tray (20x15cm), 1 pack small steristrips
3. Heparinized saline solution 50units/5ml
4. Sterile gown, surgical hat and gloves
5. Surgical mask
6. PICC insertion check list
7. Insertion of PICC may be assisted by the use of a transilluminator, which helps to locate the vein and improve accuracy in depth perception during venepuncture attempts. Placing a sterile glove over the transilluminator enables incorporation of this tool into the sterile procedure.
8. Antiseptic solution – Aqueous Chlorhexidine™ (>1000G) or Povidone™-iodine (<1000g)

Procedure of PICC Line Insertion:

- Insertion of a PICC is limited to 2 attempts on one limb at any one time
- Ensure bedside nurse is available to help. Ask for skin temperature probe to be applied and have the crib converted to an open care with the infant nursed on servo control. Assistant to wear mask, surgical hat and sterile gown to maintain sterile field when holding infant
- Place a screen around the bed to alert nurses and visitors of the sterile procedure
- Assess the infant for potential access sites and measure the approximate distance from the site of insertion to the point where the tip of the catheter will be placed (see Table 1). Place the infant in the desired position and have adequate lighting available. Open equipment and provide infant with pain coping strategies e.g. swaddling, non-nutritive sucking, sucrose
- The PICC is inserted using a sterile technique don mask and surgical hat prior to performing sterile scrub and donning gown and gloves. Arrange equipment on trolley and flush PICC with heparinised saline. Check length of PICC for any leaks or imperfections.
- Cleanse the skin with antiseptic solution (Aqueous Chlorhexidine™ or Povidone™ if <1000g) and allow to dry for 3 minutes. Do not allow solution to pool beneath infant.
- Place the limb through the fenestrated transparent drape. Use the 2 opaque drapes provided to increase the size of the sterile field
- Place the tourniquet on the limb (see diagrams A-F)
- Stabilise the limb and insert the introducer with styler into the vein. Once the vein has been cannulated, remove the styler and loosen the tourniquet
- Insert the PICC line through the introducer to the desired length aspirate blood and then flush with heparinised saline 0.5 mL to clear the catheter. This ensures the line is in a larger vessel. If excessive pressure is required to flush the line, it may need repositioning.
- Apply gentle pressure to insertion site with gauze pad, while withdrawing the introducer, to stop bleeding. If there is continuous oozing or significant bleeding an absorbent haemostat product e.g. Surgicel™ may be used at the site Once a small amount is applied to the site it should not be removed. Dressing the PICC should not be attempted until the bleeding has stopped.
- Confirm the position of the PICC tip by x-ray. Remain scrubbed and at the bedside to maintain sterility of the field in case any adjustments are required. Review x-ray on Computer on Wheels(COW). A repeat x-ray is required after any change in PICC insertion length. When positioning for x-ray: if the PICC is in the upper limb both arms must be held straight down by the sides of the body. If the PICC is in the lower limb, both legs should be held straight
- Secure catheter at insertion site with Steri-strips. The excess PICC length may be curled on the limb and secured with Steri-strips. The hub of the PICC should be secured to the limb on top of a small piece of thick Duoderm™ to prevent pressure areas. Both the insertion site and hub should be covered as one dressing with Tegaderm™
- Always use a 'sharps-safe' technique – place all sharps used into a plastic receptacle on the trolley prior to disposing of them into a sharps bin once the procedure is completed



Diagrams A-F- Procedure for Insertion of PICC *Atlas of Procedures in Neonatology, 2007*

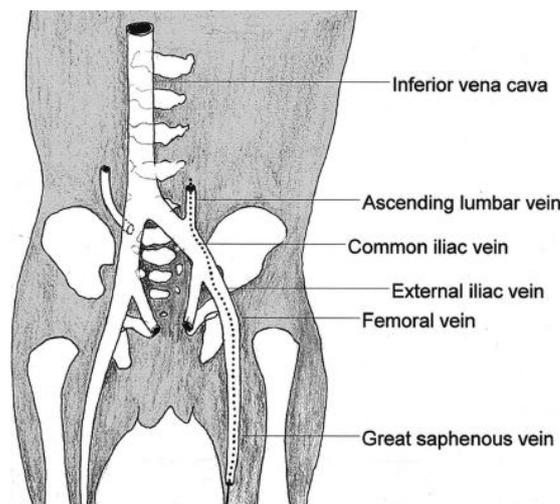
Site of Insertion	Position of Baby	Measurement
Antecubital veins	Supine, abduct arm 90 degrees from trunk; turn head toward insertion site to prevent catheter from traveling cephalad through ipsilateral jugular vein	From planned insertion site, along venous pathway, to suprasternal notch, to third RICS
Saphenous or popliteal veins	Supine for greater saphenous vein, prone for small saphenous or popliteal; extend leg	From planned insertion site, along venous pathway, to xiphoid process
Scalp veins	Supine, turn head to side; may have to turn head to midline during procedure to assist advancement of catheter	Follow approximate venous pathway from planned insertion site near ear, to jugular vein, right SC joint, to third RICS
External jugular vein	Supine, turn head to side; place roll under neck to cause mild hyperextension	From planned insertion site, to right SC joint, to third RICS
Axillary vein	Supine, externally rotate and abduct arm 120 degrees, flex forearm and place baby's hand behind head; vein is found above artery between medial side of humeral head and small tuberosity of the humerus	From planned insertion site, to right SC joint, to third RICS

Patient Position and Measurement for PICC Insertion *Atlas of Procedures in Neonatology, 2007*

Radiologic Confirmation of Catheter Position:

Though PICC lines have multiple benefits they can have potentially life threatening complications. A malpositioned line substantially increases the risk of complications.

- Upper extremities: the line tip should be positioned in the superior vena cava
 - Preterm: about 0.5 -1 cm outside the cardiac chambers
 - Term/ larger babies: 1-2 cm outside the cardiac chambers
 - The general consensus is that the PICC should never be within cardiac chambers
- Lower extremities: line tip should be positioned in the inferior vena cava at the level of lumbar spines 1-4
 - When using the left lower limb be aware that the line can migrate into ascending lumbar vein and needs to be visualized crossing the midline to be inside the inferior vena cava



Left long Saphenous percutaneous central line-inserted into ascending lumbar vein
Neonatal Network, 2010

PICC Care and Maintenance:

- Evaluate appearance of the catheter and the tissue around the insertion site frequently
- Dressing changes to site are not routine, but if necessary must comply with “Surgical Aseptic non touch technique”
- Change infusion tubing according to unit policy with aseptic technique
- Enter the line only when absolutely necessary to prevent contamination
- Administer a continuous infusion of intravenous fluids of at least 0.5 ml/hour to prevent line blockage
- Ensure that the medications infused through the line are compatible with each other and the primary infusate. A flush may be needed before and after medication administration
- Remove catheter as soon as it is no longer medically necessary

Complications:

- Incidence of major complications with PICC lines are low
- Serious complications are associated with malpositioned lines
- Complications can be reduced with standardized procedures for insertion and catheter care

Infection: Catheter related blood stream infection (CRBSI). CRBSI is an inherent risk with any vascular device. Additional risk factors are:

- In JHCH NICU PICC line insertion is generally by experienced clinicians. Trainees based in the NICU for 6 month terms should be allowed to perform PICC line placement if they are competent in peripheral venous access and the procedure is important in their training
- Multiple attempts and/or manipulation of catheter
- Contamination of the catheter hub
- Long indwelling time i.e., more than 3-6 weeks

Treatment would include removal of PICC line along with antimicrobial therapy depending on the organism isolated and clinical condition of patient

Phlebitis: may occur within 24 hours as a normal body response to the catheter. Moist warm compresses with elevation of limb usually help but in severe cases may require catheter removal.

Catheter migration/malposition: this can occur either at insertion time or any point during catheter indwelling time. This can lead to potentially dangerous complications like pericardial or pleural effusion, cardiac arrhythmias, tissue extravasation/infiltration and thrombosis.

Catheter dysfunction/breakage: mechanical problems with the catheter

Catheter Removal:

1. Wash hands. Place patient in a comfortable position. Provide adequate pain coping strategies e.g. swaddling, sucrose
2. Assemble equipment - dressing pack, appropriate antiseptic solution, sterile gloves, dressing towel
3. Don gloves. Gently remove dressing by pulling it towards the insertion site, pulling it away may remove catheter along with the dressing. Remove Steri-strips™ while holding stabilizing wings with one hand.
4. Clean site with an appropriate antiseptic for infant size and allow to dry
5. Remove the catheter using small 'bites' with a steady gentle traction. Start at insertion site with each 'bite'. The whole process should take 30-60 seconds.
6. No pressure should be applied at insertion site or along the course of the vein as this increases risk of embolus or venous spasm leading to resistance to removal.
7. Once the catheter has been removed, apply manual pressure to the area for 2-3 minutes using gauze. There should be no oozing from the site.
8. Measure and inspect the catheter. If there is any discrepancy notify the Neonatologist.

Important If a portion of catheter breaks during removal tie a tourniquet proximal (nearer to the centre of the body) to site to prevent migration into the right atrium. Check that the tourniquet is not too tight by feeling the pulse distal to it. Inform the Neonatologist and arrange for an X-ray.

REFERENCES:

- Corzine, M & Willett, K.D. 2010. Neonatal PICC: One Unit's Six-Year Experience with Limiting Catheter Complications. *Neonatal Network*, May / June, Vol. 29, No. 3
- Gustafson, R. 2010. Best Practices for the Care and Maintenance of ARGYLE Neonatal Peripherally Inserted Central Catheters. Tyco Healthcare/Kendall-LTP
- McDonald, M.G & Ramasethu, J. 2007. *Atlas of Procedures in Neonatology*, 4th Edition. Lippincott Williams and Wilkin
- Pettit, J & Mason Wyckoff, M. 2007. Peripherally Inserted Central Catheters. Guideline for Practice, 2nd Edition. National Association of Neonatal Nurses
- Sneath, N. 2010 Are Supine Chest and Abdominal Radiographs the Best Way to Confirm PICC Placement in Neonates? *Neonatal Network*, Jan / Feb Vol.29, No. 1

RELATED LEGISLATION, DEPARTMENT OF HEALTH CIRCULARS, AREA POLICIES ETC:

NSW Health Safety Alert 002/008 Peripherally inserted central Catheter (PICC line)

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