

**Policy and Procedure for Insertion and care of
Peripherally Inserted Central Catheters by Neonatal Staff**
(see Ch 8 – TPN)

1. Introduction

The peripherally inserted central catheter (PICC) is an intravenous access device made from either silastic or polyurethane. Percutaneous placement of central venous catheters involves inserting a small gauge catheter into a peripheral vessel and threading it to a central position. The tip sits in the inferior vena cava or the superior vena cava, i.e. outside the heart. Right atrial catheter tip placement should be avoided because of the risk of perforation and pericardial tamponade (Fioravanti et al, 1998). PICC's are used for long-term intravenous access in neonates and with the exception of sepsis, serious complications with these lines are rare (Trotter, 1998).

The following strategies have been shown to reduce the incidence of infection in an observational study:

- Stopping antibiotics early (after 48hours if cultures are negative)
- Early extubation to nasal CPAP
- Early trophic feeding
- Removal of UAC / UVC by day 5 where possible

Long-lines should only be placed when necessary. Each case should be evaluated individually and the need carefully assessed, taking into account when full enteral feeds are expected to be established.

1. Principles of practice

The insertion of the PICC line will be undertaken by competent staff experienced in the insertion of long lines. (members of the long-line team)

These are: Advanced Neonatal Nurse Practitioners
 Experienced Medical staff

Inexperienced staff wishing to learn the procedure must be supervised by a member of the long-line team. In general inexperienced staff should not insert lines in babies < 27 weeks gestation.

In attempting to place the line, only 3 skin punctures should be made in any one episode. If the practitioner is unable to place the line, the patient should be allowed to rest and another practitioner requested to attempt placement.

2. Indications

- Infusion of hyperosmolar medication, e.g. TPN.
- Administration of vasoactive/irritant drugs.

1. Contraindications

- Septicaemia
- Abnormal clotting

1. Preparation

Parents should be informed of the need for PICC line placement, with an opportunity provided for them to discuss the procedure with senior staff.

A platelet count should be checked prior to insertion and delaying the procedure should be considered, if outside normal parameters. In the presence of a prolonged bleeding time, clotting studies should be performed.

Prior to placing the line, adequate analgesia should be administered according to hospital policy.

2. Catheter Tip Location

The required length for insertion of the catheter must be assessed before PICC placement. The preferred veins for the peripheral insertion of PICC lines are the basilic, cephalic and long saphenous (Evans & Leutsch, 1999). Axillary and scalp veins may also be used.

Measurement of the line using the arm veins should be from the insertion site along the arm to the shoulder joint, then to the sternal notch and then to the second intercostal space (sternum at the mid nipple level). This is the approximate location of the superior vena cava.

Measurement of the line using the leg veins should be from the insertion site to the groin and then diagonally to the third intercostal space if using the left leg, and straight up to the third intercostal space if using the right leg.

Measurement of the line using the scalp veins should be from the insertion site to the clavicular head and then to the second intercostal space if using the right side and, if using the left, from the clavicular head diagonally to the second intercostal space.

It may be useful to increase the volume on the ECG monitor when advancing the line. If the heart is entered inadvertently it may cause an arrhythmia. The tip position may also be visualised by ultrasound scan if this is feasible / available.

When the line is inserted and secured in position it may be connected to an infusion of 0.9% sodium chloride running at 0.5ml/hour via syringe pump. The infusion fluid should be drawn up and connected to the line maintaining aseptic technique.

Post insertion, the patient **must always** have a chest X-ray to ascertain correct placement of the line. The catheter tip location should be outside the heart in the inferior or superior vena cava. An urgent x-ray should be requested. Contrast medium (0.5ml) should be injected into the line **prior** to the x-ray. The operator should remain scrubbed and maintain asepsis whilst injecting the dye into the line. In the event of delay where the operator cannot remain scrubbed, then they must rescrub and observe aseptic technique when drawing up and injecting the dye.

If the line is found to be in too far it is acceptable to pull the line back. Under no circumstances should the line be advanced further. If the line has to be withdrawn, repeat the X-ray (or ultrasound imaging) until the tip of the line is in a satisfactory position. Make sure that the X-ray (ultrasound image) is taken with the child in "normal" position (arms adducted and semi-flexed), especially when the line has been inserted in the upper limb or head (the tip position can vary significantly depending on the position of the arm and neck).

3. Catheter Selection

There are two sizes of PICC lines available: Vygon 23G (inserted with a 19 gauge butterfly) and Vygon 'Premicath' 27G with breakaway needle. The size of the line is dependent on the calibre of the individual infant's veins and the biggest line should be chosen in order to minimise the risk of catheter blockage. As a guide to facilitate catheter selection, infants greater than 1 kilogram require the Vygon 23 gauge and infants less than 1 kilogram may require the Vygon 'Premicath'.

In preference use the needles provided in the packs or the breakaway needle. Avoid using yellow cannula to insert the line as these cannot be removed from the line after insertion and are a potential site for infection.

4. Placement Procedure

Equipment needed

- Dressing trolley
- Long Line pack
- Green towel
- Sterile gown and hat
- 3 x 10 ml syringes and 3 x blue needles
- Extension set x 1
- Chlorhexidine 0.5% in 70% alcohol cleaning solution (> 30 weeks gestation)
- Chlorhexidine 0.05% in aqueous solution (<30 weeks gestation)
- Sodium chloride 0.9% 1 sachet
- Tegaderm x 2
- Steristrips
- Sterile gloves, powder free x 2 pairs
- Sodium chloride 0.9% x 2 vials (10 mls)
- Radio opaque dye 0.5ml
- Tape measure
- Correct size PICC line

9. Procedure

Rationale

1. Administer analgesia according to hospital policy.	Ensure that the patient is comfortable during the procedure.
2. Measure the distance from the insertion site to location of desired tip placement.	To ensure only desired length of catheter is inserted and the tip remains outside of the heart.
3. Assemble required equipment. Wash hands using Hibiscrub and effective hand washing technique. Use Chlorhexidine impregnated scrubbing brush	To ensure all necessary equipment is available at the bed side. To minimise bacterial flora on skin as an exogenous source of infection.
4. Gown, hat and sterile gloves at the bedside.	This is an aseptic procedure and requires the use of an assistant to open packs.
5. Examine the catheter along the entire length and flush with normal saline.	To observe any kinks or holes and to prime the line.
6. Clean the area extending well above and below the insertion site with Chlorhexidine solution (0.5% in alcohol for babies >30/40, 0.05% aqueous solution for babies <30/40) Allow to dry for at least 30 second and then remove with sterile normal saline (Lund et al, 1999). Ensure that the area of skin cleaned enables you to manipulate the limb whilst maintaining the sterile field. Gauze swabs may be used to cover the limb during skin preparation.	To provide an adequate sterile area for insertion. To minimise bacterial flora on skin as an endogenous source of infection.
7. Position sterile drapes around the insertion site.	To provide a sterile field.
8. Insert needle into vein and, once flashback is obtained, advance the catheter through the needle, using non-toothed forceps, until the desired length is achieved.	
9. Carefully withdraw needle leaving the catheter in place.	
10. Flush catheter gently with normal saline, using a 10 ml syringe.	To ascertain patency.
11. The line should be anchored with steristrips. A small pad of gauze should be placed between the babies skin and the hub and a Tegaderm dressing applied	To maintain catheter position and protect the skin from pressure damage
12. Draw up 5 ml of 0.9% sodium chloride in a 10 ml syringe, and prime extension set and 3 way tap. Connect 3 way tap to line maintaining aseptic technique. Run fluid at 0.5ml/hr	To maintain patency of line whilst awaiting x-ray
12. Confirm catheter tip location radiologically. Radio-opaque dye (0.5 ml in a 10 ml syringe) should be injected into the catheter via the three way tap prior to the X-ray. In the event that the catheter needs to be withdrawn as it is in the right atrium, document in the notes and on the X-ray film and re-X-ray.	To enable safe administration of all fluids and therapies.

13. Document insertion procedure, including type of line and length of insertion, in the medical section of the clinical records, using the rubber stamp provided.	To enable audit processes.
14. Check insertion site and bed linen for any residual Chlorhexidine that may cause skin burns. Ensure that the infant is comfortably positioned.	

10. Post insertion care and maintenance

Dressing

The line should be anchored with steristrips. A small pad of gauze should be placed between the babies skin and the hub and a Tegaderm dressing applied.

Dressing change

The dressing should be changed only if there is excessive bleeding at the exit site or the dressing becomes loose. Tegaderm allows for observation of the site whilst providing anchorage for the catheter (Storm and Jensen, 1999; Irving, 1999).

11. Flushing of the line

In the event of occlusion, the line may be flushed by senior, experienced staff using a 10 ml syringe and 0.9% sodium chloride. Smaller syringes exert pressure in excess of 25 pounds per square inch (psi) which could rupture the line or lead to vessel damage (Conn, 1993).

12. Complications

Mechanical phlebitis

This is due to damage to the Tunica Intima of the vein on insertion or excessive movement of the PICC. Mechanical phlebitis is evident within 7 days and often considerably sooner (i.e. 2-3 days post insertion, which is quite normal). Signs are as for peripheral cannulae. These are redness, swelling, induration.

This can be managed by observation and as a last resort the PICC may need to be removed.

13. Infective phlebitis

This may be due to poor aseptic technique during placement or when accessing the device. It is therefore essential to observe strict aseptic technique at all times when manipulating the device. Signs include redness, swelling and exudate at the catheter exit site. In the first instance, take a swab from the insertion site as systemic antibiotics may need to be prescribed. If the patient demonstrates clinical signs of infection, take peripheral cultures and commence IV antibiotics. The line should only be removed if the patient remains unwell and the line is suspected as the locus for the septicaemia.

14. Thrombosis

Signs include oedema of the arm, shoulder, neck, face or chest wall; distended veins and collateral circulation. Medical advice should be sought.

15. Catheter damage

This usually occurs due to using a syringe smaller than 10 mls, therefore applying pressure greater than 25 psi, accidental puncture or using 70% alcohol continually on the silicone, which causes it to perish over time. Signs are fluid leakage from the insertion site or any part of the catheter which is damaged. The line will probably need to be removed.

16. Catheter migration

The catheter tip location should always be ascertained by X-ray on insertion. Always check and record the line tip position on subsequent x-rays whilst the line is in situ. Lines placed in the head, neck or upper limbs are more likely to migrate.

Catheter migration is indicated by a change in amount of catheter visible at insertion site. This is due to the line not being adequately secured and excessive patient movement. If there is any doubt that there could have been catheter migration, a second X-ray should be obtained to compare tip location. The catheter may need to be drawn back if it has advanced. If the catheter has migrated outwards, future therapy may need to be modified as the risk of infiltration may be increased. Movement of the catheter may result in cardiac tamponade and pleural effusion.

17. Catheter removal

Catheters should be removed in infants who remain bacteraemic (i.e. repeat positive blood cultures on treatment) as morbidity increases and the chance of line salvage decreases

- Ensure an aseptic technique is used.
- Wash hands with antiseptic soap (e.g. Hibiscrub).
- Put on sterile gloves.
- Remove dressing and steristrips, if in situ.
- With one hand, take the line.
- With the other, apply gauze over the insertion site.
- Withdraw the catheter slowly parallel to the vein. (If resistance is met, do not pull the line. Stop, apply warm pack to the limb to decrease vasospasm, then attempt to remove. If resistance is still met, stop, apply sterile gauze over site and contact a PICC placer.)
- If line is removed without complication, apply pressure to the insertion site with sterile gauze for a minimum of 1 minute.
- Inspect catheter when removed to ensure it is intact. If you suspect that damage has occurred to the catheter, inform medical team immediately.
- Send the catheter tip for microscopy.

18. Documentation

Always document details of insertion or attempted insertion in the central line insertion documentation sheet and file it in the baby's notes. The line should be reviewed daily and the review documented in the central line care documentation sheet. Any changes to line position should also be recorded. When removing line document reason for removal.