LONG LINE INSERTION (PERIPHERALLY SITED)

A peripherally sited central venous catheter (PICC) allows administration of infusions that, if given peripherally, may cause damage to the vein and surrounding skin, or be less effective. These benefits must be weighed against the risks of line sepsis, thrombosis, embolism, and pleural and pericardial effusion. Units which use central line catheters should have a formal training package for insertion of catheters which should include assessment of technical competence and awareness of potential complications.

INDICATIONS

- Total/partial parenteral nutrition
- Concentrated >12.5% glucose infusions (12.5% glucose can be infused peripherally)
- Concentrated calcium gluconate infusions
- Inotrope infusions (inotropes can be infused peripherally while central access is gained)
- Prolonged drug or fluid administration where peripheral access is difficult
- Certain drugs as per local neonatal formulary guidance

RELATIVE CONTRAINDICATIONS

- Infection at proposed insertion site
- Sepsis with evaluation of access needs for treatment
- Severe coagulopathy

BEFORE PLACEMENT

- Correct any significant coagulopathy
- if no evidence of bleeding tendency there is no requirement to routinely check FBC and coagulation profile
- Discuss platelet transfusion with consultant before line is placed, particularly if:
- platelet count <50 or
- evidence of excess bleeding from venepuncture sites
- If baby known/strongly suspected to be septic, discuss delaying placement of PICC line until sepsis under control with consultant

EQUIPMENT

- Sterile gown and gloves
- Cleaning solution as per unit policy (0.5% chlorhexidine)
- Sodium chloride 0.9% for injection
- Tape measure
- Overhead light
- Neonatal long line – appropriate for size of baby and expected rate of infusion
- Nutriline® (single or double lumen) or Premicath® (with/without stylet)
- if flow rates to exceed 10–12 mL/hr, avoid Premicath®
- Long line insertion pack or, if not available, individual items to include:
- dressing pack with swabs and plastic dish
- sterile towels/sheets
- non-toothed forceps
- 5–10 mL syringe
- Steri-Strip™
- sterile scissors
- clear dressing (e.g. Tegaderm™/Opsite)

PROCEDURE

Must be performed or directly supervised by an individual competent in the insertion of these devices

Consent and preparation

- If non-emergency situation, explain to parents why procedure necessary and inform them of potential hazards
- provide information leaflets (if available)
- explicit consent not required
- Use 2-person technique with assistant observing the procedure for asepsis
- if available use departmental checklist to help maintain aseptic technique throughout procedure
- Discuss timing of procedure with nurses (in keeping with developmental care of baby)
- Keep baby warm, work through portholes
- if procedure urgent consider using additional thermoregulation strategies
- Identify site of insertion
- long saphenous at ankle or basilic (medial)/cephalic (lateral) veins at elbow
- where access difficult, other large peripheral veins or scalp veins anterior to ear may be used
- right long saphenous vein is preferable to the left – latter more commonly associated with malposition in the left ascending lumbar vein leading to risk of extravasation of PN into CSF
- Measure distance, aiming to insert tip of catheter into superior or inferior vena cava (to sternal notch for upper limb/head/neck insertion or to xiphisternum for lower limb insertion)

Developmental care

- Unless contraindicated, give sucrose or breast milk and non-nutritive sucking [see **Non-nutritive sucking (NNS)** guideline]
- Shield baby's eyes from bright light
- Second person to provide containment holding (see **Pain assessment and management** guideline)

Aseptic insertion

- Maintain strict asepsis throughout
- Prime catheter with 0.9% Saline
- Clean site using 0.5% Chlorhexidine on gauze swabs and allow to dry. Ensure that cleaning fluid does not pool beneath baby.
- Use splitable needle or Microsite kit to access vein.
- Where possible, avoid use of peripheral cannula for long line insertion
- When blood flows back through the needle, insert line using non-toothed forceps
- If appropriately placed, the line will pass easily beyond the tip of the needle
- Release tourniquet if used
- There may be some resistance when the line passes joints e.g. knee, and gentle repositioning of limb may help
- Should catheter advancement become difficult, infuse a little fluid whilst simultaneously advancing catheter
- When in place, withdraw needle, split cannulaand remove
- Do not attempt to aspirate blood from longlines as this can cause malposition and blockages
- Secure using dressings available in sterile long line lines packs
- tips of Premicath® with guidewire in situ are easier to identify on X-ray

Securing catheter

- Aim to minimize the risk of injury to the skin and potential catheter migration
- When haemostasis achieved, position line in loops to avoid occlusion. Secure with Steri-Strips™.
- Place small square of gauze under long line hub for pressure area care.
- Cover with Tegaderm™, ensuring that line insertion site is visible through clear dressing and that all the long line, hub and steristrips site are covered, but not encircling the limb entirely as this may restrict blood flow to limb.

- Connect a sterile 10 mL syringe containing sodium chloride 0.9% and infuse at 1mL/hr while awaiting X-ray, to ensure that the line does not clot.
- Please note: If long line is being used for extended antibiotics course then 2mL/hour is minimal to maintain patency

Determining catheter position

- X-ray to determine position
- aim is to view full length of line
- request chest/abdominal X-ray (including upper/lower limb requests as per local policy)
- tip position influenced by arm placement; catheters placed in basilic (medial) vein move towards the heart on adduction, those placed in cephalic (lateral) vein move away from the heart
- If inserted in lower limb, ensure hip is slightly flexed
- Xray of line position should be reviewed on PACs by 2 senior medical staff (ANNP/Registrar/Consultant)
- If adjustment of catheter of more than 2 cm or an uncertainty, repeat X-ray to confirm catheter tip position
- Optimal position for tip of PICC line: superior vena cava (SVC) or inferior vena cava (IVC) outside cardiac silhouette
- Upper limb catheter
- tip should be above T4 in SVC
- ensure tip of catheter crosses shoulder joint
- Lower limb catheter
- ensure tip of catheter crosses hip joint
- tip should be in IVC below T9 and lie to right side of spinal column
- ensure baby not rotated at when X-ray undertaken
- if catheter inserted in the left lower limb does not cross the midline or has a tortuous course, the line may be in a small vessel and should be repositioned
- Short long line
- in few cases, PICC lines do not advance and are short of SVC or IVC, remaining in a smaller vessel or tributary. Long line in this position is prone to thrombosis and extravasation and may cause local injury. Sometimes necessary to use such a PICC line which sits in a large vein but short of the preferred location (usually when no other suitable vessels identified to place alternative line)
  - ensure tip is within a large vein
  - ensure no other red flags (see **Red flags for malposition**)
  - ensure line samples blood. If not sampling or sampling with difficulty, withdraw line a short distance and try again
  - decision to use this line to be made by consultant
  - replace/remove lines in these positions as soon as practicable
- If catheter tip is beyond desired location, using aseptic technique, remove dressing and withdraw the catheter by the measured distance. Redress with new sterile dressing and confirm new position by X-ray if position needs significant adjustment
- Staff trained to use point of care ultrasound skills (POCUS) can use echocardiography to determine line position

Catheter tip must not lie within heart (risk of perforation and tamponade)

Red flags for malposition:

- PICC line:
- ‘sticks’ during insertion and cannot be advanced to length anticipated
- tip not clearly identified on X-ray, or lies at level of hip/shoulder joints
- route not smooth, with kinks or sharp deviations
- inserted in left leg and fails to cross midline to lie to right of spine
- does not flush/sample
- Therapeutic infusions fail to have desired effect e.g. hypoglycaemia despite glucose infusion

Failure of insertion

- If second operator is required following an unsuccessful attempt at placement, use fresh equipment

DOCUMENTATION

- Record on badgernet and Childrens Asepsis Care Bundle:
- details of discussion with parents regarding line insertion
- name and designation of operator and anyone assisting/supervising procedure
- date and time of insertion
- type, number of lumens, and gauge of catheter used
- batch number (insert tracking stickers)
- site and length of insertion
- success of insertion and number of attempts
- X-ray position and if satisfactory
- consultant paediatrician to verify position asap
- any subsequent manipulation or re-imaging of line

AFTERCARE

Dressings and site care

- Routine dressing changes are unnecessary
- Replace aseptically only if dressings lift or catheter visibly kinked or becomes insecure
- Observe site every shift for bleeding, leaking of infusate and signs of infection around insertion site and any redness, swelling around line tip point) and document on Asepsis Care Bundle and in badgernet notes

Line management and medication

- Minimise number of line breaks
- Intermittent medications only given via this route should be by a Consultant decision.
- When accessing line, observe hand hygiene, wear sterile gloves and clean connection as per local infection control policy
  Blood products should not be given via premicath.

Position maintenance

- Never routinely resite a line
- Review continued need on daily ward rounds and remove as soon as possible
- Comment on line position if X-ray taken for any other reason

COMPLICATIONS

Clinical deterioration of a baby in whom a central venous catheter is present should raise the question of catheter related complications, particularly infection, extravasation and tamponade

Extravasation of PN to CSF can cause neurological symptoms (e.g. irritability, seizures, hypotonia). It is confirmed by presence of lipaemic CSF

Prevention

- Medications should not be given routinely through long line and limit line breaks
- Avoid the use of syringes (<10 mL) for bolus injections in premicaths as this generates high pressures which may result in catheter damage
- Do not exceed pressure limits given by manufacturer – maximum infusion pressures vary for each line

Catheter-related sepsis

- Most common complication
- See **Infection (late onset)** guideline
- In cases of recent infection (if possible) wait ≥24 hr after removal of previously infected line before attempting new line insertion

Extravasation of fluids

- Into pleural, peritoneal, pericardial (above) and subcutaneous compartments

- Seek immediate advice from senior colleagues and follow **Extravasation injuries** guideline

Extravasation to CSF
- Most commonly associated with catheters placed in long saphenous vein
- Can cause varying neurological signs including irritability, abnormal movements, seizures and hypotonia
- Production of lipaemic fluid (either white “milky” coloured fluid or fluid with a high triglyceride content) in CSF is pathological and suggests this complication

Suspected/proven pericardial tamponade
- Have high suspicion in baby with acute deterioration, act quickly
- Suspect if any of the following symptoms:
- acute or refractory hypotension
- acute respiratory deterioration
- arrhythmias
- tachycardia/persistent bradycardia
- unexplained metabolic acidosis
- Confirm by X-ray (widened mediastinum, enlarged cardiac shadow) or by presence of pericardial fluid on echocardiogram
- Drain pericardial fluid (see **Pericardiocentesis** guideline) and remove catheter

Embolisation of catheter fragments
- Lines can snap if anchored within a thrombus
- If undue resistance encountered during removal, do not force
- Inform consultant, if accessible it may need surgical removal

Placement in artery
- Artery lies in proximity to vein – be aware of warning signs suggestive of inadvertent cannulation of artery:
- pulsation of blood either in introducer or long line
- arterial blood sample (analysed in blood gas analyser) aspirated from line
- blanching of skin as needle pierces artery around insertion site
- blanching of limb distal to site of insertion
- If cannulated artery suspected, seek consultant opinion and do not use line until correct placement confirmed
- If limb becomes ischemic, remove line immediately

REMOVAL

Indications
- Clinical use is no longer justified
- Currently no evidence for early elective removal of the line and replacing it to prevent infection
- Proven line infection
- if suspected, may need to be removed
- Remove 24 hr after stopping parenteral nutrition to ensure tolerance to full enteral feeds, run glucose 10% through line at 2mL/hr to maintain patency

Technique
- Using aseptic technique:
- remove adhesive dressing very carefully
- pull line out slowly, using gentle traction in the direction of the vein, grasping line not hub
- ensure catheter complete
- if clinical suspicion of line infection, send tip for culture and sensitivity
- apply pressure to achieve haemostasis
- document removal in notes