LONG LINE INSERTION (PERIPHERALLY SITED)

See also **Use of central venous catheters in neonates** – https://www.bapm.org/resources/10-use-of-central-venous-catheters-in-neonates-revised-2018

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
- Infusions of glucose >5% + calcium gluconate
- Inotrope infusions
- Prolonged drug or fluid administration where peripheral access is difficult

CONTRAINDICATIONS

- Infection at proposed insertion site
- Systemic sepsis: defer until sepsis treatment commenced and blood cultures negative unless unstable and central access needed for inotropes
- Tissue perfusion concerns

EQUIPMENT

- Sterile gown and gloves
- Cleaning solution as per unit policy
- Sodium chloride 0.9% for injection
- Tape measure
- Overhead light
- Neonatal long line – appropriate for size of baby and expected rate of infusion
- Decide whether double or single lumen line required
- 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

- Inform parents and obtain verbal consent as recommended by BAPM (If time available)
- If staff available, consider 2-person technique with assistant observing the procedure

- Discuss timing of procedure with nurses
- Keep baby warm, work through portholes
- Identify site of insertion
  - typically long saphenous at ankle or medial/lateral antecubital vein 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 upper sternum for upper limb 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 aseptic technique throughout
- Prime catheter and cut small piece of gauze for under hub
- Clean site and allow to dry. Ensure that cleaning fluid does not pool beneath baby
- Puncture site with needle from pack and follow instructions for the catheter
- Avoid use of cannulae for long line insertion unless needed for difficult insertion to improve likelihood of success
- 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, such as knee, and gentle repositioning of baby's limb may help
- Should catheter advancement become difficult, infuse a little fluid whilst simultaneously advancing catheter
- **Never** withdraw catheter back through needle
- When in place, withdraw needle as stated in catheter instructions
- Catheter should allow free aspiration of blood in the final position
  - with small size catheter, or those with a guidewire, there may not be aspiration of blood into the syringe, however blood should appear in the catheter

Securing catheter

- Aim to minimize the risk of injury to the skin and potential catheter migration
- When haemostasis achieved, fix with Steri-Strips™. Place small piece of gauze under hub, and cover with Tegaderm™/Opsite, making sure that all dressing and site is covered, but not encircling the limb tightly. Ensure line insertion site is visible through clear dressing
- Connect a sterile 10 mL syringe containing sodium chloride 0.9% and infuse at 0.5 mL/hr while awaiting X-ray (or just flushed at regular intervals), to ensure that the line does not clot.

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)
- If inserted in upper limb, ensure arm is at 90° angle to thorax during X-ray
- Small gauge neonatal long lines can be difficult to see on plain X-ray, therefore often have a guidewire within them.
- Use X-ray magnification, contrast adjustment and inversion to aid process
- After any adjustment of catheter, consider repeat X-ray to confirm catheter tip position

- post-processing radiograph should be available with the X-ray to help identify tip of catheter
- Upper limb catheter
  - tip should preferably be in superior vena cava when the corresponding arm positioned perpendicular to the chest wall, but other large veins e.g. innominate, subclavian are acceptable
  - ensure tip of catheter crosses shoulder joint
  - if any concern regarding possibility of malposition of catheter continue to infuse with sodium chloride 0.9% 0.5 mL/hr and seek consultant review
- Lower limb catheter
  - tip should ideally be in inferior vena cava above L4–L5
  - left saphenous PICC should cross the midline at L4/5 and run to the right side of the vertebral column in the IVC with the tip outside the heart
  - if catheter does not cross the midline or has a tortuous course the line may be in a small vessel. Lateral X-ray will demonstrate posterior deviation of the line towards the vertebral column
  - if malposition suspected continue to infuse with sodium chloride 0.9% 0.5 mL/hr and seek consultant review of X-ray
- Catheter tips in axillary, cephalic and femoral veins are acceptable if the benefit outweighs increased risks of reinsertion. Discuss with consultant before connecting PN to line
- Monitor site closely
- If catheter tip beyond desired location, using aseptic technique, remove dressing and withdraw catheter the measured distance. Redress with new sterile dressing and consider confirming new position by X-ray

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

Failure of insertion

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

DOCUMENTATION

- Record on BadgerNet in daily notes and well as completing local unit central line paperwork
  - date and time of insertion
  - success of insertion and number of attempts
  - type and gauge of catheter
  - site and length of insertion
  - X-ray position and alterations
- Consultant neonatologist/paediatrician to verify position within 24 hr of insertion

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 (redness, swelling) and document in daily care summary

Line management and medication

- Minimise number of line breaks
- Intermittent medications only given via this route in extreme circumstances. (This is a senior medical decision). Plan timing to match infusion changes
- When breaking into line, observe hand hygiene, wear sterile gloves and clean connection as per local infection control policy

- Change tubing used to give blood products immediately after transfusion (use to give blood product only if it is difficult to insert alternative IV line). This is not possible when using small catheters such as 'premicaths'

Position maintenance

- Consider repeating X-ray weekly to detect line migration
- Daily CRP's whilst central line in place
- Never routinely resite a line unless signs of infection clinically +/- rising CRP
- Review continued need on daily ward rounds and remove as soon as possible
- Comment on line position:
- when bedside ECHO undertaken **or**
- 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

- Do not give blood products and medications routinely through long line
- Avoid the use of small syringes (<10 mL) for bolus injections – generate high pressures which may result in catheter damage
- Avoid the use of alcohol or acetone to clean the catheter – may result in catheter damage
- Limit line breaks as above
- Do not exceed pressure limits given by manufacturer – risk of damage to the line

Catheter-related sepsis

- Commonest complication
- See **Infection (late onset)** guideline

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) is pathological and suggests this complication

Suspected/proven pericardial tamponade

- Suspect if any of the following symptoms:
- acute or refractory hypotension
- acute respiratory deterioration
- arrhythmias
- tachycardia/persistent bradycardia
- unexplained metabolic acidosis
- Have high suspicion in baby with acute deterioration; act quickly – associated with high morbidity and mortality
- 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

REMOVAL

Indications
- Clinical use is no longer justified
- Currently no evidence for early elective removal of the line and replacing it to prevent infection
- Remove 24 hr after stopping parenteral nutrition to ensure tolerance to full enteral feeds, running glucose 10% through line at 0.5 mL/hr to maintain patency
- Complications – see **Complications**

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 BadgerNet