GUIDELINE

Central Venous Access Device: Percutaneously Inserted Central Catheter (PICC)/ Long-line

Scope (Staff):	Nursing and Medical Staff
Scope (Area):	NICU KEMH, NICU PCH, NETS WA

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Read the full statement here:
CAHS Child Safe Organisation Commitment Statement

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Aim

The aim of this guideline is to outline the insertion and management of Percutaneously Inserted Central Catheter (PICC) / Long-line in newborn infants. This is a supplementary guideline to the main Central Venous Access Device Bundle.

Risk

There are risks associated with central venous access if this guideline is not followed which includes thrombosis, infection and trauma.

Complications

Complications that can arise from PICCs:

- Thrombosis (3%), refer to CVAD bundle for management.
- Leakage (2%),
- Infection (1.6%),
- Displacement/ migration (1%),
- Pleural/ pericardial effusions (0.6%)
- Breakage (0.6%).

Prior to Procedure

The general preparation for a central line insertion is discussed in the CVAD bundle.

The clinician performing the procedure must have appropriate training or supervision during the procedure. For PICC specific preparation:

- This procedure should be done in optimal conditions, hence, where possible, should be carried out during daytime hours. PICC lines should only be inserted out-of-hours when emergency central access is required due to limited staff availability.
- Inform parents about the procedure, answer any questions.
- Identify the site of insertion and measure the length of the catheter that will be inserted from the entry point. For Anatomical landmarks refer to Appendix 1 and for measurements, refer to Appendix 2. Position the infant with the identified insertion point exposed and easily accessible.
- Ensure that the patient is positioned over the Xray detector tray. This will ensure that the patient does not have to be moved when the radiographer places the imaging detector underneath the patient.
- It is often useful to swaddle an active neonate allowing for more stability and comfort during the procedure. Consider other pain relief/ sedation as required. Refer to Pain Assessment and Management.

- Provide appropriate thermoregulation measures to maintain normothermia throughout the procedure. Refer to Thermoregulation
- Inform the Portable Radiographer via VOCERA that the procedure will start (stand by radiology).

Choosing PICC catheters:

The preferred choice of catheter will depend both upon infant size and requirements and PICC factors. The following PICC are currently available:

- Vygon Epicutaneo-Cava
- Vygon Twinflo
- Vygon Premicath

Catheter	Vygon Nutriline	Vygon Epicutaneo-Cava	Vygon Twinflo	Vygon Premicath
1. Description	2Fr (24G) single lumen 15cm (for upper limb) or 30cm (for lower limb)	2Fr (24G) 30cm length single lumen	2Fr (24G) 30 cm double lumen	1 Fr (28G) 20cm single lumen
2. Introducer	20G Microflash peelable cannula 20G splitting needle 24G yellow cannula (for Seldinger technique with microsite kit only – line will not pass through yellow cannula) 20G (pink) cannula (discouraged – peelable preferred)	19G winged needle 20G Microflash peelable cannula 24G yellow cannula (for Seldinger technique with microsite kit only – line will not pass through yellow cannula) 20G (pink) cannula (can be threaded off line)	20G Microflash peelable cannula 20G splitting needle 24G yellow cannula (for Seldinger technique with microsite kit) 20G (pink) cannula (discouraged – peelable preferred)	24G (yellow) cannula 24G peelable (green) cannula included in the kit

Catheter	Vygon Nutriline	Vygon Epicutaneo-Cava	Vygon Twinflo	Vygon Premicath
3. Maximum flow rate as per manufacturer	15cm: 9ml/min 30cm: 5ml/min	5ml/min	1.45ml/min (x2)	0.7ml/min
4. Safe clinical delivery flow rate	20-30mL/hr	20-30 ml/hr	7- 10 ml/h per lumen	7-10 ml/hr
5. Stylet	No	No	No	Code 1261.201- No Code 1261.205- Yes
6. Suitable infants	Preferred PICC for all infants >1000g. Use 15cm for upper limb, 30cm for lower limb	Preferred PICC for infants >1000g if they do not require multiple incompatible infusions	Preferred PICC for all infants >1000g *if* they require multiple incompatible infusions.	Infants <1000g or occasionally may be suitable for infants >1000g when a 2Fr catheter is unable to be inserted and high flow rate is not required eg for iv Abs
7. Useful notes		The introducer should be removed after insertion by carefully sliding the cannula over the catheter. See below for details		Has a stylet which needs to be removed after insertion.

Equipment

Common equipment

- Surgical gown x 1
- Sterile pair of gloves x 2
- Mask x1
- Surgical hat x1
- Face Shield (as required) x1
- Antiseptic solution:

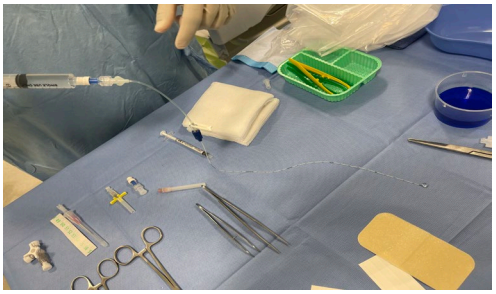
  - >27 weeks gestation: 1% chlorhexidine solution
  - ≤27 weeks gestation: Povidone-iodine solution
- PICC placement kit Appendix 4
- Sterile fields (large) x2; (x 3 if assistant)
- Sterile 0.9% Sodium chloride ampoules x2
- Sterile absorbent towel x 1
- 3-way catheter extension set
- Fluids
  - ≤27 weeks - Sodium Chloride 0.45% + 0.5 u/mL Heparin
  - >27 weeks - Sodium Chloride 0.9% + 0.5 u/mL Heparin
- Volumetric/syringe pump with pressure display monitoring and appropriate pressure giving set.
- Bin (consider small easily accessible paper bag)

PICC / Long Line specific

- Appropriate size Long-line catheter x1
- Insertion needle/ microsite kit/ 24G (Yellow) or 20G (Pink) cannula (if used as the introducer) x2 as required
- Small sterile Mepilex™/Comfeel™ x1
- Large Tegaderm™ x2
- Sterile plastic drape X 2
- (Optional) transilluminator
- If using transilluminator, need sterile ultrasound probe cover

***Note:** *Do not use a syringe less than 10ml to flush. The smaller the syringe, the greater the pressure on push - which may rupture the line.*

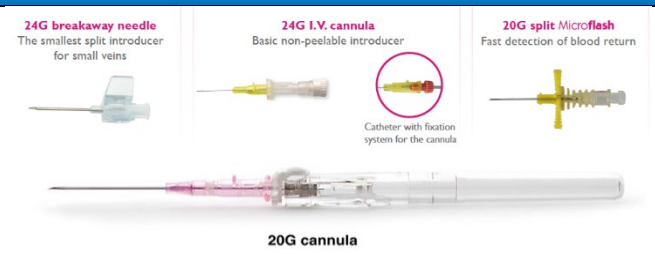
Procedure

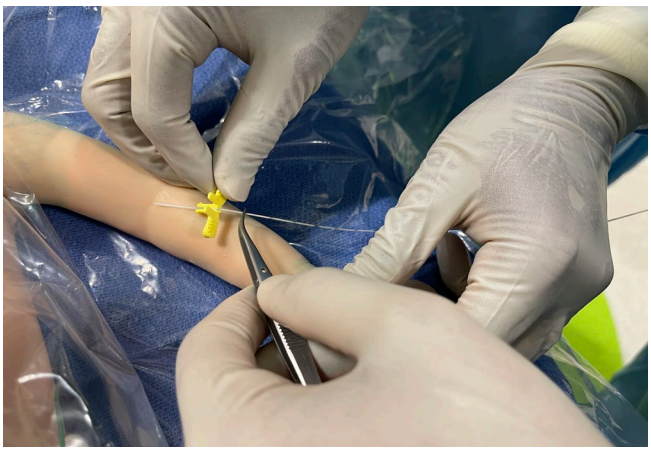
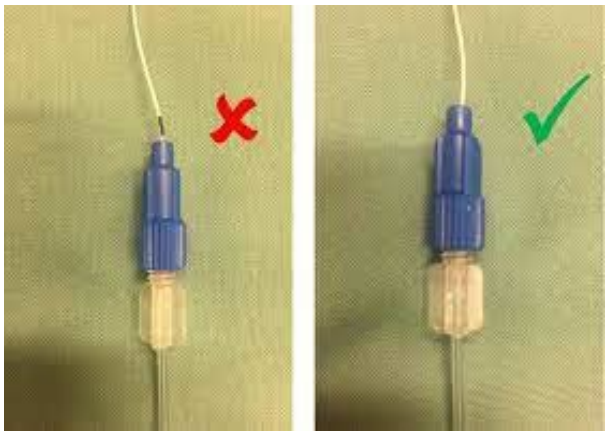
Steps	Pictures / Additional notes
1. Open all equipment onto a sterile drape that fully covers the trolley then arrange the equipment in a systematic manner.	
2. Draw 1-2 x 10ml saline syringes (depending upon number of lumens) directly from ampule with a syringe and blunt needle	
3. Prime the catheter with saline (both lumens of the catheter, if dual lumen) ensuring that there is no air in the catheter. Prime the 3-way catheter extension set.	
4. If using transilluminator prepare it by asking an assistant to drop inside a probe cover. The assistant should then pull the entire length of the plastic sleeve over the transilluminator wire using the cardboard handle. Secure with one of the elastic bands. The sterile plastic can now be placed in the sterile field noting that the cardboard cuff remains unsterile.	

Steps	Pictures / Additional notes
5. Place a blue absorbent towel below the baby to avoid chemical burns to the back from antiseptic solution	Do not allow solution to pool beneath infant. Replace any damp or wet linen immediately during or after the procedure.
6. Request the assistant to hold the infant's limb proximally, keeping it in the air. The proceduralist then cleans the hand/foot extensively twice, allowing the antiseptic solution to dry. Once dry, the hand/foot is clean and the proceduralist can take hold of it with their clean hand using an antiseptic soaked piece of gauze to hold it.	
7. The proceduralist then cleans the proximal portion of the limb using the antiseptic solution twice. • A new sterile forceps must be used for each scrub application. The proceduralist must not touch the infant or the antiseptic gauze with gloved hands at any point. • Each scrub stroke should be performed in a single direction, commencing at the wrist or ankle and moving proximally towards the axilla or groin. • The gauze is to be used for one pass only in a single direction and must not be moved back down the limb or reused.	Wait for the site of insertion to air-dry as per Aseptic Technique in the Neonatal Unit. *For ≤27 weeks thoroughly rinse the limb with lukewarm normal saline when dry.*

Steps	Pictures / Additional notes
8. The limb is now clean and sterile fields must be secured around the limb. A fenestrated drape may be used. Ensure that the drapes fully cover the patient (while allowing a self-ventilating patient to breath) and fully cover the bed including over the sides.	

Cannulation and catheter insertion

Steps	Pictures / Additional notes
9. Place a gauze torniquet proximal to the vein to be used. Insert your chosen introducer (cannula/breakaway needle/MicroFlash®). When blood flashback occurs remove the needle and insert then advance the catheter in 0.5-1cm increments through the cannula <u>using non-toothed forceps</u>.	 Copyright © 2021 VYGON

Steps	Pictures / Additional notes
Catheter advancement: 10. When catheter is advanced, apply gentle pressure on the insertion site and simultaneously ease the introducer / cannula without removing the catheter. *The catheter must NOT be picked up by the gloved hands. Use non-toothed pair of forceps to manoeuvre the catheter	
Removal of needle or cannula 10. After feeding the catheter to the measured length, peel or break-away the introducer/peelable cannula (NOT possible for IV cannulas) *Apply continual pressure to insertion site if bleeding continues. • IV cannula can be removed if the line being used is Vygon Epicutaneo-Cava. **Epicutaneo cava**: Loosen the blue compression hub from the clear plastic extension and slide out the catheter from the hub. Carefully slide off the introducer over the catheter and replace it into the hub. Note 2x rubber washers are contained in the blue hub, ensure they are not lost as they are essential to maintain the seal. In all other circumstances, IV cannula will be left in situ under the sterile dressing pulled back against the hub of the PICC line	  *Make sure the black marker is fully out of sight and tighten the hub.* *Ensure the metal end lies mainly in the clear half of the connection when in place.*

Steps	Pictures / Additional notes
	The metal can puncture through the line if it migrates beyond the blue cap end resulting in removal of the line
11. At this point, if in hours, contact the Portable Radiographer to confirm PICC position. Request assistant or available non-assisting medical/nursing staff to make the call. **If out-of hours/ radiographer not available, then move to point 12. and secure catheter prior to Xray.** Secure the catheter with a short piece of steristrip on the skin - about 0.5cm away from the insertion site. Keep the arm secured. If there is no guidewire, then attach extension set and flush all lumens of catheter well. During wait time for radiographer keep using micro flushes of saline to ensure permeability of the line.	

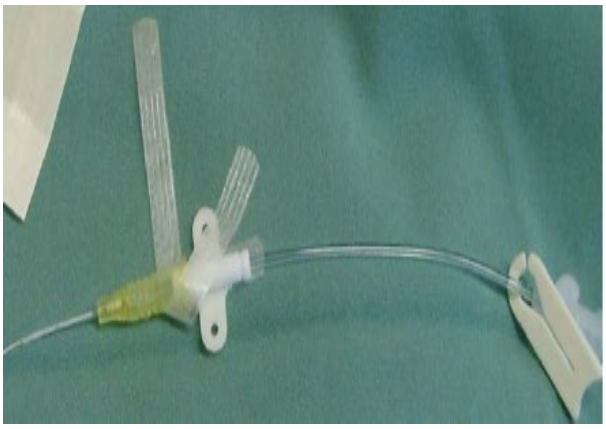
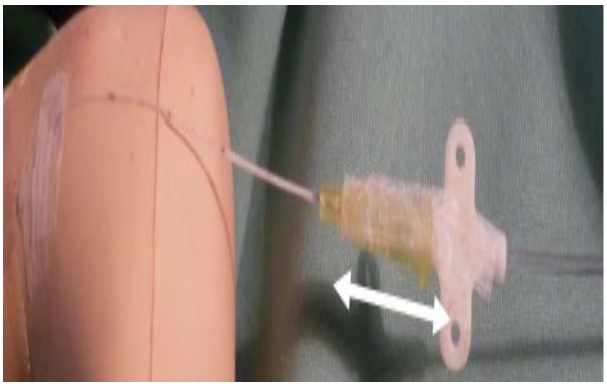
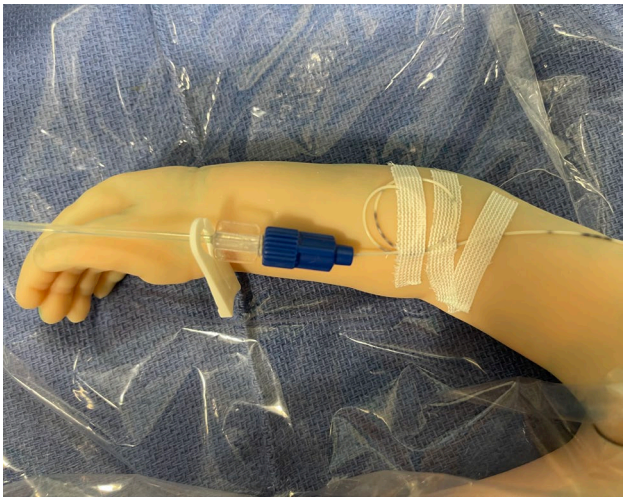
Steps	Pictures / Additional notes
12. Perform X ray The imaging detector will be placed in the tray by the radiographer. The nurse will wear protective shields and will provide containment to the baby. If needed the nurse may hold the baby below the field whilst wearing a shield. The proceduralist remains scrubbed to maintain asepsis whilst waiting for the x-ray result and if necessary, holds the limb to avoid sudden movement and displacement of the line. The proceduralist is encouraged to maintain maximum distance from patient where possible The clinician or assistant will review the AP X ray and make necessary adjustments • Confirmation of catheter tip position on X-ray: **Refer to** Central Line Imaging in Neonates In case of adjustment, an additional x ray will be necessary once the PICC is secured. The radiographer will remain until the PICC position is satisfactory.	

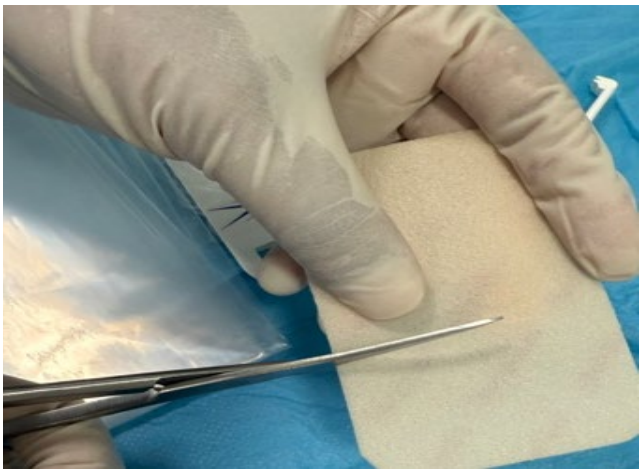
Steps	Pictures / Additional notes
13. Cyanoacrylate (tissue glue) application If catheter is re-adjusted and position on the X ray is confirmed, ensure catheter is secured with a short piece of steristrip on the skin - about 0.5cm away from the insertion site 1-2 drops of tissue glue (Dermabond) can then be used at the insertion site. Wait for ~30s before applying a second drop. Refer to CVAD bundle.	

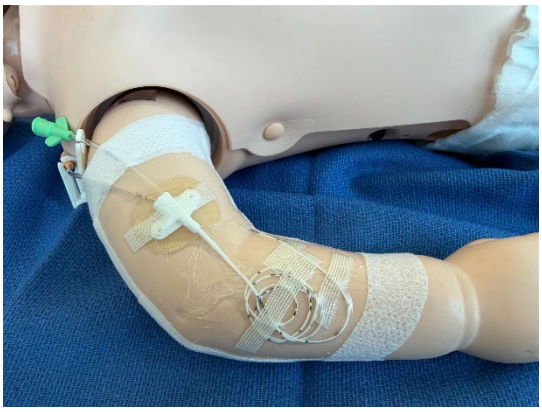
Steps	Pictures / Additional notes
14. Removal of guidewire: Once position on the X ray is confirmed, check for guidewire presence in your chosen catheter type and remove the guidewire by pulling slowly whilst keeping straight. Ensure guidewire is removed intact. Attach the extension and flush the line. ***Remove guide wire before looping the catheter for dressing***	

Securing the line and dressing:

Steps	Pictures / Additional notes
If a cannula is used as introducer, instead of a breakaway needle or Microflash®, clean the hub of the yellow / pink cannula with a 18g blunt needle attached to the 5mL syringe of normal saline.	This is to ensure removal of any remaining blood in the hub which is a potential risk of infection

Steps	Pictures / Additional notes
15. Secure the cannula onto the white winged connection of the catheter with two pieces of Steristrips™ in cross over fashion.	 
16. Coil excess catheter away from entry site without kinking the catheter with one steristrip™ If a non-peelable cannula is used, ensure that it is not folded and the catheter is not folded inside the dressing. * *DO NOT* apply excessive steristrips™. This has the potential for catheter dislodgement when the old dressing is being removed.	

Steps	Pictures / Additional notes
17. Stick appropriately sized Comfeel™/ Mepilex™ on the infant's skin and secure the hub to it with steristrip™ Apply Tegaderm to close the dressing. Use second Tegaderm™ if needed to cover the entire catheter, Mepilex™, cannula (if present) and hub. Ensure the dressing doesn't cover the arm circumferentially If bleeding is persistent despite application of pressure for at least 5 minutes, discuss with consultant.	 

Steps	Pictures / Additional notes
18. Once the catheter and hub are secured, commence heparinised fluids without delay at 0.5ml-1.0ml/hr.	A PICC line with no running fluids even for a short period is at risk of occlusion.
19. Secure the edges of the Tegaderm (from lifting off) by using the Fixomull™ tapes	
20. Remove all equipment and drapes from the infant.	To avoid potential accidents with equipment.
21. Clear away all equipment and ensure that any needles or	To safely dispose the sharps, post procedure.

Steps	Pictures / Additional notes
scalpel are safely disposed of into a sharps bin.	

Other Considerations

- Maximum 3 skin punctures in one limb to be made by given proceduralist at a time.
- If very active, again consider comfort measures/ pain relief/ sedation.
- If unsuccessful, allow for time out for infant and ask for help.
- Most 24G PICC lines will bleed back if in an ideal position but often a 28G line may not bleed back especially if in less-than-ideal position. If a PICC 24G or 28G position is confirmed by the X ray and the line is flushing as expected its not necessary to bleed back.

Unintentionally Short PICC (ie. Not in a large central vein)

In situations where there is no other venous access: They may be used as a peripheral line (i.e.: no hyperosmolar fluids/inotropes) for up to 24 hours and the site should be observed closely for extravasation. The position of the tip should **not be left at a joint** and this must be confirmed by x ray. They should be entered on the problem list as a potential risk until removed from the patient. **Use of these lines for more than 24 hours needs to be discussed with the consultant** on a case-by-case basis. They are a temporary venous access only and should be considered as a PIVC in terms of what fluids can be infused.

Post procedure

- The infant is left clean and dry, check linen under the infant and assess temperature.
- Complete documentation on the CVAD Insertion and Maintenance MR422.01 and document in the patient notes.

Dressing Changes

Considerations

- **Dressing changes of PICC lines are NOT routine**. Changing insertion site dressing may introduce bacteria into catheter and may inadvertently alter the position of the catheter tip.
- Replace the catheter-site dressing under full sterile precautions if it becomes damp, loosened, soiled or heavily blood stained (once bleeding has ceased), or when inspection of the site is necessary. Otherwise, **DO NOT** replace dressings as

the risk of dislodging the catheter and introducing infection outweighs the benefit of changing the dressing.

- Each shift, **inspect insertion site** for signs of infection/infiltration such as redness, swelling, tenderness, discharge or lifting of dressing to ensure early detection of complications. A swollen limb (or body part) near central line insertion may indicate:
    - Displacement or extravasation of central line.
    - Constriction due to tight dressing and/or tapes.
- **Check that transparent dressing is completely sealed (ideally 1cm margin between catheter and edge of Tegaderm)**, free from drainage and non-restrictive i.e. not circumferential. If no issues, leave dressing unchanged.
- **Evaluate appearance of catheter through insertion site.** Observe that catheter is not stretched or pulled out at its insertion into hub and that tape is not on too tightly. Catheter is very fragile and may break if pulled.

Equipment

- Hat and mask
- Sterile gloves
- Sterile gown
- Dressing pack
- Appropriate disinfectant
- Sterile scissors
- Sterile SteriStrips
- Transparent dressings (Tegaderm)

Dressing change procedure

Steps	Additional information
Clean trolley and bench surface (where sterile towel and gloves are placed), with surface disinfectant/wipe and allow to dry to prevent contamination of sterile equipment when pack and equipment opened.	
Collect equipment as above and arrange on side of trolley.	

Dons hat and mask to minimise risk of infection.	
Performs surgical hand wash up to the elbows for 3 minutes with 2% Chlorhexidine skin cleanser and water. Dry hands thoroughly with sterile towels.	
Dons sterile gown and gloves.	Assistant dons hat and mask and performs hand hygiene
Assistant opens dressing pack and Dr/CN/NNT takes it and opens it on the clean surface.	
Assistant to stabilize the longline hub and loosen the dressing toward the insertion site, avoiding tension on the catheter.	**Stretching the dressing can help loosen it.** Maintain sterile principles to minimize contamination of line and insertion site, damage to catheter or cause migration.
Person doing the dressing change to hold the limb with gauze and clean over old dressing**.**	Remove loosened old dressing carefully and discard. Maintain sterile field and avoid contamination.
Inspect the insertion site for signs of infection/infiltration i.e. redness, swelling, tenderness or discharge to facilitate identification of complications.	Remove line if any signs of infection/infiltration
Clean skin with appropriate disinfectant, beginning at the insertion site and clean upward away from insertion site to catheter connection, taking special care not to pull on tubing. Allow solution to air dry.	This is to reduce surface debris and cleanse tubing, thereby reducing the risk of infection under new dressing, and to reduce skin flora present on catheter and around connection.
Gently coil the excess silastic tubing and tapes to skin with steri-strip, leaving insertion site visible.	
Place hub of longline on top of transparent dressing with small duoderm under for comfort.	Ensure no kinks in line.
Cover long line and hub with transparent dressing to ensure all exposed line is protected.	The transparent dressing allows easy visualization of the site and is changed only if it is no longer adherent.
Document dressing change and condition of insertion site in clinical notes and maintenance form to ensure accurate record taking and identification of change.	

Dispose of equipment into designated containers and perform hand hygiene.	Ensure adherence to protocols on sharps and rubbish disposal.

Removal of PICC

PICCs are removed when they are no longer required, or sepsis is suspected. Removal of a PICC is a two-person standard aseptic technique; one staff member is required to aid in positioning the infant. PICC can be removed by nursing staff deemed competent in their removal.

Key points

- If sepsis is suspected, the tip must be sent to the laboratory for culture.
- Prior to removing the catheter, check the documented length of catheter inserted.
- If there is any resistance, do not pull the line with force; ask a more experienced member of staff for assistance with the removal.
- Document the line removal on the observation chart and complete the removal section on the Neonatal CVAD Insertion Record MR422.
- Documentation should include any difficulties with catheter removal and state whether the catheter was visualised to be intact.
- Consider administration of sucrose prior to procedure.

Equipment

- Dressing pack, sterile scissors/forceps
- Sterile specimen container (if tip required for culture)
- Adhesive remover
- Gauze

Procedure	Additional information
Use adhesive remover to lift edges of the dressing.	Stretch the dressing in an upward motion this allows for ease of removal. Take care not to pull or tear the catheter sheath
Remove the catheter using gentle sustained traction, holding the catheter close to the insertion site.	**Do not over stretch the catheter**. Over stretching the catheter may cause it to rupture and rebound into the vein, causing a catheter embolus.

	If catheter rupture does occur and the catheter is NOT visible, place a finger over the vein without applying pressure. If the catheter is visible outside of the infant, grasp the catheter. **Seek medical assistance and request an x-ray.**
If the catheter remains firmly attached **surgical removal** is required.	**If sepsis is suspected** cut the tip with sterile scissors inside a sterile container and send for culture. The tip must not touch any surface before entering the sterile container.
Apply gentle pressure to the site with gauze, until bleeding stops to prevent a haematoma forming.	**Do not apply** a dressing over the site until bleeding has stopped
Document removal on Neonatal Intravascular Device Insertion Record MR422 and in the medical records	

Related CAHS internal policies, procedures and guidelines

Central Line Imaging in Neonates: Radiographic Views, and Acceptable Line Positions

Central Venous Access Device Bundle

Hand hygiene

Sepsis Neonatal

PCH Central Venous Access Devices (CVAD) and Midline Insertion and Management

References and related external legislation, policies, and guidelines *(if required)*

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Useful resources

PICC placement:
http://www.nejm.org/doi/full/10.1056/NEJMvcm1101914?rss=searchAndBrowse&

This document can be made available in alternative formats on request.

Document Owner:	Neonatology		
Reviewer / Team:	Neonatology		
Date First Issued:	February 2022	Last Reviewed:	September 2026
Amendment Dates:		Next Review Date:	September 2029
Approved by:	Neonatal Coordinating Group	Date:	22nd September 2026
Endorsed by:	Neonatal Coordinating Group	Date:	
Aboriginal Impact Statement and Declaration (ISD)		Date:	September 2026
Standards Applicable:	NSQHS Standards: NSQPCH Standards: Child Safe Principles: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10		

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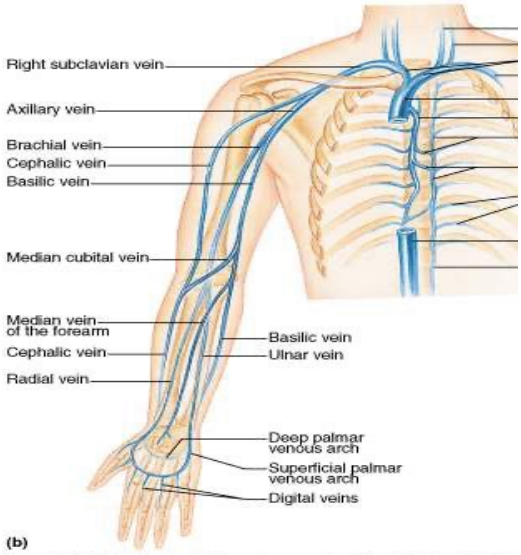
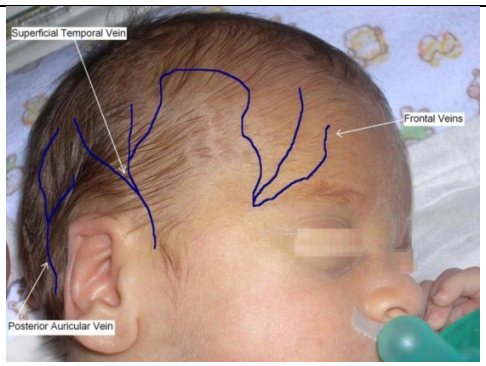
Healthy kids, healthy communities

Compassion Excellence Collaboration Accountability Equity Respect

Appendix 1: Anatomical Landmarks

Suitable veins	Picture
Long Saphenous vein Right leg is preferred over left leg due to straighter course before it enters IVC **Short Saphenous vein**	 COPYRIGHT © 2021 BY ALEXANDER STREET, A PROQUEST COMPANY
Basilic vein The right basilic vein is the vein of choice in the upper limbs due to its larger size and superficial location. Additionally, it has the straightest route to its destination and least no. of valves **Median cubital vein** The median cubital vein is prominent in the antecubital fossa and courses directly to the basilic vein and onward into the SVC **Cephalic vein** Smaller than basilic vein and can cause problems with threading at the shoulder **Brachial vein** It is smaller and runs deeper than the basilic vein	 Copyright © 2001 Benjamin Cummings, an imprint of Addison Wesley
Scalp veins ONLY if absolutely necessary and no other suitable veins are available Preferable to use posterior auricular vein due to straighter trajectory to neck	 *Scalp vein catheterisation technique, Ethan Burgvall, Dec 2020*

Appendix 2: PICC line measurement

Arm Veins (green line)

Measure from the insertion site along the arm to the shoulder joint, then to along clavicle to sternal notch and down to the third intercostal space. This is the approximate location of the proximal superior vena cava.

Leg Veins (orange line)

Measure from insertion site along medial leg to groin, to umbilicus and then up to xiphisternum. Aim is for catheter to be above L4/5, ideally in the upper IVC and avoiding renal veins around L2.

Scalp Veins (blue line)

Measure from the insertion site to the clavicular head and then to the third intercostal space.

Appendix 3: Placement

Correct placement of an upper limb or scalp PICC line in the superior vena cava just before the right atrium. Usually T4-5/ just below carina.

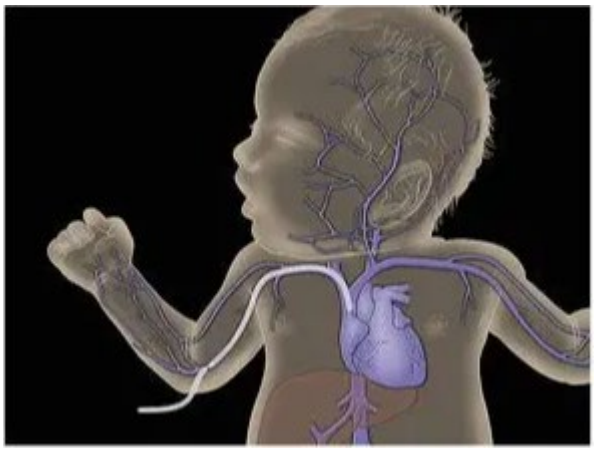
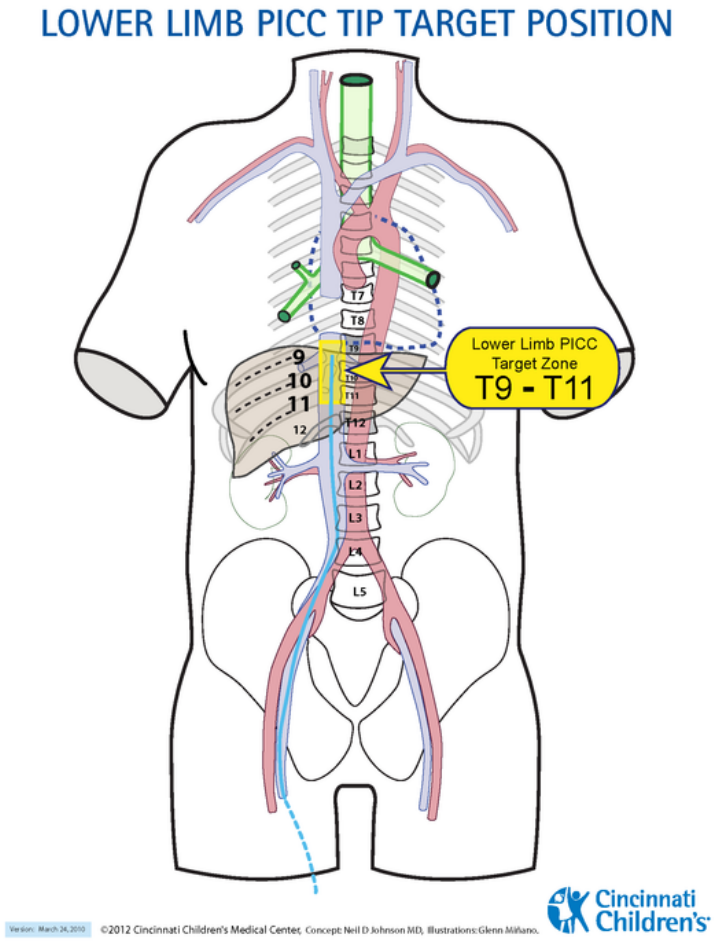


Figure 1 From Walden, M., Elliott, E., & McCay, A. (2014). PICC Placement in the Neonate. New England Journal of Medicine, 370(11), e17(1)-e17(5). https://doi.org/10.1056/NEJMvcm1101914.:



Appendix 4: PICC Placement Kit (prepacked)

- 1 x outer wrap
- 2 x drape towels (absorbent/impermeable)
- 2 x blue prep forceps
- 2 x measuring tapes (60cm)
- 2 x Tegaderm dressings (4cm x 4cm)
- 1 x 10ml luer lock syringe
- 1 x silicone neonatal tourniquet
- 4 x ball swabs
- 2 x hand towels
- 1 x peelable transparent drape with ‘easy peel’ 50cm x 50cm (opening 4cm)
- 1 x straight Reynolds scissors 9cm
- 1 x straight Iris forceps 10cm
- 1 x curved Iris forceps10cm
- 5 x swabs, 4 ply (7.5cm x 7.5cm)
- 2 x gallipots 60ml
- 1 x tray 20cm x 15cm x 4xm
- 1 x pack of small steri-strips (6 x 38mm, x 6)

Note: PICC placement kit is preferred, in-line with the PCH CVAD guideline. However, suitable sterile reusable instrument kits may be used when PICC kits are not available.