UC DAVIS HEALTH | CHILDREN'S HOSPITAL

NICU Vascular Access Guidelines

Background:

Vascular access in neonates is frequently required to provide IV fluids, medications, and blood products. Determining the proper type of access for each patient and using the access site appropriately is critical in providing safe and effective care.

Indication:

Common NICU Vascular Access Options

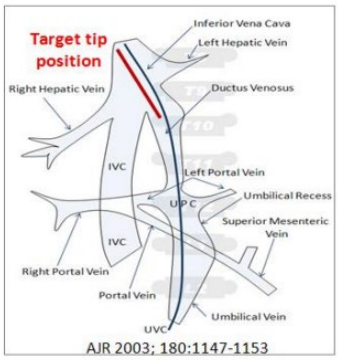
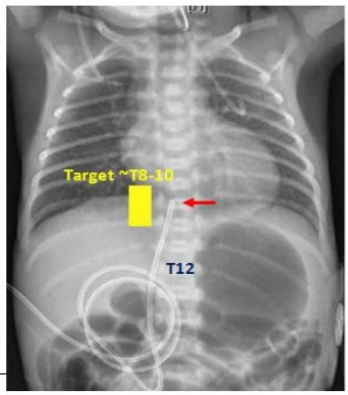
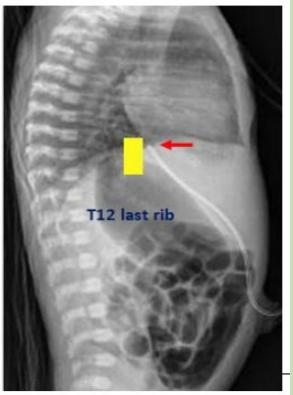
	UVC	UAC	PICC	PAL	PIV
Indications:	**1. Difficult PIV access** **2. Hemodynamic instability** **3. High GIR need**	**1. Hemodynamic instability** **2. Frequent blood draws** **3. Maintaining Arterial Access for future Cath Procedures in infants with Congenital Heart Disease (CHD)**	**1. Needed for IVF or medications** **(Unable to place UVL or UVL no longer useable)**	**1. Hemodynamic instability** **2. Frequent blood draws** **(Unable to place UAL)**	**1. Needed for IVF or medications** **2. Needed for blood products**
Gestational Age Considerations					

<26 weeks	**Recommended**	**Recommended**	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**
27-30 weeks	**Recommended**	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**
>30 weeks	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**	**Consider if indicated (see above)**

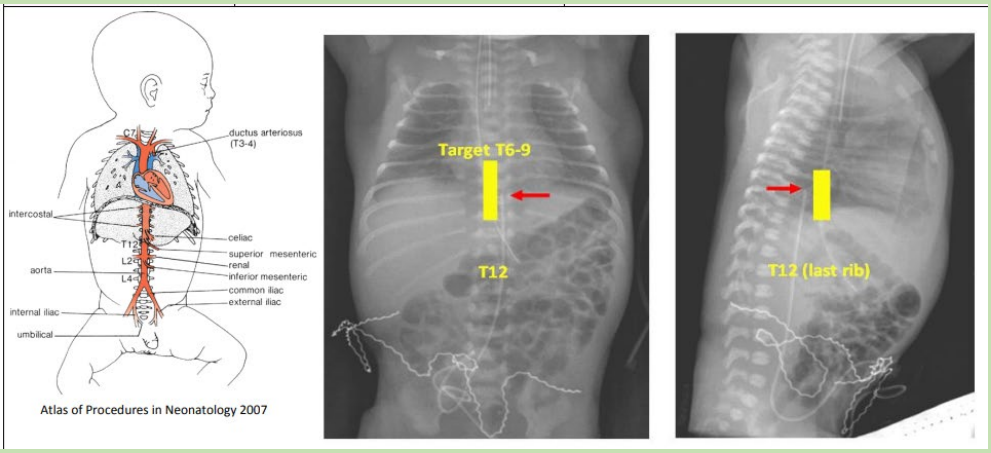
Placement/ Position:

Type: Umbilical Venous Catheter (UVC)

UVC	
Size	**< 1.5kg: 3.5F** **>1.5kg: 5F**
Length	**[(Wt. in kg x 3 +9) ÷ 2] + 1 + length of stump (cm)**
Placement	**Target: ~T8-T9 (Junction of IVC and Right Atrium)** **Avoid: Right Atrium (above T7), Portal Veins (~T11)** **Low Lying UVC (use should be avoided when possible): Tip terminates below liver**
Confirmation of Position	***Initial: Babygram + Cross-table** ***Follow-Up: Babygram 6-12 hours later** ***After Adjustments: If line moved ≥ 0.5cm, repeat Xray within 30-60 min**

	   **Image obtained from: https://torontocentreforneonatalhealth.com/wp-content/uploads/2019/07/Umbilical-Catheters-and-Peripherally-Inserted-Central-Catheters-PICC-Guideline.pdf**
May use for	**IVF: D10 (+/- electrolytes), TPN/IL, NS boluses, Must + Add Heparin 0.5 units/ml** **Meds: All meds ok** **Blood Products: All Blood products ok** **TKO Fluid: Must + Add Heparin 0.5 units/ml** **[For Low Lying UVLs: Only use non-hyperosmolar fluids, attending approval for anything else is required)**
Duration of use	*** Remove as soon as no longer needed** *** May be used up to 7 days** *** If line is determined critical, needs attending approval for 7+ days** *** For ALL infants with Congenital Heart Disease (CHD), discuss need for continued UVC use with Cardiology/Interventional Cardiology PRIOR to removing line**

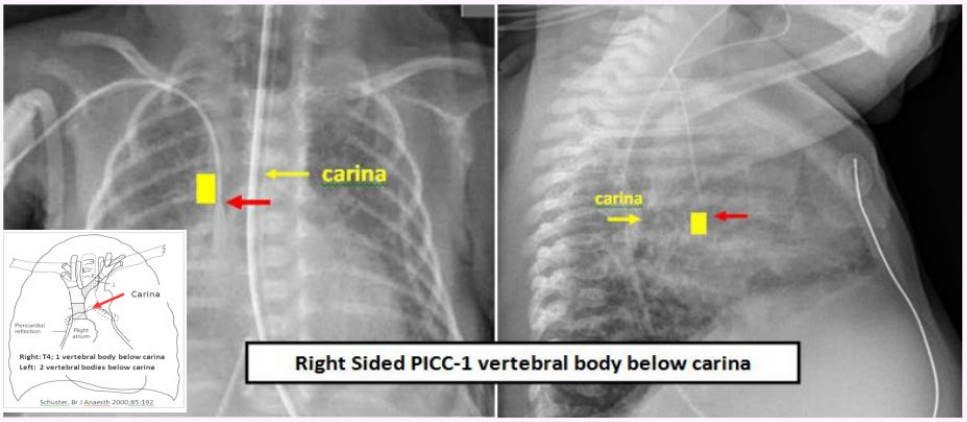
Type: Umbilical Arterial Catheter (UAC)

UAC	
Size	**< 1.5kg: 2.5 Fr, 3.5F** **>1.5kg: 5F**
Length	**(Wt in kg x 3 +9) + length of stump (cm)**
Placement	**Target: ~T6-T9** **Acceptable: L3-4** **Avoid: T10-L2, Below L4 (Bifurcation of the Aorta)**
Confirmation of Position	**<u>*Initial:</u> Babygram** **<u>*Follow-</u>Up: Babygram 6-12 hours later** **<u>*After Adjustments:</u> If line moved <u>></u> 0.5cm, repeat Xray within 30-60 min**  **Image obtained from: https://torontocentreforneonatalhealth.com/wp-content/uploads/2019/07/Umbilical-Catheters-and-Peripherally-Inserted-Central-Catheters-PICC-Guideline.pdf**
May use for	**IVF: Must + Add Heparin 0.5units/ml** **Meds: None**

	Blood Products: Not routinely used for blood administration **TKO Fluid: Must + Add Heparin 0.5units/ml**
Duration of use	*** Remove as soon as no longer needed or if any clinical signs of vascular insufficiency** *** May be used up to 5-7 days** *** If line is determined critical, needs attending approval for 7+ days** *** For ALL infants with Congenital Heart Disease (CHD), discuss need for continued UAC use with Cardiology/Interventional Cardiology PRIOR to removing line**

Type: Peripheral Inserted Central Catheter (PICC)

PICC	
Size	**Dependent on vessel size** **Neonatal PICC: Typically ≤ 1.9 Fr (1.4Fr Single Lumen, 1.9Fr Single Lumen, 1.9Fr Double Lumen)** **Pediatric PICC: For larger infants, attendings can request Pediatric PICC team to assess an infant's eligibility for a larger catheter central line.**
Length	**Catheter trimmed to size by person inserting it**
Placement	**Right Upper Extremity:** **Target: T4-5** **Avoid: Right Atrium (~below T5)**



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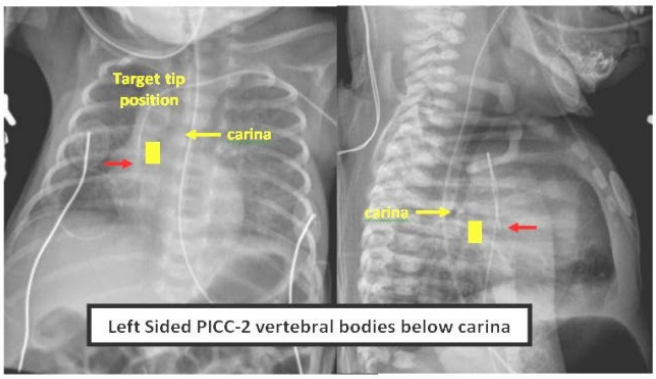
Left Upper Extremity:

Target: T4-5

Avoid: Right Atrium (~below T5)



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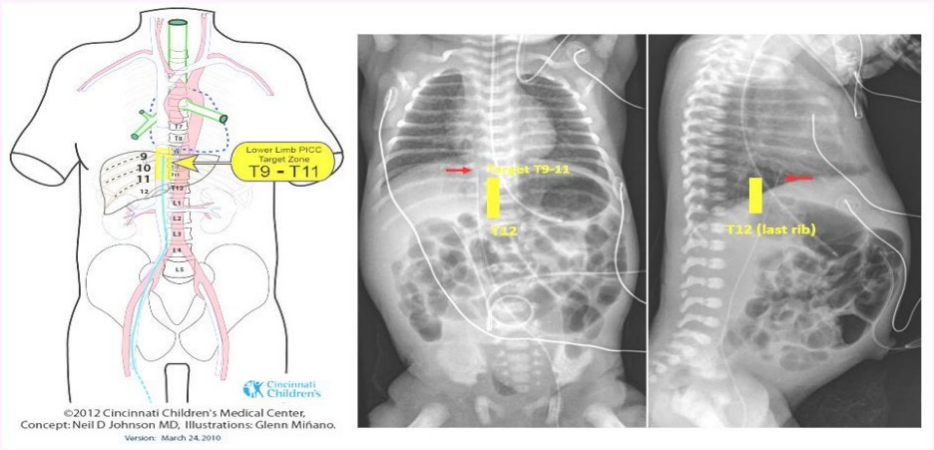
Lower Extremity:

Target: T 9-11

Acceptable: Above L2

	Avoid: Right Atrium T7, Renal Veins L2, Below L3-4 (Bifurcation of the Aorta)  **Image obtained from: https://torontocentreforneonatalhealth.com/wp-content/uploads/2019/07/Umbilical-Catheters-and-Peripherally-Inserted-Central-Catheters-PICC-Guideline.pdf**
Confirmation of Position	**Initial:** **Upper Extremity: Chest X-ray, both shoulders abducted 30*** **Lower Extremity: Babygram x-ray, frog leg position** **Follow-Up: 6-12 hours later** **After Adjustments: If line moved > 0.5cm, repeat Xray within 30-60 min** **Maintenance: Weekly Monday Xrays for picc line placement confirmation** **Transduce: Bedside RN to transduce PICC line to ensure it's not arterial before use**
May use for	**IVF: Must + Add Heparin 0.5units/ml** **Meds: All** **Blood Products: None** **TKO Fluid: Run at 1ml/hr. (May be run at 0.8ml/hr or 0.5ml/hr with attending approval)**
Duration of use	*** Remove as soon as no longer needed**

Ellucid Policy	**See Policy "Vascular Access Policy (Neonatal) 13002" for additional PICC line resources**

Type: Peripheral Arterial Line

PAL	
Size	**24G Angiocath**
Length	**n/a**
Placement	**Radial Artery (Left is pre-ductal, Right is post-ductal)** **Dorsal Pedis Artery** **Posterior Tibial Artery**
Confirmation of Position	**Ability to flush and draw blood easily** **Arterial waveform on Monitor**
May use for	**IVF: No** **Meds: No** **Blood Products: No** **TKO Fluid: 0.5ml/hr of Sterile Water + Na Acetate + Lidocaine + Heparin**
Duration of use	*** Remove as soon as no longer needed**

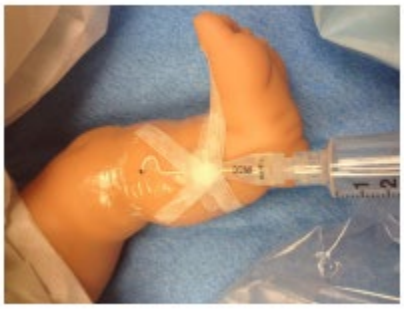
Other types of lines used in the NICU:

Type	Notes
Pediatric PICC:	- Placed by Pediatric PICC Team - Size: 3Fr Single Lumen, 4Fr Double Lumen - May be used for Blood draws and Blood product transfusions
Broviac:	- Placed by Pediatric Surgery - Size: 2.7Fr Single Lumen - Can be used for Blood draws and Blood product transfusions
Femoral or Internal Jugular (IJ) Central Line:	- Placed by PICU attending or Ped Surgery - Size: 3Fr Single Lumen, 4Fr Double Lume - Can be used for Blood draws and Blood product transfusions

Infection Prevention:

Dressing care:

- See Ellucid Policy 13002: “Vascular Access Policy (Neonatal)” for additional PICC dressing Change instructions.
- Dressing should be intact, clean, and dry.



- To minimize the risk of line migration and infection, PICC dressings must be changed as soon as loss of dressing integrity is noted.
    - a) For infants 36 weeks corrected gestational age and greater without a CHG allergy, a Silver Ion disc should be placed at the insertion site. PICC dressings must be changed every 7 days and as needed when a chlorhexidine-impregnated disc is in place.
    - b) If a silver ion disc is not in place, the dressing is changed when it is no longer clean, dry, or intact.
    - c) Tissue adhesive (for example, Secure Port IV) may be placed at the insertion site to minimize the risk of line migration.
- Assessment and documentation of insertion site, catheter and dressing integrity q 1 hour

Access frequency

- When possible, limit number of times central line is accessed to decrease risk of infection, malposition, or clotting.

Central Line placement with confirmed or suspected sepsis

- Ideal insertion of a central line occurs 48 hours after initiation of antibiotics for suspected or confirmed sepsis
- In some cases, and with attending approval, a central line may need to be placed sooner for vascular access.

Occlusion Management:

- If a central line is suspected of being completely or partially occluded:
    - Confirm external line has no visible kinks, re-dress site if needed
    - Consider Alteplase (TPA) treatment and use Ellucid Policy 13041: "Declotting Central Venous Catheters Using Alteplase" for additional guidelines."

Removal:

- See Ellucid Policy 13002: "Vascular Access Policy (Neonatal)" for additional central line removal instructions.
- After removal:
    - Examine the catheter to ensure it is intact.
    - Measure the catheter and ensure the length matches the length documented in the procedure note to ensure no catheter remains in the infant.

Complications:

Malposition:

- Upper Extremity PICC line or UVC: too deep (in Right Atrium)
    → Can lead to arrythmias or pericardial tamponade
- UVC: too low (in hepatic veins)
    → Can cause direct injury to liver

Phlebitis

- Mechanical Phlebitis: Caused by trauma to the vein from movement of the catheter
- Treatment: Elevate Extremity, provide warmth via K-Pad for 24 hours. If no improvements, consider alternative differentials

Infection:

- Can be localized vs. systemic
- Discuss with NICU attending and/or ID attending for management guidance. Management may include obtaining a blood culture, CBC, starting antibiotics and/or removing central line

Severed Catheter

- When possible, grab the severed immediately end before it retracts into the vein/artery

- Notify the NICU attending immediately

Additional Vascular Access Resources include:

- Pediatric PICC Team
- Interventional Cardiology
- Pediatric ICU Attending/Fellow
- Pediatric Surgery Attending

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