

 <p>NEONATAL CLINICAL PRACTICE GUIDELINE</p>	Title: Central Vascular Access Devices in NICU	
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	Approved by: Neonatal Patient Care Teams, HSC & SBH Child Health Standards Committee	Supersedes: HSC #80.275.400 SBH #112

1.0 PURPOSE AND INTENT:

- 1.1 To provide a process for the management of centrally placed vascular access devices in neonates who are patients in the Neonatal Intensive Care Unit (NICU). Note: these practices apply within the NICUs only due to the increased vulnerability and severity of illness for those neonates. Determine practices for neonatal-aged patients admitted to other units within the Child Health program according to the pediatric guidelines followed there. For guidelines related to standard infusion therapy practices see HSC Practice Guidelines "[Infusion Therapy: Central, Peripheral, Subcutaneous, Intraosseous](#)"

Note: All recommendations are approximate guidelines only and practitioners must take in to account individual patient characteristics and situation. Concerns regarding appropriate treatment must be discussed with the attending neonatologist.

2.0 PRACTICE OUTCOME:

- 2.1 Prevention of adverse events and sequelae related to indwelling central venous access devices

3.0 GUIDELINES:

- 3.1 Confirm device tip location by imaging. If uncertainty persists involve the attending Neonatologist to discuss options. Repeat the imaging after any repositioning of the device or if there is suspicion that the CVAD has migrated either further in or out. Imaging may consist of the following:
- 3.1.1 Anterior/posterior x-ray only for lines placed with ultrasound guidance.
 - 3.1.2 Anterior/posterior and lateral x-ray, OR focused ultrasound plus an anterior/posterior x-ray for lines placed without ultrasound guidance. (See [Focused Ultrasound in Neonates](#)).
 - 3.1.3 Both anterior/posterior and lateral x-ray any time there is uncertainty of tip location from the ultrasound.
- 3.2 If at an time the line tip is suspected to be in the peritoneal or pericardial cavity, if it is unclear if it is in an artery or vein, or if there is any unexplained clinical deterioration: conduct an x-ray with contrast and one or more of the following according to the clinical presentation :
- Comprehensive targeted neonatal echocardiography (TNE) assessment. ([See Practice Guideline](#)).
 - Intestinal ultrasound.
 - Lung ultrasound.
- 3.3 When setting up a solution on a syringe pump ensure that the pressure limit is set to low pressure. Confirm this setting once a shift as part of routine safety checks.
- 3.4 Review status of the CVAD at least once every 24 hours, typically during rounds, to determine continued need for the line.
- 3.5 For CVADs that are required for nutrition purposes only, consider removal of the device when the infant is tolerating 100-120 mL/kg/day of enteral feeding. See regional clinical practice guideline "[Removal of a Peripherally Inserted Central Catheter](#)". For surgically inserted CVADs contact the surgeon on call prior to removal. Follow the same procedure for removal ensuring that sutures are removed appropriately.

- 3.6 A physician order is not required to administer medication through a CVAD if the medication/infusion is compatible with other infusions running and is not a blood product.
- 3.7 Add heparin 0.5 international units/mL to Total Parenteral Nutrition.
- 3.8 When a line breaks and needs repair, consider immediate removal or replacement of the line to avoid the significantly increased risk of infection that results. Complete a Patient Safety Event Report (RL6). Consider completing a product complaint form if this break is potentially caused by a defective product. Consult a PICC inserter to complete the repair if it is determined to repair and keep the line in situ.
- 3.9 Measure the length of line extending from the insertion site once a shift, at every dressing change and whenever it is suspected that the line may have migrated out. In every situation where there is more line external than was documented on the insertion documentation, reconfirm device tip location with imaging.
- 3.10 Inspect ports and lines for bubbles and check and tighten all connections once a shift.
- 3.11 **Insertion Procedure for Central Venous Access Devices**
 - 3.11.1 Use maximum barrier precautions and use sterile drapes over the entire baby, leaving only a window over the intended insertion site. Complete the CVAD checklist for successful or unsuccessful insertion of every CVAD. (See site-specific forms and checklist in Appendix A)
 - 3.11.2 Before insertion cleanse the site only within the window that is visible between the drapes with chlorhexidine with 70% alcohol and allowed to dry for 3 minutes. For very early gestation infants <28 weeks gestation in the first 3 weeks of life use chlorhexidine without alcohol. In the case of an umbilical line use chlorhexidine to dab the stump and place a drain gauze over the abdomen. Remove the chlorhexidine with sterile water before applying a dressing.
 - 3.11.3 Minimize traffic around bedside during insertion of the central line. If personnel are within 1 meter of the area, they must wear a hat and mask.
 - 3.11.4 Use a sterile introducer for every attempt.
 - 3.11.5 Place a needle-free IV connector cap on the end of the UVC or PICC after insertion and under sterile conditions. Leave this cap on for as long as the line is in. Clamping is not necessary after cap is on.
- 3.12 **Catheter Site Care**
 - 3.12.1 Assess site and document findings every shift and whenever there are changes in the status of the CVAD.
 - 3.12.2 Cover all central venous line insertion sites, except umbilical sites, with a transparent semi permeable dressing.
 - 3.12.3 If the site is bleeding or oozing after catheter insertion place an absorptive dressing material such as a calcium alginate or hydrofibre dressing (i.e. Aquacel[®]) directly over the site. Change this dressing within 24 hours if it becomes saturated. If it does not become saturated, change the dressing within 7 days. If only a clear dressing is required, change the dressing only as needed.
 - 3.12.4 Examine the insertion site at least every 8 hours and document placement, dressing integrity and site condition.

- 3.12.5 Replace catheter site dressing when the dressing becomes damp, loosened or soiled or when inspection of the site is necessary and an absorptive dressing is used. Cleanse with 2% chlorhexidine with 70% alcohol for infants 28 weeks gestation and older, and with 2% chlorhexidine without alcohol for infants <28 weeks gestation.
- 3.12.6 Do dressing changes on a sterile field with the operator and assistant wearing a mask, hat and sterile gloves. When the dressing is changed cleanse the site with a 2% chlorhexidine-based preparation. Remove the chlorhexidine with sterile water before applying a dressing.
- 3.12.7 Do not apply topical antibiotic ointments.
- 3.12.8 Do not remove sutures placed during cutdown procedures until the catheter is discontinued or until directed by the surgeon.

3.13 Line Access

- 3.13.1 Every time the CVAD is accessed follow the process and requirements outlined in Appendix A. See APPENDIX C for details on specific devices.
- 3.13.2 Flush venous lines with normal saline prior to administration of medications or blood sampling and after medication administration to prevent hemolysis and any potential mixing of incompatible solutions.
- 3.13.3 To prevent air embolism remove all air from any flushes, medications and boluses prior to injecting and clamp all other ports when injecting any flushes, medications or boluses.

3.14 Tubing Changes

- 3.14.1 Use sterile technique when a complete change of administration sets is required. This includes, mask, sterile gloves and a sterile drape to create a sterile field. Bags must be spiked completely inserting the tubing (i.e.: no cuff outside of the bag). See Appendix B for the complete process and requirements.
- 3.14.2 Connect administration sets to the CVAD using Y-connector extension sets (pigtailed).
- 3.14.3 Do not cover tubing connections with tape.
- 3.14.4 Cleanse all ports and connection sites with 70% alcohol. Scrub the hubs for at least 15 seconds of contact time and then allow to dry **for 15 – 30 seconds**.
- 3.14.5 Place a filter on all infusions except some drug infusions closest to the patient. (See [Parenteral Drug Manual](#)). Note: for arterial lines place the filter between the IV tubing and the transducer. If filtering lipids ensure that you use a 1.2 micron filter.
- 3.14.6 Replace administration sets according to the guidelines below:
 - Change tubing every 96 hours for:
 - Electrolyte solutions, medication tubing & transducers
 - Continuous infusion medications (unless a change of shorter duration is ordered)
 - TPN Basic
 - Lipids – change tubing every 24 hours
 - Blood products – Change tubing every 4 hours, or when the set has been idle for >30 minutes.
- 3.14.7 Leave extension sets and needle-free connector caps that are part of the line from the sterile package in place for the duration of the line. Change all additional extension sets (single, double or triple) when administration sets are changed.

- 3.14.8 Connect infusions to the extension set in relation to the patient in the following order:
- 1) Lipid infusion closest to the patient.
 - 2) Medication port.
 - 3) Medication infusions in order of lowest infusion rate closest to the patient.
- 3.14.9 Place the IV pumps on the IV pole from top to bottom in the following order:
- 1) Volumetric pump (usually primary solution)
 - 2) Syringe pumps in order of IV rates from lowest rate down to highest rate
- 3.14.10 For hemodynamically unstable infant infusing inotropes, to minimize variability in volume delivery it is advised to minimize the compliance and internal volume of the IV-administration set. Prepare the complete multi-infusion set at once, and start it before connecting the infusion lines to the patient. Do this by preparing a duplicate IV pump and infusion set-up when changing IV tubing. Prime tubing with new infusions and then allow the pumps to run for 30-60 minutes while maintaining sterility of the connections, before replacing the old set up with the new set-up. Sterility can be maintained by connecting the tubing into a sterile empty IV bag obtained from pharmacy.
- 3.14.11 When a new line is inserted, use a new sterile solution and new tubing whenever possible.
- 3.14.12 To prevent air embolism:
- Remove any air from syringe prior to attaching to tubing.
 - Flush each port and pigtail ensuring no air present, ensuring that all other ports are clamped at this time.
 - “Flick” all ports to ensure bubbles are removed.
 - Flush and remove bubbles before handing set to line inserter or connecting lines, with every new line set up or change

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Appendix A

Line Access Central / Arterial (Aseptic)

Stop and consider whether central access is necessary. This process is for both bolus and short-term infusion medication administration. Drugs with high osmolality (eg. high percent glucose) or extreme pH, high or low (i.e. sodium bicarbonate, Vancomycin) are given centrally if a central line is available.

- Mask (unless patient in a closed bed such as incubator)
- Routine hand washing
- Put on clean gloves
- Alcohol scrub to injection port for 15 seconds and allow to air dry
- Inject fresh flush solution from pre-filled syringe
- Wipe once with remaining alcohol swab and allow to dry
- Inject medication (or connect medication infusion)
 - Repeat last 2 steps for each additional medication
- Inject flush solution from pre-filled syringe
- Remove gloves
- Routine hand washing
- Use a sterile field under the access point (can be a drape or sterile gauze)

All Solution/ Tubing Changes/Medication Infusion Preparation: Central / Arterial (Aseptic)

- Mask
- Routine hand washing
- Put on clean gloves
- Remove old solution/tubing
- Alcohol scrub to injection port for 15 seconds and allow to air dry *for 15 – 30 seconds*
- Attach new solution/primed tubing using aseptic technique.
- Use a sterile field under the line.

Withdrawing Blood from Arterial or Venous Lines (Aseptic)

- Mask if baby is on open bed
- Routine hand washing & glove with clean gloves
- On a sterile field, lay 4x4 with 2 opened alcohol swabs under stopcock and/or port
- Alcohol scrub to injection port for 15 seconds and allow to air dry *for 15 – 30 seconds*
- Attach 3 cc syringe and withdraw sufficient blood to clear line
- Remove and attach 1 cc syringe to draw sample
- Remove 1 cc syringe and refeed contents of 3 cc syringe
- Alcohol scrub to port for 15 seconds and allow to air dry
- Attach FRESH flush syringe and flush to clear line
- Remove gloves
- Routine handwashing

Central Line Dressing Changes (Sterile)

- 2 nurse procedure
- Gather supplies
- Mask
- Routine hand washing
- STERILE** gloves for nurse doing dressing change
- Sterile drape
- Cleanse skin with appropriate solution and allow to dry

APPENDIX B

Sterile Tubing Change Procedure

(Follow these steps if infusion and administration set not assembled together under a laminar flow hood)

	Duties of the Sterile Nurse	Duties of the Clean Nurse
1.	<input type="checkbox"/> Gather all necessary tubing supplies, sterile gloves and sterile drape	
2.	<input type="checkbox"/> Verify new TPN or any infusion to be hung using 2 patient identifiers.	<input type="checkbox"/> Verify new TPN or any infusion to be hung using 2 patient identifiers.
3.	<input type="checkbox"/> Mask <input type="checkbox"/> Routine handwashing	<input type="checkbox"/> Mask <input type="checkbox"/> Routine handwashing
4.	<input type="checkbox"/> Set up sterile field on appropriate table using sterile drape <input type="checkbox"/> Open all necessary tubing onto sterile field without contaminating tubing	<input type="checkbox"/> Put on CLEAN gloves
5.	<input type="checkbox"/> Put on STERILE gloves <input type="checkbox"/> Assemble tubing into correct configurations according to solution being hung including pigtails	<input type="checkbox"/> Assist opening packages where necessary for sterile nurse.
6.	<input type="checkbox"/> Begin with TPN tubing and spike new TPN bag	<input type="checkbox"/> Hold new TPN bag while sterile nurse spikes (May use blue peritoneal dialysis clamp to help prevent contamination)
7.	<input type="checkbox"/> Hold tubing to allow assistant to connect remaining solutions	<input type="checkbox"/> Connect each solution to sterile tubing and purge
8.		<input type="checkbox"/> Clamp off old pigtail (closest to baby) <input type="checkbox"/> Remove old pigtail from injection port on the end of the line <input type="checkbox"/> Alcohol scrub to port for 15 seconds and allow to air dry
9.	<input type="checkbox"/> Maintaining sterility, twist new pigtail onto cleansed injection port on end of line	<input type="checkbox"/> Hold injection port firmly while sterile nurse twists new pigtail on
10.		<input type="checkbox"/> Place all bags and/or syringes on infusions pumps and set rates etc. and discard old solutions and tubing.
11.	<input type="checkbox"/> Verify correct solution, correct rate and volume set, correct patient, correct site, and initial on the data record and Medication Administration Record.	<input type="checkbox"/> Verify correct solution, correct rate and volume set, correct patient, correct site, and initial on the data record and Medication Administration Record.
12.	<input type="checkbox"/> Ensure that all tubing and pigtails are unclamped.	

APPENDIX C
Neonatal CVAD Device Reference Chart

Type of Device	Description	Lumen Volume (mL)	Flush Volume mL/ Lumen - NS	Lock Volume mL / Lumen – Heparin (10 unit/mL)	Use/Comments
Non- Tunneled CVADs					
Umbilical catheters					
Single	3.5 Fr 38 cm	0.15	0.5 – 1	1	<ul style="list-style-type: none"> Used for fluid/medication and blood product administration, blood collection, and pressure monitoring. There is no valve. Do not use forceps to clamp. Must pinch line over to clamp
	5 Fr 38 cm	0.33			
Double	3.5 Fr	0.15 0.15	0.5-1	1	<ul style="list-style-type: none"> Clear: primary port used for pressure monitoring Blue: secondary port used for fluid and medication administration The second lumen of a double lumen UVC may be locked q6h.
PICCs (may also be inserted through cut-down)					
Open ended	1.9 Fr. Radiopaque Polyurethane Single or double lumen (i.e. L-cath, or Argyle)	Single: 0.18 Double: 0.15 0.13 Varies when trimmed	Minimum 0.5-1	NA NOTE: Do not lock CVADS 2FR or smaller due to high risk for blocking	<ul style="list-style-type: none"> CVAD is typically trimmed. Total length noted on the Central Venous Access Device (CVAD) Insertion record. Should only be used for blood product administration as a last resort. May be placed in the patients arm (or leg NICU only) Minimum flow rate 1 ml/hr
Open Ended	1.2 Fr 28 Gauge 25 cm Polyurethane (i.e. L-cath, Vygon)	0.1 Varies when trimmed	0.5-1		
Open Ended	3 Fr 26 Gauge 30 cm single lumen polyurethane (i.e. L-cath)	0.16	0.5-1	1-2	<ul style="list-style-type: none"> Used for fluid/medication and blood product administration and blood collection.

Type of Device	Description	Lumen Volume (mL)	Flush Volume mL/ Lumen - NS	Lock Volume mL / Lumen – Heparin (10 unit/mL)	Use/Comments
Open Ended	2 Fr 30 cm 24 gauge Silastic (i.e. Per-Q- Cath™)	0.15	Minimum 0.5-1	NOTE: Do not lock CVADS 2FR or smaller due to high risk for blocking	<ul style="list-style-type: none"> • Minimum flow rate 1 ml/hr • Should not be used for blood collection
Open ended	3 Fr 30 cm 21 gauge Silastic (i.e. Per-Q- Cath™)	0.26	Minimum 0.5-1	1	<ul style="list-style-type: none"> • Used for fluid/medication and blood product administration and blood collection.
Open ended/ Valved Power rated available	3 Fr. 60 cm Silastic/ Polyurethane e.g. Groshong/ Power rated	0.26	Minimum 0.5-1	NA NOTE: Valved devices do not require heparin	<ul style="list-style-type: none"> • CVAD is typically trimmed. Total length noted on the Central Venous Access Device (CVAD) Insertion record. • Used for fluid/medication • Power rated devices may be used for CT, ensure communication with Diagnostic Imaging prior to sending the patient for test.
Tunnelled CVADs (i.e. Broviac)					
Single	2.7 Fr 4 Fr 4.2 Fr 6.5 Fr	0.15 0.5 0.53 1.1 1	5-10	1	<ul style="list-style-type: none"> • Document Total length noted on the Central Venous Access Device (CVAD) Insertion record. • Used for fluid/medication/blood and blood product administration. • Minimum flow rate 1 ml/hr • Contact Surgeon specific care and maintenance requirement including blood collection.
Double	5 Fr	0.5 each lumen	5-10	2	