



Parkland Health & Hospital System  
Women & Infant Specialty Health

Nursery Services Procedure Manual

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**Umbilical Arterial and Venous Catheter  
Insertion, Maintenance, Blood Sampling, and Removal**

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**Practice**

**Statement**

An Umbilical Arterial (UAC) or Venous Catheter (UVC) shall be inserted into a patient by a provider using aseptic technique. The registered nurse shall assist with the insertion.

A Time Out shall be performed before the insertion of a UAC and UVC catheter. Refer to Admin Procedure 6-30 Time Out Procedure <http://intranet.pmh.org/home/PP-Index/Admin/admin6-30.pdf> and Nursing Procedure 37-09A Time Out Checklist <http://intranet.pmh.org/home/PP-Index/Nursing/37-09a.pdf>

Catheter tip location shall be radiologically confirmed before catheter use and documented in the patient's medical record by the provider.

The provider is responsible for labeling the UAC and UVC catheters, denoting the type of line after x-ray confirmation.

The provider shall document the Lot Number of the UAC and UVC Catheter on the Provider Procedure Monitoring Form.

Upon the written order of the provider, the credentialed registered nurse shall pull back or discontinue an umbilical arterial or venous catheter per protocol.

The dextrose concentration in a UAC shall be limited to D<sub>15</sub>W. Dextrose concentrations greater than D<sub>15</sub>W require approval from the attending physician, and the order shall be co-signed by the attending or neonatal fellow.

The dextrose concentration in a UVC shall be limited to D<sub>10</sub>W if the line is positioned below the liver.

The dextrose concentration in a UVC positioned above the liver shall be limited to D<sub>20</sub>W. Dextrose concentrations greater than D<sub>20</sub>W require approval from the attending physician, and the order shall be co-signed by the attending or neonatal fellow.

IV fluids infusing through a UAC or UVC shall contain 0.5 units of heparin per ml of IVF for the 1<sup>st</sup> week of the infant's life. After the first week of life the amount of heparin shall be increased to 1 unit per ml of IVF.

The IV fluid is administered via infusion/syringe pump, changed every 24 hours, and labeled with date, time, and initials. Record change on MAR.

Change IV tubing with filter, y-connector, medication tubing, and transducer and label with date, time, and initials:

- Every 72 hours for clear fluids
- Every 24 hours for continuous drips (i.e., Fentanyl, Versed)
- Every 24 hours with TPN and IL
- After accidental contamination

All IV fluid infusions shall be documented every hour on the flowsheet. The documentation shall include amount infused over total volume infused.

All IV fluids shall be totaled every 8 hours.

A 22-micron filter shall be utilized on all maintenance fluids in the NNICU with the exception of Intralipids.

All medications and drips shall be added to the Intravenous line after the filter.

Blood cultures shall be obtained from the UAC and UVC line(s) when a septic work-up is performed. Refer to Nursery Procedure # 1700.06 Collection of Blood Cultures. <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.06.pdf>

Refer to procedure # 1700.22 completing a Laboratory Requisition Slip for Blood Gas Analysis. <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.22.pdf>

**Purpose**

To provide arterial/venous access for:

- Arterial blood gas analysis
- Arterial blood pressure measurement
- Central venous pressure measurement
- Resuscitation
- Administration of fluids
- Administration of medications
- Exchange transfusion
- Laboratory specimen collection
- Administration of blood/blood products/blood derivatives

**Equipment UAC/UVC Insertion**

#3.5 or #5 Fr. Single or double lumen umbilical catheter  
Umbilical catheter insertion tray  
Tape measure  
Normal saline flush or ¼ normal saline as ordered by provider  
Tape or steri strips  
Limb restraints  
Procedure light  
Sterile towels, gloves, gowns  
Mask, goggles, caps  
IV pump  
Prescribed IV fluid  
IV tubing  
0.22 micron filter  
Transducer  
Time Out Checklist  
Red “arterial” label for UAC  
Blue “venous” label for UVC  
Sterile Pen and labels

**UAC/UVC Blood Sampling**

Non-sterile Gloves  
3-3cc syringes  
4x4 sterile gauze  
Pre-filled UAC/UVC Normal Saline flush (prepared by pharmacy, located in pyxis)  
Lab containers appropriate for specimen  
Patient label  
Provider order  
Lab requisition slip  
Laboratory Chart Order Form

Refer to policy 1700.20 for Blood Specimen Collection with the VIA V-LVM system <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.20.pdf>

**UAC/UVC Removal or Pulling Back**

Non-sterile Gloves  
Suture removal kit  
4x4 sterile gauze  
Restraints (optional)  
Tegaderm or steri strips (depending on how the line is secured and only necessary for pulling back the line)

## Procedure

### A. Insertion of UAC/UVC Single or Double Lumen

1. Identify patient per nursery procedure #100.02. <http://intranet.pmh.org/home/PP-Index/NICU/100/100.02.pdf>
2. Turn audible beat to beat on ECG monitor.
3. Perform the shoulder to umbilicus measurement (SU).
  - a. Measure in a straight line parallel to the neonate's body and record in cm's the distance from the infant's distal end of the clavicle to the umbilicus.
  - b. Take the SU measurement and multiply x 0.66 for UAC placement plus stump length.
  - c. Take the measurement and multiply x 0.5 for UVC placement plus stump length. This length is needed to place the tip of the catheter between the diaphragm and the right atrium.
4. Place an x-ray plate covered with blankets, for comfort, only if the infant is lying on a k-pad.
5. Restrain infant's arms and legs. Observe buttocks, legs and feet for baseline color/perfusion **prior to and following** catheterization and document any abnormalities in Nurses notes.
6. Assemble equipment for UAC/UVC placement. Provide provider with sterile pen and label for medications/solutions on the sterile field.
7. Place UAC/UVC tray on a clean utility cart and open utilizing aseptic technique.
8. Open appropriate size catheter onto sterile field or tray.
9. Perform Time Out with the provider and document on appropriate form.
10. Ensure that all personnel, assisting with the placement of the catheter and working directly over the sterile field, wear a mask, goggles, cap and sterile gown.
11. The nurse shall hold the umbilical cord clamp upward while the provider cleans the cord and surrounding skin with betadine swabs. The provider will drape the patient and place the umbilical tie around the stump of the cord. After this is complete, the provider will cut the cord off and proceed with catheter placement.
12. After X-ray confirmation the provider shall label the catheter(s) to denote the type of line. Red "arterial" label for UAC and blue "venous" label for UVC.

13. After X-ray confirmation the nurse shall secure the line to the abdomen using either the goal post or Duoderm method.

**Goal Post Method**

- a. Take two steri strips and fold the center section of each piece on itself.
- b. Place the ends of the steri strips onto on each side of the umbilicus.
- c. Wrap a steri strip from one side of the bridge to the other side, securing the catheter in the center.
- d. Loop the catheter over and secure a second section of the catheter in between the steri strip. This will secure and prevent direct pulling of the catheter at the insertion site.

**Duoderm Method** (not ideal securing method for neonates requiring an echocardiogram)

- a. Trim duoderm to the size of the infant's stomach.
- b. Place duoderm on skin.
- c. Coil UAC/UVC twice on top of duoderm.
- d. Cover lines with tegaderm.

14. Loosen umbilical tie around cord and remove feet restraints. Check infant's feet for circulatory problems and document assessment on nurse's flow sheet.

15. Assemble IV tubing, filter and transducer under laminar hood.

16. Spike IV fluid under laminar hood. Priming may be performed at the patient's bedside.

17. Attach primed IV tubing to UAC/UVC stopcock. Take care not to allow air to enter catheter. Check for air bubbles in catheter or stopcock hub before flushing or starting infusion.

18. Regulate IV rate on infusion pump per provider's order. The minimum IV rate for a UAC or UVC shall be 0.5 ml/hr.

19. When utilizing a double lumen:

- a. Use the larger port "clear" (18 or 20 g) for the infusion of maintenance IV's and blood sampling.
- b. Use the smaller port "blue" (21 or 23g) for medication or administration of blood.
- c. Either port may be used for blood transfusions after flushing with normal saline.

20. Heparin lock 2<sup>nd</sup> and 3<sup>rd</sup> lumens (if present) with 0.5 -1 ml (amount depends on length of catheter) of 10units/ml heparin solution Q6 and after each medication administration if lumen is not in continuous use.
21. Notify the physician immediately if the infant's toes, feet, legs or buttocks blanch or turn bluish, which suggest compromised blood supply. Wrapping the opposite foot with heel warmers may reverse this complication by reflex dilatation.
22. Blood cultures shall be obtained from both the UAC and UVC line(s) when a septic work-up is performed. Refer to Nursery Procedure # 1700.06 Collection of Blood Cultures. <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.06.pdf> Discuss with provider if the blood culture is necessary when the neonate is on inotropic support via the UVC and if stopping the inotropic support to obtain the blood culture will not be tolerated by the patient. If the decision is to not stop support, obtain an order to not draw sample from the UVC. **Note: Inotropes should not be infused through a UAC.**
23. Continue routine cord care.

#### **B. UAC/UVC Blood Sampling with a Stopcock**

1. Identify patient per nursery procedure # 100.02. . <http://intranet.pmh.org/home/PP-Index/NICU/100/100.02.pdf>
2. Take provider's order and laboratory test order form to the HUC station. The HUC will pois the laboratory order and provide the nurse with a laboratory requisition(s).
3. The nurse shall verify **at the patient's bedside** that the name and medical record number of the infant (id band and crib card) matches the name and medical record number on the provider order, laboratory requisition and patient label. **This step must be completed prior to blood draw.**
4. Complete a blood gas requisition slip if performing a blood gas. Refer to Nursery Procedure # 1700.22 Completing A Laboratory Requisition Slip for Blood Gas Analysis. <http://intranet.pmh.org/home/PP-Index/NICU/1700/1700.22.pdf>
5. Wash hands and don clean gloves.
6. Assemble equipment.
7. Select the stopcock on the UAC/UVC line that is nearest to the patient and attach a sterile 3-ml syringe into the top of stopcock.
8. Turn the stopcock off to the IV fluid and withdraw 1.5-2 ml of blood to clear IV fluid.
9. Turn the stopcock handle a quarter turn (between the IV fluid and the off position of the stopcock), remove syringe, and place on sterile 4x4 gauze to prevent contamination.

10. Insert a second sterile 3-ml syringe into the stopcock. Turn the stopcock handle off to the IV fluid and withdraw the desired amount of blood from the patient.
11. Turn stopcock a quarter turn (between the IV fluid and the off position of the stopcock), remove syringe, and place on sterile 4x4 gauze to prevent contamination.
12. Reinsert the initial 3-ml disposable syringe of blood in the stopcock and turn the stopcock off to the IV fluid. Aspirate gently and tap on syringe to remove any air bubbles in the stopcock and then slowly return the blood to the patient. Observe for blood clots and air bubbles.
13. Turn stopcock a quarter turn and discard the empty syringe per Nursing Procedure # 25-05. <http://intranet.pmh.org/home/PP-Index/Nursing/25-05.pdf>
14. Insert a third 3-ml syringe containing UAC/UVC flush of normal saline, unless otherwise ordered by the provider. Place the syringe into the stopcock. Turn the stopcock off to the IV fluid. Aspirate gently and tap on syringe to remove any air bubbles in the stopcock and then flush the line with 0.5 ml to 1 ml of flush. Use the least amount of flush needed to clear the line of blood.
15. Turn the stopcock back to its original upright position.
16. Observe the line closely for any reflux of blood in the line. Check monitor for return of arterial waveform.
17. Distribute blood to appropriate lab tube(s).
18. Document on patient label date, time, test ordered (i.e., CBC) and nurses initials. Attach patient label(s) to specimen **before leaving patient bedside**.
19. Take specimen, provider order and laboratory order form to HUC station.
20. Document on flowsheet:
  - a. Time specimen collected.
  - b. Amount of blood withdrawn from infant over cumulative blood out from the patient.
  - c. Site from which the blood was drawn.
  - d. Test(s) performed.
  - e. Amount and type of flush used.
21. If obtaining a blood gas specimen:
  - a. Check the blood gas sample for the presence of air in the syringe and expel any present
  - b. Cap the arterial blood gas syringe and gently rotate blood-gas syringe to ensure heparin and blood are mixed.
  - c. Document on patient label date, time, and nurse's initials. Attach patient label to specimen **before leaving patient bedside**.

- d. Document the following on flowsheet:
  - Exact time specimen collected.
  - Oxygen concentration and/or ventilator settings including MAP
  - $S_aO_2$  measurement
  - Amount of blood withdrawn from infant over cumulative blood out from the patient
  - Site from which the blood was drawn
- e. If the gas is to be analyzed by Parkland Laboratory place the specimen in clear bag with ice and take to HUC station with provider's order, laboratory order form and blood gas requisition slip.
- f. Transport specimen and blood gas requisition slip to the respiratory therapy room immediately to ensure accurate results.
- g. Place specimen on ice.

### C. Removal of UAC/UVC

1. Identify patient per nursery procedure # 100.02. . <http://intranet.pmh.org/home/PP-Index/NICU/100/100.02.pdf>
2. Restrain extremities.
3. Assemble equipment at bedside
4. Wash hands and don clean gloves.
5. Compare the markings on the UAC/UVC to another catheter of exactly the same size to determine the distance needed to pull the UAC/UVC catheter to the 2-cm mark, or utilize the graduated numbering system on the catheter.
6. Open 4x4 sterile gauze.
7. Remove the UAC/UVC tape from the catheter.
8. Using the knife blade or scissors cut and remove the sutures securing the UAC/UVC. Always cut away from the catheter.
9. Turn the stopcock off toward the patient. Discontinue infusion.
10. Withdraw the catheter gradually with steady continuous pulling action until all but approximately 2 cm of the catheter has been removed. Retape the UAC/UVC to the abdomen to prevent accidental dislodgment or tighten umbilical tie. **Once the catheter is no longer secured, the nurse should not leave the bedside for any reason.**
11. Maintain catheter at this position for approximately 15 minutes in order to allow clotting to occur.

12. Open the stopcock to air and observe for pulsation's or blood return in the catheter. If pulsation's or blood return is noted, return the stopcock to the off position and wait an additional 5-10 minutes before opening the stopcock to air to again check for the presence of pulsation's or blood return. Continue this procedure until no blood return or pulsation is observed.
13. If no blood return or pulsations are noted, the catheter may be slowly withdrawn.
14. If bleeding occurs after removal of the catheter, tighten umbilical tie and apply continuous pressure with 4x4 sterile gauze for 3-5 minutes. If the site continues to ooze, repeat pressure of an additional 3-5 minutes. If after 10 minutes a significant quantity of arterial bleeding continues, notify a provider.
15. Observe the umbilicus for bleeding after catheter removal.
16. Document on flowsheet:
  - Time UAC removed
  - Amount of bleeding noted upon removal
  - Patient's tolerance of procedure
17. Loosen umbilical tie when bleeding stops and document.

#### **D. Pulling back a UAC/UVC**

1. Follow steps 1-4 of the above procedure
2. Remove the tegaderm/steri strips (depending on how the line was secured) carefully from the line to be pulled back.
3. Loosen the umbilical tie.
4. Pull back on the umbilical line gradually with steady continuous pulling action to desired length.
5. If the catheter cannot be withdrawn using a gradual, steady continuous pulling action, stop and call the provider. **DO NOT CUT SUTURES.**
6. After pulling catheter to desired length, re-secure line with new tegaderm or new steri strips.

#### **D. Points to remember:**

1. Blood loss can occur quickly if there is a loose connection. Make sure all connections are secured. Use only Luer-lock syringes and stopcocks.

2. Prevent air embolism by removing air bubbles from being injected into the line when the catheter is being flushed. Prime tubing carefully to prevent air bubbles.
3. Blood return from a UAC/UVC line should be instantaneous. If blood will not return easily, there may be a clot and the physician should be notified.
4. Assessment of lower extremities should be documented once a shift while a UAC is in place.
5. Umbilical tape should remain loosely around the umbilical stump. Tighten only to occlude the umbilical artery in the event of accidental dislodgment or for bleeding after removal of catheter.
6. An active infant may need all extremities restrained with soft restraints to prevent accidental dislodgment.
7. Serum glucose samples should not be drawn from a line in which a dextrose solution is infusing. It is preferable to obtain electrolytes from a heel stick.
8. Abdominal positioning should be used cautiously with UAC/UVC's since accidental slipping, kinking, or removal of the catheter may occur without being immediately apparent.
9. Antibiotic peaks and troughs should not be drawn from the line through which they were administered.

#### **E. IV Therapy Recommendations**

1. Label all UAC catheters with red "arterial" label and all UVC catheters with a blue "venous" label denoting type of line.
2. Always trace an IV line from the patient to the point of origin before connecting any infusions.
3. Recheck connections and trace all IV lines to their source as part of the hand-off "line reconciliation" process upon a patient's arrival to a new setting or service and during patient report.
4. Inform providers, non-clinical staff, and families that they must get help from the nurse whenever there is a real or perceived need to connect or disconnect devices infusions.

#### **F. PRIMING VOLUMES OF CATHETERS**

SINGLE LUMEN		DOUBLE LUMEN	
Size	Priming Volume	SIZE	Priming Volume
3.5 fr	0.17 cc	3.5 fr Primary 20g	0.17 cc
5.0 fr	0.27 cc	3.5 fr Secondary 23g	0.14 cc
		5.0 fr Primary 18g	0.36 cc
		5.0 fr Secondary 21g	0.24 cc

\*Use 0.5 cc of heparin flush to flush the line, as this is an ample amount to clear the line and heparinize it.

References

PH&HS Infection Control Committee

Joint Commission Recommendations Sentinel Event Alert 36.

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