



CLINICAL GUIDELINE

**Umbilical Arterial and Venous Catheters  
(UAC/UVC)  
Insertion, Management and Removal**

<b>Scope (Staff):</b>	Nursing and Medical Staff
<b>Scope (Area):</b>	NICU KEMH, NICU PCH, NETS WA
<b>Child Safe Organisation Statement of Commitment</b>	
<p>The Child and Adolescent Health Service (CAHS) commits to being a child safe organisation by meeting the National Child Safe Principles and National Child Safe Standards. This is a commitment to a strong culture supported by robust policies and procedures to ensure the safety and wellbeing of children at CAHS.</p>	

**This document should be read in conjunction with this [DISCLAIMER](#)**

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## Key Points

- High positioning of the UAC (T8-10) is associated with a lower incidence of arterial vasospasm and blanching of the extremities.
- Infants with umbilical lines in situ should not be wrapped, have nappies or booties on, the pelvic area and feet should be visible at all times to check for adequate circulation.
- All lines (venous and arterial) should be able to be bled back on insertion; and should not be used if they do not.
- Following insertion and securing of umbilical catheter(s) commence the following infusions **prior** to placement confirmation by an X-ray:

### Suggested Starting Fluids

**UAC** ≤27 weeks - Sodium Chloride 0.45% + 0.5 u/mL Heparin

>27 weeks - Sodium Chloride 0.9% + 0.5 u/mL Heparin

**UVC** ≤27 weeks - Starter Pack 5% Glucose **or** Glucose 5% + 0.5 u/mL Heparin

27 to 29<sup>+6</sup> weeks - Starter Pack 8% Glucose

30 to 33<sup>+6</sup> weeks - Glucose 7.5% + Sodium Chloride 0.22% + 0.5 u/mL Heparin

≥34 weeks - Glucose 10% + 0.5 u/mL Heparin

- Penicillin, Amoxicillin and Gentamycin may be given prior to X-ray confirmation of line position.
- A repeat x-ray is to be performed following catheter adjustment to confirm tip position.
- Inotropes, blood products and other infusions/medications may commence only following medical review of catheter(s) position confirmation.
- Adjustments to be documented in medical notes.
- **In the event of emergency situations fluids and medications may be given via the UVC following a flush back and prior to X-ray confirmation at the discretion of the attending Senior Medical Officer.**

## Insertion

Insertion of umbilical arterial and venous catheters (UAC / UVC) is a **surgical** aseptic technique.

Decide on a case-by-case basis in discussion with consultant/ senior registrar on service. Consider the following indications:

- Preterm (<800 grams or <26 weeks)
- Increasing oxygen requirements +/- ventilation
- Requiring blood pressure or central venous pressure monitoring
- Requiring frequent blood gas monitoring
- Fluid and nutritional support
- Administration of multiple medications including inotropes and/or infusions
- Cardiac infants requiring a prostaglandin infusion
- Non-abdominal surgical infants (eg. congenital diaphragmatic hernia (CDH), oesophageal atresia/ TOF)
- Exchange transfusion

- When peripheral access cannot be obtained

### Equipment

- Sterile instrument tray
- Sterile gloves / pack / gown and hand towels
- 1% Chlorhexidine solution > 27 weeks gestation or Povidone-iodine solution ≤27 weeks gestation
- Suture 3.0 Prolene/ 3.0 silk
- Umbilical artery catheters/Umbilical venous catheters (single or double lumen)
- Umbilical tie
- 2 mL syringes (one for each catheter lumen plus x3 for blood sampling)
- 1 mL arterial blood gas syringe
- 0.9% Sodium Chloride
- Drawing up needle
- 3 way taps (one for each catheter lumen)
- Smartsite valves (x2 for each 3 way tap)
- Leucoplast tape
- Transducer set and cables
- Infusion pump
- Tape measure
- Administration set


### Procedure

- Consider use of appropriate analgesia during the procedure eg: swaddling or holding the infant or using sucrose or EBM
- Measure from the shoulder to the umbilicus perpendicular to determine the insertion length
- **Remember** to measure from the skin at the base of the stump where it connects to the anterior abdominal wall.
- **Remember** to add the length of the umbilical stump to the distance inserted.

## Umbilical Arterial and Venous Catheters

UVC Insertion distance		UAC Insertion Distance		
Shoulder - Umbilicus Distance (cm)	UVC insertion length	Shoulder - Umbilicus Distance (cm)	Low UAC	High UAC
9	5.7	9	5.0	9.0
10	6.5	10	5.5	10.5
11	7.2	11	6.3	11.5
12	8.0	12	7.0	13.0
13	8.5	13	7.8	14.0
14	9.5	14	8.5	15.0
		15	9.3	16.5
		16	10.0	17.5
		17	11.0	19.0
		18	12.0	20.0

Steps	Additional Information
1. Check correct patient for procedure.	
2. Prepare the umbilical tray.	Sodium Chloride for priming of catheters is to be drawn up directly from ampule ( <b>not</b> to be squirted into tray then drawn up).
3. Attach three-way taps to UAC and UVC catheter. For UVC (single or dual) - attach smartsite valve onto the spare insertion/withdrawal port(s).	
4. Prime catheters with sodium chloride.	
5. Clean skin and allow skin prep to dry before proceeding with the procedure.	Chlorhexidine 1% Alcohol 70% solution - wait 30 seconds.  Povidone-iodine 10% solution - wait 60 seconds (wipe off with sterile saline before proceeding with procedure).
6. Place cord tie loosely around stump. Cut off the excess cord leaving at least a 1cm stump. The cord stump should be stabilised with artery forceps.	
7. Once the catheter is in position, aspirate to verify blood return and flush line.	

Steps	Additional Information
<p>8. Secure the catheter with purse string suture around the cord stump (Wharton's jelly) and secured at least <b>once</b> through the umbilical skin, and then tied around the umbilical catheter. Remove excess skin prep with sterile water or saline.</p>	
<p>9. Infusion giving set to be opened onto sterile field, assistant to spike bag or attach to syringe for priming of line. Primed giving set to be attached to umbilical catheters using sterile aseptic technique.</p>	
<p>10. <b>UAC</b> - Open transducer with infusion giving set onto sterile field. Assistant to attach to syringe for priming. Primed giving set and transducer to be attached to catheter using sterile aseptic technique. <b>UVC</b> - commence infusion at 1 mL/hr until position confirmed by x-ray.</p>	<p>Calibrate transducer and commence infusion at 0.5-1.0ml/hr The transducer should always be positioned at the level of the right atrium.</p>
<p>11. Apply a 2.5cm piece of brown tape around catheter and suture material as close as possible to umbilical stump/catheter.</p>	

**X-Ray Confirmation Landmarks** Refer to [Central Line Imaging in Neonates](#) for further information.

<p>T12: diaphragm, celiac artery                  L1: superior mesenteric artery, renal artery                  L3: inferior mesenteric artery                  L4: aortic bifurcation</p>	<p><b>For UAC the catheter tip should be placed:</b></p> <ul style="list-style-type: none"> <li>• T8 (T6-T9) for infants &gt; 1000 grams</li> <li>• T9 for infants 700-1000 grams</li> <li>• T10 for infants &lt; 700 grams</li> </ul> <p><b>For UVC the tip should be placed:</b>                  Between the diaphragm and the left atrium.                  (~T8 – T9)</p>
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**Documentation**

- Document insertion and removal of umbilical catheters on the Neonatal Intravascular Insertion Record MR422.
- Document on the observation chart MR489 the catheter size, position and date of insertion. Observe for adequate patency of artery/vein, pink, well-perfused digits and/or limbs and pelvic/buttock area. An estimation of blood loss should be documented. Document any line adjustments.

**Management**

**Nursing Care**

- Infant to be nursed supine for 1 hour post insertion to observe for ooze/blood loss around umbilical stump.
- Infant to be nursed without nappy fastened or booties on.
- Umbilical lines to lay flat on mattress free of tangles.
- Arterial transducer to lay level of right atrium for accurate blood pressure readings.
- At least hourly inspection and of umbilical site for any signs of infection, ooze and catheter position (distance of brown tape from umbilical stump). Document on MR489.
- At least hourly inspection of lower limbs and digits and buttocks for temperature, colour and perfusion.
- Hourly documentation of volume infused.
- Set pressure alarm settings at the commencement of infusions. Check alarm settings at the commencement of each shift.

**Arterial Transducer**

- The transducer should always be positioned at the level of the right atrium.
- Calibrate transducer at the commencement at each nursing shift. When fluids are changed and if the trace becomes ‘dampened’.
- Transducer should be free of blood.
- **Note:** if concurrent non-invasive cuff BPs are taken there can be a +/- 10mmHg discrepancy. If the arterial trace is good and the transducer is at the optimal position then the invasive readings should be considered more accurate.

**Changing of Giving Sets** – Refer to [Central Venous Access: Giving Set Changes](#)

**Drug Administration-** Refer to [Central Venous Access: Medication Administration](#)

## Sampling from UAC

Sampling from umbilical catheters is an aseptic technique.

### Key Points

- All blood sampling via umbilical catheters is to be ordered by medical staff.
- Routine blood glucose monitoring being the exception to the above, but where possible should coincide with ordered tests to reduce frequency of accessing line.
- If an arterial line is not insitu the UVC can be used for sampling. Note that blood glucose levels may not be as accurate due to glucose in infusions.
- Sampling from umbilical lines can be performed by staff deemed competent in the procedure.
- There is potential risk of infection, vasospasm, emboli and ischaemic injury associated with this procedure.

### Equipment

- Blue Tray
- 2% Chlorhexidine/Alcohol swab
- Sterile gauze
- Red combi stop
- 2mL syringes (2-3)
- Blood gas syringe
- Sodium Chloride 0.9%
- Blood specimen tubes

### Procedure

Steps	Additional Information
1. Perform hand hygiene, clean blue tray and prepare equipment	Aseptic Technique/ Infection Prevention Open syringe packaging – leave in sleeves to protect key parts, prepare flush, open gauze pack and chlorhexidine swab
2. Put infusion pump on hold	
3. Perform hand hygiene and don gloves	Aseptic Technique / Infection Prevention
4. Use sterile gauze to hold 3way tap, turn 3way tap off half way between ports and remove combi stop.	
5. Clean the exposed port with a Chlorhexidine Swab for 30 seconds. 6. Allow to dry.	Reduces the risk of infection.
7. Attach empty 2mL syringe turn 3way tap open to syringe and withdraw 1mL of blood.	

Steps	Additional Information
Turn 3way tap off halfway between ports	
8. Remove syringe and re-sleeve	This blood is to be returned to the infant.
9. Attach gas syringe and withdraw required sample volume. Turn 3way tap off halfway between ports remove syringe and re-sleeve.	
10. Take further samples as required. Ensure 3way tap is off halfway between ports when attaching and removing syringes.	
11. Return blood taken initially back to infant. Take care to remove air bubble from dead space in 3way tap before returning blood.	
12. Flush 3way tap and catheter with 0.9% Sodium Chloride using a pulsatile motion (push-pause).	This takes approximately 0.5mL.
13. Clean 3way with 2% Chlorohexidine swab and attach new combi stop. Recommence infusions.	
14. Perform hand hygiene.	
15. Document blood volume taken, blood tests and flush volume.	

## Removal


- Review need for UVC and UAC on clinical rounds every day. Consider removal or alternative access for a UVC after 7 (maximum 10) days (No sufficient evidence that early planned removal of UVC reduces risk of LOS; Gordon et al 2017; Cochrane Database of Systematic Reviews)
- Removal of an umbilical catheter is a deemed competent / **2 person** aseptic technique.
- Ensure that there is another patent intravenous access prior to the removal of umbilical catheters.
- If only one umbilical catheter is to be removed, a nurse may remove the catheter if they have been stitched in separately. If the catheters have been stitched in together then it is the responsibility of medical staff to remove the catheter.
- Once decided to remove the catheter, it should be performed within an hour of the medical order and if delayed, please document underlying reason and which medical staff was informed.
- Document removal on the Neonatal Intravascular Insertion Record MR422, and in the patient's progress notes.



**Equipment**

- Umbilical catheter removal kit
- Dressing pack
- Gauze
- Gloves (sterile gloves not required)
- 1% Chlorhexidine solution (>27weeks gestation) or Povidone Iodine 10% swab (≤27weeks gestation)
- 0.9 % Sodium Chloride

**Procedure**

Steps	Additional Information
1. Consider sucrose.	Pain Relief/comfort
2. Perform hand hygiene and prepare equipment	Aseptic Technique / Infection Prevention
3. The nurse assisting should gently hold the legs of the infant	
4. Perform hand hygiene and don gloves	
5. Remove the tape around the catheter to be removed if suture not visible.	If coagulated blood around suture material and umbilical stump, moisten gauze with sodium chloride and wrap around umbilical stump for 1-2minutes. Clean area prior to commencing procedure.
6. Cleanse umbilical area with appropriate skin prep.	Reduce risk of infection
7. Apply artery forceps below the sutures prior to cutting the suture (to prevent migration of the catheter internally in the advent of the catheter being accidentally cut) 8. Cut suture.	
9. Place gauze pad directly over the umbilicus, apply gentle pressure in an upward direction for UVC and a downward direction for a UAC.	
10. Remove catheter in a slow continuous motion to promote vasoconstriction. Check that catheter is intact. Continuous pressure should be applied for a minimum of 5 minutes. Ensure the peripheries stay pink and well perfused.	
11. Clean skin prep from skin with sodium chloride.	

Steps	Additional Information
12. Leave infant in the supine position with the stump uncovered for one hour	To observe for blood loss.
13. Perform hand hygiene.	
14. Document procedure.	

## Complications

### UVC

- Infection
- Thromboembolism
- Mal-positioned catheter in heart or great vessels: pericardial effusion, cardiac arrhythmias, thrombotic endocarditis, haemorrhagic pulmonary infarction, hydrothorax
- Catheter mal-positioned in portal system: NEC, peritoneal effusion, colon perforation, hepatic necrosis

### UAC

- Mal-positioned catheter: vessel perforation, peritoneal perforation, false aneurysm, refractory hypoglycaemia (if UAC tip opposite coeliac axis)
- Vascular accidents: thrombosis, embolism, infection, vasospasm, hypertension, heart failure (aortic thrombus), air embolism, paraplegia
- Equipment related: broken catheter, transection of catheter, improper grounding of electrical equipment, conduction of current through fluid-filled catheter
- Other: haemorrhage, infection, NEC, intestinal necrosis or perforation, Wharton jelly embolism, hypernatremia
- May manifest as haematuria, hypertension, signs of NEC, or blanching/cyanosis of the skin of the buttocks and lower extremities.
- All these complications are indications for catheter removal.

### Related CAHS internal policies, procedures and guidelines



#### CAHS

- [Aseptic Technique](#)

#### Neonatology

- [Aseptic Technique in the NICU](#)
- [Central Venous Access: Medication Administration](#)
- [Central Venous Access: Giving Set Changes](#)
- [Central Line Imaging in Neonates](#)

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