

Umbilical Artery and Vein Catheterisation in the Neonate

Guideline Responsibilities and Authorisation

Department Responsible for Guideline	NICU
Document Facilitator Name	Miranda Bailey-Wild
Document Facilitator Title	SMO, NICU
Document Owner Name	Jutta van den Boom
Document Owner Title	Head of Department NICU
Target Audience	Neonatal and Paediatric SMOs, Registrars and Fellows in NICU/SCBU, Neonatal Nurse Practitioners, Clinical Nurse Specialists and Registered Nurses working in NICU/SCBU
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Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
1	Claire West	Dec 2020	Initiated
2	Claire West	Aug 2022	Information on securing catheters, replacing UAC, removing UAC, monitoring perfusion

Umbilical Artery and Vein Catheterisation in the Neonate

1 Overview

1.1 Purpose

Umbilical vessels are relatively accessible in newborn infants, and are often useful particularly in the very small and very large infants.

The National Women's / Starship guideline provides further information on the use of these catheters and the associated risks and benefits, and should be read in conjunction with this guideline. <https://www.starship.org.nz/guidelines/umbilical-artery-and-vein-catheterisation-in-the-neonate>

The document below outlines the preferences of the Waikato Hospital NICU regarding skin preparation, calculation of insertion distance and usage.

1.2 Scope

All health professionals working in the Waikato Hospital NICU.

1.3 Patient / client group

Neonates admitted to Waikato Hospital NICU, and to Midland Regional SCBU.

1.4 Exceptions / contraindications

Umbilical vessels are not cannulated in infants with omphalocele, and rarely in infants with gastroschisis.

Care should be taken with cannulation in infants after the first 24 hours from delivery due to increased colonisation of the cord and potential for introduction of infection. Infants with omphalitis should not have the umbilical vessels cannulated.

1.5 Definitions

NICU	Neonatal Intensive Care Unit
SCBU	Special Care Baby Unit
SMO	Senior Medical Officer
UAC	Umbilical Arterial Catheter
UVC	Umbilical Venous Catheter

2 Clinical Management

2.1 Equipment

See [Arterial Line: Catheterisation and set up umbilical and peripheral arterial catheter in Newborn Intensive Care Unit](#) (1637)

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2.2 Guideline

The basic background and technical information can be found in the guideline below. The Waikato NICU practice preferences are outlined after this with reference to the relevant sections of the guideline.

Try to maintain sterility until the correct position/s of the umbilical line/s are confirmed to allow further manipulation

<https://www.starship.org.nz/guidelines/umbilical-artery-and-vein-catheterisation-in-the-neonate>

Please read Starship disclaimer before proceeding further.

1. Skin preparation

- ELBW infants <1000g birthweight have skin cleaned with sterile water
- Infants with birth weight \geq 1000g have skin cleaned with 2% chlorhexidine gluconate swabs
- Ensure there is no pooling of cleaning solution underneath the baby

2. Documentation

- It is the responsibility of the clinician inserting the catheter to ensure the Central Access Device Insertion Record and Checklist is completed, confirming process and documenting measurements, confirmation of position of line, and adjustment before use. See [Central Venous Access Device \(CVAD\) insertion, management and maintenance](#) procedure 2654
- In the clinical file the clinician should note the number of attempts to place catheter/s, their final measurements at the skin after adjustment, and confirmation of position
- It is the responsibility of the nurse to document each shift the insertion length of the catheter/s on the observation chart

3. Duration of use

Use of umbilical venous catheters for greater than 7 days is associated with an increased risk of central line associated bloodstream infection (CLABSI) compared with use less than 7 days⁴

If it is anticipated that central venous access is likely to be necessary for longer than 7 days, the UVC should be replaced with a PICC line by 7 days of age.

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4. Umbilical Venous Catheters

A. Catheter size

Multiple lumen catheters are preferable if the infant is <1000g or extremely unwell

<1500g	3.5F single, 4F double lumen
>1500g	5F single or double lumen

B. Insertion distance

- The preferred method for calculating the insertion distance for UVC is:

$$\text{UVC (cm)} = (\text{Umbilicus to nipple distance} - 1 \text{ cm}) + \text{length of stump}$$

- Alternatively, the weight of the baby can be used as below – but may not be as accurate for an IUGR infant.

$$\text{UVC (cm)} = (1.5 \times \text{birthweight in kg}) + 5.5$$

- Do NOT** advance the catheter after initial insertion **unless** full sterility is maintained throughout the complete process.

C. Position (verification)

- Position of UVC should be verified with anteroposterior chest and abdominal radiograph
- If the UVC is not clearly above the diaphragm (and into the cardiac silhouette) a lateral chest and abdominal radiograph should be obtained to confirm positioning
- The ideal UVC position is in the inferior vena cava just outside the right atrium, at T8-9 (thoracic vertebrae)
- Any UVC adjusted after an X-ray should be re-X-Rayed to confirm the correct position
- An alternative method for confirmation of position is by cot-side ultrasound performed by an appropriately trained clinician.

5. Umbilical Artery Catheters

A. Catheter size

<1000g	2.5F
≥1200g	3.5F
Never use a 5 French	

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B. Insertion Distance

- The preferred method for estimating the insertion distance for the UAC is:
$$\text{UAC (cm)} = \text{umbilicus to nipple distance} - 1\text{cm} + (2 \times \text{distance from umbilicus to symphysis pubis}) + \text{length of the stump}$$
- Alternatively the weight of the baby can be used as below:
$$\text{UAC (cm)} = (\text{birthweight in kg} \times 4) + 7$$
- **Do NOT** advance the catheter after initial insertion **unless** full sterility is maintained throughout the complete process.

C. Position (verification)

- Position of UAC should be verified with anteroposterior chest and abdominal radiograph
- The ideal UAC position is at the high position at the level of T6-9 (thoracic vertebrae). The catheter tip is above the diaphragm and the coeliac axis. This is the usual initial placement
- Alternatively, the UAC can be positioned at the low position, at the level of L4 (lumbar vertebra). The catheter tip is below major aortic branches such as the renal and mesenteric arteries, at the aortic bifurcation
- Any UAC adjusted after an X-ray should be re-X-Rayed to confirm the correct position.

6. Securing Umbilical Catheters

Catheters are secured with a suture at the junction with the umbilical cord and the suture material knotted up the catheter to provide a secure fastening. However, it should not be so tight as to kink off the catheter, or to prevent pulling back the catheter after X-ray.

- A small strip of leucoplast should be wrapped around the catheter and sutures just above the insertion site to mark the depth of the insertion.
- If an umbilical catheter needs to be 'pulled back' this must be done in a clean (but not sterile) manner. After easing the catheter through the suture knots the leucoplast should be replaced (see above) and the new length at insertion site documented in the hospital record and Central Access Device Insertion Record. The change should also be noted on the appropriate X-ray to prevent confusion. **REMEMBER the catheter cannot be advanced if the line has not been kept sterile in its entirety.**
- Infants born <1000g or <32 weeks do not have the catheters reinforced by a bridge. This can be reviewed at 5 days of age.

Please refer to [Arterial Line – Sampling, Nursing Management and Removal in NICU](#) (Ref. 1638) regarding securing umbilical lines (section 2.4.1).

Whenever possible avoid bridging the UAC in ELBW babies before day 5. However, Appendix 1 in the Starship procedure (<https://www.starship.org.nz/guidelines/umbilical->

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[artery-and-vein-catheterisation-in-the-neonate](#)) does identify an alternative way of securing umbilical catheters in ELBW neonates

2.3 After care

When the insertion procedure is complete the cord tie must be removed immediately, unless there is significant continuing ooze from the stump. In this case, it must be reviewed 2-4 hours later. If appropriate haemostasis is not achieved, inform the medical team.

After placement of a UAC it is important to regularly observe the colour and perfusion of the infant's feet. The medical team must note this in the infant's daily review. The nursing team must assess and document the limb perfusion every hour, and after sampling and / or flushing the catheter.

To ensure this can be accurately assessed, phototherapy lights must be briefly switched off and footprints should not be performed until the UAC is removed (to avoid confusion with blue ink on toes/feet).

Consider a CXR (including upper abdomen) if there is significant abdominal distension to confirm the position of the umbilical catheters.

It is the responsibility of the nurse to document each shift the observed insertion length of the catheter/s on the observation chart and safety checklist.

2.4 Removal of UAC

There are comprehensive notes regarding removal of a UAC in [Arterial Line – Sampling, Nursing Management and Removal in NICU](#) (Ref. 1638) - see section 2.4.6.

2.5 Replacement of UAC

There are rare occasions when the medical staff attempt to replace a UAC that has stopped tracing and sampling. This should NOT be considered in the presence of any concerns about distal limb/buttock/genital perfusion.

This procedure should always be discussed the relevant SMO before being attempted.

This is a sterile procedure. A new UAC should be available and primed. The appropriate insertion length should be assessed.

Follow the procedure guidelines on the link above until the UAC is at 5cm. Maintain the 'old' UAC at 5cm for 5 minutes to encourage deep vessel constriction and to reduce potential arterial bleeding.

The UAC is slowly withdrawn to about 2cm over 2 minutes. Ensure the 'new' UAC is ready for immediate insertion.

The 'old' UAC is removed and immediately the 'new' catheter is inserted in the same vessel. Oozing may make this a relatively blind procedure. Once in the vessel it should be easy to insert the catheter to the calculated length and it should sample easily. The 'new'

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UAC should be sutured in place (including a small skin stitch to anchor the suture) and position checked with a chest and abdominal X-ray.

If the procedure is not easily successful it should be abandoned and pressure applied to the umbilical stump / abdomen to ensure haemostasis.

2.6 Complications

Vascular accidents (bleeding, thrombosis, embolism), extravasation, hypoperfusion, pericardial effusion.

3 Audit

3.1 Indicators

- Correct position of umbilical catheters present on initial chest + abdomen X-ray
- Repeat X-ray is taken to confirm catheter position after manipulation

4 Evidence base

4.1 References

- <https://www.starship.org.nz/guidelines/umbilical-artery-and-vein-catheterisation-in-the-neonate>

4.2 Associated Te Whatu Ora Waikato Documents

- [Arterial Line: Catheterisation and set up umbilical and peripheral arterial catheter in Newborn Intensive Care Unit](#) (1637)
- [Arterial lines – sampling, nursing management and removal in NICU](#) (1638)
- [Central Venous Access Device \(CVAD\) insertion, management and maintenance procedure](#) 2654

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