Insertion Of Umbilical Lines (UAC, UVC) Neonatal Clinical Guideline V3.0

April 2018
1. **Aim/Purpose of this Guideline**

   This guideline applies to all staff undertaking the procedure of umbilical line insertion for neonates. It aims to standardise the procedure and comply with current RCHT and BAPM policies for central line access, securing catheters and ongoing care.

2. **The Guidance**

   2.1 Umbilical vessel catheterisation is possible until the cord separates but is most successful in the first hours of life. Access is usually under strict sterile precautions although umbilical vein catheterisation can be used for central venous access in an emergency situation. Umbilical arterial catheterisation should be considered for any baby with increasing oxygen requirements, needing accurate blood gas monitoring, regular blood sampling or when continuous blood pressure monitoring is required. Where possible parents should be informed of the need for the procedure. Inexperienced staff should be directly supervised performing the procedure until competence is achieved.

   2.1.1 Indications for UVC

   - Emergency venous access
   - Central venous access for maintenance intravenous fluids, hypertonic fluids/drugs, TPN, blood products
   - Exchange transfusion

   2.1.2 Indications for UAC

   - Prematurity <27 weeks
   - Increasing oxygen requirement over 40%
   - Ventilated baby
   - Regular blood sampling
   - Invasive blood pressure monitoring
   - Exchange transfusion

   2.1.3 Contraindications

   - Evidence of vascular compromise to lower limbs or buttocks
   - Necrotising enterocolitis (NEC)
   - Omphalitis
   - IUGR infants with antenatal absent or reversed end diastolic flow consider peripheral arterial line as first choice

   2.1.4 Complications

   - Sepsis
   - Embolisation from air or blood clot
   - Extravasation
   - Cardiac tamponade
- Thrombosis, which may involve: Femoral artery – lower limb ischaemia,
- Renal artery – hypertension, haematuria, renal failure, mesenteric artery – gut ischaemia, NEC
- Haemorrhage due to accidental disconnection

2.2 Equipment

Unless access is in an emergency situation all umbilical line placements should be performed as a sterile procedure. Emergency umbilical access equipment is located in the Emergency Neonatal Trolleys on Delivery Suite and NNU

- Sterile trolley cleaned with alcohol wipe and allowed to dry
- Sterile gown and gloves
- Umbilical catheterisation sterile instruments pack
- Additional large sterile drapes/sterile pack and gauze
- Cord tie (Mersilk)
- Size 24g scalpel
- Silk suture with curved needle x2
- Umbilical arterial catheter size 3.5-4Fg
- Umbilical venous catheter 4Fg double lumen – 5Fg single lumen
- 2x 5 -10ml Luer lock syringes and needle
- 0.9% Saline ampoules
- 2x 3 way taps
- Red and blue bionectors
- Fixation steristrips and mefix tape

2.2.1 Calculate insertion lengths:

| UAC = 3 x weight + 9cm + stump |
| or diagonally umbilicus to shoulder length + 1cm + stump |

| UVC = 1.5 x weight + 5.5cm+ stump |
| Emergency UVC access 5cm with flashback of blood from vessel |

2.2.2 The umbilicus contains two arteries and a vein. The vein connects with the portal vein and then the vena cava (see anatomical diagram page 4). When a catheter is inserted into the umbilical vein for emergency use, it should reach just into the abdomen where a flashback of blood is obtained, typically around 5cm length for a term baby.

Permanent catheter placement in the vena cava above the liver is preferred, with XRay confirmation of position. The two small arteries direct downward on the inner aspect of the abdominal wall to connect with the left and right internal iliac arteries in the pelvis. The catheter should be placed in the aorta.
above the diaphragm at T6-9 level or just above the bifurcation of the aorta at L 3-4 for low position placement.

2.3 Technique: Use sterile technique. Wash hands, put on sterile gown and gloves, open sterile packs

- Prime catheter and 3-way tap with saline, leaving syringe attached throughout the procedure.
- Lift cord using sterile gauze (or ask assistant using cord clamp/forceps) clean the umbilical stump and 3-4cms of surrounding skin with 0.05% chlorhexidine solution. Ensure no cleaning solution tracks to underside of baby. Allow to dry.
- Apply sterile, waterproof drapes to area
- Place suture around base of cord and tie loosely to prevent excess bleeding from vessel when cut
- Holding the cord between medium forceps cut the cord cleanly using the lower edge of the forceps as a guide, cut firmly and cleanly away from you, leaving a 1-2cm stump
- Inspect vessels and identify the arteries, smaller and thicker walled, inferior to the single vein, often standing prominent from the cut cord
- Apply 2 forceps to opposite edges of the cord to stabilise the stump and expose the vessels. Avoid overhandling the cord.
- Using a fine dilator or fine forceps gently ease the vessel open and cannulate the vessel with the UAC towards the lower body (gentle upward traction of the cord may help) Apply gentle, steady pressure to insert the catheter to the required length. Some resistance may be felt at the umbilical ring and Do not apply excess force as this often results in a false passage outside the vessel
- Aspirate to ensure a ‘flashback’ of arterial blood with pulsation of blood/saline present. A blood gas can be used to confirm arterial blood has been obtained.
- Insert the Umbilical Venous Catheter into the vein. Traction of the cord towards the lower abdomen may be helpful as the vessel lies superiorly to the cord. Insert to the desired length and ensure the line samples and flushes

2.3.1 Fixation guidance: Mandatory RCH agreed technique as per BAPM guidance - see also APPENDIX 3. for illustrated guidance:

- Suture the catheters separately for optimal security
- Place a suture into the base of the umbilical cord, not the surrounding skin, pull the suture through to gain two equal lengths of thread. Make a fixation tie at the cord base followed by a firm tie around the base of the catheter.
- Proceed to wind the two threads in a criss-cross fashion and fix in place with a steristrip across the catheter to hold the suture threads tight.
- Place a second suture into the cord and secure with a knot
- Pull the threads to lie alongside the cord stump and catheter
- Using a length of Mefix tape placed close to the cord base fold/curl the catheter to ensure no direct traction will occur, pull the second suture thread taught alongside it and fold the tape over to hold the folded catheter and suture in place
- Ensure all connections are tight before connecting to the transducer and heparinised saline infusion.
- Additional tape can be placed around a loop in the catheter/s to avoid any direct traction on the insertion point
- Ensure and record perfusion of the buttocks and lower limbs once the UAC procedure is completed
- Infuse 1ml/hr 0.9% saline to maintain patency of the UVC.
- Confirm line sites with an abdomen and chest X Ray.
- The venous catheter should progress cephalically to the right side of the baby, the arterial line is distinguishable by a caudal dip to one of the common iliac arteries before progressing up to the aorta.
- Lines can be withdrawn or replaced but not advanced.
- The procedure, sterile pack and catheter lot numbers with line positions and any adjustments must be recorded using in baby’s notes.
- Place a yellow central line sticker with details of the procedure into the notes.
- A record of the line length at the stump should be made and conveyed to nursing staff to ensure that any line displacement is quickly noted

Lower limb discoloration/significantly reduced perfusion lasting over 15 mins means line removal is indicated
2.4 Umbilical Lines position Guidance

<table>
<thead>
<tr>
<th>UVC Optimal position</th>
<th>T8 – T9</th>
<th>UAC Optimal position</th>
<th>T6-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable with caution</td>
<td>T10 – L1 (greater risk of extravasation)</td>
<td>Acceptable with caution</td>
<td>T10-11 Or low at L3 -4</td>
</tr>
<tr>
<td>Not acceptable</td>
<td>Above T8 in heart, diversion into liver</td>
<td>Not acceptable</td>
<td>T12-L2 as mesenteric and renal arteries or any diversion into leg</td>
</tr>
</tbody>
</table>

**Fig. 1.** (Drawn from post-mortem venogram image by J Clegg, RCH) **Umbilical vein anatomy:**

**TO CALCULATE INSERTION LENGTH:**

- UAC = 3 x weight + 9 + stump
- UVC = 1.5 x weight +5.5 + stump

Use in emergency length ~ 5cm

In any baby with a central venous umbilical catheter consider extravasation or cardiac tamponade if they become unwell. Babies with an umbilical arterial catheter need hourly nursing assessment and recording of lower limb perfusion and colour.

**Fig 2** RCH radiology images

Note arterial line dips into iliac artery before ascending to aorta
2.4.1 Line removal: To remove a UAC, stop the heparin infusion but continue monitoring trace. Under sterile precautions withdraw catheter to 5cm length then withdraw by 1cm per minute until the arterial trace has completely flattened. Remove catheter and occlude the artery to stop any bleeding.

2.4.2 Line removal: To remove a UVC, stop any infusion and clamp. Withdraw the catheter slowly. Wait for clotting, then remove the catheter entirely. Be careful to occlude the vein (superior to cord) because of air embolism risk.
3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Central line catheter related sepsis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Neonatal Consultant Lead</td>
</tr>
<tr>
<td>Tool</td>
<td>Badger database</td>
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<tr>
<td>Frequency</td>
<td>Annual report</td>
</tr>
<tr>
<td>Reporting arrangements</td>
<td>Report to annual neonatal dashboard database</td>
</tr>
<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>Neonatal Consultant Lead</td>
</tr>
<tr>
<td>Change in practice and lessons to be shared</td>
<td>Required changes to practice will be identified and actioned within 3 months. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders</td>
</tr>
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</table>

4. Equality and Diversity

4.1 This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Diversity & Human Rights Policy' or the Equality and Diversity website.

4.2 Equality Impact Assessment

The Initial Equality Impact Assessment Screening Form is at Appendix 2.
### Appendix 1. Governance Information

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Insertion Of Umbilical Lines (UAC, UVC) Neonatal Clinical Guideline V4.0</th>
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</thead>
<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>25/04/2018</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>25/04/2018</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>25/04/2021</td>
</tr>
<tr>
<td>Directorate / Department responsible (author/owner):</td>
<td>JUDITH CLEGG, ANNP, NNU, RCH</td>
</tr>
<tr>
<td>Contact details:</td>
<td>01872 252667</td>
</tr>
<tr>
<td>Brief summary of contents</td>
<td>Indications for UVC and UAC placement, procedure details, confirming placement, fixation and how to remove</td>
</tr>
<tr>
<td>Suggested Keywords:</td>
<td>Neonatal, neonate, UVC, UAC, arterial, venous, umbilical, cord</td>
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<tr>
<td>Target Audience</td>
<td>RCHT CFT KCCG</td>
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<tr>
<td>Executive Director responsible for Policy:</td>
<td>Medical director</td>
</tr>
<tr>
<td>Date revised:</td>
<td>25/4/2018</td>
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<tr>
<td>This document replaces (exact title of previous version):</td>
<td>INSERTION OF UMBILICAL LINES (UAC, UVC) NEONATAL CLINICAL GUIDELINE V3.0</td>
</tr>
<tr>
<td>Approval route (names of committees)/consultation:</td>
<td>Neonatal Guidelines Consultant group approval</td>
</tr>
<tr>
<td>Divisional Manager confirming approval processes</td>
<td>Tunde Adewopo</td>
</tr>
<tr>
<td>Name and Post Title of additional signatories</td>
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</tr>
<tr>
<td>Name and Signature of Divisional/Directorate Governance Lead confirming approval by specialty and divisional management meetings</td>
<td>{Original Copy Signed}</td>
</tr>
<tr>
<td>Signature of Executive Director giving approval</td>
<td>{Original Copy Signed}</td>
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Related Documents:


Training Need Identified? NO

Version Control Table

<table>
<thead>
<tr>
<th>Date</th>
<th>Version No</th>
<th>Summary of Changes</th>
<th>Changes Made by (Name and Job Title)</th>
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<tr>
<td>January 2015</td>
<td>V1.0</td>
<td>Initial Issue</td>
<td>Judith Clegg ANNP Neonatal Unit</td>
</tr>
<tr>
<td>January 2015</td>
<td>V2.0</td>
<td>Review and Reformatting</td>
<td>Review: Judith Clegg, ANNP, Paul Munyard. Consultant Paediatrician and Neonatologist Formatted: Kim Smith. Staff Nurse</td>
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<td>April 2018</td>
<td>V3.0</td>
<td>Addition of RCH fixation procedure and renewal of Figures 1 and 2</td>
<td>Judith Clegg ANNP NNU</td>
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This document is only valid on the day of printing.

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### Appendix 2. Initial Equality Impact Assessment Form

*This assessment will need to be completed in stages to allow for adequate consultation with the relevant groups.*

<table>
<thead>
<tr>
<th>Directorate and service area:</th>
<th>WCSH, NEONATAL UNIT</th>
<th>Is this a new or existing Policy?</th>
<th>Existing</th>
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</thead>
<tbody>
<tr>
<td>Name of individual completing assessment:</td>
<td>J Clegg</td>
<td>Telephone:</td>
<td>01872 252667</td>
</tr>
</tbody>
</table>

#### 1. Policy Aim*

Who is the strategy / policy / proposal / service function aimed at?

All staff siting umbilical venous and arterial access - to standardise the procedure and comply with current RCHT and BAPM policies for central line access, securing catheters and ongoing care.

#### 2. Policy Objectives*

To provide a uniform approach to the sterile procedure for insertion, correct placement, fixation, recording and removal of UVC and UAC lines.

#### 3. Policy – intended Outcomes*

Prevention of central catheter related sepsis, correct placement, secure fixing and safe removal of umbilical lines.

#### 4. *How will you measure the outcome?*

Incidence of catheter related sepsis

Incidence of incorrect placement or accidental removal.

#### 5. Who is intended to benefit from the policy?

Neonates requiring central line access.

#### 6a Who did you consult with

b). Please identify the groups who have been consulted about this procedure.

<table>
<thead>
<tr>
<th>Workforce</th>
<th>Patients</th>
<th>Local groups</th>
<th>External organisations</th>
<th>Other</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Please record specific names of groups

Neonatal Guidelines group.

What was the outcome of the consultation?

Document approved.
7. The Impact
Please complete the following table. **If you are unsure/don’t know if there is a negative impact you need to repeat the consultation step.**

Are there concerns that the policy **could** have differential impact on:

<table>
<thead>
<tr>
<th>Equality Strands:</th>
<th>Yes</th>
<th>No</th>
<th>Unsure</th>
<th>Rationale for Assessment / Existing Evidence</th>
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<tr>
<td>Age</td>
<td>x</td>
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<td>Not indicated</td>
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<tr>
<td>Sex (male, female, trans-gender / gender reassignment)</td>
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<td></td>
<td>Not indicated</td>
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<td>Race / Ethnic communities /groups</td>
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<tr>
<td>Disability - Learning disability, physical impairment, sensory impairment, mental health conditions and some long term health conditions.</td>
<td>x</td>
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<td>Religion / other beliefs</td>
<td>x</td>
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<tr>
<td>Marriage and Civil partnership</td>
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<td>Pregnancy and maternity</td>
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<td></td>
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<tr>
<td>Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian</td>
<td>x</td>
<td></td>
<td></td>
<td>Not indicated</td>
</tr>
</tbody>
</table>

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:
- You have ticked “Yes” in any column above and 
- No consultation or evidence of there being consultation- this **excludes** any policies which have been identified as not requiring consultation. or 
- Major this relates to service redesign or development

8. Please indicate if a full equality analysis is recommended. **Yes** | **No** | x

9. If you are **not** recommending a Full Impact assessment please explain why.

Not indicated - Benefit to all infants requiring central lines

Signature of policy developer / lead manager / director

Paul Munyard

Date of completion and submission 25/04/2018
Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa, Truro, Cornwall, TR1 3HD

This EIA will not be uploaded to the Trust website without the signature of the Human Rights, Equality & Inclusion Lead.

A summary of the results will be published on the Trust’s web site.

Signed Paul Munyard

Date 25/04/2018
Appendix 2 - Method of UAC, UVC Catheter Fixation

- Place a suture into the base of the umbilical cord, not the surrounding skin, pull the suture through to gain two equal lengths of thread.
- Make a fixation tie at the cord

3. Proceed to wind the two threads in a criss-cross fashion and fix in place with a steristrip across the catheter to hold the suture threads tight.

4. Place a second suture into the cord and secure with a knot
5. Pull the threads to lie alongside the cord stump and catheter
6. Using a length of Mefix tape placed close to the cord base fold/loop the catheter to ensure no direct traction will occur, pull the second suture thread taught alongside it and fold the tape over to hold the folded catheter and the suture in place

Pictures taken by J Clegg
ANNP, RCHT