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 policies for central line access and ongoing care.

2. **The Guidance**

   **2.1 Background**
   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. Junior staff should be directly supervised performing the procedure until competence is achieved.

   **2.2 Indications for Umbilical line catheterisation:**
   **Umbilical Artery Catheterisation (UAC)**
   - Extreme Prematurity
   - Increasing oxygen requirement over 40%
   - Ventilated baby
   - Regular blood sampling
   - Invasive blood pressure monitoring
   - Exchange transfusion

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

   **Complications of UAC**
   - Sepsis
   - Embolisation from air or blood clot
   - 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
Umbilical Venous Catheterisation (UVC)

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

2.3 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 sterile instruments pack
- Additional drapes/sterile pack and gauze
- Cord tie
- Size 24g scalpel
- Silk suture with curved needle
- 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 device/tape

2.4 Calculation for insertion lengths

| UAC  | 3 x weight + 9cm + stump  
or diagonally umbilicus to shoulder length + 1cm + stump |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>UVC</td>
<td>1.5 x weight + 5cm+ stump</td>
</tr>
<tr>
<td></td>
<td>Emergency UVC access 5cm plus cord length</td>
</tr>
</tbody>
</table>

The umbilicus contains two arteries and a vein. The vein connects with the portal vein and then the vena cava. When a catheter is inserted into the umbilical vein for emergency use, it should be in around 5cms plus cord length with easy blood aspiration. Permanent catheter placement in the vena cava above the liver is preferred.

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.
2.5 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
- Apply sterile 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, leaving 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 and expose the vessels.
- Using a fine dilator or fine forceps gently ease the vessel open and cannulate the vessel towards the lower body (gentle upward traction of the cord may help) Apply gentle, steady pressure to insert the catheter. Some resistance may be felt at the umbilical ring. Excess force can result in a false passage.
- Aspirate to ensure a ‘flashback’ of arterial blood from the UAC, with pulsation of blood/saline present
- Insert the Umbilical Venous Catheter into the vein to desired length and ensure the line samples and flushes
- Suture the catheters separately and fix in place ensuring all connections are tight
- Ensure and record perfusion of the lower limbs once procedure completed
- Infuse 1ml/hr 0.9% saline to maintain patency. Confirm line sites with an abdomen and chest X-Ray. Lines can be withdrawn or replaced but **not** advanced. Line positions and any adjustments must be recorded in baby’s notes. The line length should also be marked near the stump to ensure any line displacement is quickly noted
- **Lower limb discoloration/significantly reduced perfusion lasting over 15 minutes means line removal is indicated**
Umbilical line placement sites

<table>
<thead>
<tr>
<th>UVC</th>
<th>UAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal above diaphragm T8-10</td>
<td>Optimal T6 – T9</td>
</tr>
<tr>
<td>Acceptable Low position in IVC</td>
<td>Acceptable low position L3 - 4</td>
</tr>
</tbody>
</table>
| Withdraw if in heart or diverted angle into liver, re XRay    | Withdraw if at T12 - L2 as site of mesenteric and renal arteries

2.6 Line removal

UAC: To remove an arterial umbilical catheter, stop the heparin infusion but continue monitoring pulsation trace. Under sterile precautions withdraw the catheter to 5cm length then withdraw by 1cm per minute until the arterial trace has completely flattened. Remove catheter and put pressure on the artery to stop any bleeding. UVC: To remove a venous umbilical catheter, stop any infusion, withdraw the catheter until it is just outside of the abdominal wall. Wait for clotting, then remove the catheter entirely. Be careful to occlude the vein because air embolism may result if the vessel remains open.

Insertion length:

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

UVC = 1.5 x weight + 5cm + stump

Emergency UVC access 5cm plus cord length
3. Monitoring compliance and effectiveness

<table>
<thead>
<tr>
<th>Element to be monitored</th>
<th>Key changes in practice recommended by guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Paul Munyard. Consultant Paediatrician and Neonatologist</td>
</tr>
<tr>
<td>Tool</td>
<td>Audit To be included in Neonatal Clinical Audit Programme. Findings reported to the Directorate Audit Meeting / Governance meeting.</td>
</tr>
<tr>
<td>Frequency</td>
<td>As dictated by audit findings</td>
</tr>
<tr>
<td>Reporting arrangements</td>
<td>Child Health Directorate Audit and Clinical Guidelines meetings</td>
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<tr>
<td>Acting on recommendations and Lead(s)</td>
<td>Paul Munyard. Consultant Paediatrician and Neonatologist.</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 of audit. 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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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 – Arterial (UAC) and Venous (UVC) - Clinical Neonatal Guideline</th>
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<tbody>
<tr>
<td>Date Issued/Approved:</td>
<td>January 2015</td>
</tr>
<tr>
<td>Date Valid From:</td>
<td>March 2015</td>
</tr>
<tr>
<td>Date Valid To:</td>
<td>March 2018</td>
</tr>
</tbody>
</table>
| Directorate / Department responsible (author/owner): | Judith Clegg, ANNP.  
Paul Munyard. Consultant Paediatrician and Neonatologist.  
Neonatal. Women and Child Health Directorate. |
| Contact details: | (01872) 253293 |

### Brief summary of contents
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 policies for central line access and ongoing care.

### Suggested Keywords:
Neonatal. Infant. Ambiguous Genitalia

### Target Audience

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<th>RCHT</th>
<th>PCH</th>
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### Executive Director responsible for Policy:
Executive Director

### Date revised:

### This document replaces (exact title of previous version):
New Document

### Approval route (names of committees)/consultation:
Neonatal Consultants  
Child Health Audit and Guidelines Meetings

### Divisional Manager confirming approval processes
Sheena Wallace

### Name and Post Title of additional signatories
Not Required

### Signature of Executive Director giving approval
{Original Copy Signed}

### Publication Location (refer to Policy on Policies – Approvals and Ratification):
Internet & Intranet ✓ Intranet Only
Version Control Table

<table>
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<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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This document is to be retained for 10 years from the date of expiry.

This document is only valid on the day of printing

Controlled Document
This document has been created following the Royal Cornwall Hospitals NHS Trust Policy on Document Production. It should not be altered in any way without the express permission of the author or their Line Manager.
Appendix 2. Initial Equality Impact Assessment Form

| Name: | Insertion of Umbilical Lines – Arterial (UAC) and Venous (UVC) - Clinical Neonatal Guideline |
| Directorate and service area: | Neonatal. Women and Child Health | Is this a new or existing Policy? | New |
| Name of individual completing assessment: | Paul Munyard | Telephone: | 01872 253293 |

1. Policy Aim*
   Who is the strategy / policy / proposal / service function aimed at?
   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 policies for central line access and ongoing care.
   The guideline is aimed at hospital based staff.

2. Policy Objectives*
   As above

3. Policy – intended Outcomes*
   Evidence based and standardised practice

4. *How will you measure the outcome?
   Audit

5. Who is intended to benefit from the policy?
   Neonatal Medical staff
   Neonatal patients

6a) Is consultation required with the workforce, equality groups, local interest groups etc. around this policy?
   No.

b) If yes, have these *groups been consulted?
   Neonatal Guidelines Group Consultant approved guideline

C). Please list any groups who have been consulted about this procedure.

7. The Impact
   Please complete the following table.

| Equality Strands: | Yes | No | Rationale for Assessment / Existing Evidence |
| Age | X |

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

- [X] Age
| Sex (male, female, trans-gender / gender reassignment) | X |
| Race / Ethnic communities / groups | X |
| Disability - learning disability, physical disability, sensory impairment and mental health problems | X |
| Religion / other beliefs | X |
| Marriage and civil partnership | X |
| Pregnancy and maternity | X |
| Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian | X |

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 service redesign or development

8. Please indicate if a full equality analysis is recommended. No

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

No area indicated

Signature of policy developer / lead manager / director | Date of completion and submission 22:01:2015

Names and signatures of members carrying out the Screening Assessment

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

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

Signed ____Kim Smith___________

Date ________06:03:2015_________