Clinical Guideline: Insertion of a Percutaneous Venous Catheter (PICC) In Neonates

Review author: Alex Holgate, ANNP Norfolk and Norwich NICU.

For use in: EoE Neonatal Units
Guidance specific to the care of neonatal patients.

Used by: Medical Staff, NNP’s and ENP’s

Key Words: Indications, complications, position of the catheter tip, asepsis

Date of Ratification: July 2016

Review due: July 2019 (or earlier in the light of new evidence)

Registration No: NEO-ODN-2016-7

Approved by:

<table>
<thead>
<tr>
<th>Neonatal Clinical Oversight Group</th>
<th>15th April 2016</th>
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</thead>
<tbody>
<tr>
<td>Clinical Lead Mark Dyke</td>
<td>Approved</td>
</tr>
</tbody>
</table>

Ratified by ODN Board:

<table>
<thead>
<tr>
<th>Date of meeting</th>
<th>6th July 2016</th>
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</table>

I confirm that the guideline was approved at the COG on the date above and consequently ratified by the ODN Board on the date stated.

S. Rattigan Neonatal ODN Director

Audit Standards:

Audit points
1. The catheter tip position must be verified with contrast before using the line, unless the position of the tip can be confirmed readily with PACS (Picture Archiving and Communication System).
2. The ideal position should be at the superior vena cava atrial junction or in the inferior vena cava at the level of the diaphragm.
3. The insertion of a percutaneous catheter and the position of the tip documented in the case notes.
Insertion of a Percutaneous Venous Catheter (PICC) In Neonates

1. Goal
   - To achieve central venous access
   - To achieve successful insertion with minimal discomfort to the infant
   - To ensure that the long line tip is placed at the correct level

2. Long Lines
   Long lines are small gauge silastic or polyurethane catheters, which are inserted into a peripheral vein and advanced to a central position, ideally in the inferior or superior vena cava, lying outside the heart.

3. Indications
   - Administration of parenteral nutrition
   - Long term administration of intravenous medication
   - Administration of inotropes
   - Administration of hyperosmolar fluids or irritant drugs
   - Limited intravenous access

4. Notes
   - In cases of recent sepsis wait at least 24 hours after removal of previously infected lines if possible
   - Ensure the infants’ comfort during the procedure – analgesia or comfort measures such as sucrose (see sucrose guideline), non-nutritive sucking or containment should be used
   - The catheter tip position must be verified with an x-ray (premics will require a contrast medium, Vygon silicone 24G may require contrast – users of this guideline must clarify with their local unit)
   - The ideal position is the superior vena cava atrial junction or in the inferior vena cava at the level of the diaphragm
   - Looped catheters must be withdrawn as there is a risk of migration
   - **In any infant who collapses with a long line in situ, it is critical to urgently exclude cardiac tamponade as a cause of the collapse**

5. Instability during insertion
   Physiological instability can occur during invasive procedures:
   - Observe the infant during and following procedure for signs of deterioration
   - Monitoring (ECG and oxygen saturation) should be in place throughout the procedure
### 6. Method

| Types of Long line | Vygon Premicath polyurethane 28G  
|                   | (1F) – Generally infants <1000g  
|                   | Vygon Silicone 24G (2F) – All other Babies  
|                   | Madex – inserted via a 24g cannula  
| Long line Veins   | Large vein in the antecubital fossa  
|                   | Long saphenous vein  
|                   | Lesser saphenous  
|                   | Popliteal veins  
|                   | Scalp veins  
| Insertion Distance| For long lines inserted via the leg – measure from insertion site to xiphisternum  
|                   | For long lines inserted via the arm – measure from the insertion site to the sternal notch  
|                   | For scalp long lines - measure from the site of insertion to the clavicular head and then to the sternum, level with the second intercostal space  

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![Diagram of blood vessels in a baby]
### Equipment Required
- Long line insertion pack
- Sterile field
- Sterile gloves
- Long line
- 10ml syringe
- 0.9% sodium chloride ampoule 10mls
- Steristrips
- Transparent sterile dressing
- Gauze
- Aseptic cleaning solution appropriate for skin preparation
- Water for injection ampoule to clean the skin after antiseptic has dried
- Needleless connections
- Tape measure – sterile and non-sterile
- Contrast medium (if required as per unit policy)
- Analgesia/sucrose as required
- Good lighting

### Prior to the Procedure
- In advance of the insertion, inspect the infant for suitable insertion sites
- Determine the desired catheter length by measuring the distance between the insertion site and the desired tip location

### Procedure
- Wash hands and prepare trolley using aseptic principles
- Position infant ensuring comfort measures are provided
- Wash hands and put on sterile gown and gloves
- Flush long line with 0.9% Saline and leave the syringe attached (if using an ECK line make sure that the black mark on the catheter is within the hub to prevent leakage and damage to the line) [ECK = Epicutaneo-Cava Katheter® (Vygon Ltd)]
- Clean the skin with aseptic cleaning solution avoiding excess/pooling of fluid to prevent adverse reactions to the skin in the very preterm infant
- Apply sterile field
- Apply tourniquet to limb using gauze or have an assistant apply pressure above the sterile site
- Anchor the vein by stretching the overlying skin with the thumb and fingers of the free hand
- Insert the butterfly/introducer through the skin about 0.5-1cm distal to the intended vein at a low angle (15-30°)
- When flash back occurs advance the needle about 2-5mm at a lower angle to ensure that the whole of the bevel of the needle remains within the vein
- If cannula used remove the needle
- Release the tourniquet
- Introduce the primed catheter through the butterfly/cannula using non-toothed forceps and advance to the desired length
- Once the catheter has been advanced the pre-measured distance, the butterfly is removed, taking care not to dislodge the line. Place a finger over the vessel 1-2cms above the tip of the introducer and withdraw the introducer completely. If the area bleeds place a piece of gauze at entry site and apply pressure until bleeding has stopped
- Separate the introducer from the catheter by splitting the needle or if using an ECK unscrew the hub and slide the introducer slowly over the catheter. Reconnect the catheter, ensuring that the locking pin is within the hub and flush with 0.9% saline to check that the hub is fully tightened and there is no leakage
Secure the line with Steristrips and cover the hub and line with a sterile transparent dressing to allow visualisation of site of entry (BAPM, 2015), protect the skin under the hub with a small piece of pre-cut gauze
- Ensure the dressing does not circumference the limb but does cover the entire catheter
- Avoid wrapping the heel (as prevents later capillary sampling from that limb)
- Clear away equipment
- Prior to the x-ray confirming the position of the catheter tip the line should be kept open with saline at 1ml/hr to maintain patency of the line

<table>
<thead>
<tr>
<th>Confirm the Position</th>
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<tbody>
<tr>
<td>• Obtain an x-ray to confirm catheter tip location</td>
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<tr>
<td>• If the PACS system is in use it may be possible to identify the position of the tip but where this is not possible all catheters should be flushed with at least 0.2-0.3mls of radio-opaque IV dye immediately prior to x-ray</td>
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<tr>
<td>• The catheter tip should ideally be located in the inferior or superior vena cava</td>
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<td>• The position will need to be confirmed within 24 hours by a consultant (BAPM, 2015)</td>
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<tr>
<td>• Occasionally a sub-optimal position may be acceptable due to difficult access. This should be clarified by the consultant and used for a short period of time with close monitoring. This should be discussed with parent and nursing staff should be aware</td>
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<tr>
<td>• Document the procedure in the infant's notes (using a sticker if it is local practice) including any adjustments made. Clearly document if there are any deviations from optimal position (BAPM 2015)</td>
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7. Complications

7.1 Infection
- Increased risk due to severity of illness, prematurity, postnatal age, poor skin, multiple invasive procedures and length of time the lines are in-situ for all potentially increase the risk of infection
- Central catheters to be sited under strict aseptic conditions
- Good handwashing and non touch technique maintained each time fluid is changed or drugs given (as per Catheter Care Bundle)
- Lines should be broken into as few times as possible
- Good practice is to remove the PICC line however in some cases, it may be an option to treat with appropriate antibiotics without removal of the line
- In cases of recent sepsis wait at least 24 hours after removal of previously infected lines if possible

7.2 Catheter migration
- The catheter may have looped on insertion
- May have been inserted or migrate to the cardiac chambers, internal jugular vein, subclavian vein, ascending lumbar vein
- Can cause pericardial effusion, pleural effusion, cardiac arrhythmias, tamponade, or cardiac perforation and tissue extravasation
- **Consider pericardial effusion/cardiac tamponade in any neonate who collapses with a long line/central venous catheter**
- Decision to remove line or re-position is based on the position of migration
- If the tip is in the heart the line must be pulled back to the optimum position and re-x-rayed prior to use
- The line may be pulled back and serve as a 'short' long line if looped in the jugular or brachiocephalic veins although there is more risk of fluid extravasation

7.3 Catheter Dysfunction
- Indicated by a rise in the pressures or inability to infuse fluid
- Due to malposition, fibrin clot, precipitate from infusate with high mineral content, drugs or lipid deposits
- Flexion of an extremity may also lead to temporary occlusion
- Check catheter fixation to ensure there are no kinks in the catheter
- Check the position of the catheter on X-ray - using contrast if necessary
- Consider flushing using aseptic technique to remove any blockage
- Consider line sepsis

7.4 Catheter Breakage
- The catheter may be punctured or even in rare cases severed by the introducer needle during insertion, snap because of excess tension on the external section of the catheter or rupture because of excessive pressure
- There is a risk of embolism formation from the internal section of the fractured catheter
- Do not move the limb excessively
- Secure the external portion of the catheter
- Apply pressure above the insertion site to prevent catheter advancing
- Contact Consultant Neonatologist urgently
- Consult with appropriate specialist if necessary e.g. Paediatric/Vascular Surgeon or Radiologist
- Keep parents informed and document actions in the notes
**Documentation**

When the catheter has had to be removed the reasons for removal and the duration that it has been in situ should be recorded in the notes.

<table>
<thead>
<tr>
<th>Site of insertion</th>
<th>Position of baby</th>
<th>Measurement</th>
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<tbody>
<tr>
<td>Antecubital veins</td>
<td>Supine, abduct arm at 90° Turn head toward insertion site to prevent catheter travelling towards the head</td>
<td>Insertion site, along venous pathway to suprasternal notch, to 3rd right intercostal space</td>
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<tr>
<td>Saphenous veins</td>
<td>Supine for greater saphenous - extend leg</td>
<td>Insertion site, venous pathway to xiphoid process</td>
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<tr>
<td>Scalp veins</td>
<td>Supine, turn head to side (though may have to turn the head to midline to assist advancement of catheter)</td>
<td>Follow approximate pathway from insertion site near ear to jugular vein to right sternoclavicular joint to 3rd right intercostal space</td>
</tr>
</tbody>
</table>

**References**


Northern Ireland Adverse Incident Centre. (2001) Advice Notice - The use of central intravenous access in neonatal parenteral feeding


# Exceptional Circumstances Form

Form to be completed in the exceptional circumstances that the Trust is not able to follow ODN approved guidelines.

<table>
<thead>
<tr>
<th>Details of person completing the form:</th>
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<tbody>
<tr>
<td>Title:</td>
<td>Organisation:</td>
</tr>
<tr>
<td>First name:</td>
<td>Email contact address:</td>
</tr>
<tr>
<td>Surname:</td>
<td>Telephone contact number:</td>
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| Title of document to be excepted from: |  |

| Rationale why Trust is unable to adhere to the document: |  |

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<thead>
<tr>
<th>Signature of speciality Clinical Lead:</th>
<th>Signature of Trust Nursing / Medical Director:</th>
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<tr>
<td>Date:</td>
<td>Date:</td>
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| Hard Copy Received by ODN (date and sign): | Date acknowledgement receipt sent out: |

Please email form to: mandybaker6@nhs.net requesting receipt.
Send hard signed copy to: Mandy Baker
EOE ODN Executive Administrator
Box 93
Cambridge University Hospital
Hills Road
Cambridge CB2 0QQ