# Guidelines on the care of a Central Venous Access Devices (CVAD) for Clinical Staff

<table>
<thead>
<tr>
<th>Version</th>
<th>1</th>
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<tbody>
<tr>
<td>Date of Original Issue</td>
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<td>Signature: [Signature] Date: 27/2/13</td>
</tr>
</tbody>
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## Document Review History

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<thead>
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<th>Review Date</th>
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<tr>
<td>March 2015</td>
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## Document Change History

<table>
<thead>
<tr>
<th>Change to Document</th>
<th>Reason for Change</th>
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**INTRODUCTION**

Central Venous Access Devices (CVAD) are a group of devices which are usually inserted in theatre under general anaesthetic. Peripherally Inserted Central Catheters (PICC) may be in appropriate circumstances be inserted in the ward setting. The term CVAD is used to describe this group of devices as they all end in the large vessels (Central) rather than the peripheral vessels. In the text within this document CVAD and CVC will be used.

This set of guidelines will detail the insertion and care of all CVADs used in OLCHC.

For your convenience the document contains a section for each device type, see below details of a comprehensive index to assist you in the use of this set of guidelines.

For the purpose of this suite of guidelines all skin cleansing and hub cleansing will be detailed in section 1.4.

**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATB</td>
<td>Antibiotic Therapy</td>
</tr>
<tr>
<td>CVAD</td>
<td>Central Venous Access Device</td>
</tr>
<tr>
<td>CVC</td>
<td>Central Venous Catheter</td>
</tr>
<tr>
<td>PICC</td>
<td>Peripherally Inserted Central Catheter</td>
</tr>
<tr>
<td>RIJ</td>
<td>Right Internal Jugular</td>
</tr>
<tr>
<td>UVC</td>
<td>Umbilical Venous Catheter</td>
</tr>
<tr>
<td>TPN</td>
<td>Total Parenteral Nutrition</td>
</tr>
<tr>
<td>GA</td>
<td>General Anaesthetic</td>
</tr>
</tbody>
</table>
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### 1.1 CENTRAL VASCULAR DEVICE INSERTION REQUEST FORM for the wards

![Patient Data]

<table>
<thead>
<tr>
<th>Date:</th>
<th>Urgency: A (&lt;7days) B (&lt;3days) C (&lt;24h) D (ASAP)</th>
</tr>
</thead>
</table>

#### Patient history and diagnosis:

**Reason for Central venous access:**

- ATB
- TPN
- Other medication:
  - Blood sampling
  - Haemofiltration/hemodialysis
  - OTHER:

**Expected length of therapy and recommended lines:**

<table>
<thead>
<tr>
<th>&lt; 2 WEEKS</th>
<th>&lt; 6 WEEKS</th>
<th>&gt; 6 WEEKS</th>
<th>AT LEAST:</th>
<th>WEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central line/midline</td>
<td>Picc line</td>
<td>Broviac</td>
<td>Vascath/Perm cath</td>
<td></td>
</tr>
</tbody>
</table>

**Preferred number of lumens**:  
- 1 lumen
- 2 lumens
- 3 lumens

*Please note, that more lumens means more complications, so try to keep it at minimum required. (For blood samples there is no need for dedicated lumen. Blood can be taken during changing the TPN infusions)*

#### Previous central venous access:

- Yes, < 2 weeks ago
- Yes > 2 weeks ago
- No, never

**Coagulation tests, Plt count normal:**  
- Y / N / NOT CHECKED  
- Date:

**Active infection:**  
- YES/NO  
- Isolation:** YES/NO 
- Details:

**History of venous thrombosis:**  
- YES / NO  
- Comment if yes:

**Doppler checked:**  
- YES / NO  
- Results:

**Fasting status (if GA required):**  
- last solid food:  
- last clear drink:

**LINE APPROVED BY CONSULTANT ANAESTHETIST/CONSULTANT SURGEON*:**  
(name of the consultant and a type of the line approved):

* contactoNTACT CONSULTANT SURGEON IF LINE NEEDED > 6WEEKS  
* CONTACT CONSULTANT ANAESTHETIST/INTENSIVIST IF LINE NEEDED < 6WEEKS

**Ordering Consultant is taking responsibility for the management of Central Vascular device.**

| Ordering Consultant (Printed name): | Ordering Consultant (Signature): |

See 1.2 for catheter types, length of usage.
### 1.2 Guide to CVAD choice and the duration of usage

<table>
<thead>
<tr>
<th>Type of Line</th>
<th>Type of access</th>
<th>Location</th>
<th>Length of usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PERIPHERALLY INSERTED CENTRAL CATHETER PICC</strong></td>
<td>· Short-term venous access devices</td>
<td>· Brachial, cephalic, median-cubital or scalp vein placement</td>
<td>0 days to 6 weeks</td>
</tr>
<tr>
<td></td>
<td>· Inserted under local anaesthetic</td>
<td>· Single or multiple lumens</td>
<td></td>
</tr>
<tr>
<td><strong>MIDLINE</strong></td>
<td>· Short-term venous access devices</td>
<td>· Brachial, cephalic, median-cubital or scalp vein placement</td>
<td>0 days to 6 weeks</td>
</tr>
<tr>
<td></td>
<td>· Inserted under local anaesthetic</td>
<td>· Single or multiple lumens</td>
<td></td>
</tr>
</tbody>
</table>

#### Line type

- **Central Venous Catheter**: Short term central device inserted under general anaesthetic. Location: Brachial, cephalic, median-cubital or scalp vein placement. Sutured in place. Length: 7-10 days.
- **TUNNELLLED HICKMAN OR BROVIAC**: Known to the children in OLCHC as “Freddy”. Location: Infraclavicular placement. Single or multiple lumens. Dissolvable sutures are used. Dacron cuff. Can be felt under the skin. Inform medical staff if the Dacron cuff is visible, as this is an indication that the catheter has moved. Length: indefinite.
- **Umbilical Venous Catheter**: Used in neonatal units. Location: Inserted via the umbilical vein in the umbilical cord, with the tip of the catheter positioned at the junction of the inferior vena cava (IVC) with the right atrium. It is above the diaphragm and beyond the liver at T9-T10. Length: 3-7 days.
- **Non tunneled Permcath/Vascath**: Used predominately for Haemofiltration or plasmapheresis. Location: Permcath are non tunneled long term lines used for haemodialysis or plasmapheresis. Vascaths are temporary non tunneled lines used for maximum of three weeks for haemodialysis and haemofiltration or plasmapheresis. Length: Indefinite.

#### Blood discard volumes and Flush volumes for CVADs

<table>
<thead>
<tr>
<th>Line type</th>
<th>Age</th>
<th>Blood discard volume</th>
<th>Flush volume</th>
<th>Heparin dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PICC/Midlines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 1 year</td>
<td>1ml</td>
<td>0.5</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>1-3 years</td>
<td>2.5ml</td>
<td>0.6</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 years</td>
<td>3.5ml</td>
<td>0.8</td>
<td>10 units/ml</td>
</tr>
<tr>
<td><strong>Central Venous Catheters</strong></td>
<td>&lt; 1 year</td>
<td>1 ml</td>
<td>0.5-1ml</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>1-3 years</td>
<td>2.5ml</td>
<td>1-2.5mls</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 years</td>
<td>3-5ml</td>
<td>3-5mls</td>
<td>10 units/ml</td>
</tr>
<tr>
<td><strong>Hickman/Broviac</strong></td>
<td>&lt; 1 year</td>
<td>1 ml</td>
<td>As per surgeons</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>1-3 years</td>
<td>2 ml</td>
<td>As per surgeons</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 years</td>
<td>3-5 ml</td>
<td>As per surgeons</td>
<td>10 units/ml</td>
</tr>
<tr>
<td><strong>Implantofix</strong></td>
<td>&lt; 1 year</td>
<td>N/A</td>
<td>1ml-2.5mls</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>1-3 years</td>
<td>N/A</td>
<td>1ml-2.5mls</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 years</td>
<td>N/A</td>
<td>1ml-2.5mls</td>
<td>10 units/ml</td>
</tr>
<tr>
<td><strong>Umbilical Venous Catheters</strong></td>
<td>&lt; 1 year</td>
<td>1ml</td>
<td>0.5-1ml</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>1-3 years</td>
<td>N/A</td>
<td>N/A</td>
<td>10 units/ml</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 years</td>
<td>N/A</td>
<td>N/A</td>
<td>10 units/ml</td>
</tr>
</tbody>
</table>

Midlines can be used for antibiotic therapy, and fluids, blood transfusions, although not for concentrated TPN intended to use for centrally located catheters. So midline catheters should not be used for any solution containing greater than 10 percent dextrose or 5 percent protein, or any vesicant or caustic solution.
1.4 Skin Asepsis prior to peripheral and central line insertion by clinical staff in OLCHC.

S.A.R.I. Guideline 2009- for prevention of infection associated with CVC or peripheral line insertion recommends chlorhexidine gluconate 2% in 70% isopropyl alcohol (in a single patient use application) in adults & children ≥ 2 months.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Product</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin cleansing prior to peripheral canula insertion</td>
<td>Sanicloth®</td>
<td>↑ 2% chlorhexidine gluconate in 70% isopropyl alcohol</td>
</tr>
<tr>
<td>Skin cleansing prior to CVC insertion</td>
<td>OR Chlorhexidine 2% Alcohol (Ecolab) 200ml bottle</td>
<td>↓</td>
</tr>
<tr>
<td>Device cleaning (e.g. hubs)</td>
<td>Sterexidine 200® 150ml bottle</td>
<td>contains 0.5% Chlorhexidine Gluconate w/v in aqueous solution</td>
</tr>
</tbody>
</table>

For infants < 2 months old the recommendation is 0.5% Chlorhexidine in aqueous solution

**NB: Use in premature babies:**
In immature neonates (e.g.: below 30 weeks gestation), gently dab the product onto the skin for 10 seconds & allow the skin to dry in air. Avoid ‘up & down, back & forth movement as gentle friction can damage immature stratum corneum of neonates. After the procedure, the skin should be cleaned with sterile water and dried thoroughly.

**NOTE:**
Povidone Iodine 10% (Vidine® or Betadine®) may be used in patients with a history of chlorhexidine sensitivity.

Povidone Iodine 10% (Vidine® or Betadine®) should no longer be used prior to performing lumbar puncture. Use appropriate chlorhexidine product listed above instead.

The routine use of antimicrobial or antiseptic ointments around CVC insertion sites at the time of insertion or during dressing changes is not recommended.
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**Appendix**  Trouble shooting algorithm
2.0 Peripherally Inserted Central Catheter

2.1 Definition

A Peripherally Inserted Central Catheter (PICC) is a single or double lumen catheter that is inserted via a peripheral vein into a central vein, the tip of which terminates centrally in the Superior Vena Cava (SVC) (Dougherty and Lister 2011).

2.2 Advantages of PICC

The PICC has many advantages over other central venous access devices:

- PICCs eliminate the risks associated with CVC placement such as pneumothorax, haemothorax and air embolism (Williams & Wilkins, 2011).
- PICCs have been shown to be associated with a reduction in catheter sepsis. (Carlson 2000, Williams & Wilkins, 2011)
- PICCs help to preserve peripheral veins. (Williams & Wilkins, 2011)
- PICCs have been shown to reduce patient discomfort and provide a reliable form of access (Williams & Wilkins, 2011)

2.3 Device Information

PICC’s are available as single and double–lumen catheters, open ended or valved and may be made of silicone or polyurethane (Dougherty & Lister 2008). PICCs are usually 50-60cms long with a diameter of 1-7Fr. Vygon and Cook catheters are used in Our Lady’s Children’s Hospital.

Device Insertion

PICC’s can be inserted by nurses or doctors who have received the appropriate education, training and competency. Local anaesthetic topically using Ametop is considered to reduce the pain associated with initial venepuncture. Venous access is achieved by cannulation of a peripheral vein in the child’s arm, e.g. basilic, cephalic or median cubital vein. In some cases subcutaneous local anaesthetic may be considered.

The PICC is measured, and then slowly advanced until the tip lies in the distal SVC or some other preselected site along the peripheral vascular system (Goodwin & Carlson 1993). A chest X-ray must be carried out post insertion to confirm that the catheter is correctly positioned. (Dougherty and Lister 2011). The CXR is viewed by a doctor to confirm placement. The PICC should not be used until its position has been confirmed and this is documented in the child’s notes.

INSERTION SITES FOR A PICC

PICCs must be secured in place to minimize movement while in situ (Gabriele 2001). PICCs can be adequately secured using steristrips or securement devices such as Statloc® applied to the skin (Gabriel 2000). Sutures should not be used unless strongly indicated.

PICC’S can be inserted in any clinical area by appropriately trained staff once patient criteria is suitable.

2.4 Procedure

EQUIPMENT

- Sterile gloves
- Drape
- Chlorhexidine 2% in 70% alcohol in infants > 2months corrected gestational age
  In infants < 2months use 0.5% Chlorhexidine in aqueous solution.
- Needle-free device
- Steri-strips
- Peripherally inserted catheter ( available from theatre or cath lab) type to be determined
- Introducer
- tape measure
- Transparent dressing
- 10ml syringe 0.9% sodium chloride
<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale and Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect all appropriate equipment</td>
<td>To allow for full concentration on patient and procedure</td>
</tr>
<tr>
<td>Locate patient, check patient identification</td>
<td>To minimize the risk of error and to ensure that the procedure is carried out on the correct child (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Explain the procedure to the child and family, relative to the child’s age and understanding</td>
<td>Consent for procedure must be sought and documented To obtain patient co-operation and alleviate anxieties. Ensure child/parents understand the procedure (Trigg and Mohammed, 2010)</td>
</tr>
<tr>
<td>Correct lighting and ventilation is required for the procedure.</td>
<td>To ensure operator and patient are comfortable and that adequate light is available to illuminate the procedure (Dougherty and Lister 2011).</td>
</tr>
<tr>
<td>Ensure the patient is in a comfortable position and that his/her privacy is maintained.</td>
<td>To prevent skin irritation (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Establish whether patient has allergy to skin preparation solution and adhesive material.</td>
<td>To prevent cross-infection (OLCHC, 2010b) To prevent undue delays during procedure.</td>
</tr>
<tr>
<td>Decontaminate hands.</td>
<td>To ensure equipment is fit for use. If the product’s integrity is compromised, it should not be used. (INS 2001)</td>
</tr>
<tr>
<td>Select and assemble appropriate equipment prior to procedure</td>
<td>To optimize best site for appropriate treatment. The selection of the vein may be a deciding factor in the success of and preservation of, veins for subsequent treatment. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>All equipment used for insertion PICC must be inspected for product integrity before, during and after use to ensure sterility and fitness for use</td>
<td>To minimize pain of insertion. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Assess venous access and choose appropriate vein</td>
<td>To aid insertion of introducer and then advancement of catheter. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Apply local anaesthetic cream to chosen venepuncture site and leave for allotted time</td>
<td>To enable selection of the most suitable catheter length and to establish how far to advance the catheter in order for its tip to be located in the correct position. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Position child in a supine position with the arm at 45°, with ability to move arm to a 90° angle</td>
<td>To minimize risk of infection To prevent cross-infection and protect the healthcare worker from blood spillage (INS 2001, OLCHC 2010a)</td>
</tr>
<tr>
<td>Measure using tape measure from the selected venepuncture site to the middle of the clavicle, and then measure from the clavicle across to the second/third sternal notch. This will give catheter measurement.</td>
<td>To check catheter patency and to enable easy removal of guidewire. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Decontaminate hands.</td>
<td>This rapidly reduces microbial counts on the skin (INS 2001, SARI 2009, OLCHC 2011)</td>
</tr>
<tr>
<td>Put on sterile gloves</td>
<td>To prevent re-contamination of the site(OLCHC 2010b)</td>
</tr>
<tr>
<td>Remove cap from the extension set and attach 0.9% sodium chloride, gently flush with 2 ml and leave syringe attached</td>
<td>To provide a sterile field. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Clean the insertion site with skin cleansing swab as per guideline. Apply with friction, in a circular motion, from insertion site outwards to a diameter of 5-10 cm, for a minimum of 40 seconds.</td>
<td>To encourage venous distension by obstructing venous return (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Allow to air dry for 40 seconds. Do not repalpate the site.</td>
<td>To promote stability of vein for ease of cannula insertion (Trigg and Mohammed, 2010)</td>
</tr>
<tr>
<td>Drape the site with a fenestrated drape</td>
<td>To ensure atraumatic skin entry and reduce pain (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Reapply tourniquet.</td>
<td>To indicate that the needle has entered the vein (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Use non-dominant hand to achieve skin traction, above or below the insertion site.</td>
<td>To reduce blood flow. To prevent obstruction to arterial flow. (Dougherty and Lister 2011)</td>
</tr>
<tr>
<td>Insert cannula through the skin at an angle of 10-30 degrees, with the bevel of the needle in the upward position.</td>
<td>To contain flashback, prevent contamination of the area with blood and minimize the amount of blood loss from the child.</td>
</tr>
<tr>
<td>As the tip of the cannula enters the vein a flash-back of blood will appear in the chamber of the cannula.</td>
<td></td>
</tr>
<tr>
<td>Remove tourniquet.</td>
<td></td>
</tr>
<tr>
<td>Position fingers in a V, with the index finger on wings and middle finger above sheath tip, and gently remove stylet. Apply pressure</td>
<td></td>
</tr>
</tbody>
</table>
Grip the catheter 1cm from the tip and thread through introducer sheath.
Advance the catheter 10-15cm
Ask the child to move the arm to a 90° angle
Note: A smooth entry is experienced. Resistance indicates a problem.
Turn patients head towards the arm of insertion and place the chin on the clavicle if possible.
Continue slow advancement of the catheter to the desired length.
Apply pressure above the introducer and withdraw the introducer.
Aspirate for blood return (if catheter lumen size allows) and flush with 0.9% sodium chloride using 10ml syringe as prescribed.

Apply gentle pressure on the catheter and slowly withdraw the guide wire.
Attach a needle-free device and flush catheter.
Attach line to securement device and apply device to skin.
Secure the catheter by coiling softly and securing with steristrips check there is no kink in the line. Place IV opsite 3000 over the entire site including coiled line.
Do not place steristrips around the limb circumference
➢ Place a full 12mm Steristrip, adhesive side up, under the hub of the cannula.
➢ Fold one end of the strip diagonally over the cannula
➢ Fold the other end of the steri-strip diagonally over the other side of the cannula
➢ Place another strip (not as long as the 1st) across the hub of the cannula.
Unsterile tape should not be placed over the actual insertion site.
Cover with transparent dressing. Apply low-linting gauze under the extension set, then bandage
Dispose of equipment appropriately.
Remove gloves and decontaminate hands
CXR is performed
Document procedure in notes.

To ensure the catheter is securely within the vein before moving the patients arm.
To enable further advancement of catheter.
To prevent the catheter entering the jugular vein and to ensure correct advancement of the catheter downwards.
To minimize damage to the intima of the vein. (Dougherty and Lister 2010)
To check patency of device and ensure continued patency. (Dougherty and Lister 2011)
To ensure patency of device.

To anchor the catheter securely to the skin, preventing cannula movement, mechanical irritation or extrinsic contamination of the wound. (Maki 1991, INS 2001, OLCHC 2010b).

It may occlude the circulation
To ensure protection of the site. To prevent the tubing pressing into the child’s skin. (Dougherty and Lister 2010)
To promote safety and prevent cross infection. (OLCHC 2010b, 2010a, SARI 2009, )
To allow position of the tip to be assessed. To ensure correct location. (Dougherty and Lister 2011)
To prevent cross-infection (OLCHC 2010a)
To check PICC line placement
To maintain accurate patient records. (NHO, 2009)
To act as referral source for Information. (An Bord Altranais 2002)

2.5 Checking patency of the PICC
Rupture of catheters under high pressure is a potential serious problem (Trotter and Carey 1998).
• ALWAYS USE 10ML SYRINGE WHEN CHECKING CATHETER PATENCY
• Aspirating for blood return to check patency may not be possible in small gauge PICC lines used in children.
• Do not apply excessive force as this may damage the catheter
 Ensure that the catheter flushes easily and that blood can be aspirated if the internal diameter allows for this (Levy et al 2010). This applies to catheters size 3 and above only. Needle free device to be changed following 150 accesses or a period of 1 week – whichever comes first.

2.6 Procedure for the care of a PICC line exit site dressing
This procedure is performed using level 2 aseptic non-touch technique to minimise the risk of catheter related infection All central venous access devices, including Hickman, PICC; and non -tunnelled catheters, are dressed with either
1. Sterile, transparent, semi-permeable polyurethane dressing e.g. Venegard or Opsite 3000.
2. Sterile gauze e.g. Mepore
**Requirements:**
- Tray Plastic
- Sterile gloves x 1
- Chlorhexidine 2% & 70% Alcohol wipes x 2
- Sterile prep towel
- Appropriate dressing-Mepore, Veni-gard™, Opsite 3000
- Statoc securement device if required

A semi-permeable polyurethane dressing is preferable, but if the patient perspires profusely, or if the insertion site is bleeding or oozing, a sterile gauze dressing is used to cover the site (Maki et al. 1994, Madeo et al. 1998, Little and Palmer 1998).

**Frequency of dressing change**
- Transparent dressings are changed **every seven days** or when they are soiled or unduly moist.
- Gauze dressings are changed when they become damp, loosened, or soiled. The need for a gauze dressing is assessed daily. A gauze dressing is replaced by a transparent dressing as soon as possible.
- Dressings on newly inserted catheters are changed as per surgeon’s instructions. Care must be taken to avoid dislodging the newly inserted catheter.
- Irrespective of the type of dressing used, apply a new dressing when the catheter is replaced, when the dressing becomes damp, loosened or soiled, or when inspection of the site is indicated (Masoorli 1997, O’Grady 2002).

### 2.7 1& 2 Fr PICC LINES: SPECIAL CONSIDERATIONS

<table>
<thead>
<tr>
<th>Action - Use ANTT level 3.</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the procedure to the child and family</td>
<td>To ensure child/parents understand the procedure. (Dougherty and Lister, 2011)</td>
</tr>
<tr>
<td>Clean an appropriate work surface tray/trolley with a 70% isopropyl alcohol preparation and allow to air dry for at least 40 seconds.</td>
<td>To create a sterile field and ensures efficacy of alcohol swab (Pratt et al. 2008)</td>
</tr>
<tr>
<td>Prepare sterile area by opening glove packet or sterile towel onto work surface. Decontaminate hands</td>
<td>To create a sterile field (Dougherty and Lister, 2011)</td>
</tr>
<tr>
<td>Carefully remove old dressing taking care not to dislodge the catheter...... Use an adhesive remover as required Discard old dressing into a Healthcare risk waste bag. <strong>Do not</strong> use a scissors or other sharp instrument near the catheter</td>
<td>Adhesive remover dissolves the adhesive on the dressing, preventing trauma to the child’s</td>
</tr>
<tr>
<td>Assess the insertion site for evidence of infection - redness, ooze or inflammation. If signs of infection are present, take a swab for culture and sensitivity Decontaminate hands Put on sterile gloves Clean the exit site with the required skin cleansing swab as per OLCHC guidelines. Repeat three times moving a little way out from the exit site each time. Clean an area in total of 5cms from where the line exits site. Allow area to dry leaving for 40 seconds at least</td>
<td>Using a sharp implement close to the catheter may result in harm to the child or accidental damage to the catheter Careful assessment allows early identification of colonisation or infection of the insertion site (Dougherty and Lister 2011) To prevent cross infection (OLCHC 2010b, SARI (2009)) Ensures that the whole insertion site is thoroughly cleaned (Trigg and Mohammed 2010, SARI, 2009)) Prevents contamination from soiled part of the site (Dougherty and Lister 2010) Ensures maximum efficacy of skin cleansing (Pratt et al, Epic 2, 2009)</td>
</tr>
<tr>
<td>Pick up Chlorhexidine &amp; Alcohol swab and gently pat the line from the exit site to the end of the line Apply water resistant transparent dressing to insertion site Ensure the child is comfortable. Dispose of all equipment appropriately Decontaminate hands Document procedure in child’s nursing care plan.</td>
<td>To clean the length of the line A dressing protects the insertion site from contamination and helps to stabilise the catheter (Dougherty and Lister 2011) To promote safety and prevent cross infection (OLCHC 2010b,)Hand Hygiene Guideline OLCHC (2010b) Maintains accountability through accurate recording of nursing intervention. (ABA, 2002) NHO, 2011</td>
</tr>
</tbody>
</table>
A 1 Fr PICC line is often used for neonates and infants. This line can be used for delivery of therapies in the same manner as other venous catheters terminating in the superior vena cava, or upper right atrium. The line is inserted by a qualified nurse or experienced physician. The line tip position must always be confirmed by a chest X-ray prior to use, which needs to be reviewed by a doctor. The line is held in place with a steristrip and opsite 3000 dressing. A securement device may secure the line in the position shown over..... see pic 2

1 & 2 Fr Picc lines have some special properties that need to be considered:

See below:

1. The line is very small - 0.35mm external diameter - which is a big advantage for small babies in avoiding thrombosis or infection.
2. As the material is fragile, it is recommended to use a syringe for flushing of 10mls or greater, using a smaller cc syringe has an increased pressure.
3. Blood can rarely be withdrawn from the 1 & 2 Fr so therefore it is not a good indicator of line patency.
4. 1 & 2 Fr PICC lines are difficult to flush by hand as the have a small internal diameter and the line is long (20-30cm).
5. the 1 & 2 Fr PICC should be managed with a continuous infusion of Normal saline at a rate of 1 ml per hour immediately the line has been inserted.

A pump infusing through a 1Fr PICC may alarm for high pressure (see the reference below).

Use the lower volume possible (mainly for short antibiotic infusions)
Use a smaller syringe (the pump generates controlled pressure, not like your hand), but usually 10- 20mls is adequate.
Use a lower infusion rate if possible (the pump might alarm even if the flow is below the recommended 42ml/h)

Any difficulties relating to the line need to be discussed with the IV team or the anaesthetic team (bleep 652, or 528).
No LINE IS TO BE REMOVED WITHOUT CONSULTANT APPROVAL

---

### 2.8 Instilling Urokinase into a CVAD

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale &amp; Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open water for injection and wipe top of Urokinase vial with a alcohol wipes</td>
<td>To ensure a secure fit.</td>
</tr>
<tr>
<td>Add 2ml of water to the Urokinase vial</td>
<td>To check for patency. This ensures removal of any saline or heparin sodium, but may result in excessive blood loss in small infants and critically ill children. <em>(Cella &amp; Watson 1989)</em></td>
</tr>
<tr>
<td>When dissolved draw up 1ml of Urokinase (5,000 units) in 2ml syringe if &lt; 3years, and 2mls if &gt; 3years</td>
<td></td>
</tr>
<tr>
<td>Expel all air bubbles, remove green needle, and attach non injectable bung.</td>
<td></td>
</tr>
<tr>
<td>Place on tray with Chlorhexidine and alcohol wipes.</td>
<td>To prepare for administration. <em>(Dougherty and Lister 2011)</em></td>
</tr>
<tr>
<td>Insert syringe, containing Urokinase into Needle free firmly, and rotate to the right for a secure fit.</td>
<td></td>
</tr>
<tr>
<td>Open clamp and slowly and gently instill 1ml of Urokinase</td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> Do not apply force to instill the Urokinase. Use gentle push pause action. If unsuccessful contact medical personnel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential risk of thrombus release into general circulation</td>
</tr>
</tbody>
</table>
### 2.9 Removal of PICC line
Specifically trained nursing staff may remove PICC lines taking the following into account:
A decision to remove the catheter must be made in consultation with medical staff following completion of therapy, following line infection or if line appears occluded.

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<tr>
<th>Action</th>
<th>Rationale &amp; Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepare the patient for line removal. Explain the procedure to the patient if appropriate and the parent</td>
<td>To obtain patient co-operation and alleviate anxieties. Ensure child/parents understand the procedure (Trigg and Mohammed, 2010)</td>
</tr>
<tr>
<td>Gather required equipment to the bedside Decontaminate hands</td>
<td>To prevent undue delays during procedure</td>
</tr>
<tr>
<td>If the assistance of another staff member is required ensure procedure is carried out when they are available</td>
<td>To prevent cross-infection (OLCHC, 2010b)</td>
</tr>
<tr>
<td>Remove the dressing at the exit site Remove the securement device Cleanse the picc site with Chlorhexidine and Alcohol solution</td>
<td>To allow for full concentration on patient and procedure</td>
</tr>
</tbody>
</table>

### 2.10 Midline catheters

#### Introduction
Midline catheters are longer than a peripheral intravenous catheter, but shorter than Peripherally Inserted Central Catheter line or central line. Midline catheters describe central venous catheters which are inserted via peripheral vein into a vessel distal to the shoulder. The catheter used is a central line (Vygon or Cook) inserted peripherally. The catheter tip of the line should lie distally to a shoulder, ideally in axilla. They are usually used for therapies from 1-4 weeks. Midline catheters are associated with less risk of phlebitis than short peripheral IVs (Mermel, Parenteau and Tow 1995).

Midlines are associated with a rate of bloodstream infection between 0.3 and 0.8 per 1,000 catheter days (Mermel, Parenteau and Tow 1995) (Tokars, et al. 1999), a rate that is less than that reported for central venous lines and even PICC lines (Safdar and Maki 2005). 

Unlike central and PICC lines, the tip of a midline catheter is meant to end in a peripheral vein and their placement does not need to be verified by X-ray. Thus midlines avoid many of the cardiac problems that can occur with lines that terminate centrally such as heart arrhythmias (Bivins and Callahan 2000).

As is evident from the image to the left a PICC ends in the right atrium

![PICC Catheter](image)

Midline catheter ends half way to the right atrium

![Midline Catheter](image)

A midline catheter is treated as a PICC line with some differences.
- See detail regarding dressing a PICC line page 5 & 6
- IV concentrations of Dextrose > 10% not to be infused
- IV concentrations of Protein > 5% not to be infused
- Some vesicant medications not to be considered
Algorithm 1 for PICC lines
Pain

Pain in shoulder, neck or chest

Consider

1. Migration of tip
   Perform CXR

2. Extravasation/cracked PICC
   Flush line – Any symptoms?

3. Thrombosis
   Examine patient for other signs

If in doubt order a lineogram
Algorithm 2 Leaking at the site of PICC entry

Leaking at site of PICC

- Remove dressing and carefully flush the PICC whilst observing the external portion and exit site. Remember, minor bleeding is normal after initial placement or following disturbance of the catheter.

If leaking noted check connections are secure

If leak persists the catheter may be fractured. Inform the PICC placer for consideration of replacement over a wire.
Algorithm 3
Swollen arm, hand or neck

Swollen arm, hand or neck

Patient has swollen arm, hand or neck

Consider thrombosis
Discolouration of the arm, prominent veins or shoulder pain also suggestive of thrombosis

Review catheter function and arrange for:
- Chest X-ray to verify tip position
- Doppler ultrasound

If thrombosis is confirmed manage as per guidelines for thrombosis associated with CVAD

If no evidence of thrombosis catheter may be fractured. Arrange for lineogram and inform PICC placer.
Algorithm 4 Unable to Flush PICC 2Fr

Unable to flush or obtain blood (>2Fr)

Unable to obtain blood (>2Fr) from a PICC

Check for any evidence of kinking and ensure that the arm is straight

Flush with 5ml NS in 10ml syringe using a ‘push pull’ method. Repeat if necessary.

If there is still no blood return or unable to flush perform a CXR. If correct tip placement is confirmed instill Urokinase as per CVAD guidelines. If catheter occlusion persists inform IV team.
Algorithm 5 Suspected Catheter Malposition

Suspected catheter Malposition

Measure the external part of the PICC and compare with that documented at placement

If evidence of migration of PICC or unsure perform CXR

Ideal tip placement is in the mid/lower SVC
If the PICC tip is distal or proximal to this point inform PICC placer
Algorithm 6: Mechanical Phlebitis

**Mechanical Phlebitis**

Redness, swelling and pain above the PICC tracking up the arm

Has the PICC been in situ < 12 days

Has the PICC been in situ < 12 days

In the absence of signs of thrombosis or infection at the site consider mechanical phlebitis as the cause.

Treat with hot and cold therapy and consider NSAIDs unless otherwise contraindicated.

Continue to observe for evidence of thrombosis or infection
Algorithm 7 Redness at exit site

Redness at exit site

Redness at the exit site of the PICC

Is the redness associated with swelling and pain at the site?

Yes

Consider exit site infection

Send swab if exudate present. Cleanse the site. If there is redness, exudate, swelling and pain within 2 cm of the exit site treat with antibiotics as per medical team. Monitor for signs of systemic infection (pyrexia, rigors, etc.) and if present take blood culture from PICC and from peripheral vein and inform medical team.

No

Cleanse the site and observe
3. Section  

Central Venous Catheters  

3.1 Insertion of a Central Venous Catheter

Equipment
- Special CVC pack (contains suture material)
- Arrow Paediatric 2-lumen or Multi-lumen Central Venous Catheterisation Set (size as per anaesthetist)
- Sani-cloths
- Theatre gown
- Sterile gloves,
- Sterile nail brush (chlorhexidine 4%)
- Sterile drapes
- Fenestrated drape i.e. unidrape
- Face visor or goggles
- Heparin saline flush i.e. (10 i.units/ ml)
- Sterile 0.9% Normal Saline for Injection
- Syringes and withdrawal cannula
- Antiseptic Cleansing Solution:
  - Chlorhexidine gluconate 2% / 70% isopropyl alcohol solution > 2months
  - 0.5% chlorhexidine in Aqueous Solution < 2months
- Veni-gard dressing (small / large as appropriate)
- CVC Audit Form
- Needlefree devices (one for each lumen / exit port)

Optional
- Ultrasound
- Sterile probe cover
- Additional sterile guidewire

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale &amp; Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A central venous (non-tunnelled) catheter is inserted usually in theatre or the Paediatric Intensive Care Unit (PICU) by the anaesthetist. Aseptic Non-touch Technique (ANTT) –Level 1 is required for this procedure, requiring a surgical scrub.</td>
<td>Universal precautions (Department of Health 2007, OLCHC, 2011).</td>
</tr>
</tbody>
</table>

Pre Procedure

Safety
Resuscitation equipment, including oxygen and suction should be available.

Monitoring
Heart rate on cardiac monitor
Oxygen saturations with pulse tone on
Non-invasive blood pressure or intra arterial blood pressure

Sedation / analgesia
Position
The infant / child is position in a 30 degree Trendelenburg position, with a roll under their neck.

Turn head slightly away from site (RIJ site preferred).

Figure 2: Child position for neck cannulation of CVC.

The insertion site i.e. internal jugular vein is exposed and cleared of any clothing

Ensure any hair is clipped back and away from insertion site

Procedure
Clean dressing trolley with 70% isopropyl alcohol swabs i.e. Alcowipe

This allows maximum venous distension and prevents air embolism.

To create clean working surface.
and allow to air dry.

Assemble all equipment on bottom shelf of the trolley.

Decontaminate hands Aseptic Non-Touch Technique (ANTT) Level 2

Assist anaesthetist to lay out dressing field and prepare equipment for the procedure.

Attach small yellow bag to side of the trolley below the sterile field level.

Insertion site and skin around which will be covered by drapes is cleaned with:

- Chlorhexidine gluconate 2% / 70% isopropyl alcohol solution > 2 months.
- Chlorhexidine 0.5% in Aqueous Solution i.e. Sterexidine 200 ® < 2 months

Apply antimicrobial disinfectant solution, rubbing with friction using ‘back and forth’ strokes for 30 seconds.

Allow to air dry for minimum 30 seconds - 2 minutes.

NB: In the preterm infant < 30 weeks gestation, the solution should be gently dabbed onto the skin and allowed to air dry. Avoid 'up and down' and ‘back and forth’ movements. After the procedure the skin should be cleaned and dried with Sterile Water for Injection.

Observe cardiac monitor during insertion of guidewire / catheter, note any arrhythmias.

The central line is secured in position using black silk sutures by the anaesthetist.

A sterile, transparent semi-permeable Veni-gard ™ dressing is placed over he insertion site.

Post Procedure

A chest X-Ray is routinely ordered and reviewed by the anaesthetist following CVC insertion.

Dispose of clinical waste and sharps appropriately i.e. yellow bag / sharps bin.

Clean dressing trolley.

Leave the child in a comfortable position.

Remove gloves and wash / decontaminate hands.

Document date, time of insertion, type of catheter and condition in nursing notes.

To prevent cross infection (OLCHC 2010).

To be prepared for the procedure and prevent unnecessary breaks.

To prevent contamination of contents (Dougherty and Lister 2011).

Chlorhexidine gluconate is the most effective agent for skin cleansing. (DH 2010, OLCHC 2012).

To decontaminate the skin effectively (Dougherty and Lister 2011, RCN 2010).

Gentle friction can damage the immature stratum corneum of the immature infant OLCHC 2012.

Tachyarrhythmia may be due to line moving into right ventricle and requiring withdrawing.

Veni-gard™ dressing allows observation of the entry site.

Anaesthetist will confirm CVC placement and position. Distal tip of CVC should be in lower third of SVC or right atrium. Also to exclude malposition of catheter to small vessels / knotting and rule out pneumothorax and other complications.

To ensure safe disposal of waste, prevent cross infection (Department of Health and Children 2002, OLCHC 2011).

To ensure comfort (Dougherty and Lister 2011).

Standard precautions (OLCHC, 2011).

To maintain accountability by ensure accurate documentation of the procedure and continuity of patient care (An Bord Altranais 2002, NHO 2011).

Complications during Insertion

- Air Embolism
- Haemothorax (vessel pierced, increased risk with subclavian route)
- Pneumothorax (pleura pierced, especially with IJV / subclavian veins)
- Pleural or Mediastinal Effusion (danger of laceration /perforation of vessels)
- Arrhythmias (especially if catheter moves into the right ventricle).
- Pericardial Tamponade (rare)
- Catheter migration, tip moves out of position and erodes heart wall
- Haemorrhage
- Arterial Cannulation
- Chylothorax. (Thoracic duct injury especially if catheter moves into right ventricle)
- Nerve Damage

3.2 Removal of a Central Venous Catheter (CVC)

Equipment

- Dressing trolley
- Sterile dressing pack (includes sterile gloves)
- Chlorhexidine gluconate 2% / 70% isopropyl alcohol solution
- Stitch cutter
- Sterile gauze
- Sterile air-occlusive dressing i.e. Opsite™
- Sani-cloths / adhesive remover
- Face Visor / Goggles
The removal of a central venous catheter should only be undertaken by a Registered Nurse who is deemed competent and has the appropriate experience, skills and knowledge. The nurse is responsible for acknowledging the limit of their professional competence. Ensure 2 nurses present for the procedure.

**Preparation**

Check infants/child's platelet and coagulation status in high risk groups i.e. cardiac patients as medically indicated. Discuss with medical team when the infant / child is on anticoagulation therapy. Ensure infant / child is not dehydrated.

Ensure that central venous access is no longer required and alternative intravenous peripheral access have been established for continuing IV therapy / medications. Close slider clamp on each lumen of CVC line. Turn off any 3 way taps. Ensure warmth, privacy and dignity for the child during the procedure. Explanation to child / parents as clinically indicated

Ensure adequate analgesia has been administered

Lie the infant / child in a flat / trendelenburg (10-30 degree head down tilt) position and remove any pillows.

**NB: Do not remove CVC with infant / child sitting up.**

Decontaminate hands. Procedure is performed at Aseptic Non-Touch Technique (ANTT) level 2. Clean dressing trolley with 70% isopropyl alcohol swab i.e alcowipe and allow to air dry. Assemble all equipment on bottom shelf of the trolley. Decontaminate hands Aseptic Non-Touch Technique (ANNT) Level 2 Lay out dressing field and prepare equipment for the procedure. Attach small yellow bag to side of trolley below the sterile field level. Apply non-sterile gloves

Expose CVC site and remove dressing with adhesive remover / Sani-clths

Decontaminate hands and apply sterile gloves Clean site with antiseptic solution

Solution should be allowed to air dry for 2 minutes

Remove CVC sutures while holding CVC to prevent accidental migration out.

Ensure all suture material has been removed from skin. Ask child to take a deep breath and hold it, if cooperative for the period necessary to remove CVC. Once catheter removed tell the child to breath again. In the ventilated patient or an infant / uncooperative child remove the catheter at the beginning of expiration.

CVC removal is a complex procedure with the potential to result in life threatening complications (RCN 2010, Dougherty and Lister 2011).

To support the infant / child and assist the first nurse removing the CVC (Ingram et al 2006).

Prolonged clotting time will increase the risk of bleeding and haematoma formation post catheter removal (Drewett 2000).

A patient with a low central venous pressure (CVP) due to dehydration / hypovolaemia will more easily allow air to be aspirated into the systemic circulation, resulting in air embolism (Kim et al 1998).

To prevent inadvertent delivery of medication, fluid or air to the infant / child (Ingram et al 2006).

To maintain the childs’ privacy and dignity (Ball and Binder 2008, Hockenberry and Wilson 2008)

To relieve fear, anxiety and foster trust understanding and cooperation for the procedure (Hockenberry and Wilson 2008). To ensure comfort and prevent pain (Lloyd-Jones 2004).

Positioning during removal is crucial to preventing air embolism. Head down position elevates the venous pressure above atmospheric pressure and therefore minimises the risk (Drewett 2000, Peter and Saxman 2003, Ingram et al 2006). This will reduce CVP and predispose them to air embolism (Peter and Saxman 2003).

Prevent cross infection and reduce transmission of microorganisms (OLCHC 2011).

To create clean working surface.

To prevent cross infection (OLCHC 2011).

To be prepared for the procedure and prevent unnecessary breaks.

To prevent contamination of contents (Dougherty and Lister 2011). Universal precautions (OLCHC, 2011)

To gain access to the insertion site (Ingram et al 2006).

Universal precautions.

To prevent contamination of the CVC on removal and a false positive culture of CVC tip (Dougherty and Lister 2011).

To facilitate catheter removal (Ingram et al 2006). During spontaneous breathing a negative intrathoracic pressure generates the pressure gradient for inspiration. This negative pressure can also encourage air to enter the insertion site resulting in an air embolism. Breath holding engorges the neck veins and creates a positive pressure in the intrathoracic space which minimises this risk of air entering the venous circulation (Morgan 2000, Ingram 2006).
Apply pressure to site with sterile gauze swabs whilst gently withdrawing the catheter in one swift steady movement.
NB: Do not massage the exit site.

Continue applying direct manual pressure above the puncture site for a minimum 5 minutes until bleeding has stopped.
Carefully check site
If bleeding continues continue manual pressure for a further 5 minutes and repeat site check.
Following haemostasis maintain pressure for a minimum 5 minutes.
Check central venous catheter for clots and completeness.

Should catheter fracture be suspected, position patient in trendelenburg position and on left side.
Notify medical team immediately.
If catheter fragment is palpated, apply additional distal pressure to the catheter to prevent migration.

Following haemostasis apply a transparent occlusive dressing i.e. Opsite™ and ensure it is maintained for a minimum 72 hours.
N.B.
- Do not use gauze and tape
- Do not apply a BULKY PRESSURE DRESSING

When CVC removal is due, to a suspected catheter related infection, sent a 5cm tip to microbiology laboratory for culture and antimicrobial sensitivity.
Cut with sterile scissors and allow to fall into the sterile container.
Remove non-sterile gloves and Decontaminate hands.
Reposition infant / child and ensure bedrest for minimum 30-60 minutes.

Dispose of clinical waste and sharps appropriately i.e. yellow bag / sharps bin.
Clean dressing trolley.

Make the infant / child comfortable.
Decontaminate hands.
Document date, time of removal, type of catheter and condition in nursing notes. Include condition of patients skin i.e. redness, swelling, bleeding or discharge.

**Suspected Air Embolism**

- Sudden deterioration
- Agitation / confusion/ anxiety/ impending doom
- Collapse / CVS instability / hypotension
- Bradycardia / tachycardia/ cardiac arrhythmia
- Collapse / cardiac Arrest
- Desaturation / pallor/ cyanosis
- Respiratory distress / gasp/ respiratory arrest

The intrathoracic pressures are greater than atmospheric on expiration, thereby minimising the risk of air entering the venous circulation (Drewett 2000).

There is a risk of air embolism.
Gauze will also absorb any blood loss and encourage resealing of the vein wall (Dougherty and Lister 2010).
Massage can dislodge a thrombus or cause vagal stimulation (Ingram et al 2006).
Direct pressure is necessary to prevent both air entry and stop bleeding from a large vein.

Haematoma formation at a jugular venous site can impede cerebral blood flow.
A femoral venous site haematoma can impair blood flow to the lower limb (Morgan 2000, Drewett 2006, Morgan 2000).

To ensure that catheter is intact and entire catheter has been removed. Clots may form on catheter tip. They can dislodge on removal and clots / fragments can embolise to the lung (Morgan 2000, Dougherty and Lister 2011). This position may trap the embolus in the right ventricle and prevent migration to the lung (Morgan 2000).

To ensure timely medical review and treatment.

To prevent further migration (Morgan 2000).


An air-occlusive dressing is required to prevent air embolism

Cessation of bleeding from a large vein requires the application of direct pressure only (Morgan 2000).

To prevent contamination (Morgan 2000, RCN 2010).

Early detection of infection and timely treatment (Dougherty and Lister 2010).
To avoid contamination of specimen (SARI 2009, OLCHC 2011).
To maximise the infant / child’s comfort and minimise air embolism, secondary haemorrhages and pneumothorax (Drewett 2000a, Morgan 2000, Ingram et al 2006).

To ensure safe disposal of waste, prevent cross infection and environmental contamination (Department of Health and Children 2002, OLCHC 2008).

To ensure comfort (Dougherty and Lister 2011).
Standard precautions
To maintain accountability by ensure accurate documentation of the procedure and continuity of patient care (An Bord Altranais 2000).

- Lightheadedness
- Petechiae
- Weakness / seizure
- Mill wheel murmur (classical transient sign due to right atrial and right ventricular obstruction)

**Nursing Action**
- Call senior nurse / medical team
- Turn infant / child in left side down, Trendelenburg position (head down)
- In older child ask to perform Valsava maneuver if indicated
- Administer 100% oxygen / high flow 15 litres
- Check all connections / ports to ensure air tight
- Perform BLS as clinically indicated
- Assess vital signs, heart rhythm and oxygen saturation
- Attempt aspiration of air from right atrial or pulmonary artery line if in situ.

To ensure urgent and timely nursing and medical assistance and treatment.

This position may encourage air to rise in the right atrium away from right ventricular outflow track and pulmonic valve, allowing blood through and preventing embolism to the lungs (Drewett 2000b, Ingram et al 2006).

100% oxygen will help in removing nitrogen from the air embolism (Ingram et al 2006).
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4. Care of Central Venous Access Devices (CVAD)

Introduction to Central Venous Access Devices: Hickman®, Broviac® Catheters

The Hickman and Broviac catheters are a central venous access device commonly used in paediatric age group especially for Haematology/Oncology patients. It is made of silicone and is approximately 90cms long. It is cut to the appropriate size for each individual child at the time of its insertion. Catheters are inserted under general anaesthesia via the subclavian, internal or external jugular vein with a subcutaneous tunnel to the anterior or lateral chest wall. The external end exits from the chest wall usually lateral to the right breast. The catheter has a short Dacron cuff on its outer surface, situated under the skin, above the point of exit from the chest. This is designed to act as a barrier to infection and to anchor the line in the subcutaneous tissue. These catheters may have single, double or triple lumens, which allows multiple, and concurrent venous access.

4.1 General principles for the care of Hickman Catheter

Use of Sterile technique / non touch technique

Strict hand washing is essential prior to handling the catheter at all times. A sterile technique must be used while accessing the catheter for taking blood cultures, changing the needle free device and connecting or disconnecting Total Parenteral Nutrition (TPN) infusion lines. All other procedures are carried out using a non-touch technique.

When handling chemotherapy, blood products or taking blood samples, appropriate non-sterile gloves must be worn for the protection of staff (DOHC Guidelines for the Safe Handling of Cytotoxic Drugs (1996); Universal Precautions, OLCHC 2011).

The use of gloves is unnecessary when administering bolus medication, attaching or detaching intravenous infusions.

4.2 Care and maintenance

Flush and Maintaining Patency

It is essential to follow certain general principles prior to flushing and maintaining the patency of Hickman catheter. Please refer to the following:

Syringe size:

It is recommended that a 10 ml syringe (or larger) be used for withdrawing blood samples or injecting into any Hickman catheter. Infusion pressure should not exceed 25 psi. A 10 ml syringe generates pressure of less than 8 pounds per square inch (psi). Small syringes generate very high internal pressures with very little force. A catheter will rupture at pressures in excess of 25 psi. The back pressure from an occlusion (blockage) may not be felt when using a small syringe until damage to the catheter has occurred.

If a small syringe is required for accuracy of drug dose, always ensure that the catheter is flushed with a 10 ml syringe containing 0.9% sodium chloride to establish patency of the catheter prior to using the small syringe.

Exceptions are: injecting antibiotic locks and Urokinase instillation.
**Flush volumes:**
OLCHC Policy: 3ml of 0.9% sodium chloride is used, before and after drug administration, after taking blood samples, after disconnecting lines, and followed by instillation of 2.5ml of Heparin sodium (10 iu/ml).

**Push-pause method:**
It is important to use a push-pause method for flushing the Hickman catheter. This creates turbulence within the lumen and helps prevent the formation of fibrin clots. Administer 1ml of solution, pause for 1 second, and repeat until the appropriate volume has been administered. The procedure is completed using a positive pressure technique.

**Positive pressure technique:**
A positive pressure technique is accomplished by clamping the Hickman catheter as the last 0.5 ml of Heparin Sodium (10 iu/ml) is being instilled. Maintaining positive pressure in the Hickman line prevents backflow of blood into the catheter.

**Blood return and patency:**
Patency of Hickman catheter is confirmed by obtaining a blood return. It should always be checked prior to instillation of any drug or infusion. When not in use all lumens of the catheter should be clamped and heparinised weekly to maintain patency. If there is a suspicion that the line has dislodged i.e. cuff is visible, no blood return on aspiration, **do not use it**. If the line has dislodged, a chest x ray may be indicated to confirm the position of the catheter and contact OLCHC for advice.

**Blood Discard Volume chart:**
Prior to taking blood samples, the Hickman catheter should be aspirated with a 10ml syringe. The first sample will contain Heparinised saline mixed with blood and should be discarded unless being used for blood cultures. The discard volume will vary according to the age of the child (see table below). The discarded sample **must not** be returned to the patient.

4.3 Blood Sampling
When obtaining a blood sample from a multi-lumen catheter use the free lumen where possible. Ensure that the other lines are clamped to avoid contamination of the blood sample
If there is no free lumen for routine bloods, the sample can be taken from a lumen with IV fluids in progress. The IV pump should be ‘paused’, all lumens clamped and the IV line is disconnected carefully for blood sampling
If all the lumens are being treated with antibiotic locks for line infection, it is still possible to obtain a blood sample when the antibiotic lock is due to be changed. Following removal of the previous antibiotic flush, obtain the usual discard volume of blood using a 10ml syringe, then using a 2nd 10ml syringe withdraw appropriate volume of blood needed for blood samples. This will avoid frequent blood sampling from a peripheral vein.

**Needle free devices / Clamps.**
There is a needle free system in use on all IV devices in OLCHC. There are many other needle free devices available.
The hub of the Hickman catheter should always be protected with a **luer lock** device. It should be changed weekly.
The clamp is kept closed, while disconnecting an IV line, changing a needle free device and when the Hickman catheter is not in use. The clamp must only be closed over the reinforced catheter sleeve to prevent damage to the catheter.
4.4 IV Administration Sets / Drug Administration

IV administration sets:

IV administration sets connected to the Hickman line should be changed every 48 hours. However, patients who are neutropenic or on Total Parenteral Nutrition (TPN) should have administration sets changed every 24 hours.

Attach a label with the date and time of change.

The use of three-way taps is not recommended.

When IV Buretrol infusion sets are used for intermittent medication administration, they must not be disconnected and reattached for subsequent medication infusions later. Where possible use a free lumen to administer bolus medications. If there is no free lumen, and IV fluids are in progress, it is possible to use the injection port on the IV administration set to administer bolus medications (ensure no incompatible additives are infusing at the same time). Flush with 3ml of Sodium Chloride 0.9% before and after the administration of the bolus medication.

Transfusion sets used for blood and blood products should be discarded on completion of the transfusion.

Chemotherapy administration sets:

IV administration sets used for intermittent chemotherapy administration should be discarded on completion of the infusion. When chemotherapy is given as a continuous infusion over several days, the line must be changed every 72 hours for those patients. Only IV administration sets without an injection port should be used when infusing chemotherapy. When administering or changing chemotherapy infusions, gloves, goggles and an apron should be worn as per the OLCHC policy and Department of Health Guidelines (1996).

4.5 External Catheter dressings

Hickman exit site dressings should be changed weekly using an Opsite IV 3000 ‘1-hand’ dressing. If patient become sensitive to the Opsite dressing, a Mepore type of dressing can be used. The frequency of dressing changes will be governed by the condition of the underlying wound.
4.6 **Guidance for dressing changes in Hickman catheters:**

During immediate post op period and for the first 7 days post insertion of Hickman catheter, the following algorithm should be used.

**Note:** It is important that the initial dressing applied over the exit site in the operating theatre should remain in situ for 7 days if possible to allow the catheter cuff to become secure. The dressing on the neck wound should be removed after 48 hours, leaving the steri-strips in situ until the wound has healed.

### Questions

#### 1) Is the exit site bleeding on the day of insertion?

- **Yes:** Leave dressing intact and apply pressure dressing over theatre dressing. Reassess. If bleeding continues change dressing as required and contact the relevant Haematology/Oncology Consultant.
  - If bleeding stops reassess and consider cleaning the exit site and changing the dressing (theatre dressing and pressure dressing). Use Mepore type of dressing for low to moderately exuding wounds. **Take care not to dislodge the catheter.**
  - N.B. Loop catheter under the dressing to prevent catheter dislodgement.

- **No:**

  #### 2) Are there signs of infection - redness, swelling, purulent discharge?

- **Yes:** Remove dressing. Take swab from the site. Review by doctor. Clean the exit site; apply local antibiotic cream as directed. Reassess and change dressing every 24 hours using Mepore/gauze type dressing. Follow up swab result. If no improvement, consider systemic *antibiotic therapy.*

- **No:**

  #### 3) Is the child pyrexial and neutropenic?

- **Yes:** Remove dressing and examine the exit site for redness, swelling, and purulent discharge. Take swab from the site and blood cultures from catheter lines. Start antibiotics as per febrile neutropenia protocol.

- **No:**

  #### 4) Is the dressing loose and the site exposed or dirty?

- **Yes:** Change dressing as per OLCHC policy

- **No:**

  #### 5) Has the dressing been in situ for 7 days? If no, leave the dressing intact and change after 7 days.

- **Yes:**
### 4.7 Hickman Catheter Infections:

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain Blood cultures from all lumens if the child is febrile or experiences rigors during or after flushing the catheter</td>
<td>To determine cause of infection and enable treatment with appropriate antibiotics</td>
</tr>
<tr>
<td>If febrile and neutropenic follow febrile neutropenia protocol. Treat infected lumen/s with appropriate antibiotic lock</td>
<td>To treat infection</td>
</tr>
<tr>
<td>Administer systemic antibiotics via non-infected lumen if all lumens are infected give systemic antibiotics via a peripheral line</td>
<td>To ensure all lumens are appropriately treated and systemic antibiotics administered</td>
</tr>
<tr>
<td>If initial culture result is <strong>positive</strong>, re-culture catheter and commence appropriate antibiotic locks, If this re-culture is <strong>negative</strong> at 48 hours, and the child is clinically well and afebrile, discontinue antibiotic locks, If this re-culture is <strong>positive</strong> at 48 hours, continue antibiotic locks and repeat cultures on Day 6. Continue the antibiotic locks daily until the Day 6 (48 hour) result is available, If Day 6 (48 hour) culture is <strong>negative</strong>, remove antibiotic lock and discontinue, If Day 6 (48 hour) culture remains <strong>positive</strong>, re-culture and continue daily antibiotic locks for a further 48 hours. If these remain <strong>positive</strong> contact OLCHC.</td>
<td>To identify new organisms To determine what further action is necessary</td>
</tr>
</tbody>
</table>

### Management of Hickman Catheter Infection:

An infected Hickman catheter **should be suspected** when a child presents with a documented rise in temperature following flushing of the catheter. It may be associated with a chill or rigor and a period of being ‘unwell’ and may settle spontaneously.

**Mandatory Investigations:**

- **Obtain Blood Culture from each lumen:** aspirate first 1 ml of blood. When using separate aerobic and anaerobic culture bottles, place 0.5 ml into each bottle. When using a combination aerobic/anaerobic culture bottle, place 1 ml in the bottle. Label each bottle according to the hospital and laboratory policies.
- **Full blood count**
- **Peripheral blood culture for both aerobic and anaerobic cultures.** Label each bottle as per the hospital and laboratory policies.

**Management of patients with Hickman Catheter line Infections:**

Patients with a suspected Hickman catheter infection are treated empirically by daily intra catheter Gentamicin locks until the culture results are obtained.

- If a gram positive organism is identified, switch antibiotic lock to Teicoplanin and treat for 7 days (  )
- If a gram negative organism is identified continue Gentamicin locks as per policy
- If no organism is identified, remove Gentamicin lock .
- If the culture shows fungal infection, discuss with the relevant Haematology/Oncology team in OLCHC.
- Occasionally Amphotericin B intra catheter lock is used in patients with fungal infection of the line.

In-patients who are febrile but no clinical suspicion of infected catheter, all lumens are cultured and await results prior to commencing lock. If this initial lumens culture is positive, a repeat culture is obtained from the lumens prior to starting the antibiotic locks. If this repeat culture is negative and the child is clinically well and afebrile, discontinue the antibiotic locks. The catheter is re-cultured on day 6 (before the sixth dose), and locks continue until a 48 hr result of that culture is clear (i.e. patients receives a minimum of 7 doses of appropriate antibiotic locks). If the culture remains positive, antibiotic locks are continued and the lumen is re-cultured on alternate days until a 48 hr result is clear.
Re-culturing of Infected Hickman Catheter

To re-culture the Hickman line: 8 hours before the next dose of antibiotic lock is due, remove the antibiotic locks from the line, instill 2.5 ml of Heparin Sodium 10iu/ml flush into the line. After 8hrs take Hickman catheter culture and then instill the appropriate antibiotic locks as prescribed).

In case of persistent systemic infection, please contact the Haematology/Oncology team in OLCHC for advice and re management. If the patients are neutropenic they must be treated with systemic broad spectrum antibiotics as per febrile neutropenia policy along with intra catheter antibiotic locks.

Peripheral cultures

If peripheral blood culture grows gram positive Cocci, add systemic Teicoplanin at a dose of 10mg/kg 12 hourly x 3 doses then 10mg/kg once daily.

Where all the lumens are infected, a peripheral line should be inserted for systemic antibiotics, intravenous fluids and for blood products. This should be re-sited every 72 hours if the patients are neutropenic (OLCHC policy) until the Hickman line infection has resolved.

Preparation of Antibiotic Locks: General Instructions:

All instructions are based on largest volume Hickman line ie 2ml. Please refer to the individual patient's information located in patient’s medical notes and operating notes for priming volumes for individual lumens. This is particularly relevant for patients < 3 kgs. If no priming volume information is available, please use the priming volume guide below:

4.7.1 Hickman Catheter Exit Site infections

If the Hickman exit site appears red, inflamed or a discharge is evident, a swab for culture and sensitivity from the exit site should be taken. If the exit site has a discharge a Mepore type dressing should be used, to allow exudates to be absorbed. The dressing should be changed daily. Ensure that the catheter is firmly secured to prevent accidental dislodgement whilst the exit site is infected.

Depending on the sensitivity of the exit site infection appropriate topical and / or antibiotic treatment is applied. Consult with the team re treatment choice.

If the infection spreads to include the skin tunnel and tracks upwards, IV antibiotics will be required. The catheter may require removal if IV antibiotics are ineffective. If the patient is neutropenic and febrile follow appropriate antibiotic policy. If the patient is neutropenic and afebrile, please consult with the relevant team regarding treatment choice.

Refer to the Paediatric Haematology/Oncology Team in OLCHC supervising the child’s treatment for specific guidelines.
Management of Tunnel and Exit Site Infections

**Tunnel Infection**

All Patients: swab exit site for c/s

- **Afebrile / Febrile Non-neutropenic patients**: swab exit site for c/s
- **Febrile Neutropenic patients**: swab exit site for c/s

**Exit site Infection**

All Patients: swab exit site for c/s

- **Afebrile Neutropenic**: swab exit site for c/s

**VANCOMYCIN OR TEICOPLANIN IV**

(If Vancomycin resistant staphylococci)

- **No Improvement, or worsening of Infection, Contact OLCHC team**
- **No Improvement after 2-3 days**

**ORAL FLUCLOXACILLIN**

check with Haematologist/Oncologist for dosage and duration

**PIPERACILLIN/TAZOBACTAM + GENTAMICIN**

As part of broad spectrum antibiotics

**No Improvement after 2-3 days**

**SUBSTITUTE**

TEICOPLANIN/ VANCOMYCIN IV Add LINEZOLID IV if VRE present

**ADD**
4.8 Troubleshooting

**Occlusion**
Obstruction secondary to thrombus formation is one of the complications associated with CVAD. If the line is blocked it will not flush or yield blood on aspiration. Do not attempt to apply force to unblock the totally occluded catheter as it may cause rupture of the catheter or dislodge a catheter embolus. Always check the following - cuff position, the line is not kinked and the clamp is open. Consider asking the patient to change position and cough, as this may improve blood flow. Contact medical personnel as Urokinase may need to be prescribed to unblock the line occlusion (see).
A dye study may need to be performed in OLCHC to assess the cause of the obstruction.

**Catheter dislodgement**
Hickman catheters may accidentally get pulled or dislodged. If so the Dacron cuff of the catheter may become visible. Secure the catheter with steri-strips and a chest x-ray should always be performed to identify the position of the catheter tip. *Do not use the line until it is confirmed and safe to use once again.*
If the catheter falls out, apply a sterile dressing over the exit site and apply direct pressure over the entrance site (neck site) and the exit site to stop any bleeding. A chest x-ray should be performed to ensure that there is no residual tubing in situ. Contact Haematology/Oncology Team in OLCHC for further advice.

**Extravasation**
CVAD’s have decreased the incidence of extravasation. Whilst the incidence of extravasation is lower, the severity of the injuries is far greater as detection tends to occur later and is therefore more serious requiring immediate management. Extravasation can occur as a result of a leaking or damaged catheter, fibrin sheath formation or port needle dislodgement. (See Chapter 7 for details). It may present clinically as leakage of fluid around the catheter exit site, dull aching pain in the shoulder area, tingling, burning or a warm sensation of the chest wall or fever of unknown origin.

**Hickman Catheter Damage**
Catheter damage may occur in the form of a weakness / splitting of the catheter wall resulting in leakage from the catheter.

<table>
<thead>
<tr>
<th>Action</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamp the catheter between the patient and above the damaged area with a smooth-edged, atraumatic clamp</td>
<td>To prevent air entering the catheter via the damaged area and to prevent any blood loss.</td>
</tr>
<tr>
<td>Seal damaged area with a sterile occlusive dressing (IV Opsite 3000).</td>
<td>To prevent infection and air entry.</td>
</tr>
<tr>
<td>Determine the site of damage i.e. which lumen, size and type of catheter.</td>
<td>To identify appropriate repair kit and ensure a good repair.</td>
</tr>
<tr>
<td>Check if there is at least 2 inches of undamaged catheter beyond the skin exit site.</td>
<td>At least 2 inches (or 2.5 inches) of intact catheter beyond the skin exit site is needed to be able to repair the body of the catheter.</td>
</tr>
<tr>
<td>Repair catheter (performed in OLCHC). Follow the surgeon’s instructions as to when the line can be used again.</td>
<td>To restore catheter function. To ensure full mechanical strength of the repaired joint</td>
</tr>
<tr>
<td>Take cultures from all lumens 24-48 hours after the catheter repair</td>
<td>To screen for infection following damage / manipulation.</td>
</tr>
<tr>
<td>Ensure the child/parents are familiar with the clamping / taping procedure if damage should occur at home.</td>
<td>Damage may occur to the catheter in the home setting.</td>
</tr>
</tbody>
</table>

Child will need urgent referral to OLCHC for catheter repair.

4.9 Hickman Catheter Protocols:

**Hickman Catheter – Guidelines for General Care**

**Handwashing:**
Thorough hand washing should be observed prior to handling the catheter. High standards of general hygiene should be maintained and always encouraged with children and parents. When changing nappies always ensure the catheter is away from the nappy area.

**Baths / Showers:**
Children with Hickman catheters may have a bath or shower according to their preference. Before having a bath or shower, the Hickman line must be secured out of the way e.g. by wrapping the catheter in cling film and taping it securely onto the shoulder. The cling film must be removed immediately afterwards. The dressing must be kept dry at all times, and must be changed if it becomes wet after the bath / shower. **Baths:** The child may sit in a shallow bath of water. **Shower:** The child may have shower avoiding direct water pressure over the site.
4.9.1 Securing a Hickman Catheter: Hickman Catheter Dressing, Flushing, Changing Needle Free Device:
The Hickman catheter should be looped under the dressing for additional security, to reduce the effect of pulling on the catheter. For infants, the catheter should be secured further with an adapted baby vest, the seamstress at OLCHC will be happy to make this adaptation to the patient’s own vests.
A ‘Freddie Bag’ or crop top may be used for older children to secure the catheter. Adolescents may prefer ‘Cath-Secures’.
When the Hickman catheter is attached to IV fluids extra care is needed to prevent the lines being caught or pulled, particularly for babies and young children.

DECONTAMINATE HANDS and collect the following:

Requirements for single lumen:

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tray (plastic)</td>
<td>1</td>
</tr>
<tr>
<td>10ml Syringe</td>
<td>1</td>
</tr>
<tr>
<td>Filter straw</td>
<td>1</td>
</tr>
<tr>
<td>Heparin sodium (10 iu per ml IV flush solution) 5ml</td>
<td>1</td>
</tr>
<tr>
<td>Disposable disinfection wipes x 8</td>
<td></td>
</tr>
</tbody>
</table>

Note: For each additional lumen you will need: 10 ml syringe x 1, filter straw x 1, needle free device x 1, Heparin Sodium (10 unit/ml) 5ml x 1, Disposable disinfection wipes x 4

Procedure:
- Decontaminate hands
- Wipe the top surface of the tray with a disinfection wipe and allow it to dry if washable.
- Open the sterile glove packet onto the tray. The inside of this packet is now your “sterile area”
- Carefully open filter straws (s), syringes, needle free device and dressing onto the glove packet without touching the contents
- Open the disinfection wipes onto the packet in the same way
- Check the expiry date on the bottle of Heparin Sodium (10units/ml), open and leave it beside the tray
- Remove the child’s old dressing taking care not to dislodge the line. The 2nd person or the child can remove the old dressing, having first washed their hands, and taking care not to pull on the line.
- Decontaminate hands again and put on the sterile gloves only if changing dressing and needle free.
- Attach filter straw onto the syringe and draw up 2.5ml of (10 units/ml) of Heparin Sodium. Remove the filter straw. Expel the air by slowly pushing up the plunger. Place the syringe on the tray.
- Unfold all the disinfection wipes except 3 for cleaning the exit site and leave on the tray.
- With one hand (becomes the dirty hand) pick up the Hickman line, pick up a Disinfection wipe in the other hand (clean hand) and remove the needle free device by rotating it to the left, and discard both Disinfection wipe and the needle free device. Pick up another Disinfection wipe (clean hand) and clean the open end of the Hickman line. Discard the Disinfection wipe and allow it to dry for a minimum of 30seconds. Attach (clean hand) the new needle free device to the Hickman catheter by rotating it to the right for a secure fit.
- Attach (clean hand) the 10ml syringe containing Heparin Sodium solution by pushing it firmly into the centre of the needle free device and rotating it to the right for a secure fit. Open (dirty hand) the clamp and slowly withdraw blood to check for the patency of the line, then slowly inject the Heparin Sodium into the line using push – pause method. Close (dirty hand) the clamp as the last 0.5ml is being injected. Remove (clean hand) the syringe and discard it.
- Clean (clean hand) the top of the needle free device with a Disinfection wipe. Discard the disinfection wipe and allow it to dry for a minimum of 30seconds.
- Repeat the same procedure for change of needlefree devices in double and triple lumen catheters.
- Pick up (dirty hand) the Hickman line, taking care not to pull on it. Pick up (clean hand) a Disinfection wipe and carefully clean the skin around the exit site in a circular movement. Start at the catheter exit site. Discard the Disinfection wipe.
- Repeat the cleaning procedure with 2 other Disinfection wipes moving a little further out from the exit site each time.
- Now with the remaining Disinfection wipe (clean hand) gently clean the line from the exit site to the end of the line, taking care not to pull on the line, then discard
- For a double or triple lumen Hickman catheter, use a separate Disinfection wipe for each lumen, to clean from the triangle area down to the end of the catheter
- Loop the Hickman line on to the chest wall. The patient himself/herself or a second person (having washed their hands) may hold the loop in place. Place the dressing over the exit site securely and press out any air under the dressing. Place Hickman line in to a “Freddie bag” or Cath Secure
- Dispose of needle s and syringes into the sharps bin, and other equipment appropriately
- Decontaminate hands.
The care and management of all CVADs should follow the guidance below

4.9.2 Taking Blood Samples from the Hickman Catheter

DECONTAMINATE HANDS and collect the following:

Requirements:
- Clean tray + Sterile preparation towel
- 10ml syringe x 4
- Non injectable bung x 4
- 0.9% Sodium Chloride solution 10ml x 1
- Heparin Sodium (10 units /ml IV solution) 5ml x 1
- Disposable disinfection wipes x 3

Procedure:
- Decontaminate hands
- Wash the tray and dry it with a paper towel
- Open the preparation towel and cover the tray. Check expiry date of 0.9% sodium chloride solution, using a green needle (21g) and 10ml syringe draw up 3ml. Remove the green needle, expel air bubbles and attach a needlefree to the syringe tip. Place the syringe on the tray.
- Draw up Heparin Sodium solution 2.5 ml into a separate 10ml syringe using the filter needle. Remove the filter needle, expel air bubbles and attach a needlefree to the syringe tip. Place the syringe on the tray.
- Open the other two 10ml syringes and attach needlefree device to maintain the sterility of the syringe tips and place them on the tray.
- Take the tray, disinfection wipes and blood bottles to the patient’s bedside and explain the procedure to the patient/parents.
- Open the disinfection wipes and place them onto the clean area of the tray.
- Decontaminate hands again before putting on the gloves.
- Carefully clean the centre of the needle free with a disinfection wipe and allow it to dry for a minimum of 30 seconds. Place disinfection wipes under the needle free device.
- Remove the needlefree from a 10ml syringe, attach it by pushing firmly into the centre of the needle free device rotating to the right for a secure fit. Open the clamp and slowly withdraw appropriate discard volume of blood (refer to blood discard volume chart below). Close clamp, remove the syringe by rotating it to the left and discard the blood and the syringe.
- If there is any difficulty in withdrawing blood from the catheter, changing the position of the patient and asking the patient to cough may improve the flow or instill 2-3 ml of 0.9% Sodium Chloride and try again.
- Remove the needlefree and attach another syringe. Open the clamp and withdraw the required amount of blood. Close clamp, remove syringe by rotating to the left, and place it on a clean tray.
- Attach the syringe with 0.9% Sodium Chloride solution (as before), open the clamp and slowly inject 3ml using push – pause method. Close the clamp, remove the syringe by rotating to the left and discard the syringe.
- Attach the syringe with 2.5ml of Heparin Sodium solution inject slowly using push-pause method. Close the clamp as last 0.5ml being injected and remove the syringe as above and discard. Discard the disinfection wipes from underneath the needle free device.
- Carefully clean the centre of the needle free device with a disinfection wipe and allow it to dry for a minimum of 30 seconds. Ensure the catheter is secured safely.
- Place blood in appropriate bottles and label correctly at the patient’s bed side (fill U+E bottle before FBC bottle to prevent EDTA contamination of U+E sample).
- Dispose of needles and syringes immediately into sharps bin and dispose of all other equipment appropriately. Ensure bloods are transported to the laboratory with the appropriate forms.
- Decontaminate hands.

4.9.3 Taking Blood Cultures from the Hickman Catheter:

DECONTAMINATE HANDS and collect the following:

Requirements for a single lumen:
- Clean Tray + sterile preparation towel #
- 10ml syringes x 3
- Green needles (21g) x 3
- Filter straw x 1
- Heparin Sodium (10 unit per ml IV flush solution) 5ml x 1
- Disposable disinfection wipes x 6

1 set of blood culture bottles (Aerobic + Anaerobic bottles), 1 set per lumen, labelled as per hospital and laboratory policy

Sterile glove packet may be used as an alternative to sterile preparation towel, as a sterile field

For each additional lumen culture you will need: 1 set of blood culture bottles, 10ml syringe x 3, green needles x 3, filter needle x 1, 0.9% Sodium Chloride 10ml x 1, Heparin sodium (10 unit/ml) 5ml x 1 and Disposable disinfection wipes x 5, 1 pair of sterile gloves for each lumen.

*Note: If the catheter line needs to be cultured and IV fluids are in progress, stop the IV fluids when ready to start the procedure, follow protocol for “Disconnecting the Infusion Set for Blood Sampling

Special Note: When TPN and /or blood/blood products are infusing do not interrupt, culture on completion of infusion. However the patient’s clinical condition may necessitate discontinuation of infusions and immediate culture of catheter. Seek medical advice.
Procedure:
- Decontaminate hands
- Explain the procedure to the patient and the parents.
- Wipe the tray with a Disinfection wipe and allow it to dry if washable.
- Open the sterile preparation towel onto the tray and open syringes, needles and disinfection wipes onto the sterile field.
- Open glove packet onto work surface beside the tray.
- Check expiry dates on bottle of 0.9% Sodium Chloride, and Heparin Sodium, open and leave within reach of the tray.
- Check the expiry dates on Blood culture bottles. Prepare the blood culture bottles by removing the protective caps and leaving them beside the sterile field.
- Decontaminate hands again. Put on sterile gloves. Place a disinfection wipe on top of each blood culture bottle (2 in total).
- Using green needle(s) draw up 3ml of Sodium Chloride into a 10ml syringe, and using a filter needle draw up 2.5ml of Heparin Sodium (10unit/ml) into another 10ml syringe.
- Holding the catheter in one hand, pick up a disinfection wipe and carefully clean the centre of the needle free device. Allow it to dry for a minimum of 30 seconds. Place a disinfection wipe under the needle free device.
- Attach one 10ml syringe to the needle free device by pushing it firmly into the centre of the needle free device and rotating it to the right for a secure fit.
- Open clamp and slowly withdraw 1ml of blood.
- Close the clamp, remove the syringe by rotating to the left, place blood sample on sterile area.
- Attach the syringe with 0.9% Sodium Chloride to the needle free device as before and slowly inject 3ml, followed by 2.5ml of Heparin Sodium using a push – pause method. Close the clamp as the last 0.5ml is being injected. Remove the syringe as before. Discard the disinfection wipe from underneath the needle free device.
- Clean the needle free device with a disinfection wipe, allow it to dry for a minimum of 30 seconds.
- Remove the disinfection wipes from the tops of the culture bottles and using separate sterile green needle(s), inject 0.5ml of the blood sample into both aerobic and anaerobic culture bottles and label bottles.
- Ensure the catheter is secured safely.
- Send correctly labeled blood culture bottles with appropriate form to the laboratory immediately to avoid unnecessary delays.
- Dispose of all equipment appropriately.
- Decontaminate hands following the procedure.

Note:
When multiple lumens are being cultured, culture each lumen seperately and place the blood samples into the blood culture bottles immediately and label them to avoid confusion. Proceed to the next lumen and repeat as above. Change gloves - a new pair of sterile gloves are needed for each lumen culture.

4.9.4 Administration of Bolus Medication via a Hickman Catheter:

DECONTAMINATE HANDS and collect the following:

Requirements:

Drug(s) to be administered
Drug labels
Clean tray + sterile preparation towel
Prescription chart
Heparin Sodium (IV flush solution) (10units/ml) 5ml x 1
Filter straws for glass vials
Green needles (21g) (1 per syringe) Needlefree (1 per syringe
0.9% Sodium Chloride 10ml (3ml per drug) Sharps Bin
Disposable disinfection wipes x 2

Procedure:
- Decontaminate hands
- Open the preparation towel and cover the tray. Prepare drug in a clean environment using a non-touch technique. Replace the green / filter straw(s) with needlefree to maintain sterility of the syringe tip. Label appropriately and place it on the clean tray.
- Draw up 3ml of 0.9% Sodium Chloride in separate 10ml syringes: one to check the patency of the line at the start of the procedure, one to flush the line after each drug administration. Draw up 2.5ml Heparinised Sodium in a separate 10ml syringe. Replace the green / filter needles with needlefree, label appropriately and place it on the clean tray.
- Each drug must be checked and witnessed by two nurses one of whom must be registered with An Bord Altranais and who will administer the drug.
- Take the tray to the child’s bedside and explain the procedure to the child and the parent. Check the child’s identity band with the drug chart.
- DECONTAMINATE HANDS.
- Pick up catheter in your left hand. Using a Disinfection wipe in your right hand, carefully clean the centre of the needle free device and discard the Disinfection wipe. Allow the needle free device to dry for a minimum of 30 seconds. Do not remove the needle free device.
- Remove the needlefree and insert the syringe with the 0.9%Sodium Chloride firmly into the needle free. Rotate the syringe to the right for a secure fit.
- Open the clamp with the left hand and draw back gently to assess blood return, and then slowly inject 1-2ml of 0.9%Sodium Chloride into the line using push – pause method.
- Close clamp and remove the syringe by rotating it to the left and discard.
- Remove the needlefree from the syringe containing the drug to be administered. Insert syringe as before, (push syringe tip firmly into the needle free device and rotate it to the right for a secure fit)
• Open the clamp and slowly inject the drug using push – pause method.
• Close the clamp, rotate syringe to the left, and remove it.
• Insert the syringe containing Sodium Chloride, open clamp and instil 3ml of 0.9%Sodium Chloride solution to flush the drug as before. If giving more than one drug at a time, flush the line with 3ml of Sodium Chloride between each drug administration and at the end.
• Close the clamp, rotate the syringe to the left and remove it.
• Attach syringe with Heparin Sodium, open the clamp and slowly inject using push – pause method closing the clamp as the last 0.5ml is being injected.
• Close the clamp, rotate the syringe to the left and remove it.
• Carefully clean the centre of the needle free device with a Disinfection wipe and allow it to dry for a minimum of 30 seconds.
• Ensure the catheter is secured safely.
• Dispose of all needles immediately into the sharps bin and other equipment appropriately.
• DECONTAMINATE HANDS.
• Document administered medication in the prescription chart.

4.9.5 Connecting an Infusion set to a Hickman Catheter:

DECONTAMINATE HANDS and collect the following:

Requirements:

- Clean Tray + sterile preparation towel
- Sodium Chloride 0.9% 10ml x 1
- Infusion set
- 10 ml syringe x 1
- Needlefree bung x 1
- Green needle (21g) x 1
- IV fluid prescription sheet
- Sharps bin
- IV fluid for infusion
- Disposable disinfection wipes x 1

Procedure:

- Decontaminate hands
- The IV fluid intended for infusion (and any additive needed) must be checked and witnessed by two nurses
- Prepare the infusion set, maintaining the sterility of the end of the line which will be connected to the Hickman catheter.
- Open preparation towel and cover the tray. Check expiry date of 0.9% Sodium Chloride and using green needle (21g) draw up 3ml into the syringe. Remove the green needle and expel the air bubbles. Attach a sterile needlefree to the syringe and place it on the tray.
- Bring the tray and the infusion set to the child's bedside and explain the procedure to the child and the parent.
- Decontaminate hands.
- Carefully clean the centres of the needle free device with Disinfection wipes and allow it to dry for a minimum of 30 seconds.
- Remove the non injectable bung from the syringe and attach the syringe to the centre of the needle free device by pushing it in firmly and rotating it to the right for a secure fit. Open clamp. Confirm blood return by gently withdrawing blood into the syringe and slowly inject 1-2ml of Sodium Chloride 0.9% using a push – pause method. Close the clamp.
- Remove the syringe by rotating it to the left.
- Remove cap from the IV giving set and connect it to the needle free device by pushing it in firmly and rotating it to the right for a secure fit.
- Do not open the Hickman clamp until ready to commence infusion. Ensure the correct rate is set according to the prescription.
- Dispose of all needles and syringes immediately into the sharps bin and dispose of all other equipment appropriately and Decontaminate hands.

4.9.6 Disconnecting an Infusion set from the Hickman Catheter:

DECONTAMINATE HANDS and collect the following:

Requirements:

- Clean tray + sterile preparation towel
- Gloves – see below
- Sodium Chloride 0.9% 10ml x 1
- 10ml syringe x 2
- Filter straw x 1
- Non – injectable bung x 2
- Green needles (21g) x 1
- Sodium Chloride 0.9% 10ml x 1
- Heparin Sodium Flushing Solution (10 units/ml) 5ml x 1
- Sharps bin
- Disposable disinfection wipes x 3

NB Precaution - when disconnecting blood products / chemotherapy lines use non sterile gloves for staff protection / safe handling of chemotherapy.

Procedure:

- Decontaminate hands
- Open the preparation towel and cover the tray. Check expiry date of Sodium Chloride 0.9% and Heparinised Sodium. Using green needle (21g) draw up 3ml of Sodium Chloride 0.9% and using filter straw draw up 2.5 ml of Heparin Sodium into two separate
syringes. Remove the green needle / filter needle, expel air bubbles and attach a needlefree to each syringe tip. Place the syringes on the tray
• Take the tray to the patient’s bedside and explain the procedure to the patient/parents
• Decontaminate hands
• Use non sterile gloves to disconnect an infusion line containing chemotherapy or blood products.
• Turn off the pump, close line clamp and clamp the Hickman catheter
• Holding the catheter in one hand, pick up a Disinfection wipes and clean the connection between the IV giving set and the Needle free device, allow it to dry for a minimum of 30 seconds
• Rotate the giving set connection to the left, and detach it from the needle free device
• Carefully clean the centre of the needle free device with another Disinfection wipes and allow it to dry for a minimum of 30 seconds.
• Remove non injectable bung and attach the syringe containing Sodium Chloride 0.9% by pushing firmly into the centre of the needle free device and rotating to the right for a secure fit. Open the clamp and slowly inject 3ml using a push-pause method. Close clamp and remove syringe by rotating to the left and discard
• Remove needlefree bung from the syringe containing 2.5 ml of Heparinised Saline, attach the syringe to the needle free device and inject the solution as above. Close the clamp as the last 0.5ml is being injected. Remove the syringe by rotating to the left and discard
• Carefully clean the centre of the needle free device with disinfection wipes and allow it to dry for a minimum of 30 seconds. Ensure the catheter is secured safely
• Dispose of needles and syringes immediately into a sharps bin and dispose of all other equipment appropriately

4.9.7 Disconnecting the Infusion set from the Hickman Catheter for Blood Sampling:

DECONTAMINATE HANDS and collect the following:

Requirements:
- Clean tray + Sterile preparation towel
- Gloves - see below
- 10ml syringe x 3
- Blood bottles
- Non – injectable bung x 4
- Green needles (21g) x 1
- Sodium Chloride 0.9% 10ml x 1
- Sharps bin
- Disposable disinfection wipes) x 4

NB Precaution - when disconnecting blood products / chemotherapy lines use non sterile gloves for staff protection / safe handling of chemotherapy

Procedure:
• Decontaminate hands
• Open the preparation towel and cover the tray. Check expiry date of 0.9% Sodium Chloride solution, using a green needle (21g) draw up 3ml into the syringe. Remove the green needle, expel air bubbles and attach a needlefree bung to the syringe tip. Place the syringe on the tray.
• Open the other two 10ml syringes and attach the needlefree bungs to maintain the sterility of the syringe tips and place it on the tray.
• Take the tray and the unopened needlefree bung and disinfection wipes to the patient’s bedside
• Explain the procedure to the patient/parents
• Open the disinfection wipes and non injectable bung and place on the tray
• Decontaminate hands again before putting on gloves
• Pause the infusion pump and clamp all lumens
• Holding the catheter in one hand, pick up a Disinfection wipes and clean the connection between the IV giving set and the Hickman catheter
• Rotate the giving set connection to the left, and detach it from the needle free device. Place the non injectable bung on to the exposed end of the giving set and leave it aside
• Carefully clean the centre of the needle free device with Disinfection wipes allow it to dry for a minimum of 30 seconds. Place a Disinfection wipes under the needle free device
• Remove the needlefree bung from a 10ml syringe; attach the syringe by pushing firmly into the centre of the needle free device and rotating to the right for a secure fit. Open the clamp and slowly withdraw appropriate discard volume of blood (refer to blood discard volume chart below). Close clamp, remove the syringe by rotating it to the left and discard the syringe
• If there is any difficulty in withdrawing blood from the catheter, instill 2-3 ml of 0.9% Sodium Chloride and try again. Additionally ask the patient to cough or change position as this may improve the blood flow.
• Remove the needlefree bung and attach 2nd 10ml syringe (as before), open the clamp and withdraw the required amount of blood. Close clamp, remove syringe by rotating to the left, and place it on the tray
• Attach the syringe with Sodium Chloride 0.9% (as before), open the clamp and slowly inject 3ml using the push – pause method. Close the clamp; remove the syringe by rotating to the left. Discard the Disinfection wipes from underneath the needle free device
• Carefully clean the centre of the needle free device with a Disinfection wipes and allow it to dry for a minimum of 30seconds. Remove the needlefree bung from the IV giving set and re-connect it to the catheter. If the IV giving set is due to be changed, attach a new IV giving set at this time
• Place blood in appropriate bottles and label correctly at the patient’s bed side (fill U+E bottle before FBC bottle to prevent EDTA contamination of U+E sample). Recommence the fluid regime as prescribed.
4.9.8. Instillation of Antibiotic/Antifungal into the infected Hickman/Broviac Catheter

Please refer to the individual patients priming volume. This is vital for patients < 3kgs Gentamycin levels for this group should be monitored on alternate days.

If no priming volume information is available from the time of Hickman catheter insertion, please use the priming volume guide below. These instructions are based on the largest volume Hickman catheter which is 2ml. Is that 2ml per lumen? - 1.5ml in each lumen for largest line in chart =4.5ml?

**Priming Volume Guide** (when no information available)- add chart

**DECONTAMINATE HANDS and collect the following:**

**Requirements:**
- Clean Tray + Sterile preparation towel
- Gloves (non sterile)
- Non injectable bung x 2
- Prescription sheet
- Filter needle x 1
- 2ml syringe x 1
- Label for Hickman line
- 10ml syringe x 1 (to remove old flush)
- Sharps Bin
- * 10ml syringe x 1 extra for blood sampling
- Disposable disinfection wipes (70% Isopropyl alcohol and 2% Chlorhexidine gluconate) x 4
- Antibiotic:
  - Gentamicin 20mg/2ml vial x 1
  - OR
  - Teicoplanin 400 mg vial x 1
  - OR
  - Water for injection x 1
  - OR
  - Conventional Amphotericin B 50mg vial (Fungizone®) x 1
  - OR
  - Water for injection x 3
  - OR
  - Heparin Sodium Preservative Free (1,000unit/ml) **NB note dose**

**Procedure:**
- Follow the universal precautions of hand washing and non touch technique
- Wash the tray and dry it with a paper towel
- Check prescription chart for antibiotic dose for catheter lock
- Prepare the antibiotic lock as follows:
  - **Gentamicin:** Wipe the top of Gentamicin 20mg vial with a Disinfection wipe and allow it to dry for a minimum of 30 seconds. Using the 2ml syringe with a green needle, draw up 2ml (20 mg) of Gentamicin. Into the same syringe using a filter needle draw up 0.2ml of Preservative Free Heparin (1000 units/ml) and mix it with the Gentamicin in the syringe (total volume 2.2ml). *(Special Note: Monitor Gentamicin levels if the patient is also receiving systemic Gentamicin or less than 3kg)*
  - OR
  - Teicoplanin: Wipe the top of the Teicoplanin 400mg vial with a disinfection wipe and allow it to dry for a minimum of 30 seconds. Using a 5ml syringe and filter needle draw up 3 ml of water for injection. Replace the filter needle with a new green needle and slowly add to the vial. Do not shake. When dissolved using the 2ml syringe and a green needle draw up 2ml of Teicoplanin (267mg). Into the same syringe using a filter needle draw up 0.2ml of Preservative Free Heparin and mix it with the Teicoplanin (total volume 2.2ml).
  - OR
  - Amphotericin B: Wipe the top of the Amphotericin 50mg vial with disinfection wipe and allow it to dry for a minimum of 30 seconds. Add 10ml of water for injection and shake well = 5mg /ml solution. Using a 5ml syringe draw up 1ml of 5mg/ml solution, add 4ml of water for injection to the syringe and mix thoroughly = 1mg/ml solution. Withdraw 2ml of 1mg/ml solution into 10ml syringe and add 8 ml of water for injection = 200microgram/ml solution. Using the 2ml syringe draw up 2ml of 200microgram/ml solution. Using the same syringe and a filter needle, draw up 0.2ml of Preservative Free Heparin 1000 units/ml (total volume 2.2ml).
  - OR
  - Ascertain the priming volume of the infected lumen. Carefully discard the excess volume of antibiotic flush from the syringe keeping only the priming volume amount. Remove green / filter needle, and attach a non-injectable bung and place it on the tray.
- Bring the tray to the child's bedside and explain the procedure to the child and the parent. Check the child's identity band against the drug prescription chart.
- Decontaminate hands again and put on the gloves.
- Holding the infected lumen in one hand, pick up a Disinfection wipe and carefully clean the centre of the needle free device and discard the Disinfection wipe. Allow it to dry for a minimum of 30 seconds. Place a Disinfection wipe under the needle free device. Attach a 10ml syringe by pushing it firmly into the centre of the needle free device, and rotate it to the right for a secure fit. Open clamp and slowly withdraw appropriate volume of blood (to remove last lock). Close the clamp and remove the syringe.
• Attach the syringe containing the prescribed antibiotic to the needle free device. Open the clamp and slowly instil required lock volume. Close the clamp, remove the syringe and discard. Discard the Disinfection wipe from underneath the needle free device.
• Carefully clean the centre of the needle free device with a Disinfection wipe, and allow it to dry for a minimum of 30 seconds.
• Label the catheter ‘Gentamicin or Teicoplanin or Amphotericin B lock in situ’ and ensure that the catheter is secured safely.
• Dispose of needles and syringes immediately into sharps bin and dispose of all other equipment appropriately.

Important – Please note:
When intra-Hickman lock is in situ, the same lumen should not be used for systemic antibiotics, IV fluids or blood products. Always ensure the previous antibiotic flush is removed before instilling the next one.

On day 6 the infected catheter lumen must be recultured. Remove the lock in situ 8 hours before the next dose of antibiotic lock is due. Instill Heparin 10 units/ml flush (lock volume) into the lumen. After 8 hours, aspirate 1ml of blood, place 0.5ml in each of the culture bottles (aerobic and anaerobic) (see Section 6.10.5). Reinsert antibiotic locks as prescribed and await culture reports.

If lumen cultures are negative, discontinue the lock. Ensure the last dose of antibiotic lock is removed from the catheter lumen. Flush with 0.9% Sodium Chloride and Heparin Sodium (10unit/ml). The antibiotic label should also be removed from the line.
If the lumen culture remains positive, locks are continued and the lumen is re-cultured on alternate days until a 48 hr result is clear. If it remains positive seek advice from OLCHC Haematology / Oncology consultant.

Vancomycin Locks:
Management of Broviac/Hickman catheter infection in children and infants >3kg only:
Add 9.7ml water for injection to vancomycin 500mg vial and allow to dissolve.
Withdraw 0.2ml of this solution (10mg vancomycin) and add this to 4.8ml of 0.9%w/v Sodium chloride and mix thoroughly. Withdraw 2ml (4mg) Vancomycin
Draw up 0.2ml of preservative free heparin 1000 units/ml and add to 2ml vancomycin (total volume 2.2ml).
Ascertain the priming volume of the lumen/s of infected catheter (written on catheter port or in the case of Broviac/Hickman line, check theatre operating sheet).
Discard the excess volume from the syringe.
The volume instilled in the lumen should be equal to the priming volume of that lumen.
Repeat procedure for other lumens
Label the catheter, stating the drug used, concentration, and time added.
Vancomycin lock is administered as a single daily dose
Remove lock after 24 hours and instil fresh lock.

N.B: The antibiotic lock solution should never be flushed through the line at the end of the 24 hours but should be withdrawn from the line and discarded. Flushing the lock solution through the line will result in very high concentrations of antibiotic reaching the systemic circulation.
Note: for infants <3kg with catheter infection contact the Infectious Diseases Team.

Important – Please note:
When intra-Hickman lock is in situ, the same lumen should not be used for systemic antibiotics, IV fluids or blood products. Always ensure the previous antibiotic flush is removed before instilling the next one.

On day 6 the infected catheter lumen must be recultured. Remove the lock in situ 8 hours before the next dose of antibiotic lock is due. Instill Heparin 10 iu/ml flush (lock volume) into the lumen. After 8 hours, aspirate 1ml of blood, place 0.5ml in each of the culture bottles (aerobic and anaerobic) (see Section 6.10.5). Reinsert antibiotic locks as prescribed and await culture reports.

If lumen cultures are negative, discontinue the lock. Ensure the last dose of antibiotic lock is removed from the catheter lumen. Flush with 0.9% Sodium Chloride and Heparin Sodium (10unit/ml). The antibiotic label should also be removed from the line.

If the lumen culture remains positive, locks are continued and the lumen is re-cultured on alternate days until a 48 hr result is clear. If it remains positive seek advice from OLCHC Haematology / Oncology consultant.

4.9.9 Instillation of Urokinase into a Blocked Hickman Catheter:

Important – Please note:
These guidelines are for the use by staff in OLCHC from Haematology/Oncology unit who have been trained in the management of blocked Hickman catheters. In local hospitals it may be appropriate for the medical staff to carry out this procedure.

*Please do not attempt to unblock totally occluded catheters unless trained to do so as it may cause rupture of the catheter or dislodge a catheter embolus.
Decontaminate hands, collect prescription and the following:

**REQUIREMENTS**
- Clean tray + Sterile preparation towel
- Vial of Urokinase (10,000 units) x 1
- Green Needle (21g) x 1
- Needlefree bung x 1
- 2ml Syringes x 1
- Water for injection x 1
- Disposable disinfection wipes x 4

(In OLCHC Syner-KINASE® brand of Urokinase is currently being used, please note: dilution fluid for this brand is 0.9% w/v Sodium chloride. If in doubt please read the summary of product characteristics and also check with OLCHC Pharmacy staff).

**Procedure:**
- Follow the universal precautions of hand washing and non touch technique
- Check prescription chart for drug dose.
- **Decontaminate hands again.**
- Open the cap of the Urokinase bottle; clean the top with a Disinfection wipe allow it to dry for a minimum of 30 seconds. Dissolve vial of Urokinase (10,000 Units) with 2ml of water for injection. The concentration of Urokinase should always be 5,000 units per ml. It should not be further diluted.
- When dissolved, if the priming volume of the blocked lumen is known, draw up the known amount of Urokinase into the syringe. Remove the green needle, attach the non injectable bung and place on the tray. However, if the priming volume is unknown draw up 1ml (5000 Units) in a 2ml syringe for children <3 years and for children > 3 years use 2ml (10,000 Units).
- Bring the tray to the child’s bed side. Explain the procedure to the child and the parent. Check the child’s identity band against the drug chart. Decontaminate hands again.
- Ensure the line is clamped. Clean the centre of the needle free device with a Disinfection wipe, allow it to dry for a minimum of 30seconds. Remove the non injectable bung from the syringe containing the Urokinase and attach it to the centre of the needle free device firmly, rotating to the right for a secure fit. Open the clamp and slowly inject. Do not force the fluid into the catheter. Close the clamp. Clean the needle free device with a Disinfection wipe and allow it to dry for a minimum of 30seconds.
- Label the lumen to identify that Urokinase is in situ with date and time of instillation. The child must remain in the ward due to the risk of anaphylaxis. Ensure Piriton and Hydrocortisone injections are available, and medical staff is readily available.
- After one hour remove the Urokinase from the line by aspirating 4 to 5 ml of blood to ensure removal of Urokinase plus clots.
- If the line is unblocked and there is a blood return, follow the usual flushing procedure; flush with 3ml of 0.9% Sodium Chloride, followed by 2.5ml of Heparinised sodium, closing the clamp as the last 0.5ml is being injected.
- If the line remains blocked, please contact the Team for further advice. It may be necessary to repeat the procedure using the original volume of Urokinase and leave in situ for 4-6 hours. If it remains blocked after the above procedures, contact the relevant team in OLCHC.
- For persistent occlusion, the same procedure can be repeated and left in situ overnight or a continuous infusion of Urokinase 200 Units/kg/hr for 24hours can be attempted (performed in OLCHC). This approach does not require intensive monitoring of the patient or assessment of coagulation parameters.
- **Note:** For occlusions secondary to TPN and medication incompatibilities please consult with the Team in OLCHC for further advice.
5.0 Central Venous Access Devices: Implantable Ports

Introduction
An implanted venous access device consists of a portal body attached to a silicone catheter. It is implanted subcutaneously in a convenient but inconspicuous location on the body, usually on the chest. Implanted ports require little care of the site because of the intact skin layer over the accessible port. They also require minimal flushing and permit easy access for fluids and/or medications. There is less interference with daily activities and body image is not threatened by the presence of a catheter.

The catheter is inserted under general anaesthetic. A semi circular incision is made to create the pouch to hold the port and a separate incision usually in the neck is made to locate the vein into which the catheter will be placed. After one end of the catheter is placed in a suitable vein the other end is locked to the port and fluid is injected to ensure the system is working properly. The port is then placed in the skin pocket and secured in place with stitches. The port may be used immediately following insertion.

There are two basic parts to the system:
- The port – A small plastic chamber sealed at the top by a rubber disc (septum) designed to withstand multiple punctures.
- A thin catheter – one end is placed into a vein inside the body and the other end firmly attached to the portal with a special lock.

General Principles for the care of Implantable Ports

- Aseptic technique should be observed when accessing the Port - A - Cath
- Skin over the port site must be cleaned with Disposable disinfection wipes (70%v/v Isopropyl alcohol and 2%w/v Chlorhexidine gluconate) prior to accessing the port

Flushing and Maintaining Patency
Prior to accessing the port for flushing and taking blood sampling, the documented port volume plus needle volume should be obtained from the patient’s healthcare records.

Note: same general principles regarding flushing and maintaining patency as Hickman catheter applies to Port - A - Cath.

*Note: Parents are taught to do this at home in some situations.

- 100 units per ml of Heparinised saline are recommended to flush the Port- A-Cath® if the device will not be used for 4 weeks to maintain patency.
- 10 units per ml of Heparinised saline can be used after more frequent drug administration or infusion.

Port Access

Local anaesthetic cream e.g. Amethocaine 4% w/w (Huband & Trigg 2011) may be used prior to accessing the port. The skin should be washed with soap and water first to remove the ointment based anaesthetic cream, followed by cleaning with an antibacterial agent such as Chlorhexidine or Disposable disinfection wipes (70%v/v Isopropyl alcohol and 2%w/v Chlorhexidine gluconate) before accessing the port.

A Huber point (non-coring) needle and a 10ml syringe (or larger) should always be used to access the port. In OLCHC a Cytocan® or Gripper ® needle is inserted through the skin and silicone rubber septum into the portal chamber for repeated venous access e.g. for antibiotic therapy. Practitioners who have received specific education and training should access a port. (Please refer to the protocol for insertion of Cytocan/Gripper Needle and Flushing of Implanted ports section in the next page)

The needle may remain in place for up to two weeks. The needle should remain in-situ using an occlusive dressing to avoid needle dislodgement e.g. Tegaderm Opsite dressing.

An advantage of a port is that, when the port is not required the needle access is removed.

The disadvantages of a port are the discomfort associated with accessing the port (especially if placed deeply or in a difficult area to access). This can be overcome with the use of topical anaesthetic cream. However, it still requires the insertion of a needle and for some children this may be unacceptable.

5.1 Insertion of a Cytocan/Gripper Needle and Flushing of Implantable Port:

DECONTAMINATE HANDS and collect the following:

Requirements:
Clean Tray
Sterile gloves x 1 pair
10 ml syringe x 2
Filter Straw x 2
Clear dressing i.e. Tegaderm, Opsite
Needle free device x 1
Gauze x 1 packet
Non-coring Huber needle with extension set (size individual to child)
Heparin Sodium Flushing Solution (10 units/ml) x 3ml
0.9% sodium chloride solution 10ml
Disposable disinfection wipes x 3

Procedures:

- Explain the procedure to the patient and the parent. Apply Ametop cream 45 minutes prior to procedure if requested by the patient. Remove Tegaderm and Ametop from patient’s skin. Wash skin with soap and water to remove the residue.
- Follow Universal precautions of hand washing and collect the following equipment prior to starting procedure.
- Prepare the sterile field by opening the sterile gloves packet onto tray and using the glove packet as a sterile field. Open all sterile equipment onto the sterile field.
- Bring the tray, vials of Heparinised Sodium Flushing Solution (10 units/ml) and 0.9% sodium chloride solution (10ml) to the child’s bedside.
- Check expiry date of 0.9% Sodium Chloride and Heparinised sodium 10 units/ml vial clean the neck of vial with Disinfection wipe and dry it for a minimum of 30 secs. Break off the top and leave it on a flat surface beside your sterile field.
- Decontaminate hands with antiseptic solution and put on sterile gloves.
- Draw up 0.9% Sodium Chloride and Heparinised sodium 10 units/ml into two separate syringes using ampoule straw, remove ampoule straw, expel any air bubbles and place the syringes in the tray. Unfold Disposable disinfection wipes
- Connect needle free device to the Huber needle extension set.
- Prime the extension line using a syringe prepared with 0.9% sodium chloride solution and place on sterile field.
- Clean the port site and surrounding skin using disposable disinfection wipes. Working in a clockwise direction clean from the centre outwards for at least 10cm (4 inches). Use each swab once in one direction only.
- Pick up Huber Needle and syringe in right hand and remove guard from needle.
- Using left hands palpate the edges of the port and hold the outer edge through the skin ensuring port is secure & non-mobile.
- Put the needle firmly through the skin and port at a 90 degree angle until it hits the bottom of the port chamber.
- Check for blood return. Open clamp and flush the line with 10ml of 0.9% sodium chloride solution and remove syringe from needle free device.
- Attach the syringe containing Heparinised saline to the Needle free device. Open clamp and inject the heparin solution, closing the clamp as the last 0.5ml is being injected.
- Removing Huber needle: Whilst withdrawing the needle it is important to maintain positive pressure by pressing down on the port with two fingers as the last 0.5 ml of flush is infused. Apply pressure if oozing. Site may be left exposed following removal of the Huber needle or covered with a dry dressing.
- IF leaving Huber Needle in situ: Cover and secure it with a Tegaderm dressing. If needle is not flush with skin place a small piece of keyhole cut gauze between the skin and needle housing.
- Once accessed the Huber needle may remain in situ for up to 14 days or as per local policy.
- Sterile technique must be adhered to while accessing the port with a hubar needle.
- Once accessed and a Needlefree bung is applied, strict non-touch technique is sufficient and the Port is managed as per Hickman Policy
- Ensure that the child is comfortable and that the line is well secured
- Dispose of all equipment appropriately. Decontaminate hands with antiseptic solution.
- Document procedure in patient’s healthcare records.
4.9.2 Protocol for Blood Sampling from an Implantable Port:
• See section 4.9.2 for details for blood sampling as for Hickman/Broviac

4.9.3 Protocol for taking Blood cultures from an Implantable Port:
• See section 4.9.3 as for Hickman Broviac

4.9.4 Protocol for Administration of bolus medication via Implantable Port:
• See section 4.9.4 as for Hickman Broviac

4.9.5 Protocol for Connecting an infusion set to an Implantable Port:
• See section 4.9.5 as for Hickman Broviac

4.9.6 Protocol for Disconnecting an infusion set from the Implantable Port:
• See section 4.9.6 as for Hickman Broviac

4.9.7 Protocol for Disconnecting an infusion for blood sampling
Access Implantable port as per section 6.14.1

4.9.8 Protocol for Instillation of Antibiotic lock into an infected Implantable Port:
• See section 4.9.7. as for Hickman/Broviac

4.9.9 Protocol for Instillation of Urokinase into a blocked Implantable Port:
• See section 4.9.9 as for Hickman/Broviac

5.2 Troubleshooting

**Port-A-Cath Infection**

**Definition:** A documented rise in temperature in a clinically well child following flushing of the catheter associated with a chill/rigor and transient constitutional disturbance e.g. fatigue or decreased activity that settles spontaneously or with antipyretic measures. (Please follow the same protocol as for the management of Hickman Catheter Line Infections)

**Port Occlusion**

Obstruction secondary to thrombus formation is one of the complications associated with implantable Ports. Do not attempt to unblock totally occluded ports unless trained to do so as it may dislodge a catheter embolus. Contact OLCHC, Haematology/Oncology medical team who may decide that Urokinase may need to be prescribed to unblock the line occlusion. **Implantable Port 5,000 Units of Urokinase (Syner-KINASE® brand) in 1ml of saline**

**Note:** Please follow the Protocol for instillation of Urokinase into a Blocked Hickman Catheter. The same protocol applies to port occlusion also.

**Port Erosion, Splitting of the catheter**

If skin breaks down over the port reservoir seek advice from the Haematology/Oncology Team in OLCHC supervising the child's care. Once port erosion occurs the device usually requires removal. If there is a suspected break on the internal part of the catheter seek advice from the Haematology/Oncology team in OLCHC. The child may need a lineogram to confirm the breakage.

**Port Pocket Infection**

Swelling, tenderness and redness at the port site or along the catheter tract suggests port pocket infection. Please follow the action procedure in the next page when needle not in-situ and needle in-situ
<table>
<thead>
<tr>
<th>If needle not in situ</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Rationale</strong></td>
</tr>
<tr>
<td>If possible avoid accessing the Port</td>
<td>If needle is inserted through the skin into the Port, infection may be introduced into the Port and catheter. If child’s condition dictates or no other venous access available it may be preferable to access the Port. If this action is taken ensure blood cultures are obtained and IV antibiotics are commenced. Contact the medical team at OLCHC supervising the child’s treatment.</td>
</tr>
<tr>
<td>Culture any purulent discharge</td>
<td>To identify cause of infection</td>
</tr>
<tr>
<td>Give IV antibiotics via peripheral cannula for 48 hours</td>
<td>To clear Port pocket infection</td>
</tr>
<tr>
<td>Access the Port after 48 hours. If the infection is responding to IV antibiotics the Port may be accessed and antibiotics continued via Port.</td>
<td>Once infection is treated Port may be used. This is advisable if skin infection has cleared to treat any infection that may have entered the Port</td>
</tr>
<tr>
<td>Check Port daily for signs of skin breakdown</td>
<td>To identify Port erosion. If Port erosion presents contact OLCHC medical team supervising the child’s treatment as device may require removal.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If needle in situ</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action</strong></td>
<td><strong>Rationale</strong></td>
</tr>
<tr>
<td>Do not remove the needle</td>
<td>It has provided a conduit for the infection which may already have entered the port</td>
</tr>
<tr>
<td>Continue to give IV antibiotics via the port for 48 hours</td>
<td>To treat infection if it has tracked through to the port</td>
</tr>
<tr>
<td>If no improvement after 48 hours remove the needle and continue IV antibiotics peripherally</td>
<td>To rest skin. Port has received some treatment with antibiotics</td>
</tr>
<tr>
<td>If improvement in the condition of the skin – continue to treat through the port</td>
<td>Treatment is effective</td>
</tr>
<tr>
<td>Title</td>
<td>Page Number</td>
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<td>----------------------------------------------------------------------</td>
<td>-------------</td>
</tr>
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<td>6.0 Umbilical Venous Catheters</td>
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<tr>
<td>6.6 Complications of removal</td>
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</tbody>
</table>
6.0 Umbilical Venous Catheter

Introduction
An Umbilical venous catheter is a central venous catheter which is used in the first few hours of life for the purpose of delivering infusions for resuscitation and maintenance fluids, blood and blood products and parenteral nutrition. It can also be used as an alternative when peripheral venous access is not possible. Special precautions and guidelines should be followed to prevent rare but often fatal complications. Alternative IV access is ideally sought once the infant is stable between 3-5 days (Loisel et al 1996).

NB: Infants with umbilical arterial catheters are not to be cared for at ward level under any circumstances.

Location
A umbilical venous catheter (UVC) is inserted via the umbilical vein in the umbilical cord, with the tip of the catheter positioned at the junction of the inferior vena cava (IVC) with the right atrium. It is above the diaphragm and beyond the liver at T9-T10 (National Maternity Hospital 2002).

Lifespan of UVC
Usually inserted at birth in maternity hospital or within first 2 days. Maximum 10 -14 days. UVC usually removed within first few days / ASAP once alternative IV access has been established.

6.1 Indications for Use
- Rapid vascular access required for emergency fluid, medications, infusions and blood sampling during resuscitation
- Difficulty establishing peripheral IV access, within a reasonable time or attempts
- Central venous access for the administration of fluids and /or drugs i.e. 12.5% dextrose, TPN.
- CVP monitoring
- Blood and colloid administration (except platelets)

Catheter Sizes
< 1.5 kgs – 3.5 Fg
> 1.5 kgs – 5 Fg (Karlsen 2006)

UVC Catheter Tip Position
Above diaphragm at the junction of inferior vena cava / right atrium on chest X-ray
A lateral chest X-ray may be considered in addition to anteroposterior (AP) view.
NB: Correct position of UVC on x-ray must always be verified by the medical staff prior to use.

6.2. Complications

<table>
<thead>
<tr>
<th>Sepsis (most common complication)</th>
<th>Catheter malposition / migration: leading to Pericardial Effusion/ tamponade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air embolism</td>
<td>o Arrhythmias (i.e. catheter moves into right atrium)</td>
</tr>
<tr>
<td>Pulmonary / systemic emboli</td>
<td>o Intracardiac thrombus formation</td>
</tr>
<tr>
<td>Thrombosis i.e. intracardiac</td>
<td>o Myocardial perforation, crossing foramen ovale to left atrium</td>
</tr>
<tr>
<td>Necrotising Enterocolitis</td>
<td>o Pericardial effusion / tamponade</td>
</tr>
<tr>
<td>Endocarditis</td>
<td>o Pulmonary and systemic emboli</td>
</tr>
<tr>
<td>Vascular damage</td>
<td>o Endocarditis</td>
</tr>
<tr>
<td>Accidental dislodgement (Schlesinger et al 2002, Karlsen 2006, Royal Prince Alfred Hospital 2007).</td>
<td>o Pulmonary infarction</td>
</tr>
<tr>
<td></td>
<td>o Pulmonary haemorrhage</td>
</tr>
<tr>
<td></td>
<td>o Hydrothorax (catheter perforated or lodged in a pulmonary vein)</td>
</tr>
<tr>
<td></td>
<td>o Hepatic Necrosis</td>
</tr>
<tr>
<td></td>
<td>o Portal Vein Thrombosis</td>
</tr>
</tbody>
</table>
Strict adherence to aseptic technique and handwashing are essential when inserting, moving or accessing a UVC.

6.3 Contraindications
- Exomphalus
- Exomphalitis
- Necrotising Enterocolitis (NEC)
- Peritonitis
- Gastoschesis (National Maternity Hospital 2002, Royal Prince Alfred Hospital 2007)

6.4 Nursing Management of Umbilical Lines
On admission of infant with UVC insitu ensure the following has been documented / handed over:
- Date and time of catheter insertion
- Insertion depth of umbilical catheter
- Radiologic confirmation of catheter tip position
- Further catheter manipulations, as well as the infant’s tolerance of the procedure, blood loss or other complications
- Centimeter marking on the catheter at the umbilical stump at time of insertion
- This information is then used to assess for catheter migration in conjunction with clinical assessment.
- Must be checked a minimum of twice shift to ensure no change has occurred to catheter insertion depth.
  (Bradshaw and Furdon 2006).

<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE EVIDENCE &amp; REFERENCE</th>
</tr>
</thead>
</table>
| **Securing the UVC**
Position and secure the UVC using ‘H-Tapes’.
Ensure tapes are secure and catheter is looped. |
| As umbilical stump sloughs and separates the anchoring suture will no longer secure catheter, therefore ‘H-Tapes’ must secure catheter against movement or accidental dislodgement (Rotunda Hospital 2008). |

Figure 2: Securing of UVC using ‘H’ Tapes.

Place the tubing and catheter away from the infant’s limbs.

Position the nappy well below the insertion site.
NB male infants, position nappy with aim to divert the urinary stream downwards.

**Safety**
Confirmation of satisfactory placement by chest / abdominal x-ray should be confirmed prior to use.
NB: Once inserted the UVC should NEVER BE ADVANCED, only pulled back (medical responsibility).
A repeat x-ray should be undertaken to confirm correct placement before use.

Blood return from UVC should be obtained prior to administering fluids / medications through the catheter.
IV tubing and fluids should be accessed and changed using Aseptic Non Touch Technique (ANTT) level 1.

UVC and needlefree devices should always be visible.
Ensure airtight system and connections secure.

To prevent accidental tension on the catheter which could result in catheter displacement (Royal Prince Alfred Hospital, 2007).

To avoid contamination with urine / faeces.
This would represent an infection risk (Boxwell 2000).

To ensure correct placement / safety and to prevent and reduce the risk if infection (OLCHC 2005, 2007; OLCHC 2010a)

To ensure catheter / system integrity and observe for signs of dislodgement / migration

To ensure timely intervention. Loose needlefree devices / connections promote backflow of blood contributing to blood loss and possible catheter occlusion by clot formation (Bradshaw and Furdon 2006; Rotunda Hospital 2008).
Never leave an UVC open to air.

Attach to standard transducer system (PICU / HDU only) using standard fluid (0.9% Normal Saline + 2 I.U. heparin per ml) i.e. 500mls Normal Saline 0.9% + 1000 i.u. heparin, as prescribed.

Replace all infusion administration sets used with a UVC every 24 hours.

### Monitoring

Observe umbilicus and catheter site closely i.e hourly for:

- Bleeding
- Signs of infection i.e. pyrexia, tachycardia, abnormal full blood count (FBC) i.e. high white cells, low platelets, positive blood cultures.
- Non specific signs i.e. poor handling, desaturation, bradycardia or apnoea may also be due to sepsis.

An UVC should be removed as soon as possible should positive blood cultures be obtained, in conjunction and following medical review and advice.

Check that ‘H-Tape’ /strapping have not loosened and for accidental catheter migration.

Note: cm marking at the skin on UVC and then hourly until removed as clinically indicated.

Reinforce if necessary.

Observe the feet, legs and buttocks and groins for signs of vascular compromise i.e. cool peripheral temperature or compromised peripheral pulses.

Observe for blanching, blueness or mottling of buttocks or lower limbs.

Observe the infant for progressive abdominal distension, hypotension, poor perfusion.

When an infant shows signs of acute deterioration, this may indicate dislodgement of the UVC into heart

Document all observations in the nursing notes.

| The abdominal venous system is under negative pressure. Air can enter the catheter on inspiration and result in air embolism (University of Iowa Children’s Hospital 2008). |
| To maintain line patency, reduce catheter occlusion and allow CVP monitoring (Bradshaw and Furdon 2006). |
| Minimise infection risk (Rotunda Hospital 2008, OLCHC 2010b). Early detection of infection and/or dislodgement and timely intervention (Karlsen 2006). |
| If inadvertent dislodgement of UVC occurs, firmly pinch the abdomen directly above the umbilical stump, along the pathway of the umbilical vein to promote haemostasis (Bradshaw and Furdon 2006). |
| These are potential signs of infection. To remove source of infection and treat promptly |
| To ensure security of catheter position. These are signs of dislodgement/ migration/ obstruction. |
| May indicate vascular compromise and need for possible UVC removal (King Edward Memorial Hospital 2006; Rounda Hospital 2008). Must be urgently considered with signs of hypotension, tachycardia, respiratory distress, oxygen desaturation, muffled or distant heart sounds. These can be life threatening and need to be treated rapidly to ensure patient survival (Bradshaw and Furdon 2006). |
| Continuity of care and to maintain accountability through accurate recording of nursing care (An Bord Altranais, 2002, Dougherty and Lister 2011). |

### 6.5 Removal of an Umbilical Venous Catheter

**Indications**

- Alternative IV access has been established
- UVC is no longer required for IV access
- Evidence of extravasation or leaking catheter
- Proven Candida sepsis or Gram Negative Septicaemia
- Gram positive septicaemia unresponsive to antibiotic therapy in 24-48hours

**Equipment**

- Clean dressing trolley
- Sterile dressing pack and sterile prep towel
- Sterile linen cord tie
- Solution for skin preparation as per local policy
- Sterile container to collect tip of UVC
- Sterile scissors
- Stitch cutter
- Opsite™ dressing
- Sharps bin
- Protective goggles
- Sucrose 24%
- Medication Chart
<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE, EVIDENCE &amp; REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Procedure</strong> &lt;br&gt; <strong>Responsibility for Removal of UVC</strong> &lt;br&gt; Appropriately trained medical / nursing staff may carry out removal following verifying medical instructions. Registered nurses should only remove an umbilical catheter if they have received the necessary theoretical and practical instruction to practice competently, within their scope of practice. <strong>Position</strong> &lt;br&gt; Position infant supine &lt;br&gt; Wrap a small blanket / nappy around both legs. <strong>Pain Relief</strong> &lt;br&gt; Ensure the infant is receiving some pain relief measures i.e. facilitated tucking, 24% sucrose and non nutritive sucking as prescribed. <strong>Position infant with soother and swaddling both legs as condition allows.</strong></td>
<td>To ensure patient safety (An Bord Altranais 2000). To ensure adequate visibility of the UVC. To immobilise the infants’ legs. To ensure comfort and prevent / minimise pain and distress (Trigg and Mohammed 2006). Sucrose via the intra-oral route has been demonstrated to have evidence based analgesic actions for minor invasive procedures in neonates. The sweetness of sucrose appears to elevate pain thresholds via endogenous opioid pathways and result in decreased crying in the infant. Sucrose last approximately 3 – 5minutes with a peak action at 2 minutes.  (Noerr 2001, Mitchell and Waltman 2003, Stevens et al. 2004, Hockenberry et al. 2007). Effects of sucrose are intensified with sucking allowing containment during the procedure and reduced stress (Folk 2007). To maintain infants neural thermo temperature whilst ensuring close observation of patient and easy access to UVC insertion site. To have a baseline set of observations and allow monitoring throughout the procedure. To ensure the procedure is completed smoothly (Dougherty and Lister 2011). To prevent cross infection (OLCHC 2010a). This creates a clean field for dressing pack. Ensures maximum efficacy of disinfection wipe(Pratt et al, 2001) To prevent cross infection (OLCHC 2010a). Careful assessment allows early identification of colonisation or infection of the insertion site. (Dougherty and Lister 2011). To prevent cross infectionOLCHC 2010a). Cleaning the site helps to prevent contamination of the catheter on removal. (Dougherty and Lister 2011). To facilitate removal. (Dougherty and Lister 2011). To minimise and prevent bleeding. Clamping and pressure is applied to prevent haemorrhage and to encourage resealing of the vein wall. It also prevents the entry of air into the vein. (Woodrow 2002).</td>
</tr>
<tr>
<td><strong>Procedure</strong> &lt;br&gt; Ensure all necessary equipment is available. Decontaminate hands, using a aseptic non-touch technique (ANNT) level 3. Clean an appropriate work surface with 70% isopropyl alcohol swab and allow to air dry Lay dressing trolley. Decontaminate hands with antiseptic solution (ANTT) level 3. Apply non-sterile gloves. When an infusion is in progress, clean the needlefree device with an appropriate cleanser. Disconnect infusion from the needlefree device and clamp it. Carefully open ‘H-Tapes’ and lift UVC catheter from tape Assess the insertion site for evidence of infection - redness, ooze or inflammation. Obtain a wound swab for culture and sensitivity (C&amp;S) ensuring no contamination occurs, as clinically indicated. Decontaminate hands with antiseptic solution (ANTT) level 2. Apply sterile gloves Clean umbilical venous catheter insertion site with antiseptic solution as per local policy. Using sterile stitch cutter remove anchor suture(s) securing the catheter. When the umbilical stump (cord) still exists, tie the umbilical tape around it as umbilical catheter is gently removed. This is usually left in situ from the maternity hospital. Alternatively an artery forceps can be used to clamp the vessel.</td>
<td></td>
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</tbody>
</table>
once the UVC is removed, until any bleeding has ceased.
Remove the catheter slowly to the 2 cm mark, the last 2cms are removed very slowly over 2 minutes.
The vessel is clamped with an artery forceps or tied with umbilical tie once UVC is removed.
When the umbilical stump has already fallen off and clamping of the vessel is difficult, pressure can be applied with sterile gauze.
Clamp the vessel or maintain pressure on the swabs for about 5 minutes after the catheter has been removed or until the site is no longer bleeding.
Apply Kaltostat in the event of persistent bleeding in consultation with the medical team.

Apply a sterile occlusive dressing i.e. Opsite™ to the venous access site for a minimum of 24 hours.

Ensure UVC including tip is complete.
Send 5 cm of UVC tip for culture and sensitivity if clinically indicated, i.e. infant unwell and shows signs and symptoms of infection.
The Infant should remain supine for 4-6 hours.

Dispose of all equipment appropriately.
Decontaminate hands with antiseptic solution.
Document procedure in child’s medical notes and nursing care plan.

<table>
<thead>
<tr>
<th>6.6. Complications of UVC Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Infection</td>
</tr>
<tr>
<td>• Thrombosis</td>
</tr>
<tr>
<td>• Catheter malposition</td>
</tr>
<tr>
<td>• Air embolism</td>
</tr>
<tr>
<td>• Haemorrhage</td>
</tr>
</tbody>
</table>

Kaltostat is an external wound dressing designed to absorb exudates and promote haemostasis (Coombe Woman's Hospital 2005).
To protect against entry of pathogens and air.
Residual catheter tract remains an air entry port until completely sealed.
To prevent air emboli (Woodrow 2002).
To detect any infection related to the catheter, and thus provide necessary treatment. (Dougherty and Lister 2011).
To observe umbilical stump for excessive oozing / haemorrhage following removal and early / timely treatment (Royal Prince Alfred Hospital 2007, University of Iowa Children’s Hospital 2008).
To promote safety and prevent cross infection
To prevent cross infection (OLCHC 2011).
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38. Our Lady’s Children’s Hospital Crumlin, National Children’s Hospital & Children’s University Hospital Temple Street (2008) Child Protection Guidelines for the Children’s Hospitals, Our Lady’s Children’s Hospital Crumlin, Dublin.
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