Skin Tunnelled Central Venous Catheters in Children

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Key Amendments

Date	Amendment	Approved by
19th Nov 2020	Document extended for 1 year	Paediatric QIM/Dr J West
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9th Feb 24	Approved with no changes	Paediatric Review Day

Introduction

To maintain patency of the skin tunnelled central venous catheter (CVC), it should be flushed at least weekly with heparin (100 units / ml) (BCH, 2012). All children who are cared for by the paediatric department who have a skin tunnelled central venous catheter in situ are covered by this guideline irrespective of where their care occurs (in-patient or out-patient).

All paediatric patients cared for within WAHT will have their CVC inserted/removed at a specialist paediatric centre (usually Birmingham Children's Hospital – BCH). The insertion/removal of paediatric skin tunnelled central venous catheters will **not** occur at WAHT. The principles of care will therefore usually follow guidance from BCH (as the child's Principal Treatment Centre). The infection rates audits will be co-ordinated by BCH as they co ordinate the care of the lines.

NB: THIS GUIDELINE SHOULD BE READ IN CONJUNCTION WITH;

- **WAHT-PAE-035 'CARE OF AN IMPLANTED CENTRAL VENOUS ACCESS DEVICE (ALTERNATIVELY CALLED A PORT) IN CHILDREN'**
- **WAHT-INF-017 'CENTRAL VENOUS ACCESS CATHETER (CVC) DEVICES GUIDELINE FOR INSERTION AND MANAGEMENT**

Dressings

- A purpose-designed IV dressing is applied to minimise the contamination of the exit site and safely secure the device. The ideal dressing should provide an effective barrier to bacteria, allow the catheter to be securely fixed, be sterile, easy to apply and remove and be comfortable for the patient (RCN 1992, Treston-Aurend et al 1997 cited in WAHT 2006).

- Transparent dressings allow inspection of the insertion site without removal and moisture permeable transparent dressings allow moisture vapour transmission and appear to require only weekly dressings. Therefore if a transparent breathable dressing e.g. IV 3000 is used to cover the insertion site of a CVC, this will reduce the potential for infection and associated costs whilst improving patient comfort (WAHT 2006).

- BCH use a combination of Biopatch and IV 3000 dressings. All children who have a skin tunnelled central venous access device inserted at BCH will receive (on discharge) at least 2 Biopatch dressings for use by practitioners within WAHT for any dressing changes that occur here in the first 3 weeks. After the first 3 weeks following insertion, the Biopatch will not be needed for routine dressing changes (see Appendix 1).

- The BioPatch & IV3000 dressing is changed every 7 days (or more frequently in highly exudative wound –review by BCH will probably need to be arranged if more frequent dressing changes are needed).
- BioPatch dressing should only be used on the individual patient who brings it to WAHT as there are some individuals on whom it should not be used;
    - premature babies as there is a risk of hypersensitivity reactions and necrosis of the skin or
    - patients with a known sensitivity to Chlorhexidine Gluconate. Adverse reactions to Chlorhexidine Gluconate such as dermatitis, hypersensitivity and generalized allergic reactions are very rare, but if any such reactions occur, discontinue use of the BioPatch immediately.
        - (BCH 2009)
- Documentation in the patient's nursing notes should reflect routine assessment and describe the condition of the exit site. The insertion site should be visually inspected and palpated for tenderness at least daily through the intact dressing (Hart 1999)
- It is important to remember that children who have had chemotherapy treatment may be immunocompromised and may not show obvious signs of infection. If any of the following occurs;
    - Redness / tracking / swelling above the exit site
    - Bleeding
    - Pyrexia
    - Pain / tenderness that cannot be explained as post-op pain
    - Soiled / peeling or dislodged dressing,

  The dressing should be reviewed by a senior nurse with oncology experience and/or the child's medical team as appropriate, and swabs taken - advice should be sought from BCH regarding further actions to be taken.
- Patient and family/carer education regarding dressing care and maintenance should be documented in the patient's nursing notes.

Total Parenteral Nutrition (TPN) Administration

If a catheter is to be used for the administration of TPN, certain recommendations should be followed:

- Ideally any skin tunnelled CVC used for the administration of TPN should be used for that purpose only (EPIC 2014).
- Many patients receiving TPN will also be critically ill and it will be necessary to use the skin tunnelled CVC for the administration of other drugs or infusions, monitoring and blood sampling. If this is the case and the catheter has multiple lumens, one should be reserved for the administration of TPN (EPIC 2014, BCH 2014).
- Ideally, the lumen reserved for TPN administration should be a 'clean' lumen, that hasn't been used for any other purpose. However, if it is not possible to access a 'clean' lumen, any other lumen can be used, providing there is no evidence of Catheter Related Sepsis. Routine 'sterilisation' of the lumen with vancomycin prior to use is not necessary (BCH 2014).
- The lumen should be protected by a terminal in-line filter (0.2μm) to prevent debris entering the central venous catheter (Bethune 2001).

The Nutritional Care department at BCH recommend that children who require TPN administration via a skin tunnelled CVC have their catheter accessed using an aseptic technique. (See Appendix 2 for more details on aseptic technique).

There may be other occasions when the use of aseptic technique is more appropriate to access children's skin tunnelled CVCs e.g. when the individual accessing the CVC is unsure of the general cleanliness of the environment e.g. in individual patients home/school.

Surveillance

Surveillance of the catheter should include regular checking for signs of damage, daily examination of the exit site for signs of local sepsis, and the taking of appropriate cultures if Catheter Related Sepsis is suspected.

Documentation in the patients nursing notes should reflect routine assessment and describe the condition of the insertion site. Children and families should be encouraged to report any changes in exit site condition.

Frequency of Flushing

All ports of skin tunnelled CVCs should be routinely flushed (at least weekly when not in use) with an anticoagulant such as Heparinised Saline (100iu per ml) unless advised otherwise by the manufacturer [BCH 2014].
After **all** therapies or blood sampling the catheter should be flushed with 0.9% sodium chloride for intravenous use (Harris 1999).

Maintaining Patency

The patency of the catheter must be checked prior to administration of medications and / or solutions.

Checking For Blood Return

Prior to administration of medications/solutions the catheter should be aspirated and blood return seen to confirm patency. If resistance is met with absence of blood return, the practitioner should take further steps to assess patency of the catheter prior to continuing with medication administration [INS 2006].

Failure to aspirate blood:

- Ask the child/young person to cough, take deep breaths or change their position. Asking the child to flap their arms, lean from side to side or wave their arms in the air may also help blood aspiration. These can be undertaken with the syringe still attached to the hub of the line provided the syringe is held safely to prevent accidental removal and the hub of the line is covered if the child is coughing to minimise infection risk.

- If the change of position/movement does not provide a blood aspirate, the line may be gently flushed with 0.9% sodium chloride in a **10ml syringe only** (RCN 2010). If resistance is felt at any point, the lumen must **NOT** be used and BCH or the Oncology Nurse Specialist for Children and Young People should be contacted for advice on actions to be taken. The position of the line may need to be checked, or urokinase inserted in an attempt to unblock the lumen (see '*occlusion'* section below).

- If it is not possible to aspirate blood from one lumen, it may be possible to aspirate blood from another lumen (if more than one lumen is present). The above actions can be repeated for each individual lumen if blood is not aspirated immediately.

- If it is impossible to aspirate blood from any of the catheter lumens (despite the use of urokinase as described below), it should not be used until the position has been checked. This may indicate occlusion of the lumens, but could also be due to malpositioning of the catheter or migration into an abnormal location.

- A chest x-ray may be taken and the patient referred to a consultant paediatrician or BCH as soon as possible. Review by BCH will be arranged and if necessary, replacement of the catheter.

- If the catheter has more than one lumen, then only those lumens that allow free aspiration of blood should be used, until the catheter position has been deemed satisfactory by a member of the medical or senior nursing staff.

Occlusion

It is important for the patency of the device to be maintained at all times. Blockage predisposes to

- Device damage,
- Infection,
- Patient inconvenience,
- Disruption to drug delivery.

Occlusion of the catheter lumen may be related to thrombus formation, the infusate or kinking and compression of the catheter (DH 2001). No studies undertaken in children show any benefit from subcutaneous heparin, intravenous heparin infusions or flushing the catheter with heparin-containing solutions (BCH 2014).

If the catheter is not in regular use, it should be flushed weekly with a solution containing 100iu/ml of heparin (2mls/lumen). Care must be taken to ensure that babies and infants do not receive a large dose of heparin, when the CVC is flushed. Heparin strengths should therefore be individually prescribed for patients who are under 1 year old (BCH 2014).

Various methods can be used to treat a suspected occlusion of a CVC lumen. Initially, an attempt should be made to flush the lumen with 0.9% saline or heparinised saline in a 10ml syringe (BCH 2014). **Syringes smaller than 10mls should not be used in an attempt to unblock a CVC lumen (Drewett 2000).**

Urokinase or altepase can be used to unblock a thrombosed catheter (BCH 2014). Urokinase is the drug of choice at BCH. As WAHT works in partnership with BCH, it is also the drug used within WAHT paediatric department. Altepase is an alternative, but is not routinely used within WAHT paediatric department.

1) The recommended dose of Urokinase (5000 IU/lumen) should be injected directly into the line using a 10ml syringe **ONLY**. It should be left in situ for 2-4 hours (can be left longer, **BUT no more than 24 hours**).

2) Whenever possible, aspirate the Urokinase before attempting to flush the catheter. If the catheter aspirates and flushes it can be used immediately.

3) If the catheter remains blocked or unusually stiff, repeat as necessary up to a maximum of 3 times. (BCH, 2012; BNF FOR CHILDREN 2014).

If any practitioner (medical or nursing) is unsure of any part of the process to unblock a lumen, BCH should be contacted for advice.

Accidental Removal

All CVCs should be securely fixed at the time of insertion to prevent accidental removal. Ideally, this should include securing with a suture and an occlusive dressing. Small children may not understand the significance of a Central Venous Catheter, regarding it merely as annoying. The catheter should therefore be fixed and arranged in a way that makes it difficult for them to get hold of it (BCH 2014). Advice on safe and effective ways to secure a CVC can be obtained from the Oncology Nurse Specialist for Children and Young People within WHAT or nursing staff at BCH.

Extravasation

This is a rare complication in relation to Central Venous Catheters, but can happen. Ensure that the exit site is observed regularly for signs of extravasation (swelling, redness, pain etc). Any changes should be reported to medical staff immediately (BCH 2010)

Damage to the CVC*:*

The likeliest damage to a CVC is cracking of one of its lumens or the catheter itself. This will usually necessitate removal or replacement of the catheter. However, temporary repair may be able to be undertaken by the child's specialist centre. Please refer to the child's consultant paediatrician or BCH.

Replacement of Hickman lines and Vascuports will require a surgical procedure under anaesthesia, and should only be undertaken if the catheter is infected, blocked or damaged. Discuss with the patient's consultant paediatrician or BCH.

Monitoring Tool

BCH will be informed of any proven skin tunnelled Central Venous Catheter infections that are treated within WAHT– they will audit patients cared for in Worcester as part of their Central Venous Line audits for continuity. The audit criteria used by BCH cover all aspects of the Department of Health High Impact Intervention relating to Central Venous Catheter Care (DH 2007).

Oncology Nurse Specialist for Children and Young People will 'spot check' all staff regularly to ensure compliance with Aseptic Non Touch Technique is maintained.

Accessing Lines

Equipment Required

- Clean dressing trolley, procedure or sharps tray
- Non Sterile Gloves
- 10 ml syringes
- Blue Needle
- Filter Needle
- 0.9% Sodium chloride x1 10ml ampoule
- Heparinised saline (100iu in 1ml) x 1 ampoule
- 70% Isopropyl alcohol / 2% Chlorhexidine gluconate wipes (Sani-Cloth CHG 2%)
- New Cap(s)
- Liquid soap
- Alcohol Rub and access to a hand wash basin
- Sharps Box

The number of needles, syringes, heparin and saline depends on the number of lumens to be accessed

Procedure

Action	Rationale
Explain procedure at a level appropriate to child and parent	To ensure informed consent and aid compliance
Put apron on, WASH HANDS using Ayliffe technique	Effective hand hygiene is vital to reduce the risk of contaminating key parts. Reduce risk of cross infection
Clean an appropriate work surface/tray and allow to dry	To safely hold equipment/sharps whilst reducing cross infection
Collect equipment together	To ensure contamination of gloves does not occur once they are in use
Check the saline and heparin solutions strength and expiry dates. Ensure an independent second check also occurs by an appropriately qualified member of staff.	To ensure correct dosages are administered
CLEAN HANDS with alcohol rub and ALLOW TO DRY	To disinfect physically clean hands prior to putting gloves on

Action	Rationale
Put on non-sterile gloves	To comply with universal precautions when handling body fluids. Helps prevent cross infection.
Open a syringe and place onto a clean surface, **ENSURE** the key part does not touch the surface	Prevents contamination of key parts during removal from packaging
Using the blue needle, draw up 5mls of the saline solution into a second syringe	
Remove needle, dispose of safely and place syringe onto clean surface, **ENSURE** key part does not touch the surface	Safe handling of sharps reduces the risk of needle stick injuries
Using the filter needle, draw up 2mls of the heparin solution into a third syringe	Filter needles reduce the risk of glass particles entering the line
Remove needle and dispose of safely	Safe handling of sharps reduces the risk of needle stick injuries
Place syringe onto a clean surface, **ENSURE** key part does not touch the surface	Prevents contamination of key parts
Open your wipes and place onto your clean surface – do not unfold	Unfolding the wipes can lead to them drying out quickly
Ensure child is sitting comfortably and the line is exposed. If the line needs to be exposed ask your child or a helper to do this for you. **DO NOT** move child's clothes to access the line with your gloves on. If you need to move clothing / bed linen, do this before you put your gloves on or change gloves once line is exposed. Use alcohol gel in between gloves if they need to be changed.	Effective hand hygiene is vital in maintaining a clean technique. Hands may become contaminated by handling clothing etc
Pick up the line just above the cap	

Action	**Rationale**
Ensure the line is clamped	Prevents accidental air entry whilst the hub is exposed
Remove the cap and discard	
Using a wipe, clean around the hub of the line and discard. Repeat if necessary	Effective against bacteria, fungal and viral organisms
ALLOW TO DRY	Disinfection is only complete if allowed to dry
Attach empty syringe and undo the clamp	
Draw back on the syringe to remove blood from 'dead space' (approx 3mls) in the line	Ensures correct positioning of the line
Reclamp line, discard syringe and replace with syringe containing saline and unclamp line	Reduces the risk of cross contamination
Firmly and gently flush the line with the saline, a pulsating action is recommended. Clamp the line when all the saline has been instilled.	Pulsating action is recommended to prevent any build up of debris inside the line
Remove the syringe and replace with the syringe containing heparin	
Unclamp the line	
Firmly and gently instil the heparin solution into the line **BUT** clamp the line just before all the heparin is instilled.	Clamping under positive pressure helps to ensure line blockage does not occur
Remove the syringe and wipe the hub with a clean wipe if contamination has occurred	The hub may have become contaminated with blood during the discard/sampling process
Allow to dry and replace the cap with a clean one	
Repeat the procedure with all lumens using different wipes and equipment	
Make the line secure and comfortable for the patient	
Dispose of all equipment safely and appropriately	
Clean tray	Reduces the risk of cross contamination
Remove gloves and wash hands	Reduces the risk of cross contamination

Appendix 1

Exit Site Dressing for Long-Term CVCs (BCH 2008)

Purpose and Objectives

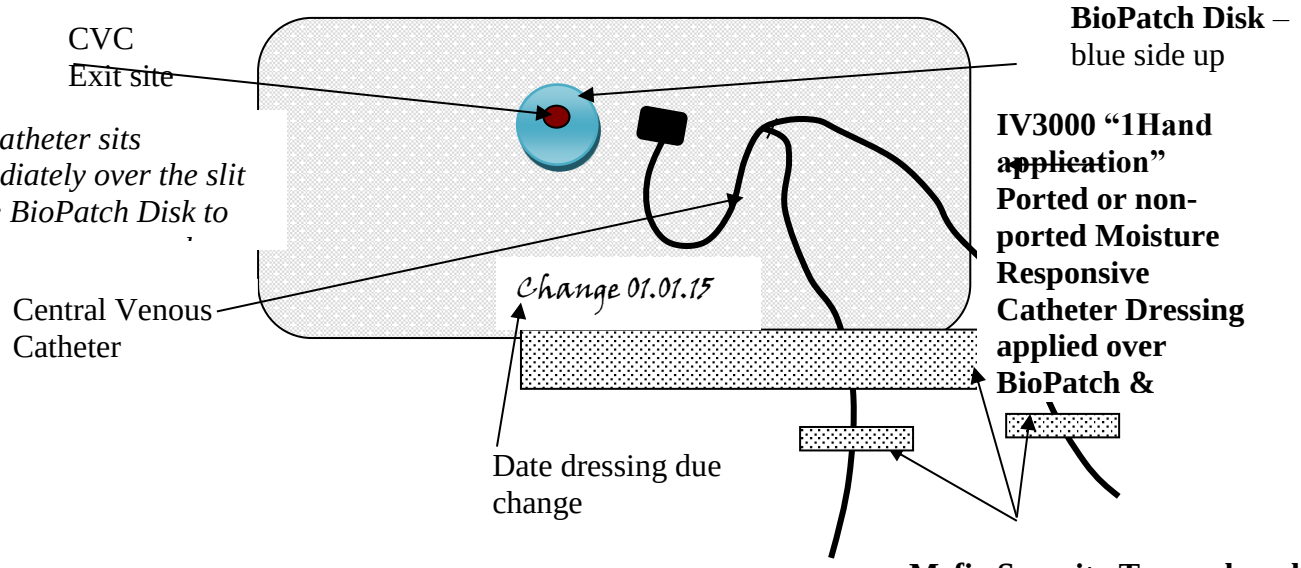
These guidelines provide guidance on the management of Central Line Exit Site Dressings post insertion and are intended to help reduce the incidence of lines lost through "fall out".

As Worcestershire Acute Hospitals NHS Trust Paediatric department works in partnership with Birmingham Children's Hospital for the care of children with skin tunnelled central venous catheters, it has been decided that BCH guidelines will be followed, see below (BCH 2008)

Dressing Procedure for 1st Three Weeks Post Insertion

– The child undergoing a central venous catheter insertion returns from the operating theatre with a BioPatch Disk around the catheter (Blue side up) with an IV3000 Standard Moisture Responsive Catheter Dressing (10cm x 14cm) immediately over the exit site and line looped in a "Lazy S" shape. There will be mefix tape along the base of the dressing and across each lumen to take weight off the dressing and the exit site. Looping the line and securing each lumen reduces pull on the exit site if the hub end of the line is pulled.

Theatre Dressing 0-3 wks



– The date of the next dressing change is identified on the dressing using a narrow permanent marker pen. The date is prepared on the dressing by nursing staff during the preparation for the procedure stage. Using Aseptic Non-Touch Technique the nurse will reapply alcohol gel to the hands after touching the pen. The dated dressing with the sterile backing intact can remain sitting in the clean tray or in its outer packaging on a clean surface until needed.

– This BioPatch / IV 3000 dressing is changed weekly for 3 weeks exactly as shown in the diagram above to allow tissue growth around the line and begin to achieve fixation.

– A senior nurse with experience of changing central line dressings undertakes dressing changes required in the first 3 weeks.

- Prior to dressing change, all persons involved including parents / carers present wash hands and apply alcohol gel.
- The nurse gathers and prepares the equipment needed to remove and reapply the dressing (as per diagram) using aseptic non-touch technique. Consider need for microbiology swab.
- Nurse(s) and patient / carer are comfortable and sitting in suitable secure position for the dressing change. Two nurses or a nurse & HCA undertake dressing changes in young children, to ensure the child is safely restrained during dressing change, preventing the line being pulled.
- The nurse re-applies alcohol hand rub and puts on non-sterile gloves.
- The nurse removes the old dressing holding the line secure onto the child's chest while the assisting nurse / HCA keeps the child occupied / still. The IV3000 dressing is removed by loosening a corner or edge of the film and stretching the dressing parallel to the patient's skin, **while holding the catheter in place**. (Two practitioners may be required to ensure the child is immobile and the catheter is held in place.) The dressing is repeatedly stretched and peeled back until removed. The BioPatch will come away with the IV3000 film without dislodging the catheter providing the BioPatch was placed with the slit underneath the catheter.
- The exit site may be swabbed and, if necessary because of blood or serous fluid oozing, cleaned with saline soaked gauze using a single wipe per gauze swab. The area is dried with dry gauze – single wipe per swab.
- All exit site infections will be reported to the child's medical team at BCH.
- The area is wiped with a suitable mixture of CHG and Alcohol – concentration depends on individual patient needs and availability of products. Please contact the Oncology Nurse Specialist for Children and Young People or a senior nurse with oncology experience for further advice about suitable products.
- Cavilon can be applied to skin which is fragile (e.g. BMT patients) prior to applying the IV3000 dressing but should not be placed under the BioPatch as this may reduce the effect of the CHG being released from the patch. Cavilon will act as a protective barrier on fragile skin, will help the IV3000 to adhere and will make removal of the dressing more comfortable for the patient.
- Place mefix tape along the base of the dressing and across each lumen to take weight off the dressing and the exit site, especially if the catheter is connected to infusion lines which may pull on the dressing. **Skin fix patches are not suitable in the first 3 weeks after line insertion as the line / lumens can slip through the dressing.**
- The nurse clears away equipment, removes gloves and re-washes hands at the end of the procedure.
- The patient is checked and can return to their usual activity.
- The nurse documents the dressing change and any relevant findings in the unified case notes, and reports any untoward findings to the child's medical team, e.g. signs of infection.
- The theatre dressing is replaced exactly as described above each week for the first 3 weeks, i.e. 2 dressing changes post theatre, before a CVC maintenance dressing is used (described below).

Procedure for Dressings from Week 3 to Week 12 Post Insertion

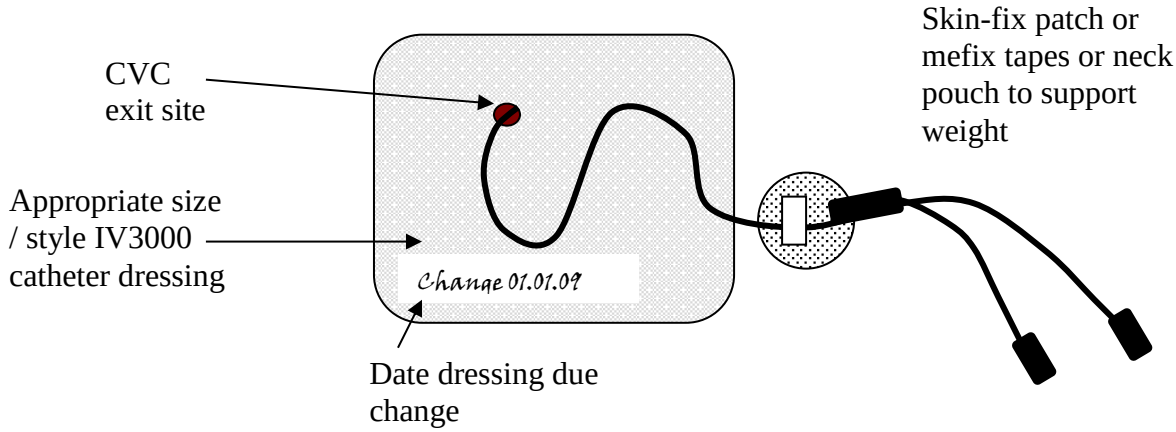
- 3 weeks post CVC insertion the theatre style dressing is to be removed and suitable dressing applied as per the EPIC guidelines for a further 9 weeks (i.e. up to 12 weeks post insertion). Parents / carers are taught how to do these dressings at home using good hand hygiene and ANTT if they wish to learn. They are also taught what signs and symptoms to report, and how and when to report.

    1. Ideally the patient continues with weekly IV3000 dressings without the BioPatch Disk. Dressing changes include;

        - cleaning any physical dirt with gauze soaked with saline
        - drying with fresh gauze and
        - wiping with CHG/Alcohol (same % mixture as used previously during the first 3 weeks dressing changes)
        - reapplying the IV3000.

    2. Patients who cannot tolerate IV3000 can use Mepore which should be changed daily to enable the exit site to be viewed (as the Mepore is not transparent).
    3. Patients with severe fragile skin problems (e.g. BMT patients with GVHD skin) can use Mepilex Border dressings which should also be changed daily to view the exit site – please seek advice from the Oncology Nurse Specialist for Children and Young People with Cancer, a senior nurse with oncology experience or BCH if this is needed within WAHT.

- These second phase dressings should continue looping and securing the line with tape or skin fix patch.



After 12 Weeks

- After 12 weeks post CVC insertion, the exit site does not need to be dressed if it is dry and healed. Young children may need tubinet vests to prevent them from playing with line. Older children may prefer continued use of skin-fix patches or use a neck pouch to prevent tugging on the line.
- Patients should have a daily bath (with shower head) or shower and let the clean shower water clean the exit site. Do not immerse the line under water. Oncology patients should have their own clean towel separate to other family members to dab dry the exit site.

(Taken from BCH 2009)

Appendix 2

Accessing a skin tunneled central venous catheter to be used for the administration of Total Parenteral Nutrition

Equipment required:

- Clean dressing trolley, procedure or sharps tray
- Dressing pack
- Sterile gloves
- 10ml syringes
- Filter needle
- Blue Needle
- Alcohol 70%/chlorhexidine 2% solution or wipes
- Heparin solution 100 units/ml (canusal) for IV administration
- 0.9% saline for IV administration
- Liquid soap
- Alcohol hand rub
- Sharps box

Explain procedure at a level the child understands

Clean appropriate work surface or tray

Tip dressing pack on to surface

Wash hands using Ayliffe technique

Open dressing pack by holding corners of paper only

Open sterile equipment onto pack

Open wipes and drop onto sterile area or pour solution into gallipot

Check saline and heparin solutions for strength and expiry date – ensure second check is completed by an appropriately qualified member of staff

Break open the ampoules and stand next to the clean surface

Wash hands again or apply alcohol hand rub and allow to dry

Put on sterile gloves

Using needles draw up heparin solution and saline (as prescribed) into 10ml syringes

Remove needles and dispose of safely

Ensure child understands the procedure and ensure sitting comfortably with the line exposed

If the child is to assist ensure they have washed their hands or applied alcohol gel

Place the dressing towel or sterile glove paper under the line

With gauze soaked in spirit or a wipe pick up the line above the cap

Using another soaked gauze or wipe remove the cap

Discard onto a dirty area

With a clean gauze or wipe clean the hub of the line and repeat if necessary

Allow to dry

Attach the empty 10ml syringe and ask the child/parent to unclamp

Draw back to remove fluid/dead space (approx 3mls) in the line

Re-clamp the line, discard syringe and replace with syringe containing saline

Gently push 3-5 mls saline into the line

Re-clamp the line and dispose of saline syringe onto dirty area

Attach syringe containing heparin solution and ask for clamp to be opened

Firmly but gently push 2mls heparin solution using a pulsating action, and asking for the line to be clamped prior to expelling all the heparin solution

Apply a luer lock cap to safely occlude the line

Repeat the procedure for each lumen with new equipment

Ensure that the line is secure and comfortable

Dispose of equipment safely

Remove gloves

Clean trolley/tray and wash hands

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