Aims
1. Explain the use of Central Venous Access Devices (CVADs).
2. To highlight the care of the following Central venous access devices:
   - Non-tunneled CVADs
   - Tunneled CVADs
   - Peripherally Inserted Central Catheters (PICCs)
   - Midline catheters
   - Totally Implantable Vascular Access Devices (TIVADs) or ports/portacath
   - CVADs used for blood processing.
**Objectives:**

- Demonstrate supplies required for care of Central Venous Access Devices (CVAD’s).
- State the importance of using aseptic technique when working with CVAD’s.
- State the possible complications in relation to working with individuals with CVAD’s.
- State what to do if air embolism is suspected.
- Locate NHS Dumfries and Galloway’s Procedures related to Central Lines;
  a) Insertion, Care and Removal
  b) Blood Sampling
  c) Maintaining Patency

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**Caring for individuals with CVAD**

In order for nursing staff to care for individuals with CVAD’s they must have completed the following:

- Vascular Access Management Course (courses available via Clinical Nurse Education Team);
- Completion of NES: Aseptic Technique—(Infection Control Section) Module 77 - Long Term Central Vascular Access Devices (3 yearly);
- Anaphylaxis training (online or face to face) (3 yearly);
- NES Intravenous Medication Administration if required.

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**What are Central venous access devices (CVAD’s)**

Central Venous Access Device or CVAD, is a broad term that includes many types of catheters (thin, flexible hollow tubes) that are inserted into and positioned within a vein in the body to deliver therapies to the bloodstream.

**Types of Central Venous Access Devices (CVAD’s) are:**

- Non-tunnelled CVAD (central line/ CVC/ neck line)
- Tunnelled CVAD (Hickman line)
- PICC line
- Midline
- Totally Implantable venous access device (Portacath)
Insertion and removal of CVADs

Insertion of a CVAD is an invasive procedure which must only be performed by personnel trained and assessed as competent to do so. Placement should comply with current best practice guidelines, including full barrier precautions, Chloraprep 2% as skin preparation as this combines the benefits of rapid action and excellent residual (ongoing) activity except in cases of hypersensitivity. In such cases, alcoholic betadine should be used. Whether the catheter is inserted under general anaesthetic, sedation or simple local anaesthetic will depend upon the situation, the patient, the type of catheter to be inserted and local practice.

Post Insertion Checks:

- Catheter tip position and any complications are verified by chest x-ray following insertion unless the tip has been screened during insertion using Fluoroscopy i.e. in the Radiology Department.
- Lines placed via the femoral routes do not need a post procedure x-ray.
- Line tip position must be clearly documented before the line is used (please note line inserted in theatre and emergencies situations may be accessed without x-ray confirmation).

CVAD Removal:

CVADs should be removed as soon as possible if they are not needed. CVAD removal should only be attempted by those assessed as competent to do so.

The techniques used for the removal of a CVAD will depend on the type of catheter and are described in the care of sections.

Care of non-tunnelled CVAD’s (central line/ CVC/ neck line)

A non-tunnelled CVAD is an invasive line that is placed in a large vein. The tip of the catheter lies within the proximal third of the superior Vena Cava, the Right Atrium, or the Inferior Vena Cava. A non-tunnelled CVAD is made up of multiple lumens, each lumen is independent of each other. Each lumen exits into the blood stream at different points along the line.

General points - Always use aseptic technique when accessing the non-tunnelled CVAD. The use of “sterile field” must be used when accessing the non-tunnelled CVAD. Clinical judgement should be used as certain patients may require sterile dressing packs and sterile gloves, for example, neutropenic patients (neutrophil count <0.5) require sterile gloves and dressing packs.

- Change Bionectors every 7 days.
- Decontaminate the Bionector hub: scrub the hub for 15 seconds prior to each use - 70% isopropyl alcohol wipe and allow to air dry for 30 seconds.
- Disconnect and flush line promptly on completion of treatment to avoid blockage

- Flush with 20mls of 0.9% normal saline has been agreed (Although patients clinical condition may determine a different flush volume, for example a level 2 or level 3 patient may only require 5ml flush to number of times line accessed and patients fluid status).

- If clearing the line for example after inotropes and vasopressors, the discard volume is 5mls.

How to flush Use a brisk ‘push-pause’ flushing technique flush briskly,
pausing briefly after approximately each ml of fluid. Clamp the line while the final 1ml of the flush is being injected slowly. Maintaining positive pressure helps prevent blood entering the catheter after flushing, which might lead to occlusion or thrombus formation.

- If taking bloods from non-tunnelled CVAD the discard volume is 5mls.

**Site care - always use aseptic technique when accessing the CVAD**
- Chloraprep 3mls should be used to clean the exit site at dressing changes. The site should be cleaned for 30 seconds using a back and forth technique. It is vital that the Chloraprep is allowed to dry (this can take up to 2 minutes) before applying the Biopatch.
- Change every 7 days (or sooner if dressing becomes wet, soiled, loose or detached). The date that the dressing has been changed should be documented on the dressing.

**Bathing & Showering:** Patient should not get the dressing wet. If possible provide a waterproof covering for bathing and showering e.g. cling film or plastic bag with bottom cut out and taped in position. Change dressing if the dressing becomes wet or ineffective.

**Blood cultures:** If a catheter-related blood stream infection is suspected, paired blood cultures should be obtained from peripheral site and catheter. There is no discard volume.

**Removal of non-tunnelled CVAD**
Non-tunnelled CVAD should be removed as soon as possible if they are not needed.

**Who can remove non-tunnelled CVAD?** Any qualified nurse who is IV trained and has been assessed as competent in CVAD care and who follows these guidelines. The tip of the CVAD should only be sent for culture and sensitivity if there is clinical suspicion of infection.

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**Care of a tunneled CVAD (Hickman Line)**

They are more comfortable and discreet than the non-tunnelled CVAD, and can stay in situ for much longer because of the tunnel that separates skin exit site and the vein entry site. The tunnelled CVAD is inserted via the Subclavian, Jugular or Femoral veins. There is a ‘cuff’ within the tunnel to which fibrous tissue will adhere, usually in the 2 to 3 weeks following insertion. At the end of this time, the sutures can be removed. The embedded ‘cuff’ helps to prevent accidental dislodgement and also acts as a mechanical barrier to ascending bacteria.

**General points**- Always use aseptic technique when accessing the tunnelled CVAD.
- The use of “sterile field” must be used when accessing the non-tunnelled CVAD. Clinical judgement should be used as certain patients may require sterile dressing packs and sterile gloves, for example, neutropenic patients (neutrophil count <0.5) require sterile gloves and dressing packs.
- TKO Bionectors must be used. Change TKO Bionectors every 7 days
- Decontaminate the TKO hub: scrub the hub for 15 seconds prior to each use 70% isopropyl alcohol wipe and allow to air dry for 30seconds.
- Disconnect and flush line promptly on completion of treatment to avoid blockage.
- Flush with 20mls of 0.9% normal saline has been agreed (Although patients clinical condition may determine a different flush volume, for example a level 2 or level 3 patient may only require 5ml flush to number of times line accessed and patients fluid status).
How to flush
Use a brisk 'push-pause' flushing technique flush briskly, pausing briefly after approximately each ml of fluid. Clamp the line while the final 1ml of the flush is being injected slowly. Maintaining positive pressure helps prevent blood entering the catheter after flushing, which might lead to occlusion or thrombus formation.

- If taking bloods from tunnelled CVAD the discard volume is 5mls.
- If clearing the line for example after inotropes and vasopressors, the discard volume is 5mls.

Site care - always use aseptic technique when accessing the CVAD
- Chloraprep 3mls should be used to clean the exit site at dressing changes. The site should be cleaned for 30 seconds using a back and forth technique. It is vital that the Chloraprep is allowed to dry (this can take up to 2 minutes) before applying Biopatch
- GripLok plus IV 3000 dressing. Change every 7 days (or sooner if dressing becomes wet, soiled loose or detached). The date that the dressing has been changed should be documented on the dressing.

Bathing & Showering: Patient should not get the dressing wet. If possible provide a waterproof covering for bathing and showering e.g. cling film or plastic bag with bottom cut out and taped in position. Change dressing if the dressing becomes wet or ineffective.

Blood cultures If a catheter-related blood stream infection is suspected paired blood cultures should be obtained from peripheral site and catheter. Blood cultures need to be taken from each lumen. There is no discard volume.

Removal of tunnelled CVAD
Tunelled CVAD should be removed as soon as possible if they are not needed. Do not remove tunnelled CVAD unless you have been specific training for the removal of tunnelled CVAD. The tip of the CVAD should only be sent for culture and sensitivity if there is clinical suspicion of infection.

Care of PICC line
PICCs, like tunnelled CVADs, are intended for mid to long term use (up to 6 months or sometimes longer) in patients who require multiple infusions of fluids, blood products, drugs or Parenteral Nutrition. Unlike tunnelled CVADs, PICCs do not have a "cuff" to secure the catheter. There is nothing to keep the PICC in place unless it is secured to the skin of the patient’s arm using, steristrips or a dedicated fixing device such as Secura Lok or SecurAcath or Griplock. Checking the external length of the PICC should be a routine part of care when changing PICC dressing. External length should be documented on the invasive device bundle.

General points- Always use aseptic technique when accessing the PICC.
- The use of “sterile field” must be used when accessing the PICC.
- Clinical judgement should be used as certain patients may require sterile dressing packs and sterile gloves for example neutropenic patients (neutrophil count <0.5) require sterile gloves and dressing packs.
- The PICC must not be used for blood sampling.
- The PICC must not be used to administer IV CT contrast via pressure injector.
- TKOs must be used on PICCs. Change TKOs every 7 days.
- Decontaminate the TKO: scrub the hub for 15 seconds prior to each use 70% isopropyl alcohol wipe and allow to air dry for 30 seconds.
- Avoid compression to vein containing the PICC. Do not use blood pressure cuff on PICC arm. Any bandage / tubular dressing must be loose.
- Use volumetric pump with a filtered giving set when infusing blood products to avoid blockage.
- Disconnect and flush line promptly on completion of treatment to avoid blockage.
For midlines and PICCS the lumen should be flushed with **10mls of 0.9% normal saline prior** to IV infusion/bolus, followed by a **20mls flush of 0.9% normal saline flush after** IV infusion/bolus.

**How to flush:** Use a brisk 'push-pause' flushing technique flush briskly, pausing briefly after approximately each ml of fluid. Clamp, the line while the final 1ml of the flush is being injected slowly. Maintaining positive pressure helps prevent blood entering the catheter after flushing, which might lead to occlusion or thrombus formation.

- Testing for flashback is not recommended as it may increase the risk of occlusion.

**Site care - always use aseptic technique when accessing the CVAD**

- Chloraprep 3mls should be used to clean the exit site at dressing changes. The site should be cleaned for 30 seconds using a back and forth technique. It is vital that the chloraprep is allowed to dry (this can take up to 2 minutes) before applying Biopatch.

- GripLok plus IV 3000 dressing. Change every 7 days (or sooner if dressing becomes wet, soiled loose or detached). The date that the dressing has been changed should be documented on the dressing.

**Bathing & Showering:** Patient should not get the dressing wet. If possible provide a waterproof covering for bathing and showering e.g. cling film or plastic bag with bottom cut out and taped in position. Change dressing if the dressing becomes wet or ineffective.

**Removal of PICCs. PICCs** should be removed as soon as possible if they are not clinically needed.

**Who can remove PICCs?** Any qualified nurse who is IV trained and has been assessed as competent in CVAD care and who follows these guidelines.

**Care of Midline**

- The midline should not be confused with a PICC. A midline is **20cm to 25cm in length**, with the tip terminating in the axillary vein. A midline is can be used for any drug that can be given through a cannula and is recommended for patients requiring IV therapy for greater than 10 days. Intravenous drugs suitable for **peripheral infusion** may be given via a Midline. Assess external length of Midline when changing dressing: the external length should be recorded when inserted. **Take care at all times not to pull the Midline out.** Remember there is nothing to keep the catheter in other than the dressing.

**General points-** Always use aseptic technique when accessing the midline.

- The use of “sterile field” must be used when accessing the PICC. **Clinical judgement should be used as certain patients may require sterile dressing packs and sterile gloves, for example, neutropenic patients (neutrophil count <0.5) require sterile gloves and dressing packs.**

- TKOs must be used on Midlines. Change TKOs every 7 days.

- Decontaminate the TKO hub: scrub the hub for 15 seconds prior to each use 70% isopropyl alcohol wipe and allow to air dry for 30seconds.

- The midline must not be used for blood sampling.

- The midline must not be used to administer IV CT contrast via pressure injector.

- Disconnect and flush line promptly on completion of treatment to avoid blockage.

For midlines and PICCS the lumen should be flushed with **10mls of 0.9% normal saline prior** to IV infusion/bolus, followed by a **20mls flush of 0.9% normal saline flush after** IV infusion/bolus.
How to flush

Use a brisk ‘push-pause’ flushing technique flush briskly, pausing briefly after approximately each ml of fluid. Clamp, the line while the final 1ml of the flush is being injected slowly. Maintaining positive pressure helps prevent blood entering the catheter after flushing, which might lead to occlusion or thrombus formation.

- Testing for flashback is not recommended as it may increase the risk of occlusion.

Site care - always use aseptic technique when accessing the CVAD

- Chloraprep 3mls should be used to clean the exit site at dressing changes. The site should be cleaned for 30 seconds using a back and forth technique. It is vital that the Chloraprep is allowed to dry (this can take up to 2 minutes) before applying the Biopatch.

- GripLok plus IV 3000 dressing. Change every 7 days (or sooner if dressing becomes wet, soiled loose or detached). The date that the dressing has been changed should be documented on the dressing.

Bathing & Showering: Patient should not get the dressing wet. If possible provide a waterproof covering for bathing and showering e.g. cling film or plastic bag with bottom cut out and taped in position. Change dressing if the dressing becomes wet or ineffective.

Removal of midlines

Midlines should be removed as soon as possible if they are not needed.

Who can remove Midlines? Any qualified nurse who is IV trained and has been assessed as competent in CVAD care and who follows these guidelines.

Care of Totally Implantable Venous Access Device (Portacath)

The implantable port is similar to a tunnelled line but instead of protruding from the patient’s chest, the catheter terminates in a self-sealing injection port which is implanted under the skin, in sites such as lateral/ anterior chest or upper arm. There are therefore no external parts. The port is accessed through the skin using a dedicated non-coring (gripper) needle by those assessed as competent to do so.

General points- Always use aseptic technique when accessing the Portacath

- The use of “sterile field” must be used when accessing the portacath. Clinical judgement should be used as certain patients may require sterile dressing packs and sterile gloves, for example, neutropenic patients (neutrophil count <0.5) require sterile gloves and dressing packs.

- Only access port using a dedicated non-coring needle with integral extension set with clamp /stopcock.

- Following insertion of the port there may be oedema and tenderness around the site. This may make accessing port painful and more difficult than usual. Ideally port should be accessed while patient is in Interventional Radiology if it is to be used immediately afterwards.

- Use volumetric pump with a filtered giving set when infusing blood products to avoid blockage

- If port in constant use for more than a week, change needle weekly using different puncture site.

- If patient undergoes MRI scan, inform scanning personnel about the port.
Inserting the Non-coring Needle

Which needle? Style: For infusions, a 90° non-coring needle with extension set should be used. For boluses, blood-taking and flushing, a straight non-coring needle with extension set may be used instead if preferred.

Gauge: A 20 or 22-gauge needle will suffice for most uses including blood administration and withdrawal.

Length: Where a 90° needle is used, the length will depend on the amount of subcutaneous tissue between the skin surface and the port. The external part of the needle should not exert pressure on the skin but equally it should not stand too proud. Hint: a 1” needle is suitable for most adult patients. Deeper or more superficial ports will require longer or shorter needles.

Numb skin over the port, if patient requests, using topical local anaesthetic (before skin prep). If patient requires skin numbed it is best to do so 30 mins prior to inserting needle. Therefore if they are an outpatient they should be given the topical local anaesthetic cream and transparent dressing to take home.

Site care - always use aseptic technique when accessing the CVAD. Chloraprep 3mls should be used to clean the exit. The site should be cleaned for 30 seconds using a back and forth technique. It is vital that the Chloraprep is allowed to dry (this can take up to 2 minutes).

Dressings

Non-accessed ports: No dressing or exit site care required (except immediately following insertion of the port, wound should be kept covered until stitches removed and wound healed).

Accessed ports: Pad needle with sterile gauze if necessary and cover with transparent IV dedicated dressing. Needle site should be visible for inspection. Tape tubing firmly to skin to prevent pulling on the needle. Inspect needle entry site at least daily. Advise patient to report any discomfort or swelling at the puncture site immediately.

Removing the needle - Always use aseptic technique when accessing the port

Technique: Lock port with 3mls heparinised saline 100 U/ml*. Ideally, remove needle while injecting last ml to achieve positive pressure finish but use gauze to prevent spray.

Removal

- Implantable ports are usually inserted and removed by Interventional Radiology.

Biopatch

The Biopatch blue sponge disc is designed to help reduce infections. The disk contains chlorhexidine gluconate (CHG) which is an antiseptic. CHG decreases the growth of many micro-organisms and bacteria under the dressing.

Precautions: Biopatch should not be placed over infected wounds. It is not intended to be used as a treatment of device-related infections. Biopatch is a preventive measure, not a reactive measure.

How to apply the Biopatch:
- Clean the skin area using a Chloraprep sponge applicator-allow area to dry, this can take up to two minutes.
- Place the Biopatch around the catheter, making sure that the BLUE side is facing up (you can see the blue side).
- Place the Biopatch dressing around the catheter/pin site so the catheter rests on or near the slit on the Biopatch dressing. The edges of the slit must touch to make sure it works properly. Assure complete contact between the skin and the Biopatch dressing.
- Place a clear dressing over the catheter and Biopatch.

Changing the Biopatch:
- Change the patch as necessary. Dressing changes should occur at a minimum of every 7 days. Dressing changes will be needed more frequently if a lot of blood or fluid is coming from the wound.
- To remove the dressing, pick up the corner of the clear dressing and stretch away from the catheter, holding the catheter in place (dressing will partially lift). Peel back until resistance is felt. Repeatedly stretch and peel as necessary until the dressing is removed.
- The Biopatch dressing will remain attached to the clear dressing and will come away from the skin as you remove the clear dressing.
**Important Information**

Sterile dressing packs must be used and sterile gloves must be worn when:

- Changing the dressing
- Blood sampling
- Removal of CAVD

**Do not allow air to enter the catheter.** The catheter should never be left open to air entry and all syringes and intravenous administration sets must be carefully primed to prevent air embolism. The negative pressure within the chest may suck air into the catheter during inspiration especially if the patient is sitting up. Best practice is to hold the syringe upside down (perpendicular to chest wall) when accessing line.

**If the catheter possesses an integral in-line clamp, keep it closed** at all other times except when administering or withdrawing fluids. Clamping should always take place at the designated area and never at the thickened area near the hub. The clamp will prevent air entry and bleeding.

**Should the catheter fracture or be accidentally cut,** clamp it without delay after the break. Specialist advice should be sought immediately to consider removal or repair of the catheter. This helps prevent haemorrhage, air embolism and infection.

**Always secure the catheter firmly to the skin.** For patient's comfort, to prevent tension or accidental dislodgement, and to reduce 'to and fro' motion which increases the risk of catheter related sepsis.

**Central Venous Access Insertion Bundle.** Insertion bundles should be completed post insertion and daily bundles should be completed.

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**Questions**

1. When should the Biopatch dressing be changed?

2. Which central venous access device should not be used for obtain blood samples?

3. How should you flush a central venous access device?

4. When scrubbing the hub on the Bionectors, which wipe would you use? How long should you scrub for? How long to allow to dry?

   Wipe used:
   Scrub for:
   Dry for:
1. Biopatch dressing should be changed minimum 7 days more frequently if a lot of blood from wound.

2. PICC lines and Midlines should not be used to obtain blood samples

3. To flush a central venous access device, a brisk push pause technique should be used, pausing briefly after each ml and clamp the device as the final ml is being flushed. Maintain positive pressure helps prevent blood entering the line after flushing

4. When scrubbing the Bionectors scrub the Bionector hub for 15 seconds prior to each use 70% isopropyl alcohol wipe (green Clinell) and allow to air dry for 30 seconds.

5. When cleansing the site of central venous access device with the Chloraprep 3mls, the site should be cleansed for 30 seconds and allowed to dry for up to 2 minutes prior to applying the Biopatch

6. A Gripl ok plus IV 3000 dressing should be used to cover central venous access device exit sites except portacaths. This should be changes minimum 7 days unless soiled or detached. Remember to date dressing when they are applied

5. When cleaning the central venous access device, an aseptic technique MUST be used. The exit site must be cleansed with Chloraprep 3ml using and back and forth motion. How long should you cleanse the site? How long should you allow the site to dry for?

   Cleanse:

   Dry for:

6. Which dressing should be used on central venous access device sites (except portacaths)?

7. What must be done post insertion, prior to central venous access device being used?

8. What can central venous access devices be used for?
7. An X-ray must be completed post insertion prior to use to ensure that the central venous access device is in the correct position.

8. Central venous access devices can be used for?
   - TPN
   - IV antibiotics
   - Multiple IV drugs
   - IV fluids
   - Obtaining blood expect PICC and Hickman cannot be used to obtain bloods
   - Obtaining venous access when patient had poor peripheral access

References


Further Information on central venous access devices can be found on beacon

Clinical Education
Central Venous Access Device Workbook
April 2019