Central Venous Catheterisation:

This procedure consists of inserting an indwelling catheter into the superior or inferior vena cava or a large vein leading to those vessels.

Veins suitable for central venous catheter (CVC) placement include:

- Internal Jugular vein
- External Jugular vein.
- Subclavian vein.
- Femoral vein.

Indications for insertion include:

- The need to monitor the central venous pressure.
- Poor venous access.
- Fluid replacement therapy.
- The need to administer multiple infusions.
- Total parenteral nutrition.
- Administration of irritant drugs.

Procedure for insertion:

- The patient should be given adequate information prior to inserting the catheter.

- Aseptic and universal precautions are employed. This includes maximal barrier precautions: sterile gloves, gown, surgical cap, surgical facemask and large drapes.

- The patient is placed head down (trendelenburg) at an angle of approximately 20°. The head-down position minimises the risk of air embolus and may also assist to dilate the target veins.

- The patient’s head is turned away from the site of insertion.

- Two-dimensional imaging ultrasound guidance is recommended as the preferred method for insertion of central venous catheters.

- The relevant anatomy and landmarks are identified and the skin is prepared with an antiseptic solution – chlorhexidine 2% (Chloraprep) for 30 seconds and the skin allowed to dry. Refer to cautions for chloraprep. Sterile drapes are then applied around the selected site.

- Adequate local anaesthesia is required and additional sedation may be required in some cases.

- The preferred technique is referred to as the Seldinger method. This involves locating the appropriate vein by using an introducer needle or catheter over needle assembly. A spring-wire guide is introduced through the needle or catheter and the central venous catheter is then threaded over the wire to the proper depth.
• The number of access points is kept to a minimum and bionectors are applied to each port.

• The distal port is reserved for TPN and requires attachment of a TPN label. If TPN is being administered the TPN administration port must not be use for any other purpose.

• The proximal port is reserved for CVP measurement.

• Blood cultures may also be taken as soon as the central line is in place.

• The patient may resume head-up position once the central line has been successfully inserted.

• The central venous line is then secured to the skin using 2/0 black silk/suture and an occlusive dressing is applied over the insertion site.

• Radiological confirmation of the position of the catheter tip must be undertaken.

Cautions:

• An alcoholic povidone-iodine solution is used for patients with a history of chlorhexidine sensitivity.

• Manufacturer’s recommendations for chloraprep: “Chloraprep is approved for patient preoperative skin preparation for children more than two months of age”

Aseptic technique using 2D imaging:

Avoids numerous punctures to tissues and helps reduce risk of infection and risk of haematoma.

The procedure is recorded in the patient’s medical notes using the appropriate sticker as shown below:

<table>
<thead>
<tr>
<th>Central line insertion</th>
<th>COMPLETE ALL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td>Time:</td>
</tr>
<tr>
<td>Inserted by:</td>
<td>Grade:</td>
</tr>
</tbody>
</table>

Type of catheter: CV/CVVHF/PA
Position: Right/Left
Fresh site/Catheter exchange
Sonosite used: Yes/No

<table>
<thead>
<tr>
<th>Type of catheter: CV/CVVHF/PA</th>
<th>Number of lumens:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Position: Right/Left</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Fresh site/Catheter exchange</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sonosite used: Yes/No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Operation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hat and mask</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterile gown and gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloraprep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Skin prepared with alcoholic 2% chlorhexidine for 30 seconds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii. Skin preparation allowed to dry fully.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterile field maintained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port left for TPN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sterile technique used to apply dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CXR reviewed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bionectors
Sutures
CXR requested

Hat and mask
Sterile gown and gloves
Chloraprep
i. Skin prepared with alcoholic 2% chlorhexidine for 30 seconds.
ii. Skin preparation allowed to dry fully.
Bionectors
Sutures
CXR requested

Please document any difficulties/complications/deviations from standard technique in case notes.
SKIN DECONTAMINATION USING CHLORPREP 2%

DoH Guidelines 2007


- **Pre-insertion skin preparation:**
  
  ‘Decontaminate the skin site with a single patient use application of alcoholic chlorhexidine gluconate (CHG) solution (preferably 2% CHG in 70% isopropyl alcohol (IPA)) prior to the insertion of a central venous access device’

- **Insertion site care:**
  
  ‘An alcoholic chlorhexidine solution (preferably 2%CHG in 70% IPA) should be used to clean the catheter insertion site during dressing changes, and allowed to air dry’

**Chloraprep application and technique:**

- 3mls = 15 x15 coverage
- Back and forth, up and down action of sponge for 30 seconds allowing area to dry naturally.
- Has long lasting anti-microbial effect – 48 hours.

**Warnings and precautions for use:**

- Solution is irritant to eyes and mucous membranes.
- Should not be used on open skin wounds, broken or damaged skin.
- Should not be used in children less than 2 months old.
- Ensure skin completely dry before puncturing especially prior to LP, spinal epidural etc.
Care of central venous ports:

- Just one 3-way tap is used.
- The 3-way tap is connected directly to the proximal port.
- Biонnectors are applied to each of the remaining ports.
- Reserve distal port for TPN and label the port appropriately.
- Decontaminate the biонnector hub: **scrub the hub for 15 seconds** prior to each use with chlorhexidine (clinell) wipe and allow to air dry.
- Change biонnector every 7 days or every 100 actuations whichever comes first.

Why use the proximal port for CVP monitoring?

- If CVC accidentally migrates from its site, trace may change or may completely disappear as proximal exit point is nearest the skin surface.
- Any unusual swelling or leakage of fluid from CVC site must be reported immediately: inform medical staff.
- Never ignore infusion pump high resistance alarms: first attempt to aspirate port and then attempt manual bolus of normal saline.
- Failure to report any of the above could result in unwanted complications e.g. subcutaneous emphysema.

Catheter cross-section of quad lumen central venous catheter:

Arrow quad lumen catheter:
Distal (16 gauge): enables flow rate 2700 ml/hr.
Medial 1 (14 gauge): enables flow rate 5100 ml/hr.
Medial 2 (18 gauge): enables flow rate 1400ml/hr.
Proximal (18 gauge): enables flow rate 1600ml/hr.
The diagram below illustrates the typical waveform of a properly positioned central venous catheter in a patient with normal venous pressure:

The normal CVP waveform has 3 positive deflections. These are referred to as a, c and v waves, which correspond to specific atrial events in the cardiac cycle:

- **The a wave** reflects atrial contraction and follows the p wave seen on the ECG.
- **The downslope of this is called the x descent** and represents atrial relaxation.

- **The c wave** represents the bulging of the closed tricuspid valve into the right atrium during ventricular contraction. The c wave is small, and is often not always visible, but corresponds to the QRST interval on the ECG.

- **The v wave** represents atrial filling and increased pressure against the closed tricuspid valve in early diastole.

- **The downslope of the v wave** is referred to as the y descent and represents the fall in pressure as the tricuspid valve opens and blood flows from the right atrium to the right ventricle.

**Troubleshooting loss of CVP waveform:**

Loss of CVP waveform may be noted on cardiac monitor and this may indicate dislodgement, clot, kinking, transducer malfunction or improper catheter location. A normal CVP trace should fluctuate appropriately with respiration and cough. Simple troubleshooting measures include the following:

1. Ensure that the transducer bag is maintained under continuous pressure of 300mmHg.
2. Check that all transducer connections are secure especially the sensor cables.
3. Undertake zeroing procedure and ensure that auto-scaling has also been performed. Ensure that the 3-way tap is open to flow at the patient-end and also at the level of the transducer itself.
Troubleshooting loss of waveform:

- Do the ports flush easily?

A catheter that neither flushes or draws is more likely kinked or clogged.

A catheter that easily flushes with no resistance but is difficult to draw suggests two potential serious difficulties: The application of excessive negative pressure in attempts to aspirate from a lumen may collapse the vein itself or draw the lumen of the catheter against the wall of the vessel.

Alternatively, the catheter could be in a small venous tributary and not in a central location. Another more troubling possibility is that the catheter is extravascular, the result of erosion or improper initial placement.

Even an initially well-placed catheter may migrate out of place, despite the best suturing and dressing. The markings on the catheter itself can gauge whether the line has migrated either in or out.

Swelling at the site may not only indicate infection but also misplacement. When one of the ports has migrated out of the vein and is immediately subcutaneous, it will be depositing its infusate just below the skin. Depending on the type of infusate (particularly vasoactive drugs and potassium infusions) this may cause skin necrosis and require immediate attention.

- Is the catheter kinked?

Internal jugular, subclavian and femoral lines are all subject to kinking both at the skin and within the vessel itself. Suturing may also induce kinking of CVCs.

- Is the catheter clotted?

The older a catheter is, the more likely it is to be clotted. Slow infusion rates, poorly malfunctioning transducer flush systems, or long intervals between manual flushes may be to blame.

- What was the intravascular location of the catheter on the last chest film?

When uncertain, another chest film can be obtained to check its placement. Does it appear kinked on the film? A well-placed catheter should have its tip well within the vein, but outside of the cardiac chambers, as it can erode through atrial and ventricular walls or cause arrhythmias.

- Could the vein be thrombosed?

Perhaps it is not merely clotting of the catheter but of the entire central vein itself. When the vein is clotted, showering of clot material to the pulmonary vasculature (i.e. pulmonary emboli) may occur which can dramatically affect a patient’s haemodynamic and pulmonary status.
Central venous pressure:

**Definition:** Central venous pressure reflects venous return to the heart and cardiac function. It is not a measure of blood volume but allows assessment of the ability of the right heart to accept and deliver blood.

Jugular venous pressure: observation of the jugular vein in the neck gives a crude indication of venous pressure. A raised jugular venous pressure may indicate cardiac failure (e.g. neck vein engorgement).

The CVP is influenced by several factors:

1. Venous return – this is blood returning to the right atrium which is delivered via the superior vena cava, the inferior vena cava and the coronary veins.
2. Right heart compliance – right ventricular compliance is the change in end-diastolic pressure with change in ventricular volume. In a healthy heart, volume administration does not cause a dramatic rise in end-diastolic pressure; the ventricle is compliant.
3. Intrathoracic pressure – mechanical ventilation creates a positive pressure within the thoracic cavity which impedes venous return.
4. Patient position – technique and position must be consistent each time a measurement is taken. The zero point is level with the mid-axillary line in the 4th intercostal space.

Central venous pressure may also be referred to as:

- Right atrial pressure
- Right ventricular end-diastolic pressure

A low CVP reading *usually* indicates loss of fluids:

- Haemorrhage/Hypovolaemia
- Excessive diuresis

A high CVP reading may be due to:

- Cardiac failure – eg. right ventricular failure or mitral valve incompetency.
- Hypervolaemia – (more complex) – eg. excessive fluid infusion.
- Lumen occlusion or obstruction – eg. catheter against vessel wall.
Important points to consider:

- CVP measurements must not be interpreted on their own, but viewed alongside the patient’s full clinical picture.

- The absolute value is not as important as the response to therapy. This can be demonstrated when observing the response of CVP to fluid boluses. Serial measurements and the resulting trend provide valuable information.

- Aim to achieve central venous pressure 8 – 12mmHg

- Patients with sepsis that continue to have hypotension, or shock, despite an initial bolus of 20ml/kg crystalloid have refractory shock. CVP should be measured and resuscitation should be commenced with fluid boluses as prescribed. Giving a fluid bolus can help increase the cardiac preload (the blood returning to the heart) and also improves cardiac output. This can be explained by the Frank-Starling Law: essentially that the heart muscle contracts more strongly when it is under some degree of stretch. The improvement in cardiac output will assist to improve oxygen delivery.

- If the CVP is greater than 8mmHg (the patient is adequately ‘filled’ but the mean arterial pressure (MAP) is less than 65mmHg or systolic less than 90mmHg, this is known as refractory shock. A vasopressor infusion of noradrenaline should be started to maintain a MAP of at least 65mmHg in these circumstances. The aim of this intervention, in the presence of adequate intravascular resuscitation, is to ensure adequate perfusion to the organs.

The Central Venous Monitoring system consists of 4 main parts:

1. The indwelling/invasive catheter.
2. The transducer which receives the signal from the tubing and converts it into electrical energy.
3. The flush system which maintains catheter patency.
4. The bedside monitor which displays the waveform.

Flush system:

- A bag of 500ml 0.9% sodium chloride is used to prime the flush-system and is inserted into a pressure infuser cuff.

- The bag is pressurised to 300mmHg for adults which infuses 3ml/hr and pressurised to 150mmHg for paediatrics which infuses 1.5ml/hr.

- This infusion solution must be prescribed and checked by two nurses against the designated prescription sheet before administration. Staff must only used 0.9% Sodium Chloride to keep lines open.

- Further checks should be made at regular intervals and key points (such as shift handover) to ensure that 0.9% Sodium Chloride is being administered and that the transducer system is maintained under continuous pressure at 300mmHg. Check that there is sufficient fluid remaining in the bag – this may be more difficult to visualise during night hours or where there is reduced lighting.
Preparing the Monitor & Tubing System:

Improper systems can cause erroneous measurements of hemodynamic indices which can potentially invalidate a patient’s entire hemodynamic profile.

To ensure accuracy:

- Priming of the pressure tubing
- Levelling and zeroing

Priming the Pressure Tubing:

1. Put on a pair of disposable gloves.
2. Use 500 ml 0.9% sodium chloride: check with a witness against the designated prescription sheet.
3. Check all connectors on tubing.
4. Spike bag and prime entire tubing (stopcocks, luer-locks, transducer).
5. Insert IV fluid bag into pressure bag and inflate the pressure bag to 300 mmHg.
6. Insert transducer into the transducer holder that mounts on to the IV dripstand.
7. Ensure all air bubbles are eliminated.
Zeroing the transducer:

1. Place HOB from zero to 45 degrees.

2. Position the patient and the transducer at the same level.

3. Make sure the transducer is located at the phlebostatic axis.

3. Perform the zeroing procedure as follows:

- Stop any infusions running via the CVP port and ensure that the 3-way tap is not in the ‘off’ position.
- Transducer 3-way tap: turn the 3-way tap to ‘off’ position away from the patient.
- Remove cap on 3-way tap: the transducer is now opened to air and enables being zeroed to atmospheric pressure.
- Select zero option on patient monitor and click to confirm.
- Wait for ‘0’ value to appear adjacent to CVP parameter.
- Verify that ‘0’ value has been registered.
- Replace cap on 3-way tap.
- Transducer 3-way tap: turn the 3-way tap back to neutral position.
- Observe and assess CVP trace.
- Recomence any infusions running via the CVP port as necessary.
- Repeat this procedure at the start of each shift.
- Re-level the transducer each time the patient changes position or the bed is raised or lowered.
Accuracy of CVP pressure readings is demonstrated by the following:

- Calibration of the system to atmospheric pressure.
- Determining the phlebostatic axis.

The **phlebostatic axis** is a physical reference point on the chest which is used as a baseline for reliable transducer placement.

This can be demonstrated by:

- Identifying the 4\(^{\text{th}}\) intercostal space where it joins the sternum.
- Locating the mid-axillary line on the side of the chest.
- A theoretical line is then drawn between the two points which approximates the level of the atria.
- The transducer level approximates the level of the tip of the invasive catheter.

Complications associated with central venous catheterisation:

- **Venous air embolism** – manifested by dyspnoea, cyanosis, apnoea, hypotension and tachycardia. If air embolism is suspected, the patient should be placed in the left lateral position in steep Trendelenburg (this assists to trap air in the apex of the right ventricle, away from the outflow tract, stopping bloodflow from the right side of the heart to the lungs). Further treatment may include additional oxygen therapy and CPR. This risk can be reduced by using Trendelenburg for inserting and removing central venous catheters. Additionally, all connections relating to the CVP line including the CVP monitoring system should be checked and made secure. Following removal of the central venous catheter, an occlusive dressing must be applied over the puncture site because air embolism may occur through the fistulous tract that forms.

- **Catheter malposition** – into the right atrium or into the right ventricle, against the wall of the vessel. The catheter should be withdrawn or advanced in order to achieve the correct position in the superior vena cava. The length of the indwelling catheter should be recorded and regularly monitored.
Complications associated with central venous catheterisation:

- **Catheter-related infection** – the rate of infection increases with femoral site insertion.

- **Pneumothorax/haemothorax:**
  
  Manifested by hypotension, tachycardia, dyspnoea, chest pain or needle aspiration of air from the pleural space.

  Further treatment may include chest drain insertion.

  A higher risk of pneumothorax/haemothorax is carried using the subclavian vein (see opposite). During approach of the subclavian vein, it is therefore important to keep the needle parallel to the chest surface and not angled downwards in order to minimise the risk. In order to facilitate placement a rolled-up towel may be placed longitudinally between the scapulae and the assistant may be requested to pull

- **Arterial puncture:**

  If this is suspected the needle should be removed and firm manual applied for 5 minutes.

  The carotid artery can potentially be punctured as it lies immediately posterior to the internal jugular vein (see opposite). However, to reduce the risk of this occurring, the artery itself is palpated and held beneath the fingers.

- **Femoral artery puncture:** the femoral artery can be accidentally punctured due to the close anatomical relationship between the femoral artery and the femoral vein. This can be avoided by using a key for order of structures, that is NAVEL.

  
  \[N = \text{nerve.} \]
  \[A = \text{artery.} \]
  \[V = \text{vein.} \]
  \[E = \text{empty space.} \]
  \[L = \text{lymphatics.} \]
WHERE ELSE CAN CENTRAL VENOUS CATHETERS BE SITED?

The following sites have already been mentioned:

**Neck/upper chest:**
- Internal jugular vein.
- External jugular vein.
- Subclavian vein.

**The arm:**
- Brachial vein.
- Cephalic vein.
- Basilic vein.

**The groin:**
- Femoral vein.
  - For femoral vein insertion the patient’s knee is extended with the foot rotated 15-30° outward.
  - The femoral veins are further away from the heart, so for accurate measurements the tip of the catheter must be advanced into the inferior vena cava near the right atrium.

Central line site selection – points to consider:

1. **Internal jugular:** most popular as straightforward access in to SVC and has a high success rate.

2. **Femoral:** there is an increased risk of infection at this site compared with other sites and for this reason, the use of a **BioPatch** is recommended and instructions for use are found on Page 14. Femoral cannulation also presents the risk of deep venous thrombosis.

3. **The subclavian route** offers the lowest risk of infection compared with other central line sites. It should be avoided for dialysis catheter insertion due to risk of subclavian vein stenosis. If arterial puncture should occur, the site has least ability to control bleeding. Least suitable insertion site for patients with potentially severe lung pathology due to the risk of pneumothorax. Least suitable site for patients with uncorrected coagulopathy, as it is associated with greater risk of uncontrollable haemorrhage.
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.

A catheter is a direct way for prescribed fluids to enter the bloodstream. As the catheter goes through the skin, there is also a potential path for bacteria which live on the skin to enter the bloodstream and cause an infection. It is therefore, essential to protect the catheter insertion site and try to reduce the chances of infection.

**Precautions:** BioPatch should not be placed over infected wounds. It is not intended to be used as a treatment of device-related infections.

**Warning:** For external use only. Do not allow this product to contact the eyes, ears, mouth or mucous membranes.

**Where can BioPatch be used?**

BioPatch is designed to reduce the number of bacteria and other micro-organisms living on the skin around the insertion site of catheters and other percutaneous devices such as intravenous catheters, central venous lines, arterial catheters, dialysis catheters, peripherally inserted coronary catheters, mid-line catheters, drains, chest tubes, externally placed orthopaedic pins, and epidural catheters.

**Blue side to the sky?**

When you put on the BioPatch you must be able to see the blue side. BioPatch will not be effective if you cannot see the blue side.

**When should I change the BioPatch?**

BioPatch should be changed as necessary. Dressing changes should occur at a minimum of every 7 days. If there is a lot of blood or fluid coming from the wound, the BioPatch will need to be changed more often.

**Frequently asked questions:**

1. What if a skin reaction develops? Adverse reactions to CG such as rashes are rare; if any such reactions occur discontinue immediately and discuss with medical staff.

2. Can the BioPatch be re-used if the top dressing becomes loose or is removed? If this occurs, the BioPatch should be removed and a new patch applied.

3. Is BioPatch latex free? Yes, the patch is latex free. All raw materials used in the manufacturer of BioPatch, including all components and packaging materials, do not contain any rubber latex or dry natural rubber latex.

4. Why does BioPatch turn yellow and does this affect how it works? The yellowing of the product is due to ageing of the polyurethane foam. This does not change how effective it is.

5. Can BioPatch be used on pregnant women? Can it be used while breast feeding? There is no information available regarding the use of BioPatch in pregnant or lactating women.
How to apply the BioPatch:

1. Clean the skin area using a Chloraprep sponge applicator.
2. Remove the BioPatch dressing from the sterile package.
3. Place the BioPatch around the catheter, making sure that the BLUE side is facing up (you can see the blue side).
4. 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.
5. Place a clear dressing over the catheter and BioPatch. Assure complete contact between the skin and the BioPatch dressing.

Apply the BioPatch as shown opposite

Changing the BioPatch:

6. 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.
7. 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.
8. The BioPatch dressing will remain attached to the clear dressing and will come away from the skin as you remove the clear dressing.
**Some DO’s and DON’TS:**

**DO** secure the catheter at least 1” (2.5cm) from insertion site. This allows proper placement of BioPatch.

**DO** align radial slit with catheter. This helps easy removal.

**DO** ensure edges of slit touch. This assures efficacy.

**DON’T** place white side up. Antimicrobial white side must face skin. If wrong, change immediately.

**DON’T** secure catheter too close to entry point. This will prevent improper placement of BioPatch.

**DON’T** allow slit edges to straddle catheter. Edges of slit must touch to ensure efficacy.

**DON’T** place BioPatch on catheter. BioPatch must have complete contact with skin to ensure efficacy.
**PROCEDURE FOR CHANGING THE DRESSING ON A CENTRAL VENOUS CATHETER INSERTION SITE**

**Equipment required:**
- Dressing trolley.
- Sterile dressing pack.
- Chloraprep 2%.
- Semi-permeable dressing.
- Sterile gloves

<table>
<thead>
<tr>
<th>ACTION</th>
<th>RATIONALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explain procedure to the patient.</td>
<td>To ensure patient understands procedure.</td>
</tr>
<tr>
<td>2. Perform the dressing as an aseptic technique.</td>
<td>To prevent infection.</td>
</tr>
<tr>
<td>3. Wash hands as per Infection Control guidelines.</td>
<td>To reduce the risk of cross infection.</td>
</tr>
<tr>
<td>4. Open sterile dressing pack.</td>
<td></td>
</tr>
<tr>
<td>5. Open the other sterile packs tipping gently onto the centre of the sterile field.</td>
<td>To reduce contamination of contents.</td>
</tr>
<tr>
<td>6. Wash hands with alcohol gel.</td>
<td>Hands may have been contaminated by handling outer packs.</td>
</tr>
<tr>
<td>7. Loosen old dressing.</td>
<td>So dressing can be removed easily.</td>
</tr>
<tr>
<td>8. Apply alcohol gel to hands &amp; put clean gloves on.</td>
<td>To prevent contact with patient’s blood.</td>
</tr>
<tr>
<td>9. Remove dressing.</td>
<td></td>
</tr>
<tr>
<td>10. Obtain swab if site is red or discharging.</td>
<td>Identification of pathogens.</td>
</tr>
<tr>
<td>11. Remove gloves, use alcohol gel &amp; put on sterile gloves.</td>
<td>To minimise the risk of infection.</td>
</tr>
<tr>
<td>12. Clean site with chloraprep as per Unit policy.</td>
<td>To minimise the risk of infection spread.</td>
</tr>
<tr>
<td>13. Apply dressing &amp; mould it into place to avoid folds.</td>
<td>To minimise skin irritation &amp; reduce the risk of the dressing peeling.</td>
</tr>
<tr>
<td>14. Remove gloves.</td>
<td></td>
</tr>
<tr>
<td>15. Dispose of waste in appropriate container.</td>
<td>To prevent environmental contamination.</td>
</tr>
</tbody>
</table>
Central venous catheters are removed if complications develop or when no longer required.

Equipment required:
- Dressing trolley.
- Dressing pack.
- Sterile gloves.
- Chloraprep 2%
- Stitch cutter.
- Semi-permeable dressing.
- Sterile scissors and universal container (if tip requires to be sent to Microbiology Dept)

Procedure:
1. Explain procedure to the patient.
2. Place the patient supine and flat in the trelenburg position to prevent air embolism.*
3. Turn off all infusions and disconnect all infusions from the central venous catheter.
4. Wash hands and put on clean gloves.
5. Remove & discard the old dressing and change to sterile gloves.
6. Clean the site with Chloraprep 2%. Inspect site for signs of exudate or inflammation.
7. Cut and remove any skin suture securing the catheter. Ensure all suture material has been removed.
8. Cover the insertion site with a gauze swab and ask the patient to perform the valsalva manoeuvre.
9. Hold the catheter with one hand near the point of insertion and pull firmly and gently. If resistance is felt, seek help from Medical Staff. As the catheter begins to move, press firmly down on the site with the gauze swab. Maintain pressure on the swab for about 5 minutes after the catheter has been removed.
10. If the catheter is removed because of infection, carefully cut off the tip (approximately 5cm) of the catheter using sterile scissors and place in a universal container for microbiological examination.
11. When the bleeding has stopped (approximately 5 minutes) cover the site with a transparent semi-permeable dressing. The dressing should remain in situ for at least 24 hours.
12. At the end of the procedure return the patient to a comfortable position.
13. Dispose of all the used equipment in the appropriate container as per Hospital Waste Policy.
14. Remove gloves and wash hands.
15. Document the date and time of removal in the patient’s nursing notes or other relevant documentation.

* If air embolism occurs or is suspected – the patient should be positioned in the left lateral trendelenburg (this assists to directing the air bubble away from the pulmonic valve) and seek medical assistance.
SUMMARY OF PREVENTION OF INFECTION MEASURES:

- Hand hygiene must be performed before the commencement of all line maintenance/access procedures.

- Needle-free connectors: these are changed every 7 days or after 100 actuations, which ever comes first.

- Alcohol hub decontamination: this must be performed before each hub access/drug or fluid administration.

- Central line dressings: these are changed at least every 7 days or when no longer intact or if it becomes wet or soiled/or moisture collects under the dressing.

- Chlorhexidine gluconate 2% (Chloraprep): this is used for cleaning the insertion site during dressing changes.

- Disposable transducer flush systems: these are changed every 96 hours.

- Review need for intravascular devices daily and document. Central venous catheters are the commonest cause of hospital-acquired bacteraemia and should therefore be removed at the earliest opportunity when no longer clinically required. Assess and document daily the need for continued use of the CVC.

- Remove intravascular devices that are a potential infection source promptly after establishing other vascular access.

- If there is evidence of central venous catheter bloodstream infection, the catheter tip should be sent to Microbiology Department for culture.

- Monitor the patient’s temperature and pulse for signs of catheter-related bloodstream infection (sustained temperature >38°C) associated with line usage.

- The CVC insertion site should be visually inspected at least daily for signs of infection; the observation should be recorded in the nursing notes/relevant documentation. Report any abnormal findings eg pyrexia or inflammation to Medical Staff.