NOTTINGHAM UNIVERSITY HOSPITALS NHS TRUST

Guidelines for the insertion, securing and verifying the position of central venous catheters (CVC`s) and temporary haemofiltration catheters.

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</tr>
</tbody>
</table>
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowchart: Performing Central Venous Cannulation</td>
<td>3</td>
</tr>
<tr>
<td>Flowchart: Management of Catheter related thrombosis</td>
<td>4</td>
</tr>
<tr>
<td>Flowchart: Inadvertent Arterial Line Puncture</td>
<td>5</td>
</tr>
<tr>
<td>Flowchart: Troubleshooting central venous catheters</td>
<td>6</td>
</tr>
<tr>
<td>Purpose/Scope/Exclusions</td>
<td>7</td>
</tr>
<tr>
<td>Definitions</td>
<td>8</td>
</tr>
<tr>
<td>Indications</td>
<td>8</td>
</tr>
<tr>
<td>Contra indications</td>
<td>8</td>
</tr>
<tr>
<td>Site of Access</td>
<td>8</td>
</tr>
<tr>
<td>Insertion</td>
<td>11</td>
</tr>
<tr>
<td>Preparation</td>
<td>11</td>
</tr>
<tr>
<td>Equipment</td>
<td>12</td>
</tr>
<tr>
<td>Asepsis</td>
<td>13</td>
</tr>
<tr>
<td>Procedure</td>
<td>13</td>
</tr>
<tr>
<td>Post procedure</td>
<td>17</td>
</tr>
<tr>
<td>Fixation</td>
<td>18</td>
</tr>
<tr>
<td>Central Line review</td>
<td>18</td>
</tr>
<tr>
<td>Catheter tip position</td>
<td>19</td>
</tr>
<tr>
<td>Transducing</td>
<td>21</td>
</tr>
<tr>
<td>Accessing the central line</td>
<td>21</td>
</tr>
<tr>
<td>Removal or Replacement of CVC</td>
<td>22</td>
</tr>
<tr>
<td>Catheter related thrombosis</td>
<td>22</td>
</tr>
<tr>
<td>References</td>
<td>25</td>
</tr>
<tr>
<td>Certification of Employee Awareness</td>
<td>27</td>
</tr>
</tbody>
</table>
PERFORMING CENTRAL VENOUS CANNULATION

PREPARE

- POSITION PATIENT APPROPRIATE TO INSERTION SITE
- COMMUNICATE PLANS WITH NURSING STAFF/ COLLEAGUES
- FULLY MONITORED PATIENT
- ENSURE HELP AS NEEDED
- AVOID DISTRACTIONS

- STRICT ASEPSIS
  - GOWN, GLOVE, HAT and FACEMASK and EYE PROTECTION
  - SKIN PREPARATION and LOCAL ANAESTHETIC
  - FLUSH ALL CVC PORTS WITH SALINE TO REDUCE RISK OF AIR EMBOLISM

STOP MOMENT
CONFIRM PATIENT/PROCEDURE

USE REAL TIME ULTRASOUND

CONFIRM NEEDLE IN THE VENOUS SYSTEM
- LOW PRESSURE, DARK BLOOD, DIRECT VISUALISATION OF NEEDLE TIP ON ULTRASOUND

PERFORM

YES
- THREAD WIRE
- CONFIRM WIRE IN VENOUS SYSTEM USING ULTRASOUND

NO
- OR
- DIFFICULTY IN THREADING THE WIRE

DO NOT PROCEED
- WITHDRAW NEEDLE AND WIRE AS ONE IF CAN NOT BE CONFIRMED IN VEIN
- PERFORM BLOOD GAS TO CONFIRM VENOUS PLACEMENT
- CALL FOR HELP
- SEE INADVERTANT ARTERIAL PUNCTURE GUIDELINE

PROCEED TO DILATION AND CATHETER PLACEMENT
- ENSURE WIRE IS REMOVED TO AVOID INADVERTANT RETENTION, CONFIRM WITH ASSISTANT
  - SUTURE AT 4 POINTS
  - STERILE CLEAR DRESSING

POST PROCEDURE

- CLEAR AWAY SHARPS INTO SHARPS BIN SAFELY
- ORDER X RAY ON CORRECT PATIENT VIA NOTIS/MEDWAY
- DOCUMENT CENTRAL LINE INSERTION USING NUH TRUST STANDARD “YELLOW STICKER”
- CONFIRM POSITION IS CORRECT ON CXR AND DOCUMENT IN THE MEDICAL NOTES
- CHECK DATE AND TIME OF CXR, ENSURE IT IS THE CORRECT PATIENT
- INFORM BEDSIDE NURSE THAT CENTRAL VENOUS CATHETER IS SAFE TO USE
- COMPLETE CVC TRANSDUCER STICKER
  - IF IN DOUBT DISCUSS WITH SENIOR CLINICIAN
MANAGEMENT OF CATHETER RELATED THROMBOSIS

CLINICAL SIGNS

ASYMPTOMATIC (MAJORITY)
SWELLING OF HEAD/NECK/LIMB
LOCALISED PAIN/NUMBNESS
JAW OR SHOULDER PAIN
HEADACHES/SENSATION OF HEAD FULLNESS
SUPERFICIAL VENOUS DISTENSION
INFLAMMATION/PHLEBITIS
ERYTHEMA OF LIMB
DIFFICULTY WITH INFUSION OR ASPIRATION
INCIDENTAL FINDING ON CT

INVESTIGATIONS

VENOUS DUPLEX SCAN or CT VENOGRAM

TREATMENT

PROVEN THROMBOSIS

DISCUSS WITH SENIOR CLINICIAN and/or HAEMOTOLOGY TEAM

ENSURE NO CONTRA-INDICATION TO ANTICOAGULATION (Epidural in-situ, Intra-cranial blood, ICP or EVD in-situ, clotting abnormality)

CONSIDER LMWH
(<40kg, 1.5mg/kg OD, 40 – 150kg, 1.5mg/kg BD, >150kg 1mg/kg BD
if CRC <30 then 1mg/kg OD)
or HEPARIN INFUSION ( see Trust Guidelines)
MONITOR Factor Xa levels or APPT as needed

RETAIN CVC UNLESS SIGNS OF INFECTION, FAILURE TO WORK, OR SYMPTOMS DO NOT RESOLVE

REMOVE CVC IF LIMB THREATENING SYMPTOMS or SYSTEMIC ANTICOAGULATION IS CONTRAINDICATED
**INADVERTANT ARTERIAL PUNCTURE**

**MINIMISE RISK**
- USE REAL TIME ULTRASOUND
- CONFIRM GUIDEWIRE POSITION IN THE VEIN WITH ULTRASOUND PRIOR TO DILATION
- CONSIDER BED SIDE BLOOD GAS TO CONFIRM VENOUS OR ARTERIAL PLACEMENT
  - TRANSDUCE THE CVC IMMEDIATELY AFTER INSERTION

**IN THE EVENT OF INADVERTANT ARTERIAL PUNCTURE**

**DO NOT DILATE**
REMOVE NEEDLE (OR CANNULA) and WIRE (IF INSERTED)
APPLY FIRM PRESSURE FOR 5 MINUTES OR MORE
DISCUSS WITH A SENIOR CLINICIAN PRIOR TO FURTHER ATTEMPTS
CLEARLY DOCUMENT INADVERTANT ARTERIAL PUNCTURE IN THE MEDICAL NOTES
ENSURE BEDSIDE NURES IS AWARE AND WILL OBSERVE FOR HAEMOTOMA FORMATION
CONSIDER NON URGENT ARTERIAL DUPLEX SCANNING TO RULE OUT COMPLICATIONS

**IN THE EVENT OF INADVERTANT ARTERIAL PUNCTURE and DILATATION OR CVC INSERTION**

**DO NOT REMOVE THE CATHETER**
DISCUSS URGENTLY WITH SENIOR CLINICIAN
DISCUSS WITH VASCULAR SURGICAL TEAM AND/OR INTERVENTIONAL RADIOLOGY TEAM
DOCUMENT CLEARLY IN THE NOTES
CONSIDER DUTY OF CANDOUR IMPLICATIONS
TROUBLESHOOTING CENTRAL VENOUS CATHETERS

MALPOSITION

Current practice is to confirm position of central venous catheters using a chest x-ray. We do not advocate re-wiring of the central line to advance or reposition a central line. The wire tip can tear or pierce the CVC leading to potential extravasation of infusions. Retraction of a too long CVC will require resuturing and a further x-ray to confirm position. If the CXR shows a position consistent with central venous placement, please ensure all catheters are checked to confirm that all lumens aspirate venous blood (low pressure, dark, deoxygenated and non-pulsatile) and that a satisfactory central venous pressure trace is seen.

NOT FLUSHING

If a central line port does not flush; ensure no kinks in the catheter or unnoticed clamps. Attempt to aspirate the CVC into a saline filled syringe and flush with Saline only. If this fails, attempt to reposition the patient and attempt further aspiration and flushing. If the patient is awake, get them to deep breath, raise their arms or tilt their bed steep head down. If these fail, the port should be blocked off and marked “DO NOT FLUSH”.

BROKEN CATHETER OR LUMEN

On occasions, agitated patients can pull and snap the CVC lumens. In the event of this happening, a clamp should be applied to prevent the entrainment of air. In almost all cases the CVC should be replaced when safe to do so.

DISLODGEEMENT

Not infrequently CVC’s become dislodged. Dislodgement becomes obvious if the external portion of the catheter changes in length. A catheter that may be dislodged must have its position checked with X-Ray and senior advice sought. The consequences of continuing to use a dislodged catheter include DVT/PE, great vein perforation and drug extravasation. If the CVC is dislodged due to inadequate fixation, complete a DATIX report. Where a CVC has been completely removed accidentally, pressure should be applied to the insertion site to prevent haematoma formation.

INFECTION

Consider CVC related infection in every patient with a CVC and temperature. CVC blood cultures should be taken at the same time as from other lines and a peripheral sample. Trying to salvage an obviously infected central line can lead to significant patient harm, and an infected line should be removed and replaced immediately.

VASCULAR PERFORATION

Can occur either with the needle, wire or dilator. Rapidly expanding haematoma should arouse suspicion. Apply firm pressure to the area and discuss with a senior clinician.

AIR EMBOLISM

This can occur when air is entrained via the CVC. Significant air embolism presents as severe CARDIOVASCULAR COLLAPSE, CYANOSIS, RESPIRATORY DISTRESS and SEVERE CHEST PAIN. It is a medical emergency, summon senior Medical help immediately. The patient should be positioned head down and left side down whilst ensuring all lumens are clamped and no more air injected. Aspirate any air from lumens if seen. In the event of Cardiac arrest proceed to resuscitation as per ALS guidelines.
**Purpose & Objectives**

- To provide a clear, concise guide for those inserting, fixing and verifying the position of central venous catheters (CVC’s) and temporary haemofiltration catheters.
- To allow safe and effective practice of CVC management, to minimise error and standardise the medical practice in Critical Care.

**Scope**

All adult patients with central venous catheters and/or temporary haemofiltration catheters within Nottingham University Hospitals Adult Critical Care wards (Adult Intensive Care Unit, Ward E12 and Critical Care Department).

It should be noted that on rare occasions it is necessary to admit patients under the age of 16 years to the adult critical care wards. This is done in line with trust policy. Under such circumstances the same standards of care set out in this document apply to those patients.

**Exclusions**

**Paediatric patients.**

Adult patients with central venous catheters and/or temporary haemofiltration catheters outside of critical care (this is likely to include patients within the Renal Unit or those with extremely challenging venous access).

Patients with central venous catheters and/or temporary haemofiltration catheters within the Trent Cardiac Centre.

**Definitions**

Central venous catheter

1. Also known as a “CVC”
2. A device used to directly access a central vein
3. Central veins typically accessed using such a device include:
   1. Internal jugular vein
   2. Subclavian vein
   3. Axillary vein
   4. Common femoral vein

Temporary haemofiltration catheters
   1. Also known as a “vascath”
   2. A device used to provide access for temporary renal replacement therapy (continuous veno-venous haemofiltration or haemodiafiltration and, on occasion, intermittent haemodialysis)

*Indications*

There are multiple indications for the use of CVC in Critical Care. The vast majority of Critical Care patients will have a central line in place already, or will require insertion of a CVC during their Critical Care stay. The table at the start of the document outlines indications for the insertion of a CVC:

*Contra-Indications*

There are no absolute contra-indications to the insertion of a central line. Below are some considerations. Bleeding associated with CVC insertion has a reported incidence of 0.5–1.6%. (1,2)

*Site of access*

When choosing the site of CVC access, there are patient and clinician factors to consider. Multiple studies have looked at the optimal insertion site with varying conclusions. In the largest, the 3SITES trial(3), with 3471 CVC’s inserted, the investigators concluded that the subclavian approach was prone to less infectious complications and fewer deep
vein thrombi, but, in comparison to femoral or internal jugular access, more mechanical complications (primarily pneumothorax). In direct comparison with the subclavian route, femoral catheterization was associated with a higher incidence rate of overall infectious complications (19.8% vs 4.5%; \(P < .001\); incidence density of 20 vs 3.7 per 1000 catheter-days) and of major infectious complications (clinical sepsis with or without bloodstream infection, 4.4% vs 1.5%; \(P = .07\); incidence density of 4.5 vs 1.2 per 1000 catheter-days), as well as of overall thrombotic complications (21.5% vs 1.9%; \(P < .001\)) and complete thrombosis of the vessel (6% vs 0%; \(P = .01\))(4). However there seems to be little difference when the internal jugular site is compared to femoral (incidence of 40.8 [femoral] vs 35.7[IJV] per 1000 catheter-days; hazard ratio [HR], 0.85; 95% confidence interval [CI], 0.62-1.16; \(P = .31\))(5). Aside from these considerations, patient factors, such as C-spine immobilisation are likely to influence site choice. If the patient is coagulopathic, cannulation of the subclavian vein carries a greater risk as it is not compressible by virtue of its anatomy. A femoral or internal jugular vein approach would be more appropriate.

Equally, clinician experience plays a role. Most people will gain initial familiarity with a single site (internal jugular being the most common). It is good practice to obtain senior supervision if you are attempting to perform a CVC technique that you are not familiar with. The preferred sites for Vascath insertion for CVVHD/HDF are the internal jugular or femoral vein. Subclavian Vascath access is considered to be the third choice due to the higher risk of complications with insertion(6). Use of the subclavian for temporary CRRT catheters is associated with higher rates of central vein stenosis, which would affectively prevent the use of the ipsilateral arm as a site for long-term HD access (AV graft, fistula).
Right Internal Jugular access carries the most favourable characteristics with a direct line to the caval-atrial junction and thus better flow rates, followed by the LIJV (which has a more tortuous pathway). Femoral access is quick, and does not require the patient to lie head down, but obviously restricts patient mobility and carries a higher risk of infectious complications. In the event of chest trauma or pathology other than with associated vascular injury, it makes sense to place the CVC on the same side as the injury.
**Insertion**

Critical care medical staff and advanced critical care practitioners should be formally assessed for competency and have this signed off by a consultant in critical care and/or anaesthesia prior to inserting central venous cannulas and/or temporary haemofiltration catheters without direct supervision.

**Preparation**

- Check clotting and discuss with senior clinician if clotting is abnormal. A pragmatic approach should be adopted, if circumstances dictate rapid central access with significant clotting abnormalities, consider the most appropriate approach.
- Space and access around the bed should be planned prior to commencing.
- Ensure all help necessary is available. If the procedure is to be undertaken by an inexperienced doctor this must be under the direct supervision of a competent doctor for the duration of the procedure.
- **COMMUNICATE** your plan with the bedside nursing staff, with the patient (if awake), and with senior staff. A bed side nurse should be present to assist the procedure.
- Consent patient if conscious otherwise document why the procedure is in the patients best interests.
- Position the patient as appropriate to access the insertion site, remember to have patients in the head down position when inserting internal jugular or subclavian lines as this improves venous engorgement and reduces the risk of inadvertent air embolism. Be mindful of ICP in TBI or the potential for respiratory embarrassment, and in these circumstances, delay head down until absolutely necessary.
• **PRESERVE PATIENT DIGNITY AS MUCH AS POSSIBLE**

• Other than in an emergency situation, **ULTRASOUND** should be used for the placement of all Internal jugular and femoral vein CVC’s [NICE TA49, 2002]. Ultrasound guidance utilising the axillary vein approach to the subclavian vein is recommended, with good evidence of a reduction in complications(7,8). This approach seems to be the simplest of the ultrasound guided subclavian vein cannulation techniques to master. Consider scanning the venous site prior to starting to ensure cannulation is possible.

• **ALL PATIENTS SHOULD BE FULLY MONITORED DURING INSERTION**; there is rarely a need to insert lines when monitoring is not established.

**Equipment**

• Central line insertion packs should be readily available in all situations where CVC`s are being inserted. The pack contains:
  o Sterile Gown
  o Sterile hand towels
  o Blunt drawing up needle
  o Orange sharp safe needle
  o 10 ml Luer slip syringe
  o 5 ml Luer slip syringe
  o 2 X 5 square Green gauze (with Red ties)
  o 5 Bungs
  o Suture
  o Local anaesthetic sticker and Saline Sticker
  o Needle holder and forceps
  o Saline/Fluid pot
- Sterile US probe cover, sterile ultrasound gel and elastic band
- In addition, when inserting a line, one must obtain a Central Venous catheter (Vygon, 5 lumen, 16cm lines), usually in the same place as the insertion packs, Skin preparation and Local anaesthetic
- Ultrasound with linear (Vascular) probe

**Asepsis**

- **STRICT ASEPSIS** should be observed at all times.
- Wash hands prior to donning gloves and gowns
- Gown, gloves, mask and hat and eye protection should be worn.
- Skin should be prepared with 2% Chlorhexidine gluconate and isopropyl alcohol (usually a 3ml Chloraprep applicator) prior to draping with sterile field as supplied in the central line insertion packs. Allow the insertion site to dry before inserting the catheter.
- Sterile Ultrasound probe covers should be used, protecting both the patient from infection and preserving asepsis, but also protecting the probe from contamination with blood

**Procedure**

- **STOP Moment; CONFIRM PATIENT/CONFIRM PROCEDURE**
- Patients within the adult critical care areas are typically sedated not anaesthetised, and as such local anaesthesia should be used (lidocaine 1% or 2% up to 3mg/kg ideal body weight).
- Confirm anatomy with ultrasound. Doppler ultrasound can be used to assess flow characteristics
- Consider using ultrasound guidance to infiltrate lignocaine cutaneously, subcutaneously and around proposed vessel.
• WHILST LIGNOCAINE HAS TIME TO WORK flush all lumens of the line and then clamp all lumens except the Seldinger lumen (green lumen) – **THIS WILL AVOID INADVERTANT COMPLETE GUIDEWIRE INSERTION**

• Insert needle or cannula over needle under direct ultrasound guidance into vessel. Confirm needle placement with ultrasound and free aspiration of venous blood into saline filled syringe. If in doubt, consider aspirating blood into an blood gas syringe and confirming venous placement with blood gas (compare S0₂ and P0₂ with existing arterial samples and peripheral oxygen saturations)

• Place Seldinger wire via needle or cannula immediately, tip or J-point first. The wire should pass freely without significant force. Watch ECG monitoring for arrhythmias. In the event of arrhythmias, withdraw the wire by a few cm until they cease.

• Do not withdraw and repeatedly insert the Seldinger wire as there is risk of lacerating the wire on the needle cutting surface. If passage of the wire is difficult, withdraw the needle and wire together. Be wary, if excessive force is needed, there is likely a problem. Wires have been known to fray or snap. If in doubt, obtain senior assistance.

• Keeping hold of the wire, remove the needle or cannula

• Confirm venous placement of the wire with short and long axis ultrasound views of the vein.

• Use the supplied scalpel to make a small skin incision of roughly 3mm. Cut away from the wire to ensure no damage to the wire.
• Pass the dilator over the wire and gently but firmly dilate a tract through to the internal jugular. At this stage there may be some bleeding so ensure to have some swabs ready.
• The dilator should only be inserted far enough to open the vessel puncture site, and NOT pushed to its full length. It is vital that excessive force is not used.
• Remove the dilator and pass the central line over the Seldinger wire. Do not advance the line until you have hold of the end of the wire.
• Ensure adequate and appropriate CVC depth (Depth markers are on the Catheter). Remove the wire and confirm wire removal with assistant.
• Suture the CVC to the skin at FOUR POINTS (unless the CVC is to the hilt) using the supplied fixation device and the integrated wings. See photos and the explanations below.
• When the line is secured, the site should be thoroughly cleaned of blood or debris prior to dressing.
• Aspirate and flush all ports to confirm free flow of venous blood.
• Cover the central line with adhesive sterile dressings.

In the event of failure, STOP, and discuss with senior clinician

Do not allow air to enter the catheter. 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.

In the event of cardiovascular collapse in a patient with an in-situ or recently removed CVC the possibilities of venous or arterial perforation and haemorrhage, pericardial tamponade, air embolism,
arrhythmia, haemothorax or pneumothorax must always be considered.

Photograph One

It is important to realise that monofilament sutures require multiple throws to ensure they remain tight. Two throws are inadequate and have led to lines becoming displaced and extravasation of irritant drugs into soft tissues.

Photograph One shows that with two throws the knot does not remain tight and there is risk of line displacement.

Photograph Two

Photograph Two shows a CVC sutured at the clip only. This is wholly inadequate as once the CVC within the clip becomes coated with the patient’s sweat the CVC is not held securely. There have been cases where this has caused the CVC to become displaced.

Photographs Three & Four
Photographs Three & Four show correct fixation of a CVC.

Photograph Three shows correct technique for CVC’s placed in the:
- right internal jugular vein,
- right subclavian vein or
- right axillary vein
using four sutures – two at the clip and two at the CVC hub.

Photograph Four shows correct technique for CVC’s placed in the:
- left internal jugular vein,
- left subclavian vein,
- left axillary vein or
- either common femoral vein
using two sutures at the CVC hub. When using these sites the CVC should be inserted to the hub.

Photograph Five shows correct fixation of a vascathe using three sutures – two on the wings of the vascathe and one around the line itself in the groove designed for the third suture.

**Post Procedure**

- Clear away sharps into sharps bin safely
- Order X ray on correct patient via Medway.
- Clean ultrasound machine, return to storage area and plug in to charge
- Document central line insertion using NUH trust standard “yellow sticker”
Prescribe CVC transducer set using NUH trust standard sticker. CVC should only be transduced with 0.9% saline.

Confirm position is correct on CXR and document in the medical notes (check date and time of CXR, ensure it is the correct patient).

Inform bedside nurse that central venous catheter is safe to use.

If in doubt discuss with senior clinician.

The member of staff who inserts the device has sole responsibility for safely disposing all sharps. They must also ensure that their removal of the guidewire is witnessed by the assisting nurse.

Central venous catheters that have been placed in sub-optimal conditions without strict asepsis (such as ED) should be removed, and replaced if needed, as soon as possible. Usually this will mean following admission to ICU/HDU and a period of stabilisation.

**Fixation**

Monofilament sutures are required to secure the CVC and/or vascath in the correct position. Sutures are mandatory at both the clip and device hub for central venous cannulas.

In the case of temporary haemofiltration catheters there is no clip but three sutures are required at the device hub. It is important to realise that monofilament sutures require multiple throws to ensure they remain tight. Two throws are inadequate and have led to lines becoming displaced and extravasation of irritant drugs into soft tissues.

**Central Line Review**

Central lines should be reviewed daily for:

- signs of local infection at the insertion site (tenderness, pain, redness, swelling)
- signs of systemic infection
- suture and dressing integrity
- catheter tip and insertion site position
- patency of CVC lumens
- ongoing need – remove as soon as possible when no longer needed
- Document clearly in the medical notes.

**Catheter tip position**

A poorly positioned central line is likely to cause further complications, such as thrombosis, mechanical damage, arrhythmias, erosion of cardiac chambers and death. Catheter tip position, relative to CVC length clearly depends on point of entry, but both too far or too short tip placements have appreciable morbidity and mortality associated with them. Multiple guidance states that the optimal position for the catheter tip is lying above the pericardial reflection. On CXR, placement of the tip at the level of the carina is deemed optimal, as the pericardial reflection is generally accepted to be below the carina(9). A simple technique is to measure externally on the patient from the proposed site of insertion. Caution should always be taken on very large or very small patients, and their size taken into account when inserting lines. A CXR should be ordered immediately following the insertion of Subclavian or Internal Jugular central venous catheters. Unless discussed with a senior clinician, no infusions should be commenced via the CVC unless position has been confirmed on CXR (see diagram below).
Infusions should only be commenced via a CVC that’s position has not been confirmed at the request of a senior clinician. Transducing the CVC and ensuring a typical central venous trace can aid this decision.

Figure 1 OPTIMAL POSITION FOR CVC PLACEMENT

Figure 2 OPTIMAL CVP TRACE

A = ATRIAL CONTRACTION, C = TRICUSPID VALVE MOVING TOWARDS ATRIUM IN ISOVOLEMIC CONTRACTION, X[DESCENT] = ATRIAL RELAXATION, V = SYSTOLIC FILLING OF THE ATRIUM, Y[DESCENT] = EARLY VENTRICULAR FILLING
Ultrasound techniques can be utilised to ensure correct position when CXR is not immediately available; Micro bubble/agitated saline artefact can be observed in the Right atrium (usually best visualised by a Subcostal 4 chamber or Apical 4 chamber echocardiogram view) when saline is flushed via the distal CVC port, and pneumothorax can be ruled absent with the presence of bilateral pleural sliding. In a recent systematic review and meta-analysis (10), confirmation of CVC position utilising Contrast-enhanced US showed pooled sensitivity of 72% (95% confidence interval, 44%-91%), pooled specificity of 100% (95% confidence interval, 99%-100%), a positive predictive value of 92.1%, and a negative predictive value of 98.5% compared with chest radiography for confirming the placement of central venous catheters.

**Transducing**

All CVC’s should be transduced with **ONLY 500ml bag of 0.9% Normal Saline**, the bag should be prescribed using trust CVC transducer stickers, and checked and signed for by two individuals prior to use. Monitoring the CVP via the proximal port would appear to be a simple method to aid detection of catheter migration through loss of the normal CVP trace(11). Undetected central venous catheter migration can lead to subcutaneous administration of drugs resulting in significant morbidity and even death.

**Accessing the Central Line**

Strict asepsis should be maintained when accessing the CVC. Utilise an aseptic, non-touch technique (ANTT) at all times. When accessing a CVC, the no needle hub must be disinfected thoroughly with an alcoholic chlorhexidine gluconate sterile wipes and left to dry for 15 seconds before use.
**Removal or Replacement of CVC**

It is easy to overlook the presence of a CVC and leave it in for longer than necessary. Failure to remove or replace unused or potentially infected CVCs in a timely manner has been found historically to be the root cause of several bacteraemias. Consider the need for CVC in each patient on a daily basis, and document the decision to retain or remove the CVC on the daily review sheet. If it is appropriate to remove a central line, ensure that alternative IV access is provided promptly. Ensure that the CVC is removed if it is decided that there is no rationale for continuing its use. CVCs should be removed within four hours of the decision to remove and before any transfers to other care areas. There is no evidence that scheduled or routine replacement of CVCs results in fewer CRBSI. Ongoing daily inspection of the central line site should be performed to rule out site insertion infection. Positive microbiology from blood cultures taken from CVC’s should prompt review of the CVC, and in almost every case, the CVC should be replaced. Consider the length of time a CVC has been in place in patients with pyrexia, or signs of infection. Blood cultures should always be taken from CVC if in situ. Replacement of a central line should not occur over a wire at the same site; there is the potential to propagate or worsen CRBSI(12). In the event of difficult IV access, consider discussing the patient with interventional radiology and consider radiology guided insertion of new line.

**Catheter Related thrombosis**

The presence of a Central venous catheter or PICC line exposes patients to an increased risk of thrombosis formation. The incidence of CRT has been estimated at 0.4 to 1.0 per 10,000 persons(13). The
majority of CRT occurs within 100 days of catheter placement. Most are likely to be asymptomatic, but a high index of suspicion should be retained. Unexpected neck or limb swelling should prompt further investigation using venous Doppler examination. Atypical symptoms can occur, such as jaw pain or shoulder pain, and DVT should be considered. CRT risk varies by insertion site with the femoral vein being the highest risk site followed by jugular and then subclavian vein. A meta-analysis of 11 studies found that PICCs were associated with a 2.5 fold higher risk of DVT than centrally-inserted venous catheters(14). Duplex ultrasound is the imaging modality of choice to diagnose thrombosis, as it is relatively easy, quick and non-invasive. Contrast venograms should be considered if suspicions remain despite negative Ultrasound investigations. There is no evidence that D-Dimer assessments are useful in the diagnosis of catheter related thrombosis(15). There is no current evidence for the specific prophylaxis against CRT, but all AICU patients should be on NUH standard VTE Prophylaxis unless there is a contraindication. There is limited good evidence for systemic or local anticoagulation in CRT. Most evidence extrapolates from practice in managing DVT or PE, and in patients with malignancy. The best guidance is from the “International clinical practice guidelines for the treatment and prophylaxis of thrombosis associated with central venous catheters in patients with cancer”(16) and the “Antithrombotic therapy for venous thromboembolic disease: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition)”(17). These suggests “For the treatment of symptomatic CRT, anticoagulant treatment (AC) is recommended for a minimum of 3 months; in this setting, LMWHs are suggested(16)” and “For DVT of the upper extremity, we recommend similar treatment as for DVT of the leg (Grade 1C)”(17). All decisions to systemically
anticoagulate patients in this circumstance should be discussed with a senior clinician and/or the haematology on call services. There is consensus opinion that, if the catheter continues to work well and is non-infected, and with treatment, symptoms resolve, the CVC does not need to be removed(18). The line should be removed if not all these criteria are met, if anticoagulation is contraindicated or if the thrombosis is life or limb threatening.

References


11. The following abstracts were presented at the Association of Anaesthetists of Great Britain & Ireland’s Annual Congress in Harrogate, September 2010: Abstracts. Anaesthesia. 2010 Dec;65(12):1234–55.


CERTIFICATION OF EMPLOYEE AWARENESS

<table>
<thead>
<tr>
<th>Document Title</th>
<th>Guideline for the insertion, securing and verifying the position of central venous catheters (CVC’s) and temporary haemofiltration catheters.</th>
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<tbody>
<tr>
<td>Version (number)</td>
<td>v1</td>
</tr>
<tr>
<td>Version (date)</td>
<td>September 2018</td>
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I hereby certify that I have:
• Identified (by reference to the document control sheet of the above policy/procedure) the staff groups within my area of responsibility to whom this policy/procedure applies.
• Made arrangements to ensure that such members of staff have the opportunity to be aware of the existence of this document and have the means to access, read and understand it.

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