The Shrewsbury and Telford Hospital NHS Trust

GUIDANCE FOR INSERTION & CARE OF ADULT CENTRAL VENOUS CATHETERS, PERIPHERALLY INSERTED CENTRAL CATHETERS (PICCs) & MIDLINES

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This policy provides a framework for the insertion and maintenance of adult central venous catheters (CVCs) in line with best evidence based practice in order to reduce the risk of infection and other complications to the patient. It is written with the intent of ensuring that the patient is exposed to minimal risk of infection, discomfort, trauma or other complications.

A central venous catheter is an intravascular device whose tip sits in a large vein such as the SVC, IVC or the atrium. Included in the scope are midlines that have a tip commonly sited in a larger peripheral vein such as the subclavian, axillary or basilic vein.

DEFINITIONS OF CENTRAL VENOUS CATHETER DEVICES

Non-tunnelled CVCs

Used for short term central venous access, usually inserted under ultrasound guidance*. Mainly used for administration of vasoactive, inotropic or hypertonic drugs, resuscitation of patients with poor peripheral access, administering short term parenteral nutrition and introduction of temporary pacing wires. There is no tunnelling of the line subcutaneously prior to vein puncture and the line passes directly through the skin with a short route into the vein.

*2-D imaging ultrasound guidance should be the preferred method when inserting of central venous catheter into the internal jugular vein in adults in 'elective situations' and should be considered in most clinical situations where CVC insertion is necessary, whether the situation is elective or an emergency. (NICE 2002) Ultrasound imaging of the subclavian route is much less useful than the jugular or femoral as the vein puncture-point lies behind the clavicle unless a lateral subclavian approach is used.

PICCs

Peripherally inserted central catheters. These are usually placed via the basilic or cephalic veins in the arm rather than directly into the more proximal venous system. Used for medium to long term IV therapy for a number of months. They are inserted via peripheral venous access and are ideal for prolonged courses of antibiotics, parenteral nutrition, or chemotherapy administration.

Skin Tunnelled CVCs

Used for medium to long term IV therapy (may be used for permanent access). Ideal for prolonged courses of chemotherapy, parenteral nutrition (especially when self-administered), preparation and treatment for bone marrow transplantation and any long term condition requiring regular IV access. The subcutaneous tunnelling makes the line more secure for outpatient use and possibly reduces line infection risk.

Implanted port

Used for long term IV therapy including permanent access. Ideal for courses of chemotherapy lasting more than 6 months and any long term condition requiring regular IV access. The injection site lies subcutaneously as a needle puncture diaphragm and is therefore better protected from cutaneous organisms.

Midlines (peripheral not central access)

Used for short term IV therapy when treatment is likely to exceed 7 days and be less than 4 weeks, or as an alternative to peripheral cannulation in patients with poor peripheral venous access. They are ideal for short courses of antibiotic therapy or outpatient use. The lines are inserted in proximal arm veins and are shorter than normal central lines, being around 20 cm. They terminate more proximally in the axillary, subclavian or brachiocephalic veins

Haemodialysis catheters (acute/long-term dialysis, apheresis and plasma exchange)

Usually larger bore and used to facilitate high blood flow for the purpose of haemodialysis, apheresis (filtration) or plasma exchange. These CVCs may be acute for short term or intermittent therapy or skin tunnelled for long-term or permanent therapy.

REASONS FOR INSERTION OF A CENTRAL VENOUS CATHETER

Drugs that require infusion into the central circulation that would otherwise cause a peripheral vasculitis.
Emergency resuscitation of haemodynamically unstable patients

Difficult peripheral access

Provision of long term intravenous therapy or nutrition.

Access for extracorporeal blood circuits required to therapies such as renal replacement therapy, plasmapheresis/exchange and ECMO.

Provision of temporary cardiac pacing

Monitoring of venous oxygen saturations and/or central venous pressures.

WHO CAN PUT CENTRAL LINES IN?

Central line insertion can be associated with serious complications and insertion should only be carried out by trained personnel or by a nurse or doctor in training under the supervision of a trained individual. Supervised individuals in training should only be inserting lines with the purpose of learning the skill. It should not be inserted by inexperienced personnel who will have no future requirement to maintain the appropriate skill set.

Appropriate individuals to perform this procedure include; hospital consultants and trainees if they have been observed as competent by a consultant; nurses that are specialist vascular access nurses; advanced care practitioners with ITU competencies. Some vascular access nurses may only be trained for PICC line insertion and not central line insertion.

The level of supervision required for a particular central line needs to be appropriate for the experience of the operator and the clinical condition of the patient. When a difficult catheterization is anticipated, patient safety mandates that the procedure be performed or supervised by an experienced physician.

Ultrasound guided insertion of CVCs has become the standard of care in the UK and the ease of imaging of the internal jugular compared with the subclavian has made the internal jugular vein the most popular route for short term access.

Reducing infection risk and monitoring for complications requires that central access is only carried out in certain hospital environments. These are;
Theatres
Intensive care units
A&E resuscitation areas
Cardiac pacing suites
Radiology suites
Appropriate procedure rooms in the oncology, renal and haematology clinics.

Central line insertion should not be carried out in the general ward areas unless circumstances are acute and life threatening. If the technique insertion under any circumstances was sub-optimal a replacement line should subsequently be inserted with full aseptic technique (see below).

PREPARATION & CONSENT

The patient should be consented and be informed of the complications with written consent or verbal consent recorded in the notes. Where the patient lacks capacity a line may be inserted on the basis of 'best interest'.

Pre-insertion a recent platelet count and coagulation study should have been taken. Where a coagulopathy exists, the risk/benefits of treating the coagulopathy and choice of anatomical insertion site will need discussion with a senior clinician.

During insertion the patient should have ECG monitoring to observe for dysrhythmias and means to measure oxygen saturation. A baseline blood pressure and heart rate should be recorded. The patient must be monitored post procedure for complications such as the potential for occult haemorrhage, cardiac and respiratory complications (see complications for further details).

CHOICE OF CENTRAL LINE AND ANATOMICAL INSERTION SITE

Site of insertion

There are three common venous access points.

1. Internal Jugular
2. Subclavian (infra or supraclavicular approach)
3. Femoral

The **internal jugular route** is a common intensive care unit site of insertion. It has a low complication rate for pneumothorax and excess bleeding is both visible and usually easily managed by compression and blood products if required. Accurate placement is facilitated by localisation of the vein with an ultrasound image, which should always be used.

The **subclavian route** has a higher risk of pneumothorax and excess bleeding is less easily managed as direct vessel compression is not possible. The insertion technique is not usually facilitated by ultrasound imaging as the puncture-point lies beneath the clavicle unless a very lateral approach is used. It is recommended that the jugular route should be considered first. However the subclavian route is less visible and more comfortable for ambulatory patients and outpatients. It is <u>not recommended</u> for dialysis as post line insertion subclavian stenosis can result. Access can be achieved by both an infra and supra clavicular approach.

The **femoral route** is usually only suitable for non-ambulatory patients. It can be a good option for dialysis. Line contamination from a stoma, surgical site nearby or excessive diarrhoea can increase the risk of a line infection and so it should be avoided in these circumstances. It can be an excellent route for temporary non-ambulatory haemodialysis catheter insertion.

The following patient related factors also need to be considered:
Patient cooperation
Body habitus
Coagulopathy
Previous surgery and/or radiotherapy or scarring at site of vein
Previous CVC insertion at same site
Infection, trauma or burn at insertion site
Pre-existing vessels thrombosis or stenosis
Pre-existing pneumothorax or haemothorax (ideally insert on side of pneumothorax to minimise injury to the normal lung).
Likely duration of CVC insertion
Likelihood of patient requiring long-term renal replacement therapy in the future

The evidence as to the best route for reducing the risk of catheter colonisation, thrombosis and occlusion is both complicated and conflicting. The reader is best advised to consult Uptodate.com or Cochrane reviews at http://cochranelibrary-wiley.com/cochranelibrary/search for further information.

TYPE OF LINE AND NUMBER OF LUMENS

Two decisions need to be made.

Number of lumens.

Up to 4 lumens are commonly available within the Trust. The **minimum number of lumens** should be chosen. More lumens potentially result in a higher line infection rate especially if they are being utilised with poor aseptic technique (see below) or become full of clot and are unusable. Dialysis lines are specifically designed for that purpose and are large bore double lumen lines that may or may not have an accessory infusion port.

Line length.

The Trust generally has 16cm and 20 cm lines available. For adults a 16 cm line is the best choice except for the femoral route when 20 cm is better. A large or obese individual with a deep chest may also require a 20 cm line, especially with the left subclavian route. The tip should just reach the right atrium if the placement is ideal. Sometimes accepting a slightly short insertion tract is justifiable if re-insertion is likely to be difficult.

ASEPTIC INSERTION TECHNIQUE

Implementation of the central line bundle
The central line bundle consists of 5 key components:
1. Hand hygiene
2. Maximal barrier protection
3. Chlorhexidine skin asepsis
4. Optimal catheter site selection
5. Daily review of line necessity

Each of these components must be rigorously addressed if the full benefit of the bundle is to be realized.

Hand hygiene
Proper hand hygiene is mandatory when carrying out any invasive procedure and central line insertion is no exception. Washing hands or using an alcohol-based waterless hand cleaner can help to prevent contamination of central line sites and bloodstream infections

Maximal barrier protection
The insertion of a central venous line should be treated as an invasive surgical procedure and, as such, maximal barrier precautions should be employed. The operator should use the Trust's pre-prepared central line access pack and observe strict compliance with hand washing, wearing of a cap, mask, sterile gown and gloves

Patient
Use a large sterile fenestrated drape from the CVC pack to create a sterile field.
Chlorhexidine skin antisepsis has been proven to provide better skin antisepsis compared to other antiseptic agents such as povidone-iodine solutions. It is the disinfectant of choice for central line insertion. If available, single patient use chlorhexidine gluconate 2% in 70% isopropyl alcohol (Chloraprep) should be used. Apply chlorhexidine solution using a back and forth friction scrub for at least 30 seconds. Do not wipe or blot. Allow the antiseptic solution time to dry completely before puncturing the site (~ 2 minutes).

On COMPLETION OF THE PROCEDURE CHECK THAT THE SELDINGER GUIDEWIRE HAS BEEN REMOVED

VERIFICATION OF CORRECT PLACEMENT AND THE COMPLICATIONS OF CENTRAL LINE INSERTION

The following is MANDATORY with appropriate documentation in the notes to verify correct placement of the line. Failure to do so lies outside the Trust's central line policy. This is essential from a medico–legal perspective.

1. **Can blood be aspirated through all lumens?**
2. **Is the blood venous confirmed with measurement of the PO2 in a blood gas syringe?**
3. **Is the transducer waveform consistent with a CVP waveform? (2 or 3 usually acceptable)**
4. **Is the catheter on CXR consistent with placement within a central vein (i.e. overlies the trajectory of the SVC) and not kinked?**

Provide points 1and 4 are satisfied, usually either point 2 or 3 is adequate in lieu of the other to establish that the line is in the venous system, but both investigations should be considered if there is some uncertainty. If the answer to these questions is yes then the CVC is likely to be in a central vein and can be used. If the answer is no to any of the questions then further consideration as to the CVC's tip whereabouts is required (Gibson & Bodenham 2013). Ideally the line tip should lie in the superior vena cava or proximal brachiocephalic system on CXR to reduce the risk of atrial induced arrhythmias or perforation.

DOCUMENTATION

The date, time, and name of operator should be recorded in the notes. Compliance with aseptic technique and any complications and recommendations are also required (e.g. a planned delayed repeat CXR at 8-24 hours if there is some concern concerning pleural puncture.) The type of line used and its readiness for use should also be recorded. The length of insertion under the skin should also be recorded.

DRESSING CHANGES AND ON GOING CARE FOR A CENTRAL VENOUS ACCESS DEVICE

Good practice tips

- The dressing should be changed every 7 days using a transparent, semi-permeable dressing.
- Any dressing should be changed if it has become loose, damp or soiled.
- Sutures should be in place to secure the line, in addition to the transparent, semi-permeable dressing.
- Measure the catheter length to check for migration. Check this against documented insertion length.
- Needle free connectors should be changed every 7 days.

Equipment

- Dressing trolley
- 2% Chlorhexidine gluconate in 70% alcohol stick (Chloraprep)
- Sterile dressing pack
- Non-sterile gloves
- PPE
- Transparent, semi-permeable dressing.
- Statlock dressing (if no stitches in place securing the line) & CHG skin cleansing wipe to remove a previous statlock

Action	Rationale
Explain and discuss the procedure with the patient, in a way the patient understands. Obtain informed consent for the procedure (wherever possible) and establish if the patient has any known allergies for example to cleaning solution or medication.	Inform and reassure the patient. To obtain the patients consent and co-operation. To ensure the patient has no allergies to cleaning solution or dressing. (NMC 2010)
• Assess the need to carry out any more procedures e.g. change of needle free connectors, swab.	Needle free connectors need to be changed every 7 days in accordance with the license of the product.
• Wash and dry your hands thoroughly and put on your apron.	To minimise risk of infection (RCN 2016)
• Open the dressing pack and prepare the equipment using an ANTT and assemble on a clean trolley.	To minimise risk of infection and maintain asepsis (RCN 2016)
• Maintain aseptic technique at all times.	To minimise risk of infection and maintain asepsis (RCN 2016)
• Inspect the catheter for signs of infection, damage, migration or phlebitis, if you have any concerns inform the doctor, or contact the critical care outreach service for advice.	To minimise risk of infection and maintain patient safety (RCN 2016)
• Put on non-sterile gloves and loosen the dressing, removing it without touching the catheter and exit site.	To minimise risk of infection (RCN 2016)
• Gel your hands and put on the sterile gloves from the dressing pack.	To minimise risk of infection and maintain asepsis (RCN 2016)
• Clean catheter with a 2% chlorhexidine gluconate in 70% alcohol stick. Clean for 30 seconds and allow to air dry for a minimum of 30 seconds.	Chlorhexidine gluconate in70% alcohol is recommended for cleaning venous devices (NICE 2012) (RCN 2016)
• On the skin with the 2% chlorhexidine gluconate in 70% alcohol stick use a gentle scrubbing technique, start from the exit site, extending out to the area that will be covered by the dressing. Clean for 30 seconds and allow to air dry for a minimum of 30 seconds.	To minimise risk of infection (RCN 2016)
• If there are no stitches securing the line a statlock dressing should be in place to secure the line. This should be changed during this dressing change.	
• Apply the transparent, semi-permeable dressing over the top of the insertion site and flat to the	Prevention of catheter migration (Ullman *et. al*, 2016) To ensure patient safety (RCN 2016)

skin leaving the ports of the lumens exposed. • Dispose of all equipment immediately as per the Trust policy. • Wash and dry your hands thoroughly. • Document date and time of dressing change, any concerns regarding the condition of the catheter and the VIP score. Also apply a date of dressing label to the dressing.	To ensure patient and staff safety (RCN 2016) To minimise the risk of infection (RCN 2016) To ensure adequate record keeping and enable care of device and patient (NMC 2015) To minimise risk of infection (RCN 2016) To ensure adequate record keeping and enable care of device and patient (NMC 2015)

ROUTINE FLUSHING OF CENTRAL LINE

***See comment pertinent to renal dialysis lines below.*

Equipment

- Dressing Trolley
- 2% Chlorhexidine gluconate in 70% alcohol wipe
- 10ml syringes
- 10mls Sodium Chloride 0.9%
- Sterile dressing pack
- PPE

Action	**Rationale**
Explain and discuss the procedure with the patient, in a way the patient understands. Obtain informed consent for the procedure (Wherever possible) and establish if the patient has any known allergies for example to cleaning solution or medication. Confirm patients name and date of birth and check the patient's unit number against the prescription sheet.	Inform and reassure the patient. To obtain the patient's consent and co-operation. To ensure the patient has no allergies to cleaning solution or dressings. (NMC 2010) To ensure correct patient.
• Wash and dry your hands thoroughly and put on your Apron • Open the dressing pack and prepare the equipment using an ANTT and assemble on a clean trolley. • Maintain aseptic technique at all times. • Inspect the catheter for signs of infection, damage, migration or phlebitis, if you have any concerns inform the doctor, or contact the critical care outreach service for advice. • Decontaminate hands and apply sterile gloves. • Place sterile field under the central line lumens.	To minimise risk of infection (RCN 2016) To minimise risk of infection and maintain asepsis (RCN 2016) To minimise the risk of infection and maintain asepsis (RCN 2016) To minimise the risk of infection and to ensure patient safety (RCN 2016) To minimise the risk of contamination blood or body

Action	Rationale
• Clean the needle free bung on the port using a 2% Chlorhexidine gluconate in 70% alcohol cleansing wipe for 30 seconds and allow to air dry for a minimum of 30 seconds.	fluids to the operator, and prevent descaling of skin onto key parts (RCN 2016) To minimise risk of infection (RCN 2016).
• Attach a sterile 10ml syringe to the needle free connector, unclamp the lumen and gently aspirate enough to visualise blood in the lumen, known as 'flash back'. There is no need to withdraw blood from the lumen. Once visualised slowly flush the sodium chloride 0.9% into the line using a push/pause or pulsating flush technique, for the last 2mls flush maintain a constant pressure and apply the clamp whilst doing so. • Nb if there is a possibility / known heplock within the line, withdraw 2mls of blood and disregard before flushing the line as above. • Do not force if resistance is met.	2% Chlorhexidine gluconate in 70% alcohol is recommended for cleaning venous devices (NICE 2012) (RCN 2016) To check catheter patency (RCN 2016). This creates turbulence within the lumen(s) of the catheter, thereby decreasing the risk of fibrin and platelets becoming adhered to the internal wall of the catheter and minimising occlusion (Doughty 2006) To maintain positive pressure and prevent backflow of blood into the catheter and possible clot (Doughty 2006)
• Dispose of sharps and equipment immediately as per the Trust policy. • Wash and dry hands thoroughly. • Document procedure and assessment of the site in the patient's notes/CVAD care record.	Applying undue force may result in an emboli or catheter rupture. To Ensure patient and staff safety (RCN 2016). To minimise the risk of infection. To ensure adequate record keeping and enable care of device and patient (NMC 2015)

***Dialysis catheters; flushing and locking*

Dialysis lines are locked with the anti-microbial & anti-coagulant solution CITRALOCK 30% after each use. This solution is administered slowly, over 8-10 seconds, according to the exact volume of each lumen written on each lumen. The patient may experience a metallic taste in their mouth if too much is instilled- this will disappear after a few seconds.

ADMINISTRATION OF INTERMITTENT INTRAVENOUS MEDICATION VIA A CENTRAL LINE – BOLUS

Equipment

- Dressing Trolley
- 2% Chlorhexidine gluconate in 70% alcohol wipe
- 10ml syringes
- 10mls Sodium Chloride 0.9%
- Drug for administration
- Sterile dressing pack
- PPE

Action	Rationale
Explain and discuss the procedure with the patient, in a way the patient understands. Obtain informed consent for the procedure (Wherever possible) and establish if the patient has any known allergies for example to cleaning solution or medication. Confirm patients name and date of birth and check the patient's unit number against the prescription sheet.	Inform and reassure the patient. To obtain the patient's consent and co-operation. To ensure the patient has no allergies to cleaning solution or dressings. (NMC 2010) To ensure correct patient
• Wash and dry your hands thoroughly and put on your Apron • Open the dressing pack and prepare the equipment using an ANTT and assemble on a clean trolley. • Maintain aseptic technique at all times. • Inspect the catheter for signs of infection, damage, migration or phlebitis, if you have any concerns inform the doctor, or contact the critical care outreach service for advice. • Decontaminate hands and apply sterile gloves. • Place sterile field under the central line lumens. • Clean the needle free bung on the port using a 2% Chlorhexidine gluconate in 70% alcohol cleansing wipe for 30 seconds and allow to air dry for a minimum of 30 seconds.	To minimise risk of infection (RCN 2016) To minimise risk of infection and maintain asepsis (RCN 2016) To minimise risk of infection and maintain asepsis (RCN 2016) To minimise risk of infection and ensure patient safety (RCN 2016) To minimise the risk of contamination blood or body fluids to the operator, and prevent descaling of skin onto key parts (RCN 2016) To minimise risk of infection Chlorhexidine gluconate in 70% alcohol is recommended for cleaning venous devices (NICE 2012) (RCN 2016)

Action	Rationale
• Attach 10mls of sodium chloride 0.9% to the needle free connector, unclamp the lumen and gently aspirate enough to visualise blood in the lumen, known as 'flash back'. There is no need to withdraw blood from the lumen. Once visualised slowly flush the sodium chloride 0.9% into the line using a push/pause or pulsating flush technique, for the last 2ml flush maintain a constant pressure and apply the clamp whilst doing so.	To check catheter patency (RCN 2016). This creates turbulence within the lumen(s) of the catheter, thereby decreasing the risk of fibrin and platelets becoming adhered to the internal wall of the catheter and minimising occlusion (Doughty 2006) To maintain positive pressure and prevent backflow of blood into the catheter and possible clot (Doughty 2006)
• Nb if there is a possibility / known heplock within line, withdraw 2 mls of blood and disregard before flushing the line as above.	
• Do not force if resistance is met.	Applying undue force may result in an emboli or catheter rupture.
• Using ANTT attach administer medication as per the manufacturers guidelines and drug chart.	To minimise the risk of contamination and allow for the administration of bolus drugs (RCN 2016).
• Flush the lumen in between medicines and promptly at the end of the procedure. Flush with 10mls of sodium chloride 0.9% at the same speed as the drug previously administered.	To prevent medicines remaining in the lumen and to minimise the risk of occlusion (RCN 2016). To prevent speed shock.
• Clean the needle free connector with a 2% Chlorhexidine gluconate in 70% alcohol cleansing wipe for 30 seconds and allow to air dry	To remove any drug residue and to minimise the risk of contamination.
• Dispose of sharps and equipment immediately as per the Trust policy.	
• Wash and dry hands thoroughly.	To Ensure patient and staff safety (RCN 2016).
• Document procedure and assessment of the site in the patient's notes/CVAD care record	To minimise the risk of infection. To ensure adequate record keeping and enable care of device and patient (NMC 2015)

Disconnecting an intravenous infusion from a central line

Equipment

- Dressing Trolley
- 2% Chlorhexidine gluconate in 70% alcohol wipe
- 10ml syringes
- 10mls Sodium Chloride 0.9%
- Drug for administration
- Sterile dressing pack
- PPE

Action	Rationale
Explain and discuss the procedure with the patient, in a way the patient understands. Obtain informed consent for the procedure (Wherever possible) and establish if the patient has any known allergies for example to cleaning solution or medication.	Inform and reassure the patient. To obtain the patient's consent and co-operation. To ensure the patient has no allergies to cleaning solution or dressings. (NMC 2010)
• Wash and dry your hands thoroughly and put on your Apron	To minimise risk of infection (RCN 2016)
• Open the dressing pack and prepare the equipment using an ANTT and assemble on a clean trolley.	To minimise risk of infection and maintain asepsis (RCN 2016)
• Maintain aseptic technique at all times. • Inspect the catheter for signs of infection, damage, migration or phlebitis, if you have any concerns inform the doctor, or contact the critical care outreach service for advice.	To minimise the risk of infection and maintain asepsis (RCN 2016) To minimise the risk of infection and ensure patient safety (RCN 2016)
• Decontaminate hands and apply sterile gloves. • Place sterile field under the central line lumens.	To minimise the risk of contamination blood or body fluids to the operator, and prevent descaling of skin onto key parts (RCN 2016)
• Clamp both the catheter lumen and the infusion line. • Disconnect the infusion from the needle free connector.	To minimise risk of infection.
• Clean the needle free bung on the port using 2% Chlorhexidine gluconate in 70% alcohol cleansing wipe for 30 seconds and allow to air dry for a minimum of 30 seconds.	To minimise the risk of infection, contamination and air emboli. Chlorhexidine gluconate in 70% alcohol is recommended for cleaning venous devices (NICE 2012) (RCN 2016)
• Attach 10mls of sodium chloride 0.9% slowly flush the sodium chloride into the line using a push/pause or pulsating flush technique, for the last 2mls flush maintain a constant pressure and apply the clamp whilst doing so. • Do not force if resistance is met.	This creates turbulence within the lumen(s) of the catheter, thereby decreasing the risk of fibrin and platelets becoming adhered to the internal wall of the catheter and minimising occlusion (Doughty 2006) To maintain positive pressure and prevent backflow of blood into the catheter and possible clot (Doughty 2006)
• Dispose of sharps and equipment immediately as per the Trust policy.	Applying undue force may result in an emboli or catheter rupture.

Action	Rationale
• Wash and dry hands thoroughly. • Document procedure and assessment of the site in the patient's notes/CVAD care record.	To maintain positive pressure and prevent backflow of blood into the catheter and possible clot (Doughty 2006) To Ensure patient and staff safety (RCN 2016). To minimise the risk of infection. To ensure adequate record keeping and enable care of device and patient (NMC 2015)

DURATION OF LINE USE BEFORE REMOVAL

No line should be left in place longer than necessary. Multiple lumen ports are usually short duration lines due to the increased risk of infection. Generally lines with blocked ports should not left in for a prolonged period even if other ports are working.

Multiple lumen internal jugular and subclavian central lines may be left in for up to a month if they have no signs of infection. Single lumen lines can be left in for a number of months

A *Vas-Cath haemodialysis line* is generally left in no more than two weeks.

PICC lines and tunnelled lines and Hickmann lines can be left in for many months if necessary and a healthy line can still be in use 6 months after insertion.

Midlines have a maximum duration of 30 days.

LINE REMOVAL

Do not leave lines in for longer than necessary as they pose an infection risk. Clean entry site with 2% chlorhexidine gluconate in 70% alcohol stick The patient should be lying flat / head down tilt, encourage patient to use the valsalva maneuver on removal to reduce the risk of air embolus. Post removal the tip should be cut off with sterile scissors and sent for C&S in a pot if line sepsis is expected. A simple sterile adhesive dressing should cover the site or in combination with gauze if there is some bleeding.

COMPLICATIONS OF CENTRAL LINES

Immediate		**Late onset**		
Mechanical	**Thromboembolic**	**Mechanical**	**Thromboembolic**	**Infective**
Arterial puncture	Air embolism	Cardiac tamponade	Catheter related thrombus	Line infection
Intra arterial placement	Wire embolism	Erosion/perforation	Pulmonary embolus	Septicaemis
haemorrhage		Venous stenosis	Air embolus	Endocarditis
pneumothorax		Line fracture embolism	Mycotic embolus	
haemothorax				
Arrhythmias				
Thoracic duct injury				
Cardiac tamponade				
Has guidewire been removed				

Management of infections

Do not replace CVCs routinely to prevent catheter related blood stream infections, replace if there is clinical evidence of infection. See 'duration of line usage' paragraph for line life. CVCs should be reviewed daily and if they are no longer needed should be removed (Loveday et al 2014).

If you suspect that a patient has a catheter related blood stream infection do not use a guide wire exchange (Loveday et al 2014). Paired blood cultures, correctly labelled, should be taken (one from the catheter and one from the opposite limb) in order to determine whether an infection is systemic or catheter related.

Antimicrobial prescription should follow the Trust's local microbiology guidelines or involve discussion with a microbiologist. Antibiotics are not always required or patients may only require limited duration antibiotic dosing if the patient is not too sick once the source of infection is removed. There is a common association with Staphlococcal colonisation and resultant systemic infection.

In the undesirable and rare situation when CVCs are inserted in an emergency situation without full asepsis techniques it should be replaced with a properly inserted line as soon as practically possible. Patients transferring into this Trust from other healthcare facilities that have a CVC must have it reviewed and replaced if deemed necessary. If there is uncertainty as to whether to remove a line please discuss with a senior colleague. A potentially infected line should have its tip sent for culture.

MANAGEMENT OF OTHER COMPLICATIONS

Extravasation; Remove line.

Fractured line; A fractured line should be clamped below the fracture and removed as soon as possible.

Haemorrhage; Requires direct compression where possible plus correction of any coagulopathy. A central venous bleed not amenable to direct compression, such as a proximal subclavian bleeding point, may require interventional radiology input also.

Thoracic haemorrhage; Thoracic haemorrhage can be acutely life threatening. Unilateral haziness on the CXR, desaturation and haemodynamic instability may be the first signs. If significant blood is lost it may require senior clinical help, a chest drain, and activation of the major haemorrhage protocol to rapidly correct hypovolaemia and any coagulopathy. Significant chest drain bleeding may be auto-transfused via a cell saver. Surgical input may be required if this does not control the situation. A patient's physiology may deteriorate rapidly so urgent senior assistance is required.

Pneumothorax; A CXR is mandatory for checking correct placement. If air is aspirated from the needle during a subclavian or jugular approach the CXR should be carefully examined for a pneumothorax. A small pneumothorax may not require a chest drain or needle aspiration. If treated conservatively the patient should have a repeat CXR after 12-24 hrs. If uncertain whether to drain discuss with a senior clinician.

Cardiac tamponade; requires urgent senior cardiology input and prompt echocardiography.

Lost or kinked seldinger wire; this may require an interventional radiologist to assist removal.

Venous Thrombosis; an acutely swollen limb will require line removal plus ultrasonography or venography. A period of anticoagulation may be required.

LINE OCCLUSION

Do not force a flush down the line, as this will result in the occlusion being forced in to the circulation system or the line rupturing. A line with multiple occluded ports needs removal & a new line inserted if necessary. A protocol does exist for thrombolysis of single lumens but line-removal versus thrombolysis requires discussion

with a senior clinician. Thrombolysis is not a suitable option to extend line life as a routine practise. Factors like other remaining available venous sites and risk of replacement need consideration when prolonged central access is required. Thrombolysis protocols are available from ITU or the renal unit following discussion with those clinical teams.

PERCUTANEOUSLY INSERTED CENTRAL CATHETER (PICCS) & MIDLINES; ADDITIONAL COMMENTS.

In general the principles of PICC management are identical to centrally inserted catheters. They are inserted with local anaesthetic through a peripheral arm vein and may require ultrasound assisted placement if the vein is difficult to palpate. The tip placement will need confirming with a CXR. Various ECG signal processing devices (depends on manufacturer) can also be used to confirm atrial placement also. Only trained medical or nursing practitioners should put them in. As midlines are so short they do not require an X-ray after insertion.

Most lines may be left in for a number of months in certain cases e.g. chemotherapy or parenteral nutrition. See 'duration of line usage' paragraph.

The complications are identical to centrally inserted lines with the exception of a pneumothorax and thoracic bleeding being very rare (thoracic complications being rare due to the distal site of insertion). Line occlusion and thrombosis can be a particular problem due to the length of the line and narrow lumen.

- **When in place a PICC requires a minimum frequency of flushing with normal saline once per week and after any medication is administered via the line. In-patient lines are likely to exceed this frequency due to regular use.**
- **Midlines need flushing on a daily basis both in hospital and in the community.**

Dr Alastair Windsor

Intensive care consultant

SATH

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