

GUIDELINE TITLE: Vascular Access Devices - Management in Adults

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1 Introduction

Airedale NHS Foundation Trust (ANHSFT) guidelines for vascular access devices (VAD), insertion, care and management in adult patients have been produced to ensure a standardised approach to the management of all VADs¹ for patients and. This guideline incorporates the reasons for insertion, care and management of:

- I. Peripheral venous access devices – usually positioned in hands or arms
- II. Midline venous access devices – (<20cms are best inserted above the ante cubital fossa and the tip ends below the level of the axillary line. There may be instances where midlines are inserted at the ante cubital fossa by medical staff for patients requiring very short term intravenous therapy (24-48 hours).
- III. Central venous access device of which there are 4 types used at Airedale NHS Trust
 - Central venous catheters (CVC) – tip positioned in the superior vena cava.
 - Skin tunnelled catheters i.e. Hickman lines– tip positioned in the lower third of the superior vena cava.
 - Port-a-caths® a totally implanted device with the tip terminating in the SVC/atrial junction.
 - Peripherally inserted central catheters (PICC) – longer than 20cms and positioned in the lower third of the superior vena cava/cavo-atrial junction.

These guidelines have been based on the epic 3 guidelines (Loveday et al, 2014) and the Standards for Infusion Therapy (Royal College of Nursing, 2010).

When caring for a patient with a Hickman line or Port-a-cath in situ, it is important that these guidelines are read in conjunction with the YCN guidance and the policies and procedures pertinent to Airedale NHSFT².

VAD insertion must only be carried out by healthcare professionals trained and competent in the procedure they are undertaking. Training must be completed and competency attained before any staff working at ANHSFT are able to cannulate unsupervised. Practitioners who insert PICC and midlines must follow the Trust's Advancing Practice Policy and be registered on the Trust's Advanced Practice register (see [Advanced Practice Policy](#)).

Unregistered practitioners are allowed to insert peripheral cannulae but only if they have undertaken specific training and followed the process described in the SOP

¹ The care and management of indwelling arterial cannula at Airedale NHS Trust is set out in [arterial line guidelines](#).

² Refer to Yorkshire Cancer Network guidance for CVADs.

(Standard Operating Procedure) for peripheral cannulation. These practitioners are covered by the medicines code to administer a **prescribed** 0.9% sodium chloride flush once they have inserted the cannula.

When a clinical decision is made that a patient requires central access for any form of therapy (in particular urgent therapeutic apheresis or dialysis) it must be inserted as soon as possible following this clinical decision.

The appropriate document must be used to confirm date/time of insertion. This documentation must be filed in the patient's medical notes.

1.1 Statement of intent

Airedale NHS Foundation Trust fully recognises that the obligation to implement guidance should not override any individual clinician to practice in a particular way if that variation can be fully justified in accordance with Bolam Principles. Such variation in clinical practice might be both reasonable and justified at an individual patient level in line with best professional judgement. In this context, clinical guidelines do not have the force of law. However, the Trust will expect clear documentation of the reasons for such a decision and for this variation. In addition, any decision by an individual patient to refuse treatment in line with best practice must be respected, escalated to the consultant and fully documented in the appropriate records of care/treatment

2 Management

2.1 Asepsis - Good standards of hand hygiene and [aseptic technique](#) can reduce the risk of infection (Epic3 2014).

2.1.1 Hand Hygiene

This can be achieved either by washing hands with liquid soap and water or by using an alcohol-based hand rub. When hands are visibly dirty or contaminated with organic material, such as blood and other body fluids or excretions, they must first be washed with liquid soap and water followed by alcohol-based hand rubs to achieve hand antisepsis (Epic3 2014).

2.1.2 Skin/Site Preparation

Decontaminate the skin at the insertion site with a single-use application of 2% chlorhexidine gluconate in 70% isopropyl alcohol (or povidone iodine in alcohol for patients with sensitivity to chlorhexidine) and allow to dry prior to the insertion of a venous access device (Epic3, 2014)

2.1.3 Maximum Barrier Precautions (MBP)

This is the process of 'gowning up' and creating as sterile an environment as possible outside of the operating theatre. It involves the use of sterile gloves, face mask, theatre hat, sterile gown and sterile drapes and is usually undertaken by senior medical and specialist nursing staff trained and competent in the procedure they are undertaking. These precautions must **always** be taken when inserting a midline or central venous access device (i.e. PICC, CVC, Hickman line, Port-a-cath and midline catheter), using the VAD trolley (for those placed in A&E, CCU and OT or the trolley appropriate to the area the device is being placed) and a [CCAT](#) form completed

2.2 Types of Vascular Access Devices (VADs)

2.2.1 Peripheral Venous Access Devices

Peripheral catheters are inserted using an aseptic technique by healthcare professionals trained and assessed as competent in this procedure. At ANHSFT, training is provided through Nursing Practice Development. It focuses on: legal and professional issues, potential complications, infection control, site selection and preparation, insertion and care.

2.2.2 Midline Venous Access Devices

A midline catheter is between 7.5 and 20cms long and provides vascular access in a larger peripheral vein without entering the central venous circulation. The midline is placed at or more preferably above the antecubital fossa into a major vein in the upper arm but, due to the catheter length, it does not extend beyond the axilla. One type of midline (careflow BD) is kept on ward 16. These are only to be used for short term amiodarone infusions for patients on CCU.

An alternative type which can remain in for up to 6 weeks (Bard). These are only available for patients assessed by the appropriate Advanced Nurse Practitioner (ANP) who deem it suitable for an interim period as an alternative to a CVC.

Midlines are not to be used for the administration of parenteral nutrition unless it is agreed by the nutrition team and clearly documented that a midline is to be utilised.

Maximum Barrier Precautions (MBP) and asepsis must be used when inserting this type of catheter. Midlines must not be used to administer chemotherapy.

2.2.3 Central Venous Access Devices (CVADs)

2.2.3.1 Central Venous Catheters (CVCs)

CVCs are inserted by medical and specialist nursing staff trained and competent in this procedure using MBP. Insertion is preferably carried out in the Operating Theatre (OT), Accident & Emergency (A&E) resuscitation room or on the Critical Care Unit (CCU) to help maintain asepsis, but in an emergency situation, insertion can be carried out in the ward area. A CVC trolley (found on CCU, A&E or OT) and an ultrasound locating device should be used and MBP maintained at all times (NICE 2002). [Ultrasound 49 GUIDANCE](#)

Silver coated CVC are available for those patients who do not have a chlorhexidine sensitivity or allergy and can remain in situ for up to 28 days³. For those patients with a chlorhexidine sensitivity or allergy a polyurethane CVC is available. These can remain in for 7 days after which point they are reviewed on a daily basis and a decision made an appropriate Consultant or competent practitioner regarding its continuence.

The central line care bundle must be followed and the [CCAT form](#) (which can be found on all CVC trolleys for those placed on ward 16) should be completed and a copy returned to the IPT.

A chest X-ray must be undertaken to check the tip of the CVC is in the correct position (superior vena cava).

CVCs are inserted:

- To monitor central venous pressure (CVP)
- When strict fluid balance management and/or early goal directed therapy (EGDT) are indicated ([Sepsis Guideline](#))
- For the infusion of parenteral nutrition (PN)⁴ [Nutrition policy](#)
- Where a skin tunnelled catheter is not indicated and therapy is required for a period of up to 28 days.

2.2.3.2 Skin tunnelled catheters (diagram 1)

Skin tunnelled vascular access devices must be inserted by medical staff under local or general anaesthetic in the OT to ensure asepsis, followed by a departmental Chest X-ray. The associated [SOPs](#) must be followed when caring for a patient with a medium to long term central venous access device in situ.

They are soft, wide-bore, single or dual lumen catheters which are placed in the lower third of the superior vena cava (see diagram 2). They have a dacron cuff which prevents displacement and also acts as a barrier to infection.

³ Chlorhexidine is combined with silver as silver is ineffective on its own against some of the most common infections, including Candida.

⁴ Consider the use of a Peripherally Inserted Central if only to be used for PN

Fibrosis of tissue around this cuff usually takes 21 days but may be delayed in patients who are immunocompromised.

Common types of these lines are Broviac, Cook, Bard and Groshong catheters. If complications do not develop the catheter can stay in place indefinitely. Many patients successfully use the same catheter for a year or more.

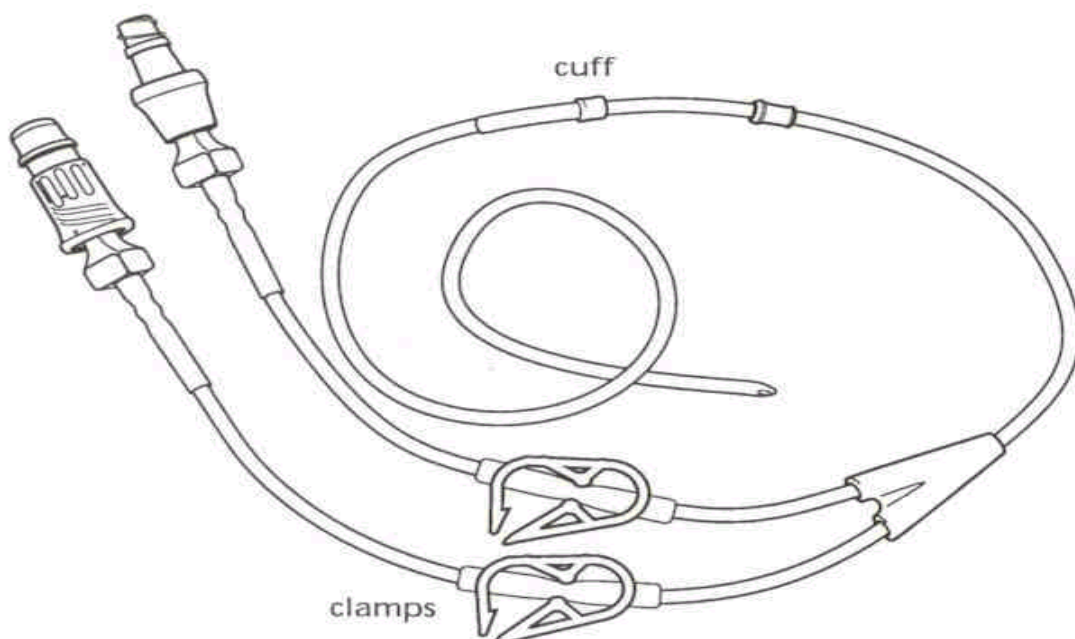


Diagram 1 - A double lumen, skin tunnelled catheter

In multi-lumen catheters, lumens are designed for administration of parental nutrition, fluids and drugs. Lumens may be dedicated for the withdrawal of blood and administration of blood products. Each lumen is regarded as a separate catheter, thus allowing otherwise incompatible solutions to be administered simultaneously. The purpose of the skin tunnelled catheter is to readily facilitate venous access in patients who require long term treatment (i.e. Oncology or haematology patients and those requiring long term PN and/or antibiotics, >28 days).

It is invaluable to patients who require repeated blood sampling, transfusions, intravenous antibiotics, nutrition, chemotherapy and bone marrow or stem cell transplants.

Whilst this line has many advantages, it also provides direct access to the circulation for potential harmful organisms. **It is therefore imperative that strict asepsis is maintained when dealing with the 'line' in any way.** Associated [SOPs](#) and [competency assessments](#) must be followed.

As with any wound, care is aimed at keeping the site clear of any exudates or debris which could encourage bacterial growth. Basic principles of wound care such as minimal disturbance of dressings apply.

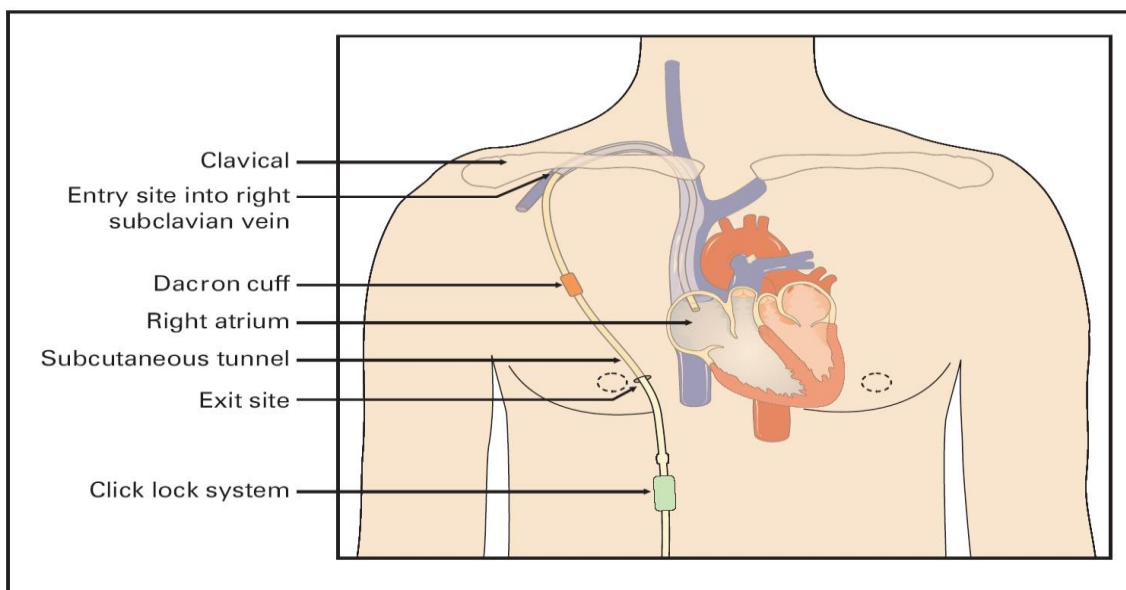


Diagram 2 - Position of a Hickman line once inserted

2.2.3.3 Peripherally Inserted Central Catheters (PICC)

PICC lines must be inserted by medical staff or nursing staff who are assessed as competent and are registered on the Trust's Advanced Practice Register. They are inserted for chemotherapy, long term parenteral nutrition, intra-venous drugs, or fluids where a CVC or skin tunnelled catheter are not indicated. A PICC must be inserted under MBP but can be undertaken in the ward environment or Radiology. PICC lines are stored on HODU and Radiology. Associated [SOPs](#) and [competency assessments](#) must be followed.

3 Device and Site selection – see Table 1

The device and site selected for all VADs depends to some extent on the use for which it is required and also on the individual patient's vascular access.

Once there is a clinical decision that a patient requires central access for any form of therapy (in particular urgent therapeutic apheresis or dialysis) it must be inserted as soon as possible following this clinical decision.

The appropriate document must be used to confirm date/time of insertion. This documentation must be filed in the patient's medical notes.

Prior to insertion, VAD insertion sites must be cleaned with a 2% chlorhexidine and 70% alcohol solution, and allowed to dry. Povidone iodine in alcohol should be used in patients identified with a sensitivity or allergy to chlorhexidine.

Common sites of insertion, site preparation and care, cleaning techniques and common uses for all VADs used at ANHSFT are shown in table 1.

TABLE 1 – Sites and Devices used at Airedale NHS Foundation Trust for Vascular Access

TYPE OF DEVICE		COMMON INSERTION SITE	SITE PREPARATION ⁵	CLEANING TECHNIQUE	COMMON USE	DURATION OF LINE INSERTION	SITE CARE	AUDIT PROCESS
PERIPHERAL CATHETER – found in every ward and department		Cephalic Basilic Dorsal venous network	PDI Sanicloth® containing 2% chlorhexidine in 70% alcohol solution	Aseptic Non-Touch Technique	Short term access - IV medication and fluids	Peripheral catheters should not be routinely re-sited unless recommendations indicates otherwise	VIP score to be recorded twice daily Inspect twice a day or at each use for signs of phlebitis +/- infection +/- inflammation	VIP score VIP score sheet
MIDLINE CATHETER – found on ICU and HODU		Basilic Median cubital Cephalic	Chloroprep®	Maximum Barrier precautions (MBP)	Short to medium term access- IV medication & fluids	1 – 6 weeks depending on manufacturer recommendations	CCAT score must be recorded twice daily whilst inpatient.	CCAT form for every midline inserted.
CENTRAL VENOUS CATHETERS	Central Venous Catheters – found in A&E, CCU, Ward 2 and OT	Jugular Subclavian Femoral			Short term access – all IV medication, fluids & PN	28 days- silver coated. 7 days for polyurethane CVC (may be extended)	Inspect twice a day or at each use for signs of phlebitis +/- infection +/- inflammation	CCAT form completed for every CVC inserted
	Skin tunnelled catheters & implanted devices (Hickman line /port-a-cath) – found in HODU and OT	Subclavian			Long term access - chemotherapy, PN & all IV medication	Up to 12 months (or longer if no complications and still required)	For those managed as outpatients Inspect alternate days until sutures removed (21 days), then weekly	CCAT form to be complete on each hickman inserted
	Peripherally Inserted Central Catheters	Basilic Brachial Cephalic			Consider PICC when access required for longer than 4 weeks and when peripheral access is difficult.		Change dressing 24-48 hours after insertion and then weekly or if wet / soiled	CCAT form to be completed for each PICC inserted

⁵ When carrying out a radial artery stab or venepuncture, a chlorhexidine 2% in 70% alcohol solution must be used to clean the site.

4 Site care

The Acute Care Team (ACT) must be notified of all CVADs inserted in patients who are to remain in hospital. This is to ensure they may be added to the ACT database to allow timely care and maintenance of the device.

Patients discharged home with VADs in situ must be provided with verbal and written information on the care of their VAD on discharge which contains a contact number in the event that they require advice.

Skin tunnelled devices should be dressed following insertion with gauze and a semi-permeable dressing for 24 hours. A softpore dressing is then applied which is changed on alternate days until the suture is removed. After this time a semi-permeable dressing is applied.

In the event that there is ooze from the site of a VAD the site should be swabbed and a gauze and semi-permeable dressing applied. As soon as the insertion site has stopped oozing, the gauze dressings must be removed. This is to prevent infection from a moist dressing and continual exposure of the VAD site by re-dressing.

All VAD insertion sites should be cleaned using a 2% chlorhexidine and 70% alcohol solution (e.g. PDI sani-cloth®, chloroprep®). If sensitive to chlorhexidine, an alcoholic povidone-iodine solution should be used as an alternative (Epic3, 2014).

Staff must be assessed as competent to care for [PICC lines](#), [Hickman lines](#) and [Portocaths](#) prior to caring for them.

4.1 Securing of VADs

VADs must be secured to prevent movement which reduces the risk of phlebitis, infiltration, infection and migration.

At ANHSFT a sterile, transparent, semi-permeable Tegaderm IV® dressing is used for all VADs to secure them in place and allow visualisation of the insertion site. The size of tegaderm used to dress the device site must be appropriate to the area to be covered i.e peripheral device, midline/PICC, CVC or Hickman.

If further securing of VADs is required, i.e. for CVCs/Hickman then sutures may be used. Sutures are not encouraged due to an increased risk of infection with PICC/midlines. A stat-lock® should be used to secure PICC and midlines.

Patients may sometimes request a bandage to cover a cannula to prevent them knocking it and making it sore. Non-ported cannulae may help prevent this and whilst not encouraged, bandages may be used as long as the insertion site is reviewed prior to each use by removing the bandage and examining the site.

5 Infusion Care

Peripheral vascular catheter sites should be inspected and scored twice daily using the VIP score. They should not be routinely resited unless clinically indicated (Epic3, 2014).

Midline and peripherally inserted central catheter sites should be inspected twice daily or at each use, if sooner. The Central Catheter Assessment Tool ([CCAT](#)) must be completed twice daily whilst an inpatient. The site dressing must be changed weekly or sooner if wet or soiled.

Short term CVCs have the highest rate of line infection and must therefore be inspected at least twice daily and the [CCAT](#) completed. The dressing can be left undisturbed for up to 7 days, if well secured but must be changed if wet or soiled.

Intravenous infusions must be managed as a closed system. This necessitates maintaining an unbroken circuit (i.e. not removing or reconnecting used caps and giving sets).

The use of Y-connections should be kept to a minimum and if utilised, these devices must always be accessed using an aseptic technique. This is especially important when accessing central venous devices and Hickman lines. CVCs must have a needle free connector attached to each lumen to enable a closed system to be maintained.

A dedicated lumen must be identified for PN infusions and incorporate a needlefree device.

5.1 Needle-free infusion systems

These should be applied to all VADs and an aseptic technique or ANTT employed for all manipulations.

The lumen utilised for PN should be identified and used only for this purpose.

When a needle free device is in place, lines do not have to be clamped between removal of syringes and flushing of the lumen. If there is no needle free device in situ then the line must be clamped whenever a syringe is removed from the lumen.

This is not recommended as continual clamping can damage the line and cause shearing, and a closed system is not then maintained.

It is important to ensure that the end of the needle free device is not pierced with a needle.

Needle free devices should be changed weekly

5.2 Administration sets (giving set)

Administration sets in continuous use do not need to be replaced more frequently than every 96 hours, unless they become disconnected or the VAD is replaced. (Epic3, 2014).

If an infusion is disconnected i.e. when an antibiotic infusion is complete or a patient is taken out of the ward environment, it must **not** be re-attached; a clean infusion set must be connected using asepsis or an ANTT.

Administration sets for blood and blood components should be changed when the transfusion episode is complete or every 12 hours. However platelets should not be transfused through a set previously used for red cells as some platelet loss will occur. The administration set must have a 170-200 µm integral mesh filter. Blood and other solutions can be infused through the separate lumens of multi-lumen CVADs. where possible one lumen should be reserved for the administration of blood components if appropriate for the individual patient (Norfolk, 2013).

Infusion sets used to administer PN must be changed every 24 hours.

Infusions administered via a peripheral cannula lasting less than 1 hour or less than 100mLs in volume should be administered using a gravity administration set with integrated air inlet. These would include IV paracetamol, erythromycin, metronidazole etc. These infusion sets must not be re-used and must be disposed of after a single use **unless they remain connected to the patient's VAD**.

The needle-free access port can be used to administer IV bolus drugs or to piggy back infusions using a Y-connector or dual lumen extension set. An ANTT or aseptic technique must be used to administer the bolus drug or attach a second infusion set [Asepsis guideline](#).

5.3 Intra venous medication administration

It may be appropriate and/or necessary to administer a continuous infusion of 0.9% sodium chloride (flush line) to enable timely and safe administration of intravenous medicines. The risks and benefits of this need to be carefully considered and a plan of care clearly documented in the patient's records.

In PICC and Hickman catheters where the catheter is being used intermittently during the day, a test for flashback of blood before administering IV bolus medication should be undertaken. If a blood return cannot be established this should be escalated to the appropriate CNS⁶ or ACT sister before proceeding with the administration of the medication.

⁶ The CNS refers to the Chemotherapy CNS for all Oncology/Haematology patients

If there is a risk of vasoactive or anaesthetic drugs in the lumen, withdraw 5 mLs and discard this prior to flushing to avoid an accidental bolus dose being administered.

5.4 Intravenous Flush

Once the bolus dose of IV medication is completed, flush the lumen with a further 10 mLs of 0.9% sodium chloride to maintain catheter patency.

For frequently accessed (> 3 times per day) PICC and Hickman catheters, a flush of 10 mLs 0.9% sodium chloride is all that is required to maintain patency. If accessed less than twice a day (12 hourly), Hickman catheters (and on occasions some PICC devices) may require heparin to maintain patency. This will be confirmed by the appropriate CNS⁷ and documented accordingly in the patient medical records. For inpatients this will be prescribed on the inpatient prescription chart.

A PICC or midline which is accessed weekly will usually only require a 10 mL flush of 0.9% sodium chloride to maintain patency. However Hickman catheters (and some PICCs) will require a 10 mL flush of 0.9% sodium chloride followed by a heparin lock. The most appropriate technique for the individual patient will be recorded in the patient held record and/or the patient prescription chart.

6 Complications

The clinical complications associated with the use of VADs can be early or late onset and can be fatal. They can be associated with insertion, ongoing management and infusion related.

Incorrect positioning of the line either on or after insertion can be avoided by checking the position of the CVAD with a Chest X-ray (CXR). The position of the line must be recorded and the exact location of the tip of the device stated. Tip position 'ok' or 'satisfactory' is not acceptable. The number of centimetres inserted must be documented for all CVADs. In addition, the external length of a PICC and midline must be recorded in order to allow monitoring for potential catheter migration.

Midline catheters and peripheral catheters can be assumed to be correctly placed if blood is not pulsating from the line but can be easily withdrawn on insertion. The vein used, number of centimetres inserted and the external length remaining must be recorded in the appropriate documentation.

Infection after insertion is common but almost **always avoidable** and can be local or systemic. Careful insertion followed by excellent site and line care must be maintained to prevent this occurring. Strict aseptic technique must be employed when accessing the VAD by staff trained and assessed as competent to do so. On

⁷ The CNS refers to the Chemotherapy CNS for all Oncology/Haematology patients PICC and Hickman Lines or the ACT

removal, line tips should be sent for Culture and Sensitivity (C&S) and blood cultures sent as per protocol. When sending blood cultures the source must be clearly identifiable on the request form i.e. peripheral sample, which lumen of CVC, Hickman, PICC, midline, port a cath.

Pneumothorax / Haemothorax is a complication of placing a CVC and must be ruled out by CXR after insertion. The clinician inserting the CVC must check and document the position prior to it being used.

Haematomas may occur on insertion, particularly if the patient is coagulopathic and pressure on the site should be maintained to prevent this.

Embolism caused by air or thrombus formation should be avoided by the meticulous catheter care employed by trained and competent practitioners.

Phlebitis is often caused by movement of the catheter and this can be avoided by securing the device in place and constant observation of the insertion site. Inflamed sites necessitate removal of the cannula and an Adverse Event Form (AEF) must be completed when a phlebitis score of 2 or more in a peripheral venous access device, or 1 and above in PICC/midline is recognised.

Catheter Related Occlusion may be thrombotic, non thrombotic or mechanical in nature and are seen in hickman, PICC, midline and portacaths. The cause of the occlusion must be ascertained and the appropriate management undertaken before proceeding to use the device. Only staff trained and assessed as competent to manage these device related complications may undertake this assessment and they must be managed according to the related SOPs.

Nerve damage may rarely be caused by damage during insertion and results in tingling, shooting pains or loss of movement in the arm.

7 Removal of VADs

Peripheral cannulae can be removed by all staff assessed as competent to remove them.

Central lines should be removed aseptically by staff assessed as competent to remove them and the line tip sent for culture and sensitivity (C&S). Patients must be lying flat and asked to perform the valsalva manoeuvre on removal. The audit form for the removal of a CVC should then be completed and a copy sent to the Infection Prevention Team (IPT).

PICC and midlines lines must be removed by trained medical or nursing staff [assessed as competent](#) to remove them. For PICC and midline catheters the audit form should be completed and a copy sent to the Infection Prevention Team (IPT). The original copy is to remain in the medical records.

Hickman/ Port-a-cath can only be removed by trained medical staff using local anaesthetic.

Please note – It is imperative that all VADs are inspected upon removal to ensure that the whole device remains intact and that no fragment has been retained in situ.

8 Implementation & audit

This guideline will be implemented across ANHSFT using Medical, Nursing and Allied Health Professional Forums.

A training programme has been devised to compliment this work and will be delivered on agreed dates to all appropriate staff at ANHSFT that have access to patients with a VAD in situ and where it is deemed pertinent to their level of expertise and skill .

Each VAD will be audited using the [VIP scoring tool](#) for peripheral devices or the [CCAT form](#) for all centrally placed devices.

Continuous audit is undertaken by the microbiology department for all line infections. Periodically spot audits will also be undertaken on the [CCAT form](#) by the IPCNS to identify any issues or areas of concern. The results will be fed back to all relevant individuals including the Ward Manager and Matron for that area. Staff will be advised to complete an AEF for complications associated with lines. Where appropriate a Root Cause Analysis will be carried out by the appropriate CNS in those cases where lessons can be learnt. A copy of completed [CCAT forms](#) should be sent to the appropriate designated person and the original retained in the medical records.⁸

Development

This guideline was developed by the VAD group to ensure consistent high quality care for all VADs inserted in this Trust. It was reviewed and updated by the Nurse Consultant and Infection Prevention Nurse in December 2012 and again in March 2014 to reflect evidence based practice. A full review was undertaken in June 2015 following additions by the Healthcare Governance Team. The guideline was further reviewed and updated in June 2017.

Consultation

All Matrons
Lead Clinicians
Assistant Director of Nursing

Medical Director
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⁸ A copy of the CCAT form is forwarded to the Infection Prevention Team

Acknowledgement and thanks to:

Allison Charlesworth
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Senior Sisters

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Nurse Consultant, CCU
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ACT

9 Glossary of terms

Aseptic Non Touch Technique	ANTT
Central Venous Catheter	CVC
Chest X Ray	CXR
Maximal Barrier Precautions	MBP
Vascular Access Device	VAD
Visual Infusion Phlebitis Score	VIP

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