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# Venous access

A Guide for  
Nurses

# Introduction

**Venous access is the access to the bloodstream via the veins. Venous access devices can be categorised as short-term, medium-term and long-term. They may also be classified as central or peripheral.**

What will you learn in this module?

- Different types of venous access
- Long-term central venous catheters (CVCs)
- Use of CVCs in haematopoietic stem cell transplantation
- Standardised procedures for tunnelled CVCs
- Guidelines for tunnelled central venous catheters
- Patient safety and wellbeing

If you would like any information on the sources used for this booklet, please email [communications@leukaemiacare.org.uk](mailto:communications@leukaemiacare.org.uk) for a list of references.

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# About Leukaemia Care

**Leukaemia Care is a national charity dedicated to ensuring that people affected by blood cancer have access to the right information, advice and support.**

## Our services

### Helpline

Our helpline is available 9:00am – 5:00pm Monday - Friday and 7:00pm – 10:00pm on Thursdays and Fridays. If you need someone to talk to, call **08088 010 444**.

Alternatively, you can send a message via WhatsApp on **07500068065** on weekdays 9:00am – 5:00pm.

### Nurse service

We have two trained nurses on hand to answer your questions and offer advice and support, whether it be through emailing **nurse@leukaemicare.org.uk** or over the phone on **08088 010 444**.

### Patient Information Booklets

We have a number of patient information booklets like this available to anyone who

has been affected by a blood cancer. A full list of titles – both disease specific and general information titles – can be found on our website at **www.leukaemicare.org.uk/support-and-information/help-and-resources/information-booklets/**

### Support Groups

Our nationwide support groups are a chance to meet and talk to other people who are going through a similar experience. For more information about a support group local to your area, go to **www.leukaemicare.org.uk/support-and-information/support-for-you/find-a-support-group/**

### Buddy Support

We offer one-to-one phone support with volunteers who have had blood cancer themselves or been affected by it in some

way. You can speak to someone who knows what you are going through. For more information on how to get a buddy call **08088 010 444** or email **support@leukaemiacare.org.uk**

### Online Forum

Our online forum, **www.healthunlocked.com/leukaemia-care**, is a place for people to ask questions anonymously or to join in the discussion with other people in a similar situation.

### Webinars

Our webinars provide an opportunity to ask questions and listen to patient speakers and medical professionals who can provide valuable information and support. For information on upcoming webinars, go to **www.leukaemiacare.org.uk/support-and-information/support-for-you/onlinewebinars/**

### Website

You can access up-to-date information on our website, **www.leukaemiacare.org.uk**.

### Campaigning and Advocacy

Leukaemia Care is involved in campaigning for patient well-being, NHS funding and drug and treatment availability. If you would like an update on any of the work we are currently doing or want to know how to get involved, email **advocacy@leukaemiacare.org.uk**

### Patient magazine

Our magazine includes inspirational patient and carer stories as well as informative articles by medical professionals: **www.leukaemiacare.org.uk/communication-preferences/**

# What is meant by venous access?

Venous access is the access to the bloodstream via the veins.

Venous access is required for:

- Intravenous (IV) treatment administration such as medication or fluids (blood or rehydrating fluids) and nutrition if required
- Obtaining repeated venous blood samples
- As an access point for blood-based treatments such as dialysis or apheresis.

Apheresis involves removing whole blood and separating its individual components to remove one particular component. The remaining blood components are re-inserted into the patient's bloodstream.

Simple IV drug administration can be given as:

- An IV infusion where continuous blood levels are required such as antibiotics, antifungals, and pain-inhibiting drugs such as morphine and other opiates

- A 'bolus' of medication over 1–30 mins, however bolus IV administration is infrequently used and often restricted to emergency situations.

By administering a drug intravenously, a first-pass metabolism of the drug, where it is metabolised rapidly after administration is avoided. Therefore, a significantly higher concentration of the drug can reach the systemic circulation, allowing a more immediate effect.

# Different types of venous access

Venous access devices can be categorised as short-term, medium-term and long-term. They may also be classified as central or peripheral.

- With central venous access devices, the tip of the catheter lies in the superior vena cava, in the atrium, or the inferior vena cava.
- In peripheral venous access devices, the catheter is located in all the other sites than those for central venous access devices.

Options for venous access include:

- Simple venepuncture (puncturing any suitable vein) for the purpose of administering IV medication, or obtaining a blood sample. This only requires a needle and vacuum tube holder.
- Conventional peripheral IV catheters are uncomplicated and suitable for short-term IV treatment (up to 96 hours).
  - Veins in the patient's

hand or arm are used for access.

- Replacement and rotation of the site is required to prevent complications with infiltration and phlebitis.
- Midline catheters :These peripheral catheters are inserted in the upper arm with the tip located just below the axilla.
  - Usually up to maximum of 20cm in size, they are designed for short-term peripheral drug delivery.
  - They are easy to place, but are contraindicated for patients with a history of venous thrombosis and limited blood flow to body extremities.
  - Midline catheters are used less commonly because of the increasing use of peripherally-inserted central catheters

# Different types of venous access (cont.)

(PICCs).

- CVCs are catheters placed into one of the great venous vessels which include the superior vena cava, inferior vena cava, brachiocephalic vein, internal jugular vein, subclavian vein, iliac vein, and common femoral vein.
  - CVCs are long, flexible, Y-shaped silicone tubes that allow effective access for medication, fluids and parenteral nutrition and whose use prevents damages to peripheral veins.

CVCs can be classified as:

- Non-tunnelled CVCs are inserted centrally through one of the veins located in the chest, neck or groin to allow temporary access to the bloodstream. They are commonly used for patients in hospital where the catheter will be needed short term such as a few days or weeks.
- PICCs are fine-bore CVCs inserted through a vein in the

arm and passed through into the larger veins near the heart when medium-term access is needed (from 4 weeks to 6 months). They may have single or multiple lumens, each of which is fitted with a clamp. They are associated with higher rates of deep vein thrombosis than other CVCs due to their insertion into veins of smaller diameter and greater patient movement in the upper extremity.

- Tunnelled CVCs are placed under the skin so that they can be used for long-term access (weeks to months). Previously called Hickman lines which was their trade name. They are suitable for patients who need numerous infusions of drugs, fluids, blood products, or total parenteral nutrition, as well routine blood sampling.
- Implantable ports, also called port-a-caths, do not have any parts that are external to the skin. The end of the catheter with the implantable

ports is connected to a self-sealing injection port which is implanted under the skin on the chest. Implanted ports can stay in place for years.

## Choice of venous access

Consistent venous access is essential for the delivery of a number of medical treatments.

The decision on which type of venous access to select is dependent on the following:

- Type of drug to be administered
  - Irritant drugs
  - Multiple drugs required to be administered at the same time which requires higher infusion volumes
- Duration of treatment which may be a few days to years
- Age and health of the patient: Peripheral intravenous lines are less suited for newborns, infants and the elderly, all of whose veins may be difficult

to access.

- Patient comfort: For long-term infusions, such as chemotherapy, a CVC avoids multiple punctures and the restriction of the patient's mobility.

# Long-term central venous catheters

Long-term CVCs refer to:

- Tunnelled CVCs
- Port-a-caths

Long-term CVCs can remain in place for months or even years. They are used for:

- Access to the central venous system for treatments in large quantities or over a prolonged period of time, such as chemotherapy, IV fluids, medications, or blood products, and for blood sampling.
- Administration of medications that are harmful to peripheral veins, particularly chemotherapy
- Patients who have poor or inaccessible peripheral venous access
- IV administration of nutrients for patients who cannot eat food or absorb enough nutrition via tube feeding (parenteral nutrition). This

may be in addition to oral or tube feeding, or it may be the only source of nutrition (total parenteral nutrition).

- Providing an access point for blood-based treatments such as haemodialysis or apheresis
- Cardiac catheterisation and transvenous cardiac pacing

## Tunnelled CVCs

CVCs are long-term, large bore, silicone tubes that are commonly inserted into the body via the subclavian, jugular or femoral veins, so that the catheter tip is positioned in the superior vena cava just above the right atrium or the inferior vena cava, hence the term central access.

Two stitches are used to secure the catheter in position until it is removed. Once secured, a small dressing is placed over the site of the insertion.

The flow of blood around the catheter in the superior vena

cava is much higher than in a peripheral vein, which enables irritant drugs or fluids to be infused without damaging the vein walls.

Tunnelling the CVC under the skin away from where it enters the body holds the catheter firmly in place and acts as a mechanical barrier to bacteria.

- Tunnelled CVCs are fitted with a small cuff which enables the patient's body tissue under the skin to gradually encircle the cuff and maintain the CVC in position. This process takes about 21 days during which time the line is kept in place by several stitches. Once the CVC is secured, the stitches can be removed.
- Tunnelled CVCs may have single or multiple lumens, each of which is fitted with a clamp or other type of sealing device.

Patients with tunnelled CVCs can return home between treatments. The healthcare team

therefore encourage patients to be independent in managing their tunnelled CVC.

Complications and the symptoms they create that patients need to be aware of and report to their healthcare team are:

- Infections, indicated by red, warm, swollen areas around the catheter, Fever, shortness of breath or dizziness
- Thrombosis: Ultrasound is recommended and anticoagulants if appropriate
- Bleeding
- Blockages which can cause painful or bruised areas around the catheter
- Leakage of fluid (infiltration or extravasation)
- Damages to the catheter tube which can be repaired depending on the extent of the damage

Intravenous infiltration occurs when IV administered fluids leak into the surrounding tissue. Extravasation is the leak

# Long-term central venous catheters (cont.)

of vesicant agents that can cause tissue necrosis or blister formation, into tissues around the IV site of its administration.

Administration of chemotherapy vesicants such as daunorubicin, doxorubicin and vincristine, can result in accidental extravasation leading to serious complications.

Both IV infiltration and extravasation can cause potentially serious complications and result in tissue damage or necrosis that may need urgent treatment.

## Port-a-caths

Port-a-caths are surgically inserted under the skin of the chest or upper arm to allow easy IV access.

They consist of a catheter and a portal, and because they are completely enclosed within the skin, they are accessed using a non-coring needle. They come with single or multiple-lumens, each of which has its own port.

Port-a-caths are positioned by a surgeon or radiologist using

either conscious sedation or anaesthesia. Clinical nurse specialists can insert and remove CVCs, or access a port-a-cath after completion of a relevant theory and practice course.

It is important to check if patients are taking anticoagulants such as warfarin and rivaroxaban, or antiplatelets such as aspirin and clopidogrel because these may need adjusting or stopping temporarily before the procedure.

A port-a-cath is not visible, but it can be felt as a slight bump where the port is inserted. Patients prefer port-a-caths because:

- They are more discreet than tunnelled CVCs
- Patients can shower, bathe or swim with a port-a-cath in place

Port-a-caths have fewer complications than other types of CVCs and increase patients' quality of life.

Port-a-caths require minimal maintenance once the skin has healed, apart from being flushed

out every 4 weeks. This is normally performed by the healthcare team in patients who are treated more frequently than every 4 weeks. For patients with less frequent appointments, an attending nurse or doctor can flush out the port-a-cath.

Patients can return home with their port-a-caths in place. It is therefore important for them to be able to recognise complications and when to contact the primary health care team.

Port-a-caths require less maintenance and have a lower risk of infection. They are recommended for patients who require long-term, frequent and intermittent venous access, but are not suitable for:

- Obese patients
- Patients with extreme weight loss and muscle wasting
- At mastectomy sites
- Before or after chest irradiation

Complications with port-a-caths include clots, blockages and

infections. Symptoms associated with these complications may be:

- Red, warm, swollen, painful or bruised area around the port-a-cath site
- Presence of considerable bleeding
- Fever, shortness of breath or dizziness
- Leakage of fluid
- Blockage

Port-a-caths are widely used in cancer patients requiring long-term or irritant chemotherapy, patients with chronic illnesses, and patients having a haematopoietic stem cell transplant (HSCT) who require long-term chemotherapy as part of a conditioning regimen.

## Use of CVCs in HSCT

For both allogeneic and autologous HSCTs, a tunnelled CVC or port-a-cath is generally inserted to facilitate administration of the following at various stages of the HSCT as required:

# Long-term central venous catheters (cont.)

- Conditioning regimen
- Stem cell infusion
- IV drugs such as antibiotics
- Blood products in case of low levels of white blood cells or platelets
- Fluid supplements to address low levels of electrolytes
- Any further chemotherapy as required
- Nutritional support

For patients undergoing HSCTs, the minimum waiting time required between insertion of a CVC and the start of the conditioning regimen must be factored into the process.

Additionally, patients' continuing education on how to manage the CVC should be undertaken, focusing particularly on preventing complications.

Nursing staff have a central role in the management of CVCs in HSCT patients including:

- Monitoring of the CVC
- Prevention of complications

- Ongoing education of patients on how to manage their CVC, with a focus on avoiding complications
- Input into determining of the timing for:
  - Scheduling the HSCT
  - Starting the conditioning regimen
  - Optimal length of time for the CVC to remain in place
- Updating the multidisciplinary healthcare team of any side effects

# Standardised procedures for tunnelled CVCs

Standardised procedures for a number of clinical procedures are published by most NHS Trusts, including those for the use of tunnelled CVCs.

These standardised procedures include the insertion, use and removal of tunnelled CVCs. It is important to follow these standardised procedures to preserve the integrity of patients' veins and prevent any complications.

Examples of standardised procedures published by various NHS Trusts on the use of tunnelled CVCs include the following:

- Royal Marsden NHS Foundation Trust Policy. This document on the insertion and care of CVCs in hospital was used as an example in the National Institute for Health and Care Excellence (NICE) medical technology guidance adoption support resource for SecurAcath for securing percutaneous catheters, but was not commissioned, produced or sanctioned by NICE.
- Guy and St Thomas NHS Foundation Trust - Hickman line insertion.
- Guy and St Thomas NHS Foundation Trust - Port-a-cath insertion.
- Hull and East Yorkshire Hospitals NHS Trust. This document combines Policy, Procedure and Guidelines for CVCs in oncology and haematology adults.
- Northumbria Healthcare NHS Foundation Trust. It is important check if patients are taking anticoagulants such as warfarin or rivaroxaban, or antiplatelets such as aspirin and clopidogrel because these drugs may need adjusting or stopping temporarily before the procedure. Clinical nurse specialists are able to insert and remove certain types of central venous access devices, and access port-a-caths following a theory and practice training course on CVC procedures in settings such as emergency rooms, intensive care units and high

# Standardised procedures for tunnelled CVCs (cont.)

dependency units.

Below is a summary of the procedures for insertion, use and removal of tunnelled CVCs in line with the standardised procedures published by NHS Trusts. These standardised procedures are comprehensive and can be referred to subsequently.

## Insertion and use

The area over the vein that has been chosen for tunnelled CVC insertion is disinfected and anaesthetised.

Aseptic techniques must always be followed when inserting CVCs, attending to the site of the tunnelled CVC, and changing dressings.

The right internal jugular is the preferred vein for inserting CVCs because it has straight course to the right side of the heart, and therefore the lowest risk of the venous stenosis and thrombosis (Portsmouth Hospitals NHS Trust 2019). However, CVCs may also be inserted into the subclavian or femoral veins.

A vascular access specialist (VAS)

makes a small cut in skin above the vein and the tunnelled CVC is inserted.

X-ray imaging or other imaging technology are used to check the location of the catheter is correct.

Lumens of tunnelled CVCs are flushed with saline before, and after, use to preserve patency of the catheters lumens.

After insertion, a sterile dressing is applied and maintained on the insertion site until it is well healed.

## Maintenance

Malfunction of the catheter, where injection or aspiration has become difficult, or impossible, indicates the catheter may be occluded, and may be related to thrombosis, the effect of drugs administered, or parenteral nutrition.

Occlusion of CVCs can be prevented by proper use of flushing.

- Flushing of long-term tunnelled CVCs requires a syringe of at least 10mL.

- They should be flushed with 10ml of 0.9% sodium chloride followed by a heparin solution (1000 international units/ml) for each lumen.

Maintaining the patency of a long-term tunnelled CVCs can be facilitated by locking a catheter. This involves injecting a small volume of liquid while it is not in use. The lock solution prevents clot formation in the catheter itself and at its tip, and also prevents micro-organism colonisation of the catheter.

## Removal

Reasons for removing a CVC:

- Catheter-related infection
- Catheter in place beyond the recommend time
- Persistent catheter occlusion
- Damaged catheter

Procedure:

- Aseptic techniques must also be followed when removing a tunnelled CVC and until the site is fully healed.
- Following removal of the

sutures, patients should be positioned with a 30% head-down tilt, both during and following the removal of the catheter, to reduce the risk of an air embolus.

- A thin, polyurethane adhesive-coated dressing, which is permeable to water and oxygen, but not bacteria, should be applied to prevent scabbing and facilitate epidermal regeneration.

Possible complications when removing tunnelled CVCs include:

- Air embolism
- Catheter fracture with embolism
- Dislodgement of a thrombus or fibrin sheath
- Haemorrhage/bleeding

# Guidelines for tunnelled CVCs

Guidelines are produced to assist healthcare professionals with the diagnosis and management of patients. The guidelines in this section on insertion and maintenance of CVCs are the result of extensive consultation among VASs and other healthcare professionals.

There are numerous clinical guidelines for CVCs, and some of the most recent ones are listed here:

- University Hospitals Bristol NHS Trust.
- Guidelines and Audit Implementation Network (GAIN) - Guidelines for insertion and maintenance of central venous access devices in children and young people.
- NICE. Guidance on the use or locating devices for placing central venous catheters. NICE are currently referencing the Royal Marsden NHS Foundation Trust Policy by way of guidance CVC <https://www.nice.org.uk/guidance/mtg34/resources/policy-for-the-insertion->

**and-care-of-central-venous-access-devices-cvad-in-hospital-royal-marsden-nhs-ft-pdf-4481503169**

Some of the international practice guidelines in the last five years include:

- Expert consensus-based clinical practice guidelines for management of intravascular catheters in the intensive care unit
- American Society of Anaesthesiologists
- European Society for Medical Oncology (ESMO) Clinical Practice Guidelines for central venous access in oncology
- Queensland Government. Guideline. Tunnelled central venous catheters

# Patient safety and wellbeing

Standardised procedures published by NHS Trusts and the Standards for infusion therapy, published by Royal College of Nursing, are designed to standardise procedures with the aim of:

- Reducing the occurrence of complications experienced by patients during and after the procedures
- Improving the safety and quality of care of patients receiving infusion therapy

One of the most serious complications that can result from the presence and use of CVCs is infection.

The guideline on the prevention of intravenous device-related infections by the Mid and South Essex University Hospitals Group sets out guidance on safe and effective insertion, care and removal of IV devices to ensure the reduction of healthcare-associated infections. The guideline is to be followed by all Medical and Nursing staff in the Trust.

The use of VAS teams is known

to decrease the rates of phlebitis and reduce erythema, induration and infiltration at the insertion site, possibly due to increased success of first-time insertion since subsequent insertions are associated with more complications and failure.

When CVCs are inserted by VAS teams, there are very low catheter-related infections, as well as complications such as pneumothorax or accidental arterial puncture.

# Abbreviations

## CVC

Central venous catheter

## ESMO

European Society for Medical  
Oncology

## GAIN

Guidelines and Audit  
Implementation Network

## HSCT

Haematopoietic stem cell  
transplant

## IV

Intravenous

## NHS

National Health Service

## NICE

National Institute for Health and  
Care Excellence

## PICC

Peripherally-inserted central  
catheter

## VAS

Vascular access specialist

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Leukaemia Care is a national charity dedicated to providing information, advice and support to anyone affected by a blood cancer.

Around 34,000 new cases of blood cancer are diagnosed in the UK each year. We are here to support you, whether you're a patient, carer or family member.

## Want to talk?

Helpline: **08088 010 444**

(free from landlines and all major mobile networks)

Office Line: **01905 755977**

**[www.leukaemicare.org.uk](http://www.leukaemicare.org.uk)**

**[support@leukaemicare.org.uk](mailto:support@leukaemicare.org.uk)**

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