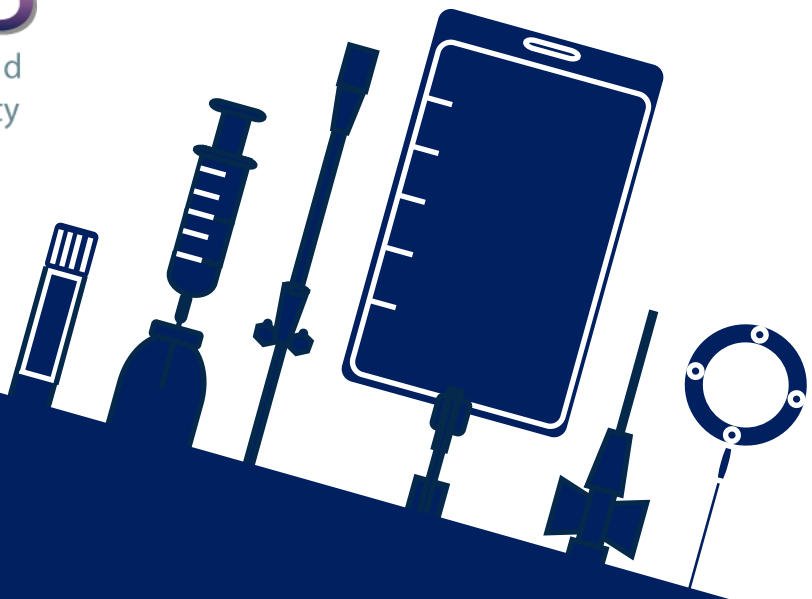
NIVAS
National Infusion and Vascular Access Society



Clinical Standards for Vascular Access & Infusion Therapy

First edition
2026

Association for Safe Aseptic Practice ANTT Aseptic Non Touch Technique

SAFER HEALTHCARE BIOSAFETY NETWORK

ACKNOWLEDGEMENTS

The NIVAS standards 1st edition has been submitted to the RCN for accreditation and are awaiting review. If RCN accreditation is achieved this will be reflected in the 2nd edition.

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The NIVAS Board would like to thank:

Ablen Dacalos, Adult Safeguarding Named Nurse and Dementia Lead Nurse, Frimley Health NHS Foundation Trust for specialist advice.
Alberto Alende-Aragon, Lead Vascular Access Clinical Nurse Specialist Vascular Access Team, Royal Berkshire NHS Foundation Trust for reviewing the Standards.
Steven Rowley, Clinical Director of ANTT for reviewing the Standards.
Rachel Dixon, RGN for proofreading the standards
Laura Kay, for proofreading the standards
The Device Related Infection Prevention Practice (DRIPP) Collaborative for sharing resources.
Royal College of Nursing for collaborative support.
Thanks to the **Safer Healthcare Biosafety Network** for reviewing the Standards.
Thanks to **NHS Injectable Medicines Guide (Medusa)** for reviewing Standards.
Thanks to the **Device Related Infection Prevention Practice** working group for sharing resources.
Thanks to the **Infection Prevention Society** for reviewing the Standards.
Thanks to the NIVAS industry partners for reviewing the Standards. Solventum, BD, BBraun

CONTENTS

LEGAL DISCLAIMER.

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EVIDENCE USED IN THESE STANDARDS.

These standards are evidenced using the most current published data available.
Where the evidence is limited, NIVAS board consensus has been used to support the standard. This has been referenced using the letter **N**.

REFERENCING THE NIVAS STANDARDS:

A. Barton, M. Guerrero, J. Bennett, E. Smith, G. Oliver, J. Godfrey, H. Briscoe, S. Melville, P. Lee, V. Aguado Lorenzo. 2026 National Infusion & Vascular Access Society *Standards for Vascular Access and Intravenous Therapy* 1st Ed. National Infusion and Vascular Access Society, London, UK.

ABBREVIATIONS:

ANTT – Aseptic non-touch technique
BSC - Biological Safety Cabinet
BSI – Bloodstream infection
CABSI – Catheter-associated bloodstream infection
CE – European Conformity
CLABSI – Central line-associated bloodstream infection
CMR - Carcinogenic, Mutagenic, Reprotoxic
CRBSI – Catheter-related bloodstream Infection
CRT – Catheter-related thrombosis
CSTD - Closed System Transfer Device
CVAA – Canadian Vascular Access Association
CVAD – Central vascular access device
COSHH - Control of Substances Hazardous to Health
DVT – Deep vein thrombosis
FDIOS – Factitious disorder imposed on self
HCPs – Healthcare professionals
HMP - Hazardous Medicinal Product
HPN – Home parenteral nutrition
INS – Infusion Nurses Society
IO – Intraosseous
IV – Intravenous
IVC – Inferior vena cava
LLDVT – Lower limb deep vein thrombosis
LL-PIVC – Longer length peripheral intravenous cannula
MARSI – Medical adhesive-related skin injury
MCA – Mental Capacity Act
MC&S – Microscopy, culture and sensitivity
MHRA - Medicines and Healthcare products Regulatory Agency
NFC – Needle-free connector
NHS – National Health Service
NICE – National Institute of Clinical Excellence
NIVAS – National Infusion and Vascular Access Society
NMC – Nursing and Midwifery Council
NT-CVC – Non-tunnelled central venous
OPAT – Outpatient Parenteral Antimicrobial Team
PICC – Peripherally inserted central catheter
PIVC – Peripheral intravenous catheter
PN – Parenteral nutrition
PPE – Personal protective equipment
POS – Pinch-off syndrome
RCN – Royal College of Nursing
SACT – Systemic anti-cancer therapy
SmPC - Summary of Product Characteristics
STC-CVAD – Skin tunnelled cuffed-central venous access device
SVC – Superior vena cava
TIVAD – Totally implantable venous access device
UK – United Kingdom
UKCA – UK Conformity Assessed
UKHSA – UK Health Security Agency
ULDVT – Upper limb deep vein thrombosis
UVC – Umbilical vein catheterisation
VAD – Vascular access device
VADD – Vascular access device decision tool
VADEIP – Vascular access device exit-site infection or phlebitis
VAST – Vascular access service teams
VHP – Vessel health and preservation

FOREWORD

The standards for infusion therapy and vascular access are intended to be a usable resource for all healthcare professionals who practice intravenous (IV) therapy and vascular access in any clinical setting for all patients, adult and child. These standards can be used by the novice or the expert to support clinical practice and provide a resource for evidence-based best practice.

The term infusion therapy encompasses all aspects of intravenous drug and fluid administration.

Vascular access encompasses all peripheral and central devices, short-term and long-term and encompasses device selection, insertion, care, maintenance, and removal.

ABOUT THE NATIONAL INFUSION AND VASCULAR ACCESS SOCIETY (NIVAS)

NIVAS was formed in 2013 by a group a multidisciplinary group of specialists working in vascular access and IV therapy in the United Kingdom. The aim of NIVAS is to promote clinical excellence in infusion therapy and vascular access.

NIVAS supports all healthcare professionals working in infusion therapy and vascular access through education and research, our goal is to influence infusion therapy and vascular access practice nationally and internationally.

THE NIVAS 5 CORE PRINCIPLES OF VASCULAR ACCESS AND INFUSION THERAPY.

- **First Principle** – Vascular access placement and IV therapy administration must only be undertaken if clinically indicated. Alternative routes of drug administration must be considered first.
- **Second Principle** – Informed consent must always be sought prior to initiating vascular access or IV therapy.
- **Third Principle** – Vessel health and preservation must be the primary consideration in clinical practice.
- **Fourth Principle** – Aseptic Non-Touch Technique (ANTT®) and infection prevention standards must always be followed in clinical practice.
- **Fifth Principle –** All healthcare professionals providing vascular access insertion/care and maintenance and IV therapy practice must be appropriately educated, maintain their competency and work within their scope of practice.

1. SCOPE OF PRACTICE

Healthcare professionals/practitioners (HCPs) must operate within their agreed scope of practice as set out by their national regulatory bodies[2] and employer. Furthermore, they must only undertake clinical practice to which they are trained and competent.

HCPs are responsible and accountable for maintaining their own clinical competence. They must be confident, competent and compliant with legislation, local and national guidelines, protocols, policies and codes of conduct.

Registered HCPs must recognise that they are accountable for their clinical practice and the clinical practice that they delegate to an unregistered healthcare worker.

Allied health professionals can administer an injectable medicine listed in the Human Medicine Regulations 2012 Schedule 17[1] in an emergency without prescription and must be aware of what those medicines are. Injectable medicines supplied under Human Medicines Regulations 2012 Schedule 17[1] exemptions should not be delegated to another person to administer. [N]

References:

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2. CONSENT AND MENTAL CAPACITY

Standard 2.1: Informed consent must be gained prior to any episode of clinical care. A patient's capacity to consent must be considered.

Practice guidance:

A. Valid and informed consent must be obtained from a person with capacity before initiating any form of treatment or examination.[1]

B. HCPs must ensure that they obtain consent lawfully. The person who obtains the consent must have the necessary knowledge and understanding of the intended care and/or treatment that they are asking consent for.[1]

C. The information provided to the patient regarding the intended treatment/procedure must include a description of the procedure, the purpose, benefits, common complications, potentially serious or irreversible risks, and any alternative options.[3]

D. Consent can be given orally, in writing or by co-operation[4]. It is important that treatment and care consider the patient's needs and preferences.

E. If the person lacks capacity to give consent a best interest decision is made under the Mental Capacity

Act (MCA) 2005 (c.9)[2] before treatment is undertaken.

F. Patients, caregivers or legal representatives must be involved in all aspects of decision-making associated with IV therapy and vascular access device (VAD) insertion.[5]
G. Children under the age of 16 can consent to their own treatment if they have enough intelligence, competence and understanding to fully appreciate what is involved in the treatment. This is known as being Gillick competent.[6]
H. HCPs must be awareness of their duty to raise potential concerns and safeguarding issues for adults and children. HCPs escalate their concerns to local safeguarding services[7].
I. Patients have a right to refuse treatment including invasive procedures, blood sampling, VAD placement and IV therapy administration. HCPs should respect and support the patients decision[1].
J. The reason why a patient refuses treatment must be explored. In the case of vascular access or IV therapy refusal, the reason may be the patient is needle phobic or is anxious about treatment side effects. Steps should be taken to reduce this anxiety and ensure the patient is fully informed about the benefits and risk of treatment. [N]
K. Patients must not be forcibly restrained to place a vascular access device regardless of mental capacity[2] as doing so poses a risk of needle stick injuries for the HCP and the patient. In an emergency, chemical restraint can be considered following local policy.
L. In emergency situations where the risks of delaying vascular access and IV therapy outweigh the potential for consent, common law and a duty of care may be invoked to justify proceeding without formal consent. However, in such situations, a clear rationale and documentation is essential.[1] An example of this may be a patient in critical care who requires a central VAD (CVAD) insertion.

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3. STAFF EDUCATION

Standard 3.1: Education and competency in vascular access and IV therapy must be standardised for all HCPs within an organisation.

Practice Guidance:

A. Education and competency should include the following theoretical components: [N,1,2,]

- **Anatomy and Physiology:** Understanding the circulatory system, including veins and arteries, and how fluids and medications are distributed within the body.
- **Vascular Access Device Selection:** Understanding vessel health and preservation, the different types of catheters, their sizes, and which are appropriate for various patients and procedures.
- **Infection Control:** Principles of asepsis, sterile technique, and infection prevention measures to minimize the risk of complications.
- **Types of Intravenous Solutions:** Learning about crystalloids and colloids, their indications, and how to choose the appropriate solution for different situations, drug pH and osmolarities.
- **Fluid and Electrolyte Balance:** Understanding how IV fluids affect fluid and electrolyte balance, and how to manage imbalances.
- **Medication Administration:** Identify local guidelines and other sources of information to assist with learning about different types of IV medications, their dosages, administration rates, and potential side effects.
- **Complications:** Recognising and managing complications including anaphylaxis and drug reactions, drug incompatibilities, phlebitis, infiltration and extravasation, thrombosis and infection. Taff must also be aware about how to report and escalate complications.
- **Documentation:** Accurately recording all aspects of IV practice, including fluid balance, medication administration, and patient responses.
- **Ethical and Legal Considerations:** Understanding the ethical and legal responsibilities of administering IV therapy.

Practical Components: [N]

- **Venepuncture:** Mastering the technique of inserting a needle into a vein.

- **Peripheral cannulation:** Mastering the technique of inserting an IV catheter into a vein.
- **Intravenous medication preparation:** Learning how to prepare and hang IV bags, including calculating flow rates and reconstituting IV therapy.
- **Medication Administration:** Practicing administering medications through an IV line, including proper techniques and safety precautions.
- **Monitoring and Documentation:** Learning to monitor patients receiving IV therapy, assessing for complications, and documenting findings.
- **Troubleshooting:** Developing skills to identify and address common problems associated with vascular access and IV therapy.
- **Discontinuation:** Learning how to safely discontinue an IV line and remove a VAD in line with scope of practice.

3.2 Standard: Staff new to an organisation/clinical area who are already competent in IV therapy and vascular access should be allowed to practice, following orientation to cover local policies and protocols to maintain safe practice.

Practice Guidance:

A. Evidence of prior learning must be provided to demonstrate previous training and competence. [N]
B. Formal training and assessment should be undertaken if previous competency evidence is not available or there are concerns about the HCPs current level of competence. [N]
C. HCPs undertaking IV therapy and vascular access practice must do so under the arrangements of their national regulatory body. [N]

3.3 Standard: Up to date records of staff IV practice training must be recorded and maintained by organisations.

Practice Guidance:

A. An organisational database should be established to record staffs training, updates and any additional information about competence. [N,4]
B. A standardised IV therapy training record passport can be used across NHS organisations to prove IV competency.[3]
C. HCPs undertaking IV therapy or vascular access practice must maintain their current knowledge and seek up to date published evidence regularly. An organisational clinical update must be provided at least every 3 years. [N]
D. There is no minimum number of procedures required to achieve competency; this must be based on the individual's capability and assessment by a competent HCP. [N]
E. An increased level of supervision and support must be provided to newly trained healthcare professionals undertaking IV practice. [N]
F. HCPs must also keep records of their own competency assessments.[4]

References:

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2. Nickel, B., Gorski, L., Kleidon, T., Kyes, A., DeVries, M., Keogh, S., Meyer, B., Sarver, M.J., Crickman, R., Ong, J. and Clare, S., 2024. Infusion therapy standards of practice. *Journal of Infusion Nursing*, *47*(1S), pp. S1-S285.
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4. PATIENT INVOLVEMENT

Standard 4.1: Patient-centred care must be a priority in all aspects of IV therapy and vascular access.

Practice Guidance:

A. Patient involvement in IV therapy practice is beneficial for both patient experience and clinical outcomes. It empowers patients to take an active role in their care, and can improve safety, better adherence to treatment, and a more positive overall experience.[1]
B. Shared decision making and patient preference must be part of the clinical process.[1]
C. Patient must be given easy to understand information and have the opportunity to ask questions prior to or during the treatment.[2]
D. Patents should be given information about post intervention care, maintenance, complications. [N]
E. HCPs must acknowledge that patients have the right to refuse treatment and procedures.[2]

References:

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5. HEALTH AND SAFETY

Standard 5.1: Sharps safety must be a priority in vascular access and IV therapy practice.

Practice Guidance:

A. According to data from the Royal College of Nursing (RCN) Blood and Body Fluid Exposures Report 2020[1] and RCN Sharps Safety 2023[2] sharps injuries occur before the procedure, during use, after use, before disposal between steps in procedures, during

disposal and while re-sheathing or recapping a needle. [1,2]

B. Some procedures have a higher-than-average risk of causing a sharps injury. These include IV cannulation and venepuncture. Devices involved in high-risk procedures are: IV cannula, venepuncture needle systems, hypodermic needles and syringes. Scalpels, suture needles, and scissors used in vascular access procedures can also cause sharps injuries. [1,2]
C. Health and Safety Regulations (2013)[3] sets out the requirement for employers to ensure that risks from sharps injuries are adequately assessed, and appropriate control measures are put in place.[3]
D. The following practice can help reduce the risk:[3]
   - No needle recapping or re-sheathing.
   - Safe construction of sharps containers.
   - Placing sharps containers at eye level and within arm's reach.
   - Disposing of single-use sharps immediately after use in designated sharps containers.
   - Sealing and discarding sharps containers when they are three-quarters full, this is for single-use sharps containers.
   - Establishing means for the safe handling and disposal of sharps devices before the beginning of a procedure.
   - Exchange reusable sharps containers when the overfill protection (if fitted) is activated.

Standard 5.2: IV therapy and VADs used in clinical practice must be sharp safety-engineered.

Practice Guidance:

A. Peripheral cannula must include a sharp safety mechanism to render the used needle sharp safe. [N,2,4]
B. Needle free connector systems must be used to access vascular access catheters. [N,2,4]
C. Protective sheaths, either sliding or hinged needle shields must be attached to disposable hypodermic needle and syringe systems. Needles and blades used in vascular access must include a sharps safe feature. [N,2,4]
D. Blunt fill needles must be used with or without a filter in IV therapy practice to draw up IV drugs. Glass ampoules requiring blunt filter needles and plastic ampoules requiring blunt fill needles. [N,2,4]
E. Sharps containers must be safety engineered to eliminate overfilling and have temporary and permanent closures, restrict hand access and be compliant with BS EN ISO 23907:1 or BS EN ISO 23907:2.[2]

Standard 5.3: Device sharp safety features must be engaged when the sharp has been used and disposed of at the point of clinical use.

Practice Guidance:

A. Preference must be given to sharp safety engineer devices used in clinical practice. If a sharp safe device is not available a secondary device must be used alongside the sharp device to enable sharp safety to be achieved (sharps block, sharps pad etc.). [N,4]
B. Sharp safe mechanisms must be deployed immediately even in the event of a failed cannulation or venepuncture attempt. [N,4]
C. Sharp safe mechanisms must never be tampered with to release the sharp after use for reuse. [N,4]

Standard 5.4: A sharps disposal container must be taken to the point of clinical procedure involving a sharp.

Practice Guidance:

A. When placing a peripheral IV catheter (PIVC), undertaking venepuncture or any other procedure involving a sharp at the bed side, a sharps bin and tray must be taken to the bed space so the sharp can be disposed of directly after use.[4]

Standard 5.5: IV therapy and vascular access practice must be latex-free unless a product-specific risk assessment has been undertaken to mitigate the risk.

Practice Guidance:

A. Latex sensitivity or allergy can be serious and sometime lead to anaphylaxis. This risk can be reduced or eliminated by ensuring at all devices, gloves, catheters and any other equipment associated with IV therapy and vascular access is latex-free, this includes within patient environments.[5]
B. Were an alternative latex free product being not available a local risk assessment must be undertaken to limit latex exposure and mitigate risk of allergic reaction.[4]

Standard 5.6: Standardised protocols to prevent occupational exposure to Hazardous Medicinal Products (HMPs) must be in place and followed.

Practice Guidance:

A. Hazardous medicinal products (HMPs) are pharmaceutical substances used predominantly for the treatment of cancer in the form of cytotoxic/cytostatic or antineoplastic drugs. HMPs are also used in the non-cancer setting, for treating non-cancerous diseases such as multiple sclerosis, HIV, psoriasis, rheumatoid arthritis, systemic lupus erythematosus and in organ transplantation, for example, as antivirals, vaccines, and

immunosuppressants. HMPs also extend to other therapeutic groups and some antibiotics. [11,12]

B. HMPs have the potential to cause effects on people other than the patient being treated if they are unintentionally exposed to the substance. [11,12]

Standard 5.7: Hazardous Medicinal Products (HMPs) and associated waste must be stored, handled, prepared, administered and disposed of safely and appropriately, in accordance with regulatory requirements, risk assessment and safe operating procedures.

Practice Guidance:

A. Hazardous drugs and waste must be stored, handled and disposed of safely. [6,7,10,11,12]

B. HMPs, which include SACT, monoclonal antibodies, and certain antivirals, immunotherapies (e.g. antibody–drug conjugates), antibiotics and hormones that meet the CLP thresholds, must be handled, prepared, administered and disposed of using the hierarchy of control required by COSHH. Employers must ensure engineering controls are in place, (Closed System Transfer Device (CSTD) for preparation, administration and disconnection. A CSTD may be one of many controls in place but does not alone reduce the risk, biological safety cabinets or pharmacy isolators for preparation in aseptic units), supported by safe systems of work and personal protective equipment (PPE) can all assist in preventing environmental contamination and exposure to HMPs. [6,7,10,11,12]

Standard 5.8: HCPs must be aware of medical waste and sharps safety container disposal procedures.

Practice Guidance:

A. All IV therapy and vascular access devices which have been exposed to blood or other HMPs including radioactive products must be disposed of according to local guidelines and manufacturers recommendations. [3,4,8,10]

B. Sharps containers must be replaced when filled to the designated level and never allowed to become overfilled. [3,4,8,10]

C. HCPs must not place their hands into sharps containers for any reason. [3,4,8,10]

Standard: 5.9: Spillages of HMPs must be managed separately from bodily fluid spills, using HMP-specific spill kits, decontamination agents and disposal routes.

Practice Guidance:

A. All clinical and community settings where HMPs are prepared, administered, transported or disposed of must have HMP-specific spill kits and written decontamination protocols and provide staff training in accordance with regulatory requirements, risk assessment and safe operating procedures and the RCN 2025 Position on The use of Hazardous Medicinal Products.[11]

B. Spill kits must be regularly checked, include HMP-appropriate absorbents, chemo-rated PPE, labelled waste containers, and be available wherever HMPs are handled — including patients' homes where ambulatory HMP infusions are in use. [9,10,11,12]

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6. ALTERNATIVE DRUG ADMINISTRATION ROUTES: IV TO ENTERAL SWITCH

Standard 6.1: Whenever possible an alternative to the IV route must be considered.

Practice Guidance:

A. The oral/enteral route must be used for drug and fluid delivery whenever possible. Other routes such as rectal, topical, etc., must also be considered first, if possible, before the IV route. [1,2]

B. If the patient's swallow is unsafe and a nasogastric tube can be safely placed for oral drug and fluid administration, this should be considered before the IV route. [N]

Standard 6.2: Patients receiving IV antibiotics must be assessed for an IV to oral switch as early as possible.

Practice Guidance:

A. A review of the patient's infection and antibiotic regime must be undertaken regularly to avoid unnecessary, prolonged regimes.[1,3,4]

B. IV to oral switch must be considered when an oral drug is available with a similar bioavailability as the equivalent intravenous preparation. [1,3,4]

C. Patients in hospital receiving IV therapy must be clinically reviewed regularly, especially those receiving antibiotics or Intravenous fluids to ensure they are still necessary, this will reduce the use of antibiotics and inappropriate used of IV therapies and fluids. [1,2,3,4]

References:

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7. VESSEL HEALTH AND PRESERVATION

Standard 7.1 Vessel health and preservation (VHP) must be considered when planning VAD placement.

Practice Guidance:

A. Maintaining VHP is achieved by limiting the number of VAD insertions performed.[1,2]

Catheter size		Vessel diameter required: 1/3 catheter vs 2/3 vein for blood flow.
2Fr	24g	2mm
2.5 Fr	22g	3mm
3 Fr	20g	3.6mm
4 Fr	18g	4.3mm
5 Fr	16g	5.5mm
6 Fr	14g	6.5mm
7 Fr		7mm
8 Fr	12g	8mm

B. The aim must be to select the most appropriate VAD which will stay in situ for the duration of the IV therapy. [1,2]

C. For CVAD placement, ultrasound should be used to measure the vein diameter to ensure catheter occupancy to vein ratio is less than ideally 33% to allow turbulent blood flow over the catheter surface and reduce the risk of thrombosis or vein phlebitis.[2,3,N]

D. The smallest gauge VAD catheter must be selected to safely deliver IV therapy, for PIVC, the smallest cannula should be sited in the most viable vessel.[1,2,6,N]

D. Points of flexion in the arm and wrist must be avoided and only used when no other sites are available. [1,2,6, N]

E. The NIVAS Vascular Access Device Decision (VADD) tool (Appendix 1) can be utilised in clinical areas as a quick reference VAD decision making tools for all HCPs.

Standard 7.2: Drug pH and osmolarity must be considered when placing a VAD.

Practice Guidance:

A. The VAD placed must be appropriate for the nature of the IV therapy, i.e., vesicant or non-vesicant, and have the ability to indwell for the duration of the whole treatment regime.[4]

B. Drugs with a pH range outside of 5-9 are classed as vesicants and should be administered into a central vein.[4,5]

C. Only IV therapy with an osmolarity below 600mmols should be given into a peripheral vein.[4,5]

Standard 7.3: An organisational, standardised approach to VHP should be embedded in practice.

Practice Guidance:

A. The VHP tool can assist HCPs involved in the delivery of IV therapy by selecting the most appropriate VAD. HCPs should embed VHP into their practice.[1,7]

References:

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8. PATIENT SAFETY

Standard 8.1: IV and VAD related complications, incidents and harms must be reported locally.

Practice Guidance:

A. Clinical complications should be recorded on a database and reported locally on an electronic incident reporting system.[1] This will allow review of the incident, regular audit of complication rates and trends which can inform clinical education and training needs and reduce further incidents occurring. [N]

B. The NHS England Patient Safety Incident Response Framework sets out the NHS's approach to

developing and maintaining effective systems and processes for responding to patient safety incidents for the purpose of learning and improving patient safety.[1] Wales, Scotland and Northern Ireland use similar systems. [2,6]

Standard 8.2: Local incident reporting systems must include a category covering IV therapy and VADs.

Practice Guidance:

A. The local incident reporting category for IV therapy and VADs must include the following: [N]
   - Phlebitis (mechanical, chemical, bacterial).
   - Catheter-related infection.
   - Catheter exit site infection.
   - Medical adhesive-related skin injury.
   - Retained Wire (Never Event)
   - Catheter embolism.
   - Infiltration
   - Extravasation.
   - Medical Adhesive Related Skin Injury (MARSI)
   - Failure to place vascular access device.
   - CVAD Insertion associated complication.
   - Deep vein thrombosis (DVT)/thrombosis
   - Catheter migration
   - Inadvertent arterial puncture/cannulation
   - Any other local complication or incident.

B. The organisational lead for vascular access and/or intravenous therapy must have oversight of related incidents and act accordingly. [N]

Standard 8.3: Patients involved in incidents associated with vascular access and/or IV therapy must be fully informed of what occurred and what action has been taken.

Practice Guidance:

A. Duty of candour process must be undertaken in line with local policy and where possible the vascular access and/or IV therapy lead must be involved in the response to ensure clinical practice accuracy.[1,2]

Standard 8.4 Incidents or adverse effects involving medical devices or medicines must be reported.

Practice Guidance:

A. All incidents involving medical devices including those caused by human error, that have caused, or have the potential to cause harm to patients, HCPs or others must be reported to the Medical Device Safety Officer (MDSO) within your organisation and the relevant national body. [N]

B. Adverse effects involving medicines must be reported to the Medicines Safety Officer (MSO) within your organisation and relevant national bodies where applicable. [N]

C. The Medicines and Healthcare Regulatory Agency (MHRA) yellow card system must be used to report any suspected or confirmed incidents involving healthcare products in England and Wales.[3,4]

D. For Scotland, reports must be sent to Health Facilities Scotland.[5]

E. For Northen Ireland, reports must be sent to the Northen Ireland Incident Centre (NIAIC).[4,6]

F. All defects, patient safety incidents or adverse events associated with a medicines, product or medical device must be reported locally in the incidents reporting system and cross-referenced to the MHRA report via the yellow card scheme.[3,4]

G. Retain product/device and send to manufacturer for investigation if deemed necessary. If this is not possible, for example for infection control concerns, take a photograph of the defect and record brand, lot/batch number and expiry of the affected medicine or device. [N]

References:

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9. VASCULAR ACCESS EQUIPMENT AND DEVICES

Standard 9.1: Medical devices used in clinical practice must meet the required UK or relevant national classification criteria.

Practice Guidance:

A. Medical devices used in clinical practice must meet UK regulations and classification criteria and be marked with either a CE or UKCA mark.[1,2,3,5]

B. Organisations must have systems in place to ensure that medical devices are acquired only via authorised routes and with controls in place to ensure that only compliant devices are used in patient's therapy. [1,2,3,5]

C. There should be a local safety risk assessment undertaken before use. [1,2,3,5]

D. CE marking remains valid in great Britan until at least 2028 or 2030 depending on the device type. [1,3,5]

E. Personal medical devices must not be brough into an organisation and used.[2]

F. Medical devices and products must be maintained in line with local policies and guidelines. [1,2,3,5]

Standard 9.2: All IV therapy and VAD associated products must not be used after the manufacturer's specified expiration date.

Practice Guidance:

A. Expiry dates of products must be checked prior to use. [N,3,4]
B. Products such as blood bottles that have been decanted into storeroom containers must have expiry dates checked regularly. [N]
C. Products should not be decanted from their original containers and stores when the expiry date of the product is indicated on the external packaging. [N]

Standard 9.3: Single use ② items must be used in accordance with manufacturer's instructions and discarded after one single use.

Practice Guidance:

A. PIVC and blood collection sets must be discarded after an unsuccessful insertion and not use for a second attempt. [N,4,8]

Standard 9.4: IV and VAD equipment must be used in accordance with its intended purpose as defined by the manufacturer.

Practice Guidance:

A. IV and VADs must not be inappropriately tampered with, mechanically changed or used outside of the intended purpose. Any deviation of the intended use may result in adverse patient outcomes and breach regulatory requirements. [5]
B. VAD indwell time must not exceed manufacturer's recommendations. [N]

Standard 9.5: Only devices intended for use as a tourniquet should be used for this purpose in line with manufacturer's instructions.

Practice Guidance:

A. A venous tourniquet is only required if the vessel is not firm and palpable enough to undertake cannulation or venepuncture. [N,6,7]
B. Disposable tourniquets are single-use products and must be disposed of after first use.[4]
C. Tourniquets used in vascular access are not intended to profoundly limit blood flow to the limb, care must be taken to ensure venous tourniquets are only tightened around the limb enough to palpate the vein. [N]
D. Knotting the tourniquet must be avoided. [N]
E. Consider the use of a reusable, non-fabric tourniquet to align with sustainability principles. [N]
F. If a reusable tourniquet is used it must be decontaminated between every use in line with manufacturers guidance. [8,N]

References:

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10. INFECTION PREVENTION AND CONTROL

Effective hand hygiene must be undertaken before and after every patient contact in line with local and national infection prevention guidelines.[1]

Standard 10.1: PPE must be used when appropriate to protect the patient and the HCP from infection.

Practice Guidance:

A. PPE must be located close to the point of use. If providing care in the community and domiciliary care, PPE must be transported in a clean receptacle to prevent contamination in a clean, dry area until required (expiry dates must be adhered to). [1,3,4,7]
B. PPE is single-use ② only unless specified by the manufacturer. [1,3,4,7]
C. PPE must be changed and disposed of immediately after each patient contact and/or after completing a procedure or task. [1,3,4,7]
D. PPE must be disposed of after use into the correct waste stream, e.g., domestic waste, offensive (non-infectious) or clinical waste. [1,3,4]
E. PPE must not be used if damaged or contaminated. [1,3,4]
F. Reusable PPE, such as goggles/face shields/visors, must be decontaminated after each use according to manufacturer's instruction. [1,3,4]

Standard 10.2: Gloves must only be worn to protect the HCP from exposure to harmful chemicals and blood or bodily fluids, or to protect the patient from risk of infection during vascular access procedures.

Practice Guidance:

A. Gloves must only be worn when exposure to blood and/or other body fluids, non-intact skin or mucous membranes is anticipated or likely. [1,3,4,7, N]
B. Non-sterile gloves are not required for the mixing and administration of general IV therapy [31]
C. Gloves must be changed immediately after each patient contact and/or after completing a single procedure/task even on the same patient, and hand hygiene performed. [1,3,4]
D. Gloves must be changed if a perforation or puncture is suspected or confirmed. [1,3,4]
E. Gloves must never be decontaminated with hand sanitiser or soap. [1,3,4]
F. Gloves must be appropriate for the tasks being undertaken, fit for purpose and well-fitting, considering the substances being handled, type and duration of contact, size and comfort of the gloves, and the task and requirement for glove robustness and sensitivity. [1,3,4]
G. Sterile gloves must be worn when clinically indicated to perform standard and surgical ANTT procedures where direct contact with Key-Parts or Key-Sites is unavoidable, or where the procedure is complex, invasive, or prolonged. [1,3,4,5]
H. Latex gloves must be avoided as sensitivities and allergies may be triggered.[2]

Standard 10.3: Healthcare organisations must have guidelines, protocols and policies that actively reduce and mitigate the risk of infection related to IV therapy and VAD insertion and use.

Practice Guidance:

A. Guidelines, protocols and policies must be in date and regularly updated with recent evidence. [N]
B. HCPs must adhere to these local guidelines, protocols and policies without deviation. [N]
C. A multidisciplinary approach to developing local guidelines, protocols and policies should involve specialist vascular access and IV therapy HCPs. [N]

Standard 10.4: Principles of asepsis must be applied to all aspects of clinical practice associated with IV therapy and vascular access.

Practice Guidance:

A. **Aseptic Technique** – refers to a set of infection prevention actions aimed at protecting patients from infection during invasive clinical procedures and management of indwelling medical devices. [1,3,4,5]
B. **Aseptic Non-Touch Technique (ANTT®)[5]** – Refers to a specific and comprehensive framework based on an original concept of Key-Part and Key-Site Protection; achieved by integrating Standard Precautions such as hand hygiene and personal protective equipment with appropriate aseptic field management, non-touch technique, and sterilized supplies. It is designed for all invasive clinical procedures and management of invasive medical devices. In the context of infusion therapy, this includes VAD insertion and management and infusion administration. ANTT can be successfully implemented as a standalone initiative or as an integral part of a clinical care bundle. [5]
C. **Standardised Practice Terminology of ANTT®:[5]**
    - Key-Site: Any portal of entry into the patient (e.g., VAD site, injection site, open wound) that could transfer harmful microorganisms and cause infection, an example of which is the skin entry site for cannulation. [5]
    - Key-Part: The component of equipment within the procedure that, if contaminated, is likely to contaminate the patient (e.g., syringe tip, male Luer end, spike of administration set, injection needle). [5]
    - General Aseptic Field: A decontaminated and disinfected surface (e.g., procedure tray, cart, or single-use procedure kit/ barrier) used to promote, but not ensure, asepsis. Key-Parts placed onto this surface must be protected by micro critical aseptic fields when not in use. [5]
    - Critical Aseptic Field: A sterile drape/barrier. Used to ensure asepsis; all procedure equipment is placed upon the drape and managed collectively. [5]
    - Micro critical aseptic field: A small protective sterile surface/housing (e.g., sterile caps, covers, the inside of recently opened sterile equipment packaging) that protect Key-Parts individually. [5]
D. Depending on the clinical procedure being undertaken, either standard-ANTT or Surgical-ANTT must be followed. [5]
E. **Standard-ANTT:**[5] A combination of Standard Precautions and an approach of protecting Key-Parts and Key-Sites individually, using non-touch technique and Micro Critical Aseptic Fields within a General Aseptic Field. Must be used for achieving asepsis where protecting Key-Parts and Key-Sites is straightforward and short in duration, such as VAD flushing and locking, intravenous administration set preparation and change, bolus or infusion intravenous medication administration, and simple wound care. If Key-Parts or Key-Sites require direct touch, sterile gloves must be used.[5]

F. **Surgical-ANTT:**[5] A combination of standard precautions and an approach of protecting Key-Sites and Key-Parts collectively using a sterile drape(s) and barrier precautions. Used for clinically invasive procedures, where achieving asepsis and protecting Key-Parts and Key-Sites is difficult and/or procedures are long in duration, such as surgery and central vascular access device insertion. [5]

Standard 10.5: Skin decontamination must be performed prior to vascular access device insertion using chlorhexidine 2% w/v with alcohol 70% v/v sterile solution.

Practice Guidance:

A. If skin is visibly soiled prior to procedure the area should be cleaned before decontaminated with chlorhexidine 2% w/v with alcohol 70% v/v. [N]
B. For peripheral cannulation, at least 1mL of chlorhexidine 2% w/v with alcohol 70% v/v must be used for skin decontamination around the intended cannulation site. [N,6,32,36]
C. For CVAD cannulation, at least 3mL of chlorhexidine 2% w/v with alcohol 70% v/v must be used to clean the skin at and around the intended cannulation site. [N,32,33,46]
D. The area of skin decontamination must be at greater than the size of the intended film dressing that will cover the insertion site. [N,33,36]
E. The skin must be decontaminated for 30 seconds using a back-and-forth technique with the product.[6,7,36]
F. Caution during skin decontamination must be exercised where skin is fragile. [N,8]
G. Long-term CVADs must be placed following surgical ANTT, and a larger volume of chlorhexidine 2% w/v with alcohol 70% v/v must be used via a sterile applicator or sterile forceps. The size of the area decontaminated must cover the intended critical aseptic field. [N,33]
H. The skin must be allowed to dry after decontamination before the procedure is commenced. [3,8,36]
I. Decontamination of the skin prior to venepuncture with alcohol 70% v/v must be allowed to dry before taking the blood sample to ensure blood laboratory result are not affected. [37]
J. Applying medical adhesives onto skin with wet chlorhexidine can cause MARSI.[8]
K. Standard ANTT must be used for venepuncture or PIVC insertion, the puncture site must not be contaminated during needle insertion once the skin has been decontaminated, the vein must not be palpated again, except if the operator is wearing sterile gloves. [5]
L. Skin decontamination solution must be contained within a sterile packet or applicator and be single-use. [34]
M. Larger bottles of solution are single-use must be discarded after opening and decanting into a sterile container for skin preparation and not reused.[34]
N. All products used for skin decontamination must hold a valid UK Marketing Authorisation from the MHRA. Products with a UK marketing authorisation have a licence number in the format 'PL 12345/0001', 'PLGB 12345/0002' or 'PLNI 12345/0003'. The licence number can be found on the packaging of the product, and the first 2 characters always contain the letters 'PL'.[35]
O. Wipes containing less than 1 mL chlorhexidine 2% w/v with alcohol 70% v/v should not be used to decontaminate skin prior to peripheral IV venous catheterisation, this is due to the limited amount of solution contained in the swab or wipe. [N,36]
P. Pads or applicators containing 1mL or more of chlorhexidine 2% w/v with alcohol 70% v/v can be used effectively for skin prep for cannulation. [N]
Q. An alcohol 70% v/v swab can be used to decontaminate the venepuncture site prior to taking a blood sample. The alcohol must be allowed to evaporate before venepuncture is undertaken.[37]
R. Chlorhexidine 2% containing products can be used on neonates prior to VAD placement.[9,10]
S. Where a patient is sensitive or allergic to chlorhexidine products, antiseptics such as alcoholic iodine tincture 10% preparations can be considered. If allergy to iodine, just alcohol 70% v/v can be used.[11,12,13]

Standard 10.6: VAD exit sites must be monitored and assessed regularly for signs of complications.

Practice Guidance:

A. For inpatients, a visual inspection of the VAD exit site must be undertaken[14] at least twice a day or every time the device is used. [N,7]
B. A visual inspection must be undertaken during every visit for patients in the community. [N]
C. Action must be taken to remove the device if signs of complications are present, such as redness, pain or swelling. [N,7]
D. A consistent approach using a scoring tool to assess the VAD exit-site Infection or Phlebitis must be in place. Any signs of phlebitis must initiate removal of the device to avoid progression of exit site infection. Follow the new NIVAS Vascular Access Device Exit-site Infection or Phlebitis (VADEIP) assessment score, which replaces visual infusion phlebitis (VIP) scoring:[N]

E. The NIVAS VADEIP assessment tool is designed to identify and manage various VAD exit site complications, including phlebitis, infection, MARSI, and thrombosis. The tool recommends removal of the device as soon as complications are noticed (score 1) to prevent the complication progressing. Complications seen at the exit sit of long-term CVAD may be managed rather than opting for removal however this must be an agreed local protocol. [N]

NIVAS VADEIP-Assessment Score Vascular Access Device Exit-site Infection or Phlebitis		
No Signs of Infection or phlebitis	0	CONTINUE EXIT SITE OBSERVATION
Signs of Exit-site Infection or Phlebitis ✓ Redness ✓ Pain ✓ Swelling ✓ Discharge	1	REMOVE DEVICE • Follow local policy for swabbing exit site and/or sending catheter tip for MC&S. • Cover site with sterile waterproof dressing. • Incident report and document. • Consider alternative causes – Extravasation, MARSI, Thrombosis • Follow local policy for long-term CVAD.

F. A sterile, single-use, vapour control semipermeable transparent film IV dressing must be used to cover the VAD with the catheter exit site being at the centre of the dressing.[4]

G. A chlorhexidine-containing IV dressing should be used to reduce the risk of VAD-related insertion/exit site infection. [7]

H. IV dressings must be changed every 7 days or sooner if visibly soiled or loose.[4]

I. Adopting a standardised, hospital wide tool such as the I-DECIDED® checklist created by Gillian Ray-Barruel and the AVATAR Gorup can provide a comprehensive, evidence-based, valid and reliable invasive device assessment and decision tool. Derived from evidence-based guidelines, this simple checklist promotes comprehensive device assessment and management and prompts timely removal of temporary invasive devices, The I-DECIDED tool can be used as the basis for daily in invasive device assessment documentation (Appendia3) [52,53,54,55]

Standard 10.7 A standardised approach to classifying infections associated with VADs is crucial for accurate diagnosis, consistent surveillance, and effective treatment.

Practice Guidance:

A. Infections associated with indwelling or recently removed VADs can occur at the exit site, tunnel or port hub site, or systemically as a bloodstream infection (BSI).[38] HCPs and organisations must ensure prevention, recognition and treatment is standardised. [N]

B. VAD-associated infections can be serious and potentially life-threatening and are associated with prolonged hospital stay, increased healthcare costs, morbidity and mortality. [15,16,38]

C. HCPs must understand the key differences between VAD infection classifications:[18,40]
- Catheter-associated blood stream Infection (CABSI).
- Catheter line-related blood stream infection (CLABSI).
- Catheter-related blood stream infection (CRBSI)

D. CABSI refers to BSIs originating from either PIVC and/or CVAD. Both are equally injurious and can occur from 3 sources:[7,17,19,40]
- During catheter insertion through transfer of microbes into the catheter tract.[17,7]
- Via the catheter hub/lumen during routine administration and manipulation at the hub/lumen. [17,7]
- Due to endogenous microorganisms within the bloodstream from contaminated infusates.[7]

E. The definition of CABSI includes by default other definitions to classify BSIs associated with VADs.[39,40]
- CLABSI is a surveillance definition used to report BSIs in patients with an intravascular catheter in place within 48 hours of infection onset, even if the line is not definitively proven as the source.[45]
- CRBSI: A clinical definition requiring specific laboratory testing (e.g., matching blood cultures from the catheter tip and a peripheral vein) to confirm that the catheter is the direct source of the BSI.[16,18,45],with signs and symptoms of sepsis and the BSI is not related to an infection at another site and a positive catheter tip of the same organism.[20,39]

F. CABSI can lead to serious secondary, or metastatic, infections such as infective endocarditis and osteomyelitis. When a central venous catheter becomes infected, bacteria can enter the bloodstream and travel to other parts of the body, causing deep-seated infections.[40,46]

G. VAD exit site infection: Signs of inflammation confined to an area (typically < 2 cm) surrounding the catheter exit site and the presence of exudate that proves to be culture positive.[48]
H. CVAD tunnel infection: Inflammation extending beyond 2 cm from the exit site (along with the track or cephalad towards the vein entry site or extending beyond the cuff), typically associated with pain and tenderness along the subcutaneous track and culture-positive exudate at the exit site that may not be seen unless expressed by palpation.[48]

Standard 10.8 HCPs must receive regular education and training related to CABSI prevention, recognition and clinical escalation.

Practice Guidance:

A. CABSI risk factors include prolonged hospital stay, heavy microbial colonisation of insertion site or catheter hub, multi-lumen catheters, multiple catheterisations, parental nutrition, high body mass index (BMI), suboptimal care and maintenance, frequent catheter manipulations, concurrent catheters, neutropenia, prematurity, reduced nurse-to-patient ratio in intensive care, and transfusion of blood products.[45,46,47]
B. Symptoms associated with a CABSI can occur specifically when infusing through the catheter or at the exit site redness, discharge, pain or swelling.[19]
C. CABSI is suspected but not limited to when a fever and or rigors occur, often within 30/60mins of starting or occasionally when disconnecting an infusion.[20]
D. HCPs, patients and carers must be aware of the risks, signs and symptoms of CABSI, and catheter exit site infections and be trained to reduce these risks during VAD access, care and maintenance. [N,19]
E. Protocols for the prevention and management of CABSI and must be set out in organisational policies and procedures. [N,19]
F. If CABSI is suspected, paired blood cultures must be taken. Blood cultures must be taken from all CVAD lumens, and a separate peripheral blood culture must be taken. When obtaining blood cultures, timing of paired samples, sample volumes and sampling technique can affect results and lead to erroneous results or contamination of samples.[21,46] A local protocol should be followed to ensure standardisation of this practice. [N,21]
G. All blood culture bottles should be labelled to indicate which was the peripheral sample and from which lumen the others were taken from. [N,21]
H. For suspected VAD exit site or CVAD tunnel infections a swab should be taken and sent for Microscopy, Culture and Sensitivity (MC&S).[N,7,46]
I. Where a CABSI is suspected, do not use the VAD. Alternative IV access should be used. [N]
J. PIVCs, midline arterial catheters and non-tunnelled central venous catheters (NT-CVC) should be removed at once where CABSI or exit site infection is suspected. [N]
K. Peripherally inserted central catheter (PICC) exit site infections, skin tunnelled cuffed - CVAD (STC-CVAD) exit site or tunnelled infections, and totally implantable VAD (TIVAD) pocket infections may be treated without catheter removal, depending on the organism present and severity of infection. Silver, chlorhexidine or topical antimicrobial-containing products can be used at the exit site in conjunction with or without oral antibiotics. [N]
L. Catheter salvage can be attempted and managed with catheter line locks for long-term CVADS, PICCs, STC-CVADs and TIVADs, depending on the organism present and severity of infection. [23,24] Patient groups include:
    - Paediatrics.
    - Complex chronic condition patients.
    - Patients with limited venous access due to prior CVAD use.
M. PICC exit site infections, STC-CVAD exit site or tunnelled infections, and TIVAD pocket infections may be treated without catheter removal, depending on the organism present and severity of infection. Silver, chlorhexidine or topical antimicrobial-containing products can be used at the exit site in conjunction with or without oral antibiotics. [N]
N. Positive catheter tip cultures alone have limited value when CRBSI is suspected. [7,22]

Standard 10.9 HCPs must follow evidenced based practice to prevent CVAD infection during insertion.

Practice guidance:

A. Surgical ANTT must be used for CVAD insertion.[5]
B. Use of a standardised CVAD insertion pack is recommended. [N]
C. CVAD exchange over a guidewire should be avoided as the risk of introducing infection into the new catheter is high. [2525]
D. Early PICC insertion for the treatment of a BSI should be considered to enable administration of IV antibiotics. Local policy should be followed.[26]
E. The integration of antimicrobial and hydrophobic catheter materials, and pressure-activated valves, into polyurethane PICCs are innovations designed to prevent infective and thrombotic complications. [27]

Standard 10.10: Infection prevention surveillance of VADs should be undertaken locally.

Practice Guidance:

A. Daily surveillance of patients who have PIVC and CVAD in situ should be undertaken to ensure the catheter is still required and there are no signs of infection.[3,4]
B. An insertion and complication database of all long term CVAD, midlines and longer length PIVCs should be maintained to assist with audit and surveillance. [N]
C. A database of CABSIs should be maintained to monitor local prevalence [N]
D. Organisational-wide VAD audits should be undertaken at least annually to establish trends in device use, indwell time, complications and clinical practice deficiencies, this data can assist with training updates. [N]
E. Environmental audits or clinical areas used to place CVADs should be undertaken to ensure national standards of cleanliness are adhered to. [28]

Standard 10.11: Infection prevention surveillance of VADs should be undertaken locally.

Practice Guidance:

A. Follow manufacturers guidance for individual device decontamination. [N]

Standard 10.12: Asepsis must be maintained when using an ultrasound probe use during peripheral and central vascular access.

Practice Guidance:

A. An appropriate sterile single-use ultrasound probe cover and gel must be used during vascular access procedures to avoid the risk of cross contamination from the probe and the skin . [N]
B. When assessing veins, if vessel cannulation is likely to be within 24 hours a single-use sterile gel and sterile probe cover must be used to prevent infection. [N,30]
C. The skin must be decontaminated, and a sterile single-use ultrasound gel and probe cover must be used during vein assessment prior to vessel cannulation.[30]
D. Designated single-use packaged sterile ultrasound gel must be used in accordance with ultrasound manufacturer's guidance. [N,30]
E. The ultrasound probe must be cleaned with a disinfectant wipe after removal of the probe cover, directly following the procedure to prevent patient-to-patient cross-contamination. Always check with the ultrasound manufacturer which type of disinfection wipe can be used. [29,41,42]

Standard 10.13: Excessive body hair must be removed prior to VAD placement.

Practice Guidance:

A. Excessive body/neck hair around the VAD site should be removed with the patient's consent to ensure optimum skin decontamination and effective dressing adherence. [7,43]
B. A single-use, disposable electric clipper must be used to trim body hair. The cut hair must be removed prior to skin decontamination. [7,43,44]
C. Using razors to trim body hair must be avoided as it can cause micro skin abrasions which can increase the risk of infection. [7,43,44]

Standard 10.14: Vascular Access Devices must be protected when patients are showering.

A. Patients should be supported with education and advice about keeping their VAD dry during personnel care, especially when showering to prevent the primary dressing becoming wet and saturated which could lead to infection. Bathing should be advised against.[49,50]
B. PICC shower protection sleeves can be used; patients should be assisted in ensuring the correct sleeve size is selected to ensure maximum protection. [N]
C. Adhesive pouches can be used to protect PICCs and STC-CVAD or TI-CVAD. Patients should be taught how to effectively apply these adhesive waterproof pouches ensuing the skin is protected from the adhesive to prevent MARSI, and the adhesive shower pouch does not inadvertently remove the primary dressing when removing.
D. Chest hair should be shaved regularly if using an adhesive shower protection pouch to reduce the risk of MARSI and ensure optimum adhesion.
E. CVADs with external lumens must not be submerged in water, patients should avoid bathing and swimming unless they have a TI-CVAD which is not accessed. [51]

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11. VENEPUNCTURE

Standard 11.1: **Venepuncture must be undertaken using ANTT.**

Practice Guidance:

A. Decontaminate the venepuncture skin site with either an alcohol 70% swab or chlorhexidine 2% with w/v/alcohol 70% v/v applicator or pad which is licenced for skin use.[1]

B. The skin must be allowed to air dry before the procedure, otherwise the wet alcohol can

contaminate the blood sample and affect the laboratory test results.[19]

C. Once decontaminated, the venepuncture site must not be re-palpated or contaminated. If re-palpation is necessary, a sterile glove must be used to maintain asepsis. HCPs should work toward competency that avoids re-palpation directly before inserting the needle. [1,25]

Standard 11.2: A safety-engineered needle system must be used to minimise the risk of needle stick injury.

Practice Guidance:

A. Safety-engineered blood collection devices which incorporate a built-in passive or active mechanism to shield the needle after use must be used to reduce the high risk of needle stick injuries.[1]

B. In addition to using a safety-engineered needle system, a sharps container must be used at the point of venepuncture for disposal.[2]

C. Organisations should standardise the use of the same safety-engineered needle system to maintain sharp safety by ensuring all staff are trained correctly using the same device rather than having multiple devices in different clinical areas.[3,23,N]

D. The use of a syringe and hypodermic needle must be avoided to obtain or transfer blood into blood collection tubes as this increase the risk of a sharp's injury to the HCP.[2]

E. The safety-engineered mechanism of the needle device must always be activated at the end of the procedure even if the venepuncture attempt has failed.[2]

Standard 11.3: The safety-engineered needle venepuncture system must be compatible with evacuated blood collection tubes.

Practice Guidance:

A. Evacuated blood collection systems use a double-ended needle inserted into a holder. Once the needle punctures the vein, a pre-vacuumed tube is pushed into the holder, and the vacuum automatically draws the precise, predetermined volume of blood into the tube, this is considered a closed system, which minimises the risk of exposure to blood-borne pathogens.[3]

B. An evacuated blood collection system should be the primary method used for venepuncture to provide a safe transfer of blood from needle to blood collection tube.[30,N]

C. Integrated blood collection system (made of blood collection needle/set, holder and evacuated blood collection tube) from a single manufacturer, or from different manufacturers who declare mutual compatibility for the intended use) can minimise the staff and patient safety risks. [N]

D. A winged blood collection set or butterfly consists of a short needle with plastic wings connected to thin tubing. The other end of the tubing is connected to a needle holder compatible with evacuated blood collection tubes. Winged blood collection sets allow a flash back of blood to be seen in the tubing, which confirms successful venepuncture. They are also safety-engineered and are the preferred device for venepuncture. [26]

E. When using a winged blood collection set, it is critical to first use a blood collection tube to fill the "dead space" in the tubing before collecting the required specimens. This prevents underfilling of the blood collection bottle. [N]

F. Venepuncture needle and holder sets are commonly used for venepuncture; however, due to the absence of a flash back, the procedure can be more painful with a higher degree of vein transfixation. [N]

G. Dripping blood into a blood sample bottle should avoided. [4,5]

Standard 11.4: Blood samples must be drawn in a specific order.

Practice Guidance:

A. Order of draw should be followed to avoid cross-contamination of the sample caused by additives found in different collection tubes; blood cultures must be the first samples drawn if required.[6,7]

B. After blood cultures, the coagulation bottle must be the first blood collection bottle to be filled.[6]

C. For blood cultures, the aerobic bottle must be used first, then the anaerobic bottle, to avoid contaminating the anaerobic bottle with air. [N]

D. Local guidance must be available in clinical areas outlining the order of blood bottle. [N]

E. Venepuncture training and education must include the order of blood draw. [N]

Standard 11.5: Blood samples must be labelled at the patient's side and the patient's identifying details must be confirmed and cross-referenced against the blood test order.

Practice Guidance:

A. Blood collection tubes must be labelled at the time of taking the blood sample in clear handwriting with the patient's name, date of birth, hospital or NHS number and date and time of collection as a minimum. Additional patient information may be required depending on local protocols.[7]

B. Use of barcode labelling of tubes at the time of collection, when used as part of an IT system which allows the retrieval of the above information when

required, may enhance sample traceability and safety by providing a clear chain of custody of the sample. [N]

C. The patient's details must match the blood request. The patient must also verbally confirm that their details are correct.[7]
D. Only take and label one patient's set of blood samples at a time to prevent sending the wrong blood sample attributed to the wrong patient. [N]
E. When available, pre-barcoded blood collection tubes must be used to ensure traceability as they are linked to the patient, the sample collected, test request, test requestor and HCP collecting the sample. This is a safer system than handwritten details on the blood collection tubes.[7] Ensure the patient details match the blood collection tube. N
F. Ensure prompt transfer of samples to the laboratory – unnecessary delays in transit and incorrect storage of samples should be avoided as this can lead to unusable samples.[7]

Standard 11.6: HCPs must avoid and prevent haemolysis of the blood sample.

Practice Guidance:

A. Blood bottles with liquid-based citrate buffer for coagulation testing should be gentle inverted (180° and back) to avoid clotting. Always follow manufactures instructions for use.[8]
B. The prolonged use of a venous tourniquet must be avoided as it promotes interstitial fluid leakage into the tissue, resulting in haemolysis.[9]
C. Standard thin-wall 23- and 25-gauge needles are associated with a higher risk of haemolysis. 21- and 22-gauge needles should be used unless evidence exists to support the use of higher gauge needles without causing haemolysis, such as those that use ultra-thin-wall needle.[27,31]
D. Partial draw (low vacuum) evacuated blood collection tubes or closed manual aspirations systems can be used to minimise haemolysis in blood collection from VADs.[10]

Standard 11.7: Venepuncture site assessment must be undertaken prior to the procedure.

Practice Guidance:

A. The patient should give informed consent. [N]
B. Venepuncture must be performed in the opposite arm of any indwelling PIVC, especially when infusions are running as the sample results can be affected by infusion.[11]
C. Venepuncture should not be undertaken from an arm with a planned or functioning renal fistula, if this is unavoidable, restrict venipuncture to the dorsum of the hand only on the affected side.[11]
D. Venepuncture in the ipsilateral arm can be undertaken following mastectomy or lymph node dissection, provided that lymphoedema is not present [12,13,14,15]
E. Venepuncture must not be performed in a site where there is a break or injury to the skin or hematoma. [N]
F. Venepuncture should be avoided in a limb with injury or weakness.[11]

Standard 11.8: HCPs must consider all safety aspects of blood sampling from VADs.

Practice Guidance:

A. There are risks associated with the quality of blood samples taken from a VAD, and this must be considered. These risks include haemolysis of the sample, contamination from precipitates or residual fluid from the VAD and catheter occlusion. [N,11,26]
B. ANTT must be followed to obtain blood samples from VAD lumens.[16]
C. A needle-free blood collection set must be used to obtain blood from a CVAD. [N]
D. Prior to blood sampling from a CVAD, 3 mL of blood must be discarded to remove precipitate or residual fluids from the catheter. (Not applicable for blood cultures). [N,18]
E. Blood sampling for drug therapeutic levels must not be taken from a CVAD lumen used to administer the drug that the levels are testing. [N,17]
F. If using a CVAD lumen for blood sampling (not for drug levels or blood cultures), infusions must be paused for 1 minute prior to obtaining the blood sample. The lumen must be flushed with 10mLs sodium chloride 0.9% and 3 mL of blood must be drawn and discarded before collecting the sample. The lumen must be flushed directly after obtaining the sample to avoid catheter occlusion. [N,18]
G. Blood culture samples must not be taken from a PIVC as this can increase the risk of contamination, a blood culture sample must be taken from a separate venepuncture procedure. [11]
H. Blood cultures must only be taken from a CVAD lumen if CRBSI is suspected and paired with a peripheral blood culture set.[11] The blood culture bottles must be clearly labelled to identify which lumen the sample was taken from and the peripheral set labelled as peripheral. [N]
I. When drawing blood from a CAVD, the largest lumen should be used to maximise blood flow. [N]

Standard 11.9: HCPs must consider all safety aspects of blood sampling from arterial catheters.

Practice Guidance:

A. Arterial blood samples can be taken from an arterial catheter/arterial line using ANTT and a closed system attached to the transducer kit for flushing and maintaining catheter patency.[11,16]
B. The device must be flushed before and after the blood draw and the first 3 mL must be discarded.[11,18]

Standard 11.10: HCPs must consider all safety aspects of arterial blood gas sampling with a needle and blood gas syringe.

Practice Guidance:

A. The patient should give informed consent. [N]
B. Local anaesthetic injection, cryogesic ethyl chloride spray or topical anaesthetic cream can be used to reduce pain. [N]
C. ANTT and skin decontamination must be undertaken when obtaining an arterial blood gas sample.[16]
D. Arterial blood gas sampling must only be performed by a competent HCP.[N]
E. The radial artery should be the primary site for obtaining a blood gas sample. [N]
F. Where possible, ultrasound-guided arterial blood gas sampling must be used to ensure accurate needling of the artery, which can reduce complications.[11,15]
G. A safety-engineered arterial blood gas needle and syringe set should be used to reduce the risk of sharps injury. [N]
H. Manual pressure must be applied on the puncture site for a minimum of 5 minutes after the procedure. [N]
I. The puncture site must be covered with a sterile film dressing. [N]

Standard 11.11: HCPs must consider all safety aspects of capillary blood sampling.

Practice Guidance:

A. Capillary blood sampling can be used in patients who have difficult IV access as an alternative to venepuncture following local protocols. [N]
B. Decontaminated the skin with an alcohol 70% swab which must be allowed to air dry before the procedure as wet alcohol on the skin can affect the laboratory results.[19]
C. Small volume blood collection tubes for capillary blood samples are non-evacuated, and blood is collected in an open manner. The HCP should ensure adequate PPE measures are used to protect themselves. [N]
D. The middle or ring finger or heel (depending on age) is pricked with a small handheld device (lancet), which has an in-built needle to prick the skin. This must be safety engineered.[19]
E. Manual pressure must be applied to the site after the procedure until any bleeding has stopped. The puncture site must be covered with a small, waterproof sterile dressing. [N]
F. Puncture sites must be rotated to avoid skin and tissue complications. [N]
G. In paediatrics, capillary blood taking is preferable to using long-term CVAD, to reduce the risks of associated CVAD complciations.[20]

Standard 11.12: Obtaining a blood culture must be undertaken with ANTT to prevent contamination of the blood bottle.

Practice Guidance:

A. Obtaining a blood culture must be undertaken using ANTT, ensuring that the skin is properly decontaminated using at least 1 mL sterile solution of chlorhexidine 2% with w/v/alcohol 70% v/v applicator or pad. [N,11,16,21]
B. Once decontaminated, the venepuncture site must not be re-palpated and contaminated. If re-palpation is necessary, a sterile glove must be used to maintain asepsis. HCPs should work toward competency that avoids re-palpation directly before inserting the needle.[1,25]
C. Blood must not be taken from a newly sited PIVC due to the risk of contaminating the blood sample and obtaining a false positive result. [N,11]
D. Ultrasound-guided venepuncture can be used to aid successful blood culture sampling. [N,11]
E. A blood culture sampling pack can standardise practice within an organisation, ensuring the correct equipment is used to prevent contamination of the blood culture sample. [N,22]
F. A winged evacuated blood collection set can be used to allow adequate manipulation of the adaptor and blood culture bottles. [N,23]
G. The aerobic bottle blood sample must be taken first, followed by the anaerobic bottle. This prevents air from being drawn into the anaerobic bottle, which can affect the laboratory result.[5]
H. Studies have demonstrated reduction in blood culture contamination by diverting the first 0.5 mL of blood away from the blood culture bottle by using a specific diversion blood collection set which discards potentially, externally contaminated blood away from the blood culture bottle. The same standard can be achieved by filling and discarding a blood collection tube with 1mL of blood before the blood culture bottles are filled.[11,28,29]

I. For adults, fill the bottles with 8-10 mL of blood.[5]
J. For paediatric patients, follow local guidance. [N]
K. CVADs must not be used to obtain blood culture samples unless CRBSI is suspected.[7,11]
L. If CVAD CRBSI is suspected, one set of blood culture bottles must be taken per lumen and labelled to identify which lumen the set is from. A separate peripheral blood culture set must also be taken at the same time and labelled to indicate they are peripheral.[11]

Standard 11.13 HCPs must consider the management of complications associated with venepuncture.

Practice Guidance:

A. The venepuncture site must be covered with a waterproof sterile dressing to prevent infection.[7,16]
B. Hematoma or puncture site bleeding can be a significant complication of venepuncture and can be caused by multiple venepunctures attempts in the same vessel, accidental arterial puncture or by uncontrolled bleeding after needle removal. This can be avoided by limiting the number of attempts in the same vessel and by applying firm manual pressure over the puncture site for a minimum of 5 mins. [N,11,15]
C. Accidental nerve damage can occur during venepuncture; the patient may experience severe pain or unusual sensations in the venepuncture limb. The superficial branch of the radial nerve is located near the cephalic vein at the wrist; similarly, the median nerve runs into the antecubital fossa, and these areas must be used with care. If nerve damage is suspected, the needle must be immediately withdrawn, and firm pressure applied to the site to minimize hematoma formation, while also reassuring the patient.[15]
D. Venepuncture is known to induce vasovagal reactions, ranging from nervousness, light-headedness, nausea, feeling of being extremely hot or cold, confusion, slight inability to speak, weakness and visual disturbances, to loss of consciousness. Ensure the patient is sitting or lying during the procedure. If a patient loses consciousness, they must be placed in a supine position with their legs elevated, with emergency procedures initiated if necessary. The patient should be monitored and observed post syncope episode following local protocol. [24]

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12. THERAPUTIC VENEPUNCTURE

Standard 12.1 HCPs undertaking therapeutic venepuncture should follow a standardised pathway that focuses on vessel health and preservation.

Practice Guidance:

A. Therapeutic venipuncture (or venesection) is the controlled, prescribed removal of blood to treat specific conditions like hereditary hemochromatosis, polycythaemia vera, or iron overload.[1,2]
B. The standards of care focus on ensuring patient safety, vessel health and preservation, accurate volume removal, and stringent infection control.[1,2]
C. A protocol should be followed to define the exact volume of blood to be removed (typically 450–500 mL) and the frequency of the procedure associated with laboratory blood values.[1,2]
D. The patient's informed consent is required to undertake the procedure. [1,2]
E. Haemoglobin (Hb) or haematocrit (Hct) levels must be checked prior to the procedure; in many guidelines, if Hb is below a certain threshold (e.g., <110 g/L for women, <120 g/L for men), the procedure is delayed. [1,2]
F. Ensure the patient is hydrated and has eaten. [1,2]
G. Assess for contraindications like anaemia, low blood pressure, or recent surgery. [1,2]
H. A closed, sterile, sharp safe, single-use, 18g or 20g peripheral intravenous cannula can be used instead of a steel needle and closed bag system. [N]
I. The antecubital fossa is the preferred site, choosing a large, firm, and straight vein. [1,2]
J. If intravenous fluid exchange is required pre and post venesection, the same PIVC can be used for IV fluid administration and the venesection rather than inserting 2 PIVC. [1,2]
K. Using ultrasound guided PIVC insertion can improve first time cannulation success rate and reduce pain and vessel damage. [N]
L. The venesection bag should be placed below the patient's cannulation site to allow gravity to drain the blood. [N]
M. The bag should be placed on a scale to monitor the volume of blood collected, ensuring it does not exceed the prescribed amount, usually a maximum of 500 mLs per session.[1,2]
N. After the procedure, the patients' blood pressure should be monitored and only discharged once the baseline blood pressure has been achieved. [1,2]

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13. FLUSHING, LOCKING, UNBLOCKING VADs

Standard 13.1 VADs must be flushed pre and post IV administration to maintain patency.

Practice Guidance:

A. Catheter flushing refers to administering a manual injection of sodium chloride 0.9%, or other compatible fluid, to clear IV therapy from the catheter or maintain the catheter patency. [N]
B. Catheter locking refers to solutions that are instilled but not administered into the vein and remain in the catheter after flushing to prevent occlusion and bacterial colonisation within a catheter when it is not in use. [N]
C. Sodium chloride 0.9% flushes can be drawn up from an ampoule or supplied as a prefilled syringe.[1,5]
D. Sodium chloride 0.9% ampoules are licenced medicines and must be prescribed.[2,3,5]
E. Sodium chloride 0.9% prefilled syringes are classed as medical devices and do not need to be prescribed.[3,5]
F. Sodium chloride 0.9% prefilled syringes should be classified as a class 2a or class 2b medical device as a minimum, class 3 devices have undergone further evaluation to ensure a higher level of quality, safety and efficiency. [N]
G. Where possible, the use of a prefilled sodium chloride 0.9% flush is preferred over drawing up a sodium chloride 0.9% flush from an ampoule. [1,2,3,5]
H. A prefilled 10 mL barrel sodium chloride 0.9% flush can be safer because the syringe is labelled clearly, reducing the risk of inadvertently flushing with other medicines instead of the intended sodium chloride 0.9%.[1]
I. Never use sterile water as an IV-flushing solution.[1]
J. Externally packaged sterile prefilled 10 mL barrel sodium chloride 0.9% flushes are available, which can be opened onto a sterile field. [N]
K. If drawing up a flush from a plastic ampoule, a blunt fill needle must be used. If a glass ampoule is being used, a blunt fill filter needle must be used to prevent particles from being inadvertently injected.[4]
L. VADs must be flushed before and after IV therapy administration with 10 mL sodium chloride 0.9%. [N,1]
M. When not in use for IV therapy administration VADs must be regularly flushed to maintain patency: [1]
    - PIVC at least daily.

- Midline at least daily.
- PICC weekly.
- PORT and other tunnelled catheter 4-6 weeks although some studies have suggested that a 12-week interval is safe. [6,7,8]

N. Where IV therapy is incompatible with sodium chloride 0.9%, a compatible solution must be used as the primary flush followed by a final flush of sodium chloride 0.9%.[5]

O. A pulsatile/push pause flushing technique must be used to ensure the internal lumen of the catheter is fully cleared reducing the risk of occlusion.[1]

P. Only a 10 mL syringe barrel or above must be used to flush or administer IV therapy into a VAD, 2 mL, 3 mL or 5 mL syringes must be avoided as they can increase intraluminal pressure and damage the catheter. [1]

Q. Paediatric patient VAD flushing volumes must be based on weight:[5]

   Weight <5 kg: 1-2 mL
   Weight 5 – 50 kg: 2-5 mL
   Weight >50 kg: 5-10 mL

R. Where a negative or passive NFC is being used, catheter clamping in between flushing before the syringe is disconnected should be considered to reduce the risk of distal catheter reflux which can cause occlusions. [1]

Standard 13.2 CVAD locking solutions can be used to prevent catheter occlusion and infection.

Practice guidance:

A. Locking solutions are not intended to be administered directly into the bloodstream, the intention is to indwell in the catheter and aspirate out before CVAD use.[5]

B. HCPs should be aware of the different types of locking solutions and utilise the most appropriate solution as clinically indicated. [N]

C. Ensure the patient is not allergic to any component of the locking solution before locking the CVAD. [N]

D. Follow the manufacturer's Summary of Product Characteristics (SmPC) including how to reconstitute the locking solution if required. [N]

E. Do not routinely flush locking solutions into the patient. [N]

F. Where aspiration of the lumen is not possible, check the locking solution manufacturer's guidance on the safety of flushing the locking solution into the patient as a one off.
   - Perform a chest X-ray to confirm the CAVD catheter tip location is in the correct position and malposition is not the cause of the persistent withdrawal occlusion. [N]
   - If it is safe to do so, flush the lumen and follow local protocols on persistent withdrawal occlusion treatment. [N]
   - If it is not safe to flush the locking solution into the patient, remove the CVAD and, if clinically indicated, replace. [N]

Types of locking solutions: [5]

- Taurolidine-containing locking solutions are a derivative of the amino acid taurine, which acts as an antimicrobial agent. Taurolidine works against bacteria and fungi by inhibiting lipopolysaccharide activity, which makes it a reliable locking solution to prevent CRBSI in CVADs. Taurolidine possesses no anticoagulant activity; some products contain added heparin or urokinase, which then provide anticoagulant cover. Some brands of Taurolidine locking solutions are indicated for prevention of catheter colonisation infections.[5]
- Trisodium citrate locking solutions are metal chelators which exhibit anticoagulant effects via chelation of calcium, which is required for activation of calcium-dependent clotting factors in the coagulation cascade. They also exhibit antimicrobial effects. Care must be taken to avoid flushing into the patient; high citrate concentrations must be used cautiously because of potential adverse effects, such as serious arrhythmias.[5]
- T-EDTA 4%, like citrate, is a metal chelator and exhibits anticoagulant effects via chelation of calcium. It also possesses antimicrobial, anti-biofilm, and anticoagulant properties, which makes it a reliable locking solution for CVADs. T-EDTA 4% is metabolised rapidly by the body; it does not pose the same risk of systemic anticoagulation as heparin.[5]
- It is essential that serum samples are taken before citrate and EDTA locking. Failure to adhere to this can lead to contamination of blood specimens. EDTA contamination can cause increased potassium levels, leading to an invalid interpretation of potassium status. It can also cause a decrease in calcium, magnesium, and alkaline phosphatase levels.[5]
- Ethanol locks are NOT recommended as the effects of interaction with catheter materials are unclear.[5]
- Antibiotic locks use concentrated antibiotics to kill bacteria in CVADs, targeting specific pathogens for CRBSI. Primarily used for treating active CRBSI to salvage the catheter, used alongside systemic antibiotics. The use of antibiotic locking solutions

increases the risk of potential antibiotic resistance and can incur a high cost.5

- Heparin locking solutions provide anticoagulation. Heparin is not recommended as a CVAD lock as it has been shown to stimulate biofilm formation of certain microorganisms. There is no evidence of the long-term anticoagulant effect of heparin inside the catheter lumen. The use of heparin as a CVAD lock has been associated with causing drug hypersensitivity, drug incompatibilities, and heparin-induced thrombocytopenia.5

Standard 13.3 Unblocking long term CVAD solutions

Practice Guidance:

A. Unblocking solutions are generally only indicated for use in CVAD occlusions.

B. Urokinase is a thrombolytic agent that converts plasminogen into plasmin (fibrinolysin), a proteolytic enzyme that breaks down fibrin, fibrinogen, and other plasma proteins. Urokinase, when used as a lock solution for patients with CVADs, may reduce the risk of BSIs.[5]

C. Syner-KINASE (urokinase) is a pharmaceutical drug and must be prescribed. Its indication is for the treatment of CVAD occlusion including those used for haemodialysis and is supplied in 10,000 , 25,000 or 100,000 IU vial. Always follow the SmPC:

- **Locks (First-Line Treatment)**:
  - Dose - 5,000 to 25,000 IU per lumen.
  - Preparation - Reconstitute 10,000 IU or 25,000 IU vial with 0.9% sodium chloride
  - Final reconstitution volume should match the catheter lumen volume.
- **Administration Techniques**:
  - Push Lock Instil urokinase + 0.5 mL overfill.
    - Push additional 0.5 mL every 10 minutes
    - Up to total 1.5 mL overfill
  - Dwell Lock - Instil full lumen volume, leave in situ for 30–60 minutes.
  - Three – way – tap (see point F)
  - If unsuccessful, consider repeat lock at increased dose (up to 25,000 IU per lumen)
- **Infusion (2nd line option) Infusion is used when lock fails to restore patency, or persistent Withdrawal Occlusion (PWO) is suspected, or recurrent / resistant occlusion.**
  - Total dose: up to 250,000 IU
  - Concentration: 1,000–2,500 IU/mL in sodium chloride 0.9%.
  - Administer as a continuous infusion via the catheter, Infuse over 90 to 180 minutes
- **Example Regimens**
  - 25,000 IU in (10-25ml) If your unit only has 50ml, discard the remaining solution to obtain volume of 25ml sodium chloride 0.9% bag) over ~100 minutes.
  - 100,000 IU in 50 mL over ~120 minutes.
  - 250,000 IU in 100 mL over ~180 minutes.

D. Alteplase is a recombinant human tissue-type plasminogen activator, a glycoprotein, which activates plasminogen directly to plasmin. Once bound to fibrin, it is activated, inducing the conversion of plasminogen to plasmin, leading to the dissolution of the fibrin clot.

E. Actilyse Cathflo (Alteplase) is a pharmaceutical drug and must be prescribed. Its indication is for the treatment of CVAD occlusion. Always follow the manufacturers SmPC:

- Actilyse Cathflo (Alteplase) is licensed for thrombolytic treatment of occluded CVADs, including those used for haemodialysis and is supplied in a 2 mg vial which is reconstituted with 2 mL of sterile water for injection. [5]
- Actilyse Cathflo (Alteplase) is not recommended as a preventative locking solution.
- Actilyse Cathflo (Alteplase) can be administered as a bolus lock or by using the three-way-tap technique.

F. The 3 way-tap method of instilling the lock solution to occlude or partially occluded catheter can be used.

- Step 1. Prepare the unblocking solution following the manufacturers guidance.
- Step 2. Attach the syringe containing the unblocking solution to one of the 3-way tap luer openings. Attach an empty 10mL syringe to the other 3-way tap luer opening.
- Removed the needle free connector from the catheter and connect it to the last 3-way tap luer opening.
- Step 3. Open the tap to the empty syringe and draw back 6-7 mL air from occluded device (Fig1)

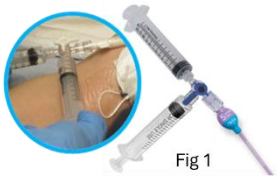
Fig 1

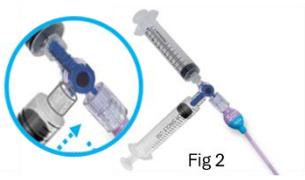
Fig 2

- Step 4. Turn the tap to the syringe containing the unblocking solution (Fig 2), the negative pressure created from step 4 will draw the unblocking solution into the dead space that has been created. Continue step 3 and 4 until all the all the unblocking solution has been locked into the catheter lumen.

Standard 13. 4 VAD catheter priming volumes must be measured and documented at the time of catheter insertion.

Practice guidance:

A. CVAD priming volume will inform the HCP about the correct amount of locking solution to instill.[5]
B. The catheter priming volume will be specified by the manufacturer unless the catheter has been trimmed.[5]
C. If the catheter has been trimmed, the locking volume can be measured by attaching a 10 mL syringe containing 5 mLs of sodium chloride 0.9%. and flush. Aspirate back the flush until blood is seen in the hub of the lumen and stop aspirating. Measure the amount of sodium chloride aspirate into the 10 mL syringe and this will be the locking solution volume. [N]
D. For TIVAD, follow the same process through the non-coring needle set. [N]
E. If the catheter does not aspirate blood, refer to the manufacturer's priming/locking volume information and recommendations. [N]

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14. VASCULAR ACCESS

Standard 14.1 HCPs must consider the safety of patients when undertaking VAD placement.

Practice guidance:

A. HCPs must assess vessel health and preservation before placing VADs, the location of the device and its effect on the patient must be considered to ensure harm is not caused by the device or its intended use.[1,2,3,6]
B. Select the most appropriate device with the fewest number of lumens appropriate for the prescribed treatment.[2,6]
C. Select the smallest catheter diameter to minimise trauma to the vein.[2,6]
D. The ideal PIVC insertion site is in the forearm away from joints and points of flexion to maximise indwell time and reduce the risk of complications.[2]
E. Ideally, up to 80% of the PIVC should sit within the vessel to enable turbulent blood flow over the catheter surface and for it to be anchored within the vein securely to reduce the risk of dislodgment. [N,5]
F. PIVC in the neck veins should only be placed in emergencies where no other peripheral sites are available; these must be replaced as soon as possible and not left in situ for post emergency use.[2]
G. In adults, VADs should not be placed in feet or lower legs. These lower extremities have less effective blood flow and PIVC are easily dislodged or damaged. This can lead to avoidable complications, including extravasation, infection, and thrombosis. In paediatrics, lower extremities should be used as a last resort.[2]
H. Vessel health can be compromised in the peripheral when vesicants are administered. Vesicant drugs with an extreme pH outside of 5-9 or with an osmolarity above 600 mOsmol must not be administered routinely into a peripheral vein via a PIVC, as extravasation can occur. A CVAD should be used to administer vesicant drugs and placed as soon as possible if vesicant drug delivery needs to be initiated urgently via a PIVC.[5,6]
I. Vesicant drugs with extreme pH or osmolarity must be administered into a central vein via a CVAD.[5,6]

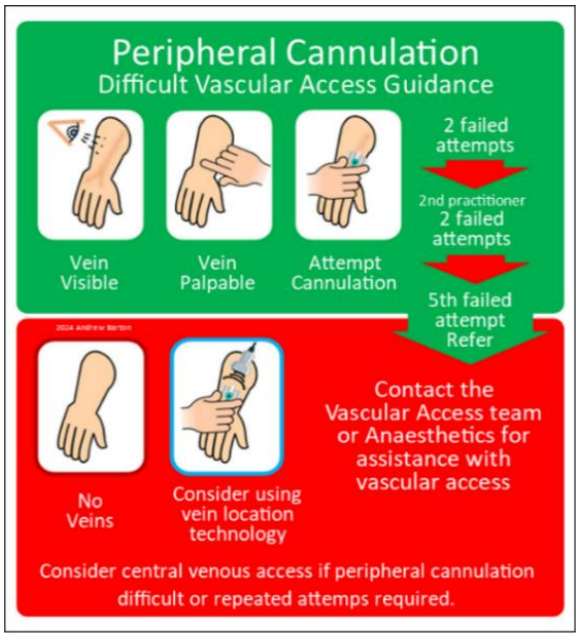
Standard 14.2 Difficult IV access pathways must be in place to reduce the number cannulation and venepuncture attempts.

Practice Guidance:

A. PIVC and venepuncture must only be attempted if there are palpable or visible veins.[6]
B. Multiple attempts at peripheral intravenous cannulation and venepuncture are painful and can cause vessel damage and complications. [N,2]
C. Escalation pathways for difficult IV access patients should be utilised to avoid repeated, unsuccessful and inappropriate PIVC and venepuncture attempts. [N,2,5,6]
D. For patients who have difficult IV access, vein visualisation technology should be used routinely for the first attempt. [N,2,6]
E. For patients who have difficult IV access, a PICC may be indicated even for short-term IV treatment. [N]

F. Midlines (not for vesicant drugs administration) or PICCs should be considered as early as possible to avoid repeated PIVC insertion attempts in difficult IV access patients. [N,2,6]

G. After a total of 4 failed attempts in the same clinical episode of care by 2 HCPs the patient should be classified as having difficult IV access and escalated to a vascular access service or HCP experienced in ultrasound guided cannulation for difficult IV access patients. [N,6]



H. For patients with long-term conditions requiring IV therapy a TIVAD should be consider. [N]

I. A device insertion decision tool should be implemented to allow HCPs to decide which vascular access device will most suit the intended intravenous therapy (Appendix 1).[N]

Standard 14.3 A protocol must be in place to manage patients with VADs who are transferring between clinical areas and external hospitals.

Practice Guidance:

A. VAD insertion documentation must be handed over between internal and external hospital transfers. [N,2]

B. Patient who are admitted to a hospital with a CVAD in situ must have a device passport documenting the insertion details, including the length and type of catheter, placement indication, and care and maintenance record. This documentation must also detail the power injection capabilities of the device/catheter and for TIVAD, the non-coring needle size required. [N,2]

C. The CVAD should aspirate blood to indicate good tip position, if there is limited documentation and or the catheter does not aspirate blood a chest X-ray should be taken to confirm the catheter tip location prior to use. [N,2]

D. PIVCs placed out of hospital in an emergency are more likely to require removal and re-siting to reduce the risk of infection. [N,7]

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15 PERIPHERAL VASCULAR ACCESS

Standard 15.1 HCPs must be familiar with standard PIVC devices to ensure safe IV practice.

Practice Guidance:

A. PIVC (also known as a cannula) is a thin, flexible tube inserted into a peripheral vein for the administration of IV therapy. [N]

B. The smallest diameter cannula must be selected based on the required flow rate and for the duration of IV treatment required.[7]

C. There are many different types of PIVC and standardisation to the use of one system within a healthcare organisation promotes safety and reduces complications. [N]

D. Types of cannulas:

- Closed system PIVC – A closed system PIVC, also known as a blood control system, prevents blood leakage during insertion and pathogen entry into the cannula. Some closed systems also integrate a built-in extension and needle-free connector (NFC) which can aid compliance to NFC and extension set use. [N]
- Open ended, ported, winged PIVC require an extension and NFC to be added. They have a top port through which it is possible to administer drugs intravenously. The cannula has wings that improve stability. The top port on these devices can harbour infection within the dead space. [N]
- Non-ported cannula lacks a top port and can be winged or non-winged. An extension and NFC need to be attached. [N]

E. Where possible non-ported and closed systems PIVC should be used to reduce the risk of catheter-related infection. [N,26]

Standard 15.2 HCPs must be aware of the risk, prevention, and management of PIVC related sharps injuries.

Practice Guidance:

A. A safety-engineered PIVC should be used as an alternative to non-safety PIVC. [1,3]
B. The safety mechanism of the PIVC must be engaged following cannulation, even if the attempt is unsuccessful. The safety sharp must be disposed of in a sharp safe container.[1]
C. Reintroduction of the needle into the PIVC following a failed flash back of blood during cannulation can lead to shearing and embolism of the catheter and must not be practiced. [N,22,23]
D. The same PIVC must not be reinserted following a failed cannulation attempt. [N]

Standard 15.3 HCPs must be aware of the risk, prevention, and management of PIVC-related complications.

Practice Guidance:

A. ANTT must be followed when placing a PIVC to reduce infection. [N,2,3]
B. The PIVC site must be decontaminated with chlorhexidine 2% and alcohol 70% (unless allergic) using at least 1 mL of sterile solution using a back-and-forth technique to apply to the skin, ensuring that the area of skin decontaminated is the same size as the dressing and allowing it to dry before cannulation. [N,2,3,4]
C. The smallest cannula diameter must be selected based on the required flow rate. N,2

D. If patients are allergic to chlorhexidine, povidone-iodine and alcohol-based solutions can be used as an alternative.[2]
E. Once decontaminated, the cannulation site must not be re-palpated and contaminated. If necessary, a sterile glove must be used to maintain asepsis. [N,3,5]
F. HCPs should work towards competency that avoids re-palpation of the vein during PIVC insertion after skin decontamination. [N]
G. PIVC are intended for short-term access and non-vesicant drug administration. [N,2,6,7,8]
H. Indwell time is usually between up to 5 days; however, recent evidence suggests that it is not always necessary to routinely replace a PIVC if there is a clinical indication for it to remain in place and is complication-free. [N,2,8]
I. If used for as long as clinically indicated, measures must be put in place to ensure the PIVC is continuously reviewed and not left in situ when no longer required. [N,8]
J. PIVCs should only be sited in internal or external jugular veins in life-threatening emergencies, as the risk of harm is significant. [N,2]
K. Where a PIVC is placed in an unsuitable anatomical location, it must be replaced within 24 hours to avoid complication. [N]
L. Ultrasound-guided placement of PIVC can increase insertion success rates, reduce procedural pain, and reduce the risk of catheter dislodgement. [N,7,10,11,12]

Standard 15.4 The PIVC insertion site must be managed effectively to prevent complications.

Practice Guidance:

A. A sterile, transparent semipermeable membrane film dressing should be used to cover the device. [N,2,13,14]
B. The dressing must be large enough to cover the device to enable its securement, ensuring the catheter exit site is in the centre of the dressing. [N]
C. Chlorhexidine-containing dressings can be used to protect the exit site. [N,2]
D. An NFC must be attached to each lumen of the PIVC. [N,2,14]
E. Dressings and NFC must be changed on indwell day 7 or earlier if the dressing fails due to poor skin adherence or becomes soiled or the NFC malfunctions. [N,2,14]

Standard 15.5 Power injection into a VAD must only be undertaken following manufacturer's instructions for use.

Practice Guidance:

A. The level of pound-force per square inch (PSI) tolerated by the VAD catheter must be considered

and not exceeded when using the device for power injection. This must be documented in the clinical notes, ideally with the insertion documentation. [N,2]

B. Standardisation of VADs used within an organisation can ensure that there is a general awareness of the power injection capability of the VADs available. [N]
C. The use of a fenestrated PIVC has been shown to allow smaller gauge sizes for computed tomography power injection without increasing the risk of catheter dislodgment in line with recommendations on VHP. [25]

Standard 15.6 Longer length PIVC can be placed in patients who have deeper peripheral veins as an alternative to a standard PIVC or midline.

Practice Guidance:

A. Longer length PIVC (LL-PIVC), also known as short midlines, can indwell for up to 6 weeks if clinically indicated, following manufacturer's IFU. [N]
B. LL-PIVC are suitable for use in difficult IV access patients who have deep veins and are at increased risk of cannula dislodgement with a standard length PIVC. [N,2]
C. LL-PIVC are usually between 5 cm to 10 cm in length, which enables up to 80% of the catheter to sit in the vessel, which can reduce the risk of catheter dislodgment. [N,7]
D. LL-PIVC are not suitable for vesicant drug administration. [N,2,7]
E. Ultrasound guidance is often required to enable successful placement in deeper veins. [N,2,7,10,11,13]
F. LL-PIVC can be used to obtain regular blood samples safely; however, blood aspiration can be time-limited and unreliable. [N]
G. LL-PIVC can be placed in the lower or upper arm veins. HCPs should ensure that the tip of the indwelling catheter does not breach a joint or point of flexion as this could lead to an increased risk of complications. [N]

Standard 15.7 HCPs must be aware of the benefits and risks related to midline catheters.

Practice Guidance:

A. Midline IV catheters are inserted in adults via peripheral veins of the upper arm (basilic, cephalic, or brachial). In adults and paediatrics, the catheter tip terminates at the level of the axilla. [N,2,9]
B. Recent clinical studies in adults have demonstrated that the midline catheter tip can terminate safely beyond the axillary crease within the midclavicular axillary/subclavian vein. [2,15]
C. Midline catheters must not be used to administer any vesicant or irritant IV therapy/drugs as the anatomical location of the catheter tip makes it difficult to visually monitor for signs of infiltration and extravasation injuries. [N,2,7,17]
D. Midline catheters should be placed with ultrasound guidance. [N,2,16]
E. Blood sampling is possible through a midline catheter, depending on the catheter gauge; however, blood aspiration can be limited and cause catheter occlusions. [N]
F. Blood draw from a midline that is 2Fr or below must be avoided, as they are more likely to occlude.
G. Confirmation of midline patency must be made by flushing with 10 mL sodium chloride 0.9% without complication. [N]
H. Absent blood aspiration does not indicate catheter malfunction if the catheter flushes without complication is should still be used. [N]
I. Midline peripheral catheters can indwell for as long as clinically indicated in line with manufacturers guidance. [N]
J. A PICC that fails to reach the superior vena cava (SVC) upon insertion, or migrates backward during use, should never be cut down to function as a midline catheter. This practice changes the intended use of the PICC and can cause confusion about where the catheter tip is located. This could lead to inappropriate vesicant administration. The PICC should be removed, and if clinically indicated, replaced with a suitable VAD.[N]

Standard 15.8 HCPs should always consider minimising pain during PIVC or midline insertion.

Practice Guidance:

A. Local anaesthetic agents used topically or by infiltration are prescription-only medications. They should be prescribed and administered following the manufacturer's guidelines and local protocols. [N]
B. Injectable local anaesthetic can be injected subcutaneously at the intended cannulation site.
C. The injection itself can be as painful as the VAD procedure, so discussion with the patient is essential to ensure they understand the benefits and related complications. [2,18]
D. The use of injectable lidocaine in the upper arm during midline insertion can cause the vessel to be obscured on ultrasound, this can be reduced by massaging the injection site while maintaining sterility prior to cannulation with ultrasound. [N]
E. Topical local anaesthetic creams can be applied to the skin over the intended insertion site and must be applied and covered with a small film dressing to activate the action of the drug. Peak effect may require 45 mins of application time, and the skin may develop some erythema, which is not considered a reaction in most cases. In paediatrics,

this can vasoconstriction. Manufacturer's guidance must be followed. [N]

F. Topical cryogesic ethyl chloride spray can provide effective analgesia prior to cannulation and venepuncture. Cryogesic spray can cause initial discomfort. The spray must be used as directed by the manufacturer. Cryogesic spray commonly causes erythema of the skin in the area of its use. This product is highly flammable and must be used with caution. [N]

G. Any allergic reactions should be reported and documented locally and via the MHRA yellow card reporting portal. [N,24]

Standard 15.9 HCPs must be aware of the benefits and risks related to arterial cannula insertion, care, and maintenance.

Practice guidance:

A. An arterial cannula, also known as an arterial line, is a catheter inserted into an artery to allow continuous arterial blood pressure monitoring and arterial blood sampling. [N]

B. Arterial cannulation must be undertaken using ANTT and a sterile field. [N,2,3]

C. The smallest diameter catheter should be used for radial arterial access to reduce the risk of complications. [N,2,19]

D. Lower angles of insertion (<30°–45°) reduce the risk of catheter kinking and associated device occlusion. [19]

E. In order to reduce failure after device placement, it is recommended that more than 65% of the catheter should dwell within the vessel. [N,19,20]

F. A safety-engineered arterial cannula system must be used to minimise the risk of sharps injury; the device should also incorporate a blood control mechanism where possible. [N]

G. Arterial cannulation using a Seldinger guide wire technique must be undertaken with care to avoid inadvertent guide wire retention. [N]

H. An ultrasound assessment of the radial arteries can be undertaken to confirm adequate radial and ulnar arterial blood flow before cannulation is undertaken, the results of this assessment should be documented in the clinical notes. [N,2]

I. The use of ultrasound-guided cannulation can increase the chances of a successful arterial cannulation on the first attempt and can reduce complications such as arterial transfixation. [N,2]

J. Moving the insertion site proximally, 4–10 cm from the wrist crease, provides more stability for overall securement and can reduce mechanical failures.[18]

K. The radial artery should be the first choice for arterial cannulation. [N,2,19]

L. The use of local anaesthesia is recommended and may improve first attempt success rate. [19]

M. Red coloured NFCs must be used to maintain a closed system and identify the catheter as arterial. [N]

N. Brachial artery cannulation is associated with a higher risk of embolism and mechanical phlebitis and must be avoided where possible.[N,2]

O. The arterial cannula should be fixed securely with an adhesive securement device and film dressing. Securing with sutures can lead to secondary infection at the insertion site. [N,2,19]

P. An arterial cannula should be attached to a pressurised transducer set to ensure continuous flushing to minimise occlusion. [N,2]

Q. Arterial catheter sets should be identifiable as arterial to avoid inadvertent IV therapy administered.[21]

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16. CENTRAL VASCULAR ACCESS DEVICES

Standard 16.1 Non-Tunnelled Central Venous Catheter (NT-CVC).

Practice Guidance:

A. NT-CVCs are most used for short-term central venous access in critically ill patients; however, they may be used for any patient requiring short-term vascular access when peripheral routes are not available, including PICC.[N,11]
B. Commonly placed via the internal jugular vein in the neck. Femoral veins are also a viable central access route. [N,11]
C. Subclavian vein insertion without ultrasound is associated with a higher risk of pneumothorax compared with ultrasound to access the internal jugular vein. [N,2,4,5,6,11]
D. Multiple lumen catheters are available; the least number of lumens required for treatment must be used to avoid complications. [N,2,3]
E. Catheters below 8.5Fr can be inserted without stopping anticoagulation therapy, clotting and platelets should be check prior to placement to ensure they are within locally agreed safe limits. [N,3]
F. Placement of NT-CVC must be undertaken using surgical ANTT. [N,5]
G. NT-CVCs are associated with an increased risk of CRBSI and are generally only left in situ for up to 10 days to reduce this risk. [N,1,2]

Standard 16.2 NT-CVC tip confirmation.

Practice Guidance:

A. Chest X-ray is used to confirm placement in the lower 3rd of the SVC. [N,2,3]
B. Catheter placement within the venous system is also suggested by a low pressure, venous waveform, when transduced. [N]
C. Blood gas analysis of a blood sample taken from the NT-CVC should indicate venous gas values. [N]
D. Catheter tip position can be confirmed with Intracavitary electrocardiography (IC-ECG) and is the fastest way to confirm tip location. The IC-ECG P wave should be higher than its baseline amplitude on the surface ECG with no deflection; this indicates the catheter tip is near the cavo-atrial junction. [N,2,3]
E. Tip location confirmation must be documented in the patient's clinical record as safe to use. [N,2]

Standard 16.3 NT-CVC Securement.

Practice Guidance:

A. NT-CVCs are often secured using sutures however sutures can increase the risk of secondary infection. [N,2]
B. Adhesive securement devices can be used as an alternative to suturing to secure the NT-CVC with or without tissue adhesive to seal the exit site. [N,2]
C. Subcutaneous anchoring devices can be used as an alternative to suturing. [N,2]
D. A sterile transparent semi-permeable film dressing with or without chlorhexidine gluconate impregnation can further support catheter securement. [N,2]

Standard 16.4 NT-CVC removal.

Practice Guidance:

A. NT-CVC removal must be undertaken with the patient in the Trendelenburg position and, if able, performing the Valsalva manoeuvre; if unable, the catheter can be removed during expiration.[2]
B. Gentle manual pressure should be applied to the insertion site for 5 minutes to prevent haematoma. [N,2]
C. The exit site must be covered with an airtight waterproof dressing to prevent air embolism, ensuring there is no bleeding or haematoma. [N,2]
D. Prior to removal, all clamps must be closed with NFCs securely attached to all lumens to reduce the risk of air embolism. [N,2]
E. NT-CVC below 8.5Fr can be removed without stopping anticoagulation therapy, clotting and platelets should be check prior to removal to ensure they are within locally agreed safe limits. [N,3]

Standard 16.5 Peripherally Inserted Central Catheter (PICC).

Practice Guidance:

A. PICCs are CVADs which are placed into a peripheral vein in the upper arm. The catheter tip must be positioned in the lower 3rd of the SVC near the cavo-atrial junction. [N,11,15]
B. PICCs can be inserted into the upper basilic, brachial or cephalic veins; PICCs can also be tunnelled into the veins of the neck, chest or mid-thigh and may indwell for as long as clinically required. [N,2,3,11]
C. In neonates and children, other sites are also used.[7]
D. Ultrasound guided cannulation of the vessel using a Modified Seldinger Technique (MST) should be used to insert a PICC to reduce complications. [N,2,3,9,10,11]
E. Placement of a PICC must be undertaken using surgical ANTT. [N,5,11]
F. PICCs can either be made of silicone or polyurethane, they can be open ended or have a

valved (either on the distal catheter tip or the external hub) or have an external clamped. Some PICCs are power injectable, which can be used for CT contrast media injection under high-pressure. [11]

G. PICCs are available from 1Fr up to 6Fr and have single, double, or triple lumens. Choosing the catheter size and number of lumens should be related to the vessel size and intended use. [N,11]
H. If clinically indicated PICCs can be used for short term use, such as the administration of vesicant drugs to prevent peripheral extravasation. [N]
I. PICCs are not emergency CVADs; the flow rates can be slow and blood sampling can be unreliable. [N,7]

Standard 16.6 PICC tip confirmation.

Practice Guidance:

A. The catheter tip location should be located in the lower third of the SVC or at the cavo-atrial junction. [N,2,3]
B. Catheter tip position can be confirmed with IC-ECG and is the fastest way to confirm tip location. The IC-ECG P wave should be higher than its baseline amplitude on the surface ECG with no deflection, indicating the catheter tip is near the cavo-atrial junction. [N,2,3,12]
C. Intracavitary ECG technology relies on the P wave being readable; patients in atrial fibrillation or who have a pacemaker require a chest X-ray to confirm catheter tip location. [N,2,3,10,12,13,15]
D. A chest X-ray can be used to confirm placement in the lower third of the SVC. [N,2,3]
E. Catheter tip navigation technology can also be used to guide the catheter tip into the SVC and reduce malposition in real time during placement. [N,14]
F. Tip location confirmation must be documented in the patient's clinical record as safe to use. [N,2]

Standard 16.7 PICC securement.

Practice Guidance:

A. PICCs should be secured using sutureless methods, either adhesive securement or subcutaneous anchoring with or without tissue adhesive. [N,2,15]
B. A sterile transparent semi-permeable film dressing with or without chlorhexidine gluconate impregnation can further support catheter securement. [N,2]

Standard 16.8 PICC removal.

Practice Guidance

A. The patient must be sitting or lying comfortably during PICC removal, with the arm below the level of the heart. [N]
B. If an adhesive securement device is used for securement, this should be removed first with the film dressing. The PICC can then be gently pulled out with manual pressure applied to the exit site for 5 minutes to prevent bleeding. [N]
C. If a subcutaneous anchoring device is used for securement, the film dressing and PICC should be removed first by gently pulling out with manual pressure applied to the exit site for 5 minutes to prevent bleeding. Then the subcutaneous anchoring device can be removed. [N]
D. HCPs should follow the subcutaneous anchoring device manufacturer's guidance on removal techniques, as this procedure can be painful and must be undertaken following specific steps. [N]
E. Removal of the catheter should only require gentle traction; if there is resistance, the PICC should not be forcibly removed. [N]
F. If the PICC becomes stuck, advice should be sought locally from the interventional radiology or vascular team. [N]
G. Once removed, the PICC should be inspected to ensure the catheter is intact and the same length as the insertion measurement. If the catheter is not intact, it may indicate that part of the catheter has been retained. Advice should be sought locally from the interventional radiology team to manage this complication. [N]
H. After removal, the exit site must be covered with a sterile waterproof dressing to prevent exit site infection. [N]

Standard 16.9 Skin Tunnelled Cuffed - Central Venous Access Device (STC-CVAD).

Practice Guidance:

A. STC-CVADs are commonly inserted into the internal jugular vein in the neck,[6] they may also be placed in the subclavian/axillary veins.[4] A subcutaneous tunnel is created (usually on the upper chest wall) through which the catheter is passed and secured with a fibrous Dacron cuff. The catheter exits the skin at a distance from the vein entry site, usually on the chest wall. The tunnel and cuff are designed to prevent infection from reaching the venous system. [15]
B. STC-CVADs are intended for long-term IV therapy. [N,11,15]
C. Single, double, and triple lumen catheters are available in various sizes and the choice of which configuration to use will depend on the intended use. [N]
D. These catheters are manufactured from silicone or polyurethane. [N,15]
E. A single lumen STC-CVAD is preferred for home parenteral nutrition and must be dedicated for

parenteral nutrition administration only to avoid infection complications. [N,25]

F. STC-CVAD are commonly used for haemodialysis and should be dedicated for this use and not used
G. for other IV therapy administration outside of the renal unit. [N,11]

Standard 16.10 STC-CVAD Tip confirmation.

Practice Guidance:

A. Catheter tip confirmation must be undertaken with chest X-ray, IC-ECG or fluoroscopy depending on the placement technique. [N,2,3]
B. The catheter tip location should be located in the lower third of the SVC or at the cavo-atrial junction. [N,2,3]
C. Tip location confirmation must be documented in the patient's clinical record as safe to use. [N,2]

Standard 16.11 STC-CVAD Securement.

Practice Guidance:

A. The catheter is secured within the subcutaneous tunnel by a fibrous Dacron cuff which adheres the catheter to the subcutaneous tissue in the tunnel. [N,15]
B. Following insertion, the duration of cuff healing is patient-specific, although one study suggests 3 weeks.[2] A sterile film dressing should be used to cover the exit site. The catheter should be externally secured at the exit site while the Dacron cuff securement is established. Sutures can be used, but can be difficult to remove; adhesive securement devices or subcutaneous anchoring devices provide equivalent securement. [N]

Standard 16.12 STC-CVAD Removal.

Practice Guidance:

A. HCPs must be competent to undertake this minor surgical procedure.[N,2,16]
B. Removal must be undertaken using surgical ANTT. [N,5]
C. The patient should be in the Trendelenburg position. [N,2,15,]
D. The removal procedure should be undertaken in a suitable clinical setting, such as theatre or minor procedure room. [N,2,15,16]
E. The patients clotting should be within a normal range to prevent bleeding. [N]
F. Removal of the catheter involves either a minor surgical cut down procedure following infiltration of local anaesthetic; a small incision is made and the cuff dissected free from fibrous adhesions with blunt dissection or by the traction method, which involves blunt dissection along the tunnel from the exit site to the Dacron cuff.[N,15,16]
G. Dissection and removal of the catheter above the cuff first can be safer, as once the catheter is removed from the vein it can be cut and dissected without the risk of catheter fracture leading to intravascular catheter retention or air embolism. [N]
H. Once the cuff has been dissected free, the catheter may be gently withdrawn. [N]
I. Apply digital pressure on the vein puncture site for 5 minutes. [N]
J. The cut down method and the traction method have benefits and negatives, and a local protocol should be followed to standardise practice. [16]
K. Forceful traction without dissection must be avoided, as this can fracture the catheter and cause tissue trauma. [N,16]
L. The cut down incision should be closed with sutures or tissue adhesive and a sterile waterproof dressing applied. [N]
M. Following haemostasis, the catheter exit site can be closed with sterile adhesive strips and allowed to heal naturally. [N]

Standard 16.13 Totally Implantable Venous Access Device (TIVAD).

Practice Guidance:

A. TIVADs (ports) consist of a reservoir covered with a membrane, attached to a catheter. [N]
B. The TIVAD reservoir is implanted into a subcutaneous pouch, usually on the upper chest. [N]
C. Alternative sites include the inner surface of the upper arm (PICC port) or thigh. [N]
D. TIVAD insertion must be performed by competent HCPs using surgical ANTT, full drapes, surgical PPE, and surgical skin decontamination in an appropriate minor operations room. [N,8]
E. TIVAD catheters can be inserted into the internal jugular or axillary vein, the femoral vein, or the upper arm veins (PICC ports). [N,17]
F. A subcutaneous pouch is created caudal to the incision, making sure that the incision will not overlay the intended port puncture area.[N,17]
G. The incision and pouch of the port should be as narrow as possible to ensure a snug fit to avoid port rotation in the pocket after insertion. Internal sutures can be used to secure the port if required. [N,17]
H. The TIVAD is accessed using ANTT and skin decontamination with at least 3 mL of chlorhexidine 2% and alcohol 70% (unless allergic)
I. The TIVAD reservoir is cannulated through the skin using a non-coring needle. Hypodermic needles must not be used as they will damage the port septum. [N,8,2]

J. Patency is confirmed by aspirating blood and easy flushing the TIVAD. [N,2]
K. The non-coring needle can remain in place for up to 7 days. [N,2]
L. If the TIVAD stops aspirating blood or stops flushing the non-coring needle must be checked to confirm it is in the correct position. [N,2]
M. If the TIVAD stops aspirating blood or stops flushing a chest X-ray should be performed to assess the catheter course and confirm tip location. [N]
N. Attempts should be made to achieve blood return using antithrombotic locks. [N]
O. Administering an IV fluid bolus to confirm the patency of a TIVAD when blood return is absent is not a standard, evidence-based procedure and carries potential risks. [N]
P. An annual chest X-ray assessment should be undertaken to confirm the port position, catheter tip location, and device integrity. [N,2]

Standard 16.14 TIVAD Tip confirmation.
Practice Guidance:

A. Catheter tip confirmation must be undertaken with chest X-ray, IC-ECG or fluoroscopy, depending on the placement technique. [N,2,3]
B. The catheter tip location should be located in the lower 3rd of the SVC or at the cavo-atrial junction. [N,2,3]
C. Tip location confirmation must be documented in the patient's clinical record as safe to use. [N,2]

Standard 16.15 TIVAD Securement.

A. **Practice Guidance:** The TIVAD is secured within the subcutaneous pouch, and the incision is closed with suturing and/or skin adhesive. The pouch incision must be covered with a waterproof sterile dressing until it has healed, which is usually 14 days. [N]

Standard 16.16 TIVAD Removal.
Practice Guidance:

A. HCPs must be competent to undertake TIVAD removal. [N]
B. The patient must be in the Trendelenburg position during removal. [N,2,15]
C. The removal procedure must be undertaken in a suitable clinical setting such as theatres or minor procedures room using surgical ANTT, drapes and surgical PPE. [N,8]
D. The patient's clotting should be within a normal range to prevent bleeding. [N]
E. An incision is made around the pouch site. Blunt dissection is used to remove the TIVAD, ensuring the catheter is removed intact first to avoid the risk of catheter fracture, retention and air embolism. [N]
F. The pouch incision should be closed with sutures and/or tissue adhesive and covered with a waterproof sterile dressing until it has healed, which is usually 14 days. [N,17]

Standard 16.17 Intraosseous (IO) access.
Practice Guidance:

A. Intraosseous (IO) access provides rapid central vascular access by inserting a needle into a medullary space of the bone, offering an alternative route to IV, especially when IV access is difficult or delayed. IO access is indicated for cardiac arrest, trauma, burns and emergency peri-arrest. [N,2,18]
B. IO access can be used for rapid infusions of fluids and medications in adults and paediatrics. [N,2,18]
C. Recognised IO sites are either the proximal humeral head or the proximal tibia. [N,2,18]
D. IO can be inserted manually; however, electric intraosseous devices are more commonly used. [N,18]
E. Staff must be trained and competency assessed to use IO. Regular training updates must be given due to the limited number of times an HCP may place an IO placement. [N,2]
F. ANTT principles must be followed when placing or using an IO. [N,2,8]
G. A specific securement stabilising device with integrated dressing and IV extension set is required and must be readily available with the IO kit. [N,18]
H. IO access is a temporary measure for IV access and ideally removed within 24 hours. Some studies have explored extended dwell times up to 48 hours.[N,2]
I. In the event of a failed IO insertion, an alternative limb must be used for a second insertion attempt. [N,2]
J. Consideration should be given to using local anaesthesia prior to IO insertion and during its use in conscious patients. [N,2,18]
K. To remove an IO needle, refer to the manufacturer's guidance. [N]

Standard 16.18 Umbilical vein catheterisation (UVC).
Practice guidance:

A. Umbilical vein catheterisation (UVC) is commonly performed in neonatology for obtaining central venous access, particularly for critically ill or premature infants. UVCs allow delivery of fluids, medications, and nutrition, and are also used for monitoring central venous pressure and obtaining blood samples.[19,20]
B. Indications for UVC: [19,20]
   - Placement up to 5 days after birth.[19,20]
   - Emergency venous access during resuscitation. [19,20]

- Umbilical catheters are appropriate for administering non-peripherally compatible infuscate. [19,20]
- Exchange transfusions. [19,20]
- Monitoring central venous pressure. [19,20]
- Infants with difficulty establishing peripheral IV access. [19,20]

C. Only competent HCPs must perform UVC access. [N]
D. ANTT principles must be followed during insertion and for use, care, and maintenance. [N,8,19]
E. X-ray confirmation of catheter tip placement is crucial to ensure correct placement in the inferior vena cava, above the diaphragm. [19,20]
F. Frequent assessment of UVC tip positioning is recommended. [19,20]
G. UVCs dwell time range from 7 to 14 days; it must be removed sooner if not clinically required. [19,20]
H. Complications include infection, malposition, and air embolism. Portal vein stenosis is a long-term complication. [N,20]
I. Local protocols for the securement, care, and maintenance of UVCs should be standardised and followed. [N]

Standard 16.19: HCPs must be aware of the benefits and risks related with CVAD.

Practice Guidance

A. A VAD is only considered a CVAD if the catheter tip resides in the superior or inferior vena cava. For upper body CVADs, the catheter tip should reside in the SVC below the carina at the cavo-atrial junction or in the right atrium. For lower body CVADs, the tip should sit in the inferior vena cava (IVC) above the renal veins. [N]
B. CVAD can be used to administer all intravenous therapy, especially vesicants. [N,2]
C. In all age groups If the CVAD tip is not sitting in SVC/IVC, a complication can occur. [2,3,21,22,23,N]
D. Using the term 'long-line' is often used indiscriminately to label both PICC and midline catheters and should not be used. The correct terminology for each catheter should be used to avoid confusion in clinical practice. [N,24]
E. It should remain the responsibility of the practitioner placing the CVAD to confirm the tip location with appropriate imaging or ECG technology and confirm the catheter is safe to use, this must document in the patient's clinical record. [N]
F. All CVAD clamps must be kept closed (over clamping sleeves on silicone catheters if applicable) when the catheter is not in use to avoid complications. [N,2]
G. A CVAD with the fewest necessary lumens should be used to reduce the risk of complications. [N,2,3]
H. HCPs must confirm a CVAD is power injectable before using it for CT contrast administration. [N]
I. CVAD power injection should only be undertaken following confirmation that the catheter is power injectable; this includes TIVAD non-coring needles.[N,22]
J. The power injection capacity of the CVAD should be printed on the lumen of the catheter. Power injectable TIVAD capacity can be visually confirmed by reviewing the patient's chest X-ray. If the device is power injectable, it will display radiopaque letters CT or P on the TIVAD. [N]
K. Written information detailing the CVAD insertion and aftercare should be available for HCPs and given to the patient along with information relating to managing complications and how to access help and assistance if a complication should arise. [N,22]
L. Long-term CVADs should be X-rayed annually to ensure the catheter tip remains in the SVC below the carina. In paediatrics, as the child grows the CVAD tip can migrate out of the lower third of the SVC and if this occurs, the CVAD should be replaced. [N]

Standard 16.20 CVAD placement must only be undertaken by trained and competent HCPs.

Practice Guidance:

A. Standardised education and practical training must be undertaken by all HCPs placing CVADs throughout an organisation. [N,2,3]
B. Education and practical training should be structured to include didactic learning, simulation training, supervised practice, and competency assessment. [N,3]
C. A period of supervision must be undertaken to ensure continued competence. [N]
D. Assessment must be undertaken by an experienced practitioner who is currently placing CVADs in clinical practice. [N]
E. ANTT principles must be part of the education and practical training program and be assessed. [N,2,8]

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17. SAFE CVAD INSERTION

Standard 17.1 HCPs must ensure continued safe practice when placing CVAD via a central vein.

Practice Guidance:

A. Real-time ultrasound guidance should be used when placing a CVAD to reduce complications. [N,2,3,4]
B. The use of a Modified Seldinger Technique (MST) is the preferred method of placing all CVADs except for NT-CVC, where a Seldinger technique is commonly used. [N,3,31,32]
C. The right internal jugular vein or axillary vein is the preferred access site for upper body CVADs because of its straight path to the cavo-atrial junction. [N,3,6,28,29,32]
D. Left-sided catheter placement can have a higher rate of migration and thrombosis than right-sided catheters. [N,1,30,32,33]
E. The subclavian vein can be considered for CVAD placement if clinically indicated due to trauma when a cervical collar negates the choice of the internal jugular. Subclavian vein CVAD placement has a higher relative risk of pneumothorax and is less accessibility ultrasound use for placement, and the non-compressible location posterior to the clavicle. [27,35]
F. Fluoroscopy provides real-time, high-fidelity visualisation and should be used for left-sided internal jugular approach for long-term CVAD placement. This reduces the risk of complications such as venous perforation, azygos vein malposition, and poor catheter tip positioning. [N,30,32]
G. Confirmation that the catheter is safe to use must be clearly documented in the medical record. [N,3]
H. Removal of the guidewire must be witnessed and documented at the time of catheter insertion. [N,1]

Standard 17.2 CVAD insertion must follow a local safety standard for invasive procedure (LocSSIP).

Practice guidance:

A. Local safety standards for invasive procedures (LocSSIP) are based on National Safety Standards for Invasive Procedures (NatSSIPs) and are detailed safety standards developed by HCPs to ensure safe patient care during invasive procedures. [1,2]
B. The aim of LocSSIPs is to promote consistent, standardised, safe practices across different healthcare settings.[1,2]
C. Organisation must have a vascular access LocSSIP.[1,2]
D. LocSSIP principles should be embedded practice for all HCPs who insert CVAD.[1,2]

Standard 17.3 Surgical Aseptic Non-Touch Technique (Surgical-ANTT) must be used for all CVAD insertion.

Practice guidance:

A. The insertion of a CVAD requires a specific, high level of aseptic technique, often referred to as Surgical Aseptic Non-Touch Technique (Surgical-ANTT) [N,3,4,5,6]
B. The procedure must be performed using a full sterile field. [N,4,5]
C. HCPs must wear sterile gowns and sterile gloves.[N,3,4,5,6]
D. Even with sterile gloves, it is crucial to maintain a non-touch technique to prevent contamination of the key parts of the sterile equipment, such as the CVAD catheter tip.[N,3,4,5]

E. Where ultrasound is used, a sterile probe cover and sterile ultrasound gel must be used.[N,7,8]

Standard 17.4 Equipment and products associated with CVAD insertion, use, care and maintenance should be standardised within an organisation.

Practice Guidance:

A. Standardising equipment ensures consistency, compatibility and safety across healthcare settings, which can improve quality, reduce costs and minimise complications.[N,2]
B. Healthcare organisations should standardise PIVC, CVAD and IV equipment and accessories as much as possible, across all clinical specialities so HCPs are familiar and competent when using them. [N]
C. Local policies, training and education must reflect the standardisation of equipment used. [N,1]

Standard 17.5 Indwelling CVAD catheters should not be used as a method to insert a replacement CVAD catheter.

Practice Guidance:

A. Over the wire catheter exchange should be avoided as there can be an increased risk of infection, the first option should be to remove and replace the CVAD if clinically indicted. [N,9]
B. If alternative vessels cannot be identified and over the wire catheter exchange is required, it should never be undertaken in a catheter with a known infection as the risk of infection or thrombosis can be high. [N,3]

Standard 17.6 HCPs undertaking CVAD insertion involving closure of a skin incision or for securement must be competent in suturing techniques.

Practice Guidance:

A. If suturing is required in the HCPs practice, an accredited suturing course should be undertaken. [N]
B. Multifilament braided sutures must not be used, as these are associated with increased risk of infection. [N,10,11]
C. Subcuticular suturing is the preferred method for TIVAD pouch closure following a deeper subdermal suture. [N]
D. TIVAD can be stabilised within the pouch with a non-dissolvable stay suture. [N]
E. Sharp safe systems must be used to secure discarded suture needles. [N]
F. Suture needles must be accounted for and disposed of safely post procedure. [N]

Standard 17.7 CVAD catheter tip location must be confirmed and reside in the correct position post.

Practice Guidance:

A. The optimal position of the CVAD tip must be below the carina in the proximity of the cavo-atrial junction where the lower third of the SVC and the upper RA is located. [N,1,3,14,32]
B. There is a higher incidence of perforation of the SVC during the insertion of left-sided CVADs. [N,13,]
C. When the catheter tip touches or abuts the vein wall, it causes chronic mechanical endothelial injury, which can lead to thrombus formation on the vein wall (mural thrombus) or perforation. [N,1,3,13,32]
D. A 'high' tip position in the upper or middle third of the SVC must be avoided due to increased risk of thrombosis and malfunction. [N,1,3,13,32]
E. A 'low' tip position on the IVC through the tricuspid valve or the right ventricle must be avoided due to the risk of serious complications. [N,13]
F. Lower limb CVAD insertion, specifically the femoral veins, the catheter tip should be positioned in the IVC above the level of the renal veins**,** just above the diaphragm**,** around the L1 vertebral level. This positioning ensures proper drainage and avoids potential complications. [N,1,3]
G. CVAD catheter tip location (SVC/IVC) must be confirmed and documented in the patient record prior to use. [N,1,3]
H. Inability to flush the catheter during insertion could indicate malposition and must be resolved prior to completion of procedure. [N]
I. Inability to aspirate blood from a CVAD can indicate catheter malposition and must be investigated prior to CVAD use. [N,3]

Standard 17.8 CVAD catheter measurements must be documented during insertion and after during episodes of catheter care and maintenance.

Practice Guidance:

A. Catheter lengths, internal and external catheter measurements and priming volumes must be documented in the patients' clinical notes after insertion. [N,3]
B. External catheter measurements should be documented after each episode of CVAD care and maintenance in the patients' clinical notes to monitor for CVAD migration. [N]
C. Action must be taken to investigate the CVAD tip location if catheter migration is detected using a chest X-ray. [N,3]
D. If the CVAD catheter tip has migrated above the carina or outside of the SVC it should be removed and if clinically indicated, replaced. [N]

E. PICCs and STC-CVAD should be cut to an appropriate length to allow the minimal amount of catheter externally to accommodate securement devices. [N]

Standard 17.9 CVADs placement must be undertaken in a suitable clinical environment.

Practice Guidance

A. The environment must minimise the risk of infection and support the level of surgical ANTT required for the procedure.[3,4]

B. The following should be considered. [N,3]
- Access to emergency resuscitation equipment.
- Adequate space for staff to circulate.
- Adequate space of ultrasound equipment and sterile field for equipment.
- Adequate hand decontamination facilities.
- Access to reversal agents for sedation drugs if required.
- Sharps disposal.

C. PICC placement at the bedside can be safely undertaken with the following considerations: [N,15,16,17]
- ECG technology should be used at the bedside to reduce the risk of CVAD catheter tip malposition, reduce the time to confirm the CVAD is safe to use and reduce exposure to X-ray. [15,16,17]
- Arrange the bedside so that there is minimal clutter. [N]
- Ensure the aseptic field can be maintained. [4]
- Ensure the patient can comply with positioning during the procedure. [N]
- Ensure hand washing sinks are not located next to the aseptic field to avoid cross contamination. [N]
- Ensure emergency call bell and emergency equipment is available close by. [N]
- Ensure maximum barrier precautions can be maintained. [N,4]
- Ensure that the inserter can freely move from the patient to the sterile field without contamination of the sterile gown or gloves. [N]
- Ensure sharp disposal is at the bed side. [N]
- Single PICC placers at the bedside should seek assistance from a HCPs (registered or unregistered) working within the clinical area who can assist with patient positioning and act as a chaperone. [N]

Standard 17.10 HCPs must undertake a thorough clinical assessment of the patient prior to CVAD insertion.

Practice Guidance:

A. An appropriate indication for CVAD insertion must be confirmed and documented in the patient clinical notes. [N,3]

B. A Review of the patient's medical history must be undertaken, this should include the following: [N,3]
- The IV therapy administering requirements
- Allergies.
- Taking anticoagulation.
- Previous surgery, especially around the intended CVAD placement site.
- Any electrical implants in the chest.
- Breast or chest muscle implants.
- AV fistulas and/or renal history.
- Previous CVAD placement.
- SVC/IVC filters.
- Previous lymph node removal.
- Drug implants in the upper limbs.

C. There is limited evidence to guide placement of CVAD including PICC in patients with electrical implants like permanent pacemakers (PPM) or Internal Cardiac Defibrillators (ICD). [N]

D. Lead dislodgment is one of the most common complications of pacemaker (PPM) procedures post insertion. According to multiple studies It typically occurs early post-implantation (within 1–2 days) but may also manifest up to 120 days after initial implantation.[24,25]

E. To ensure the risk of PPM lead dislodgement during CVAD is kept to a minimum, placement of a CVAD should be undertaken with fluoroscopy during the first 4 months post PPM insertion.[24,25,34]

F. CVAD Placement should be undertaken contralaterally to the implanted cardiac device. [N,18]

G. Insertion of a CVAD in the presence of an active CRBSI may result in the colonisation and infection of the catheter, resulting in a relapse of the bacteraemia after treatment. In clinical scenarios where there is ongoing need for central vascular access, clinicians must weigh the risk/benefit of placing a new CVAD with active bacteraemia. [N,19,20]

Standard 17.11 Coagulation and platelet levels must be reviewed and managed prior to CVAD insertion.

Practice Guidance:

A. Uncomplicated PICC and NT-CVC placement do not normally require specific coagulation or platelet count consideration.[1]

B. TIVAD and STC-CVAD or complex PICC placements in patients with difficult anatomy require coagulation management and platelet consideration.[1]
C. HCPs should follow local protocols for acceptable platelet and coagulation biochemistry levels and consider correcting coagulopathy before CVAD insertion. When the patient's coagulation levels indicate a higher risk of bleeding, corrective action should be considered.[1,26]
    - PT ≥ 18 s
    - INR ≥ 1.5
    - APTT ≥ 42 s
    - APTTr ≥ 1.5
    - Platelet counts ≥50x10^9/L
D. For patients taking oral anticoagulants the risks and benefits of holding anticoagulation before CVAD insertion must be considered and local protocols should be followed.[1]
E. It may be necessary to stop oral anticoagulation and replace/bridge, with low molecular weight heparin (LMWH) injections until after the procedure, HCPs should follow local protocols.[1]

Standard 17.12 HCPs must ensure a limb assessment is undertaken prior to peripheral CVAD placement.

Practice Guidance:

A. A reference circumference measurement of the patient's upper arm should be recorded in the clinical notes prior to PICC insertion for future comparison in case of upper limb DVT (ULDVT). [N,3] This should also be considered for mid-thigh PICC placement. [N]
B. The presence, or likely future placement, of an arteriovenous fistula for haemodialysis would preclude ipsilateral arm CVAD placement. [1,3,18,20]
C. Planning a peripheral CVAD placement in patients with chronic kidney disease must involve the renal team prior to placement. [N]
D. Following axillary lymph node removal, peripheral CVAD placement is preferably undertaken in the contralateral arm; however, following recent evidence, the ipsilateral arm can be used if there is no lymphoedema already present in the limb.[1, 21,22,23]
E. A VAD must not be inserted in a limb already affected by an ULDVT. [N,20]
F. Placement of a peripheral CVAD should be placed above the antecubital fossa, to minimise kinking or occlusion of the catheter and mechanical vessel phlebitis. [N,1,3]
G. Peripheral CVAD must not be placed in areas of broken skin, hematoma or infection. [N]

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18. NEEDLE FREE CONNECTORS

Standard 18.1: Catheter lumen must be protected with a needle free connector (NFC) which must be decontaminated before and after each use.

Practice Guidance:

A. NFCs must be attached to all vascular access device lumens to protect the intralumenal space and create an airtight seal.[1,2]
B. NFC specification:[1,2]
   - Positive Displacement: Are designed to prevent catheter occlusions by pushing a small volume of fluid into the VAD tip upon disconnection of a syringe or administration set.[1] Sequence of use: flush, disconnect, clamp.
   - Negative Displacement: Have no internal mechanism to prevent blood reflux into the VAD, especially during disconnection and during pressure changes in the closed IV system. Sequence of use: flush, clamp, disconnect.[1]
   - Neutral Displacement: These maintain a fixed volume of fluid within the catheter tip when syringes or administration sets are attached or disconnected. Because they do not push fluid backward (reflux), they significantly minimize the risk of catheter tip occlusion.[1] Sequence of use: flush, disconnect, clamp.
   - Anti-Reflux: Designed to minimize or prevent blood reflux (backflow) into the VAD, thereby reducing thrombotic occlusions. While some displacement might be unavoidable, these devices often do not require a strict clamping sequence.[1]
   - NFC must only be accessed with a Luer-compatible device and never a needle. [N,1]
C. The NFC must be decontaminated with a Chlorhexidine 2% w/v with alcohol 70% v/v wipe for at least 15 seconds and allowed to dry before use, ensuring that ANTT is adhered to.[N,1,3,4,5]
D. Where a patient has an allergy to chlorhexidine, an Alcohol 70% v/v swab can be used. [N,1]
E. HCPs must follow the NFC manufacturer's guidance on when to replace the device. This is most commonly every 7 days, after 200 activations or if the NFC is soiled or malfunctioning. [N,1,4,5]
F. Passive disinfection caps containing alcohol 70% v/v can be attached to the NFC when the VAD is not in use to protect the NFC and VAD from infection.[1,3,5,6]
G. Passive disinfection caps and NFC can be a choking hazard and must be used with caution in vulnerable patient groups. [N]

Standard 18.2: 3-way taps should not be attached to VADs for ongoing routine use.

Practice Guidance:

A. 3-way taps (stopcocks) should not be routinely left attached to VADs due to an increased susceptibility to harbouring bacteria in the dead space. [7,8,9]
B. Following intended use in theatres or after locking occluded CVADs, 3-ways taps should be removed and replaced with an NFC.[7,8,9]

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19. OUT OF HOSPITAL IV THERAPY AND VASCULAR ACCESS

Standard 19.1 Protocols must be in place to manage and support patients with VADs in the community or at home.

Practice Guidance:

A. Patients who have a VAD in situ for out-of-hospital IV therapy must have information about the device detailing insertion information, VAD specifications and what to look out for and who to contact if a complication arises. A means of recording regular care and maintenance by the community care provider should also be provided, this may be managed in the form of a VAD passport. [N]
B. A VAD IV extension may be required if the patient is self-administering IV therapy.

C. An NFC should only be connected to the distal end of the IV extension, not in between the VAD lumen and IV extension. [N]
D. Acute hospital vascular access teams, outpatient antimicrobial therapy teams and local community nursing services should work together to ensure familiarity and standardisation of VAD catheters, IV systems and hardware in order to maximise patient safety. [N]
E. Complication management must be aligned between acute and community services to ensure standardisation. This includes using catheter locks, managing MARSI and aligning flushing regimes. [N]
F. Where a patient or carer is administering IV therapy at home, governance related to consent and capability must be in place and be part of appropriate patient or carer/relative training. [N]

Standard 19.2 Home Parenteral Nutrition (HPN) administration must be delivered through a dedicated single lumen CVAD.

Practice Guidance:

A. HPN can be delivered via a PICC, TIVAD or STC-CVAD. [N,1]
B. HPN must be delivered via a dedicated single-lumen catheter to reduce the risk of complications and preserve vessel health.[1,2,5,9]
C. Where a multi-lumen CVAD is being used in the acute hospital setting, a dedicated lumen appropriately labelled must be used and not contaminated with other infusions or blood sampling. A risk versus benefit decision should be made about changing the CVAD to a single lumen if the patient is being discharged for home HPN, considering vessel health and preservation. [N,2,8]
D. ANTT must be adhered to when managing HPN infusions and undertaking care and maintenance of the catheter, hand hygiene is essential, sterile gloves are not required. [N,1,4]
E. The intraluminal space must be protected when HPN is not running; catheter locks can be used to reduce the risk of infection.[1,3]
F. Disinfection caps can be used to protect the CVAD lumen from infection when not in use.[3]

Standard 19.3 Local protocols must be in place to manage patients receiving ambulatory IV Systemic Anti-Cancer Therapy (SACT).

Practice Guidance:

A. Ambulatory SACT should be administered via a CVAD not a PIVC to maintain safety. [8]
B. When attaching, infusing and disconnecting ambulatory HMP pumps (including SACT) in the community, CSTDs must be used at all connection and disconnection points, appropriate PPE must be worn, and HMP spill kits must be available at the point of care — including in patients' homes. Local protocols must cover patient, carer and family exposure, disposal and incident reporting. Training must be provided to community nurses and, where relevant, to patients and carers.[6,10]
C. Where a patient has a CVAD for SACT, this should be used for blood sampling in the community and the acute hospital setting to promote vessel health and preservation. [N,5]

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20. VAD PLACEMENT TECHNOLOGY

Standard 20.1 HCPs should utilise technology for vein location and catheter tip navigation and location confirmation.

Practice Guidance:

A. Patient experience and safety can be improved by using technology for VAD placement. This includes vein imaging for PIVC and CVAD, CVAD catheter magnetic tracking navigation and IC-ECG to confirm CVAD catheter tip location. [N]
B. Ultrasound is recommended for PIVC placement in difficult IV access patients to reduce the number of cannulation attempts. [N,1,2]
C. Ultrasound guidance can be used to improve success rates for arterial cannulation. [N,1,2]
D. Ultrasound guidance for CVAD vessel puncture is recommended over landmark-based placement. [N,1,2,3]

E. Infrared vein location technology can be used to visualise veins for PIVC placement where the veins are at a depth of up to 10 mm . [N,4]
F. Thermal vein warming systems can be used to improve palpation of vessels for PIVC placement. [N,5]
G. Magnetic tracking can be used for CVAD catheter tip navigation into the SVC; this technology can reduce malposition during device insertion. [N,6,7,10]
H. IC-ECG can be used to monitor changes in the P wave morphology as the CVAD tip is advanced into the SVC towards the SA node. A high P wave with no deflection indicates the catheter tip is positioned correctly and is highly accurate. [N,1,2,8,9,10]
I. Fluoroscopy can be used to produce real-time images during the placement and positioning of a CVAD and ensures accurate catheter navigation and correct tip placement in the SVC or IVC. [N,10]
J. A chest X-ray can be used to confirm the general position of a CVAD catheter tip in the lower SVC or upper IVC. [N,1,2,10]

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21 VASCULAR ACCESS COMPLICATIONS

Standard 21.1 HCPs must be aware of the risks, signs, symptoms and actions to follow in the event of VAD-related complications.

Practice Guidance:

A. Local vascular access guidelines must be in place to prevent, recognise and treat complications and should include the following: [N] (See Appendix 2).
   - Infection
   - Phlebitis
   - Thrombosis/ULDVT
   - Catheter malposition/migration
   - Catheter fracture/embolism
   - Air embolism
   - Catheter salvage
   - Cardiac arrhythmia
   - Cardiac tamponade
   - Pneumothorax/haemothorax
   - Bleeding/haematoma
   - Nerve damage
   - Arterial puncture
   - Lymphatic puncture
   - Fibroblastic sheath
   - Port erosion
   - Guidewire retention
   - MARSI

Standard 21.2 HCPs must be aware of the risks, prevention, signs and symptoms of catheter related thrombosis (CRT).

Practice Guidance:

A. CRT can cause partial or complete vessel occlusion, potentially disrupting treatment or leading to VAD-related ULDVT or LLDVT or SVC syndrome. [N,3,55,56,57]
B. VAD insertion can cause endothelial injury, leading to clot formation, especially in the presence of factors such as blood stasis and hypercoagulability. [N,56,57]
C. CRT can be reduced by using an ultrasound-guided MST and the smallest catheter diameter possible to limit damage to the endothelium. [N,1,2.57]
D. Prevention, recognition and treatment protocols must be in place to reduce the risk of CRT. [N]
E. Signs and symptoms include the following:
   - Swelling of the limb where the VAD is sited. [N,55,56,57]
   - Swelling of the neck or chest. [N,56]
   - Pain where the VAD is sited. [N,56,57]
   - Erythema around the VAD site. [N,56,57]
   - SVC Syndrome - face/neck swelling, distended neck veins, cough, dyspnoea, orthopnoea, upper extremity swelling, distended chest vein collaterals, and conjunctival suffusion. [N,56]
F. Prevention is essential; the smallest diameter catheter should be used with careful VAD site selection and placement. [N,2,56,57]
G. The femoral vein has a higher rate of thrombosis than the internal jugular vein and axillary/subclavian vein. [1,2,56]
H. Left-sided catheters may have a higher rate of thrombosis than right-sided catheters. [1,2,54,56]

I. Peripherally inserted central catheters can have a higher rate of venous thrombosis than centrally inserted catheters. [1,2] To reduce this risk the smallest PICC catheter lumen size should be used. [N]

J. An ultrasound compression Doppler examination of the affected limb must be undertaken to confirm an upper or lower limb DVT. [N,2,3,56]

K. PICC-associated ULDVT treatment involves anticoagulation therapy. Removing the PICC is not usually necessary and rarely leads to pulmonary embolism (PE). [N,1,55]

L. Anticoagulation treatment must not be delayed while awaiting ultrasound compression doppler to confirm CRT. [N,56]

M. Anticoagulation for at least 3 months is recommended; local protocols must be followed.[1]

N. Central venous thrombosis treatment primarily involves anticoagulation with heparin to prevent further clot formation and, in some cases, thrombolytic therapy. Specialist opinion should be sought. [N,56]

Standard 21.3 The external CVAD catheter must be monitored to observe catheter migration.

Practice Guidance:

A. Catheter migration can lead to various complications, including decreased catheter patency, discomfort, thrombosis, venous occlusion and infiltration and extravasation.[2,4,5]

B. External catheter measurement must be documented during device insertion in the patient's medical records. [2]

C. External catheter measurement technique must be standardised across both hospital and community settings to ensure consistency and continuity of care. [N]

D. VAD securement must be sufficient to avoid inadvertent catheter migration or dislodgment. The use of adhesive film dressing and securement devices, subcutaneous anchoring devices and cyanoacrylate glue can be used. [6,7,8]

E. Factors contributing to VAD catheter migration:[2]
   - Intrathoracic pressure changes: Coughing, sneezing, straining, or weightlifting can increase pressure in the chest cavity, potentially leading to catheter migration.[2]
   - High infusion flow rates can also cause the catheter tip to migrate [2]
   - Left-sided subclavian or internal jugular vein placement. [2]
   - Accidental dislodgment by patient.[2]
   - Accidental dislodgment by HCPs during catheter manipulation when performing care and maintenance dressing changes.[2]

Standard 21.4 HCPs must be aware of the risks and management of VAD catheter fracture.

Practice Guidance:

A. VAD catheter fracture can occur due to device defect or accidental catheter damage.[2]

B. Reinserting the integrated needle back into a PIVC can partially or completely transect the plastic cannula, causing catheter embolism. HCPs must completely withdraw the integrated needle and cannula following a failed PIVC insertion attempt. [N,9]

C. High-pressure infusion/manual flushing of a VAD can damage catheter material. Only syringes with barrels of 10 mL or above should be used to minimise pressure and power injection should only be performed into a VAD that is power injectable following manufacturers device IFU.[2,10,11]

D. Catheter fracture or shearing can occur during the removal of subcutaneous anchoring devices or sutures when a sharp instrument is being used to assist removal. Only trained and competent HCPs should undertake the removal of subcutaneous anchoring devices or VAD sutures. [N,11]

E. The total VAD catheter length must be noted on removal and compared to the insertion length. If there is a discrepancy, this must be investigated as it could indicate a retained catheter fragment. [N]

F. If a retained catheter fragment is suspected, this must be escalated to the interventional radiology team for possible intravascular catheter retrieval. [N]

G. Local incident reporting and duty of candour must be undertaken. [N,58]

H. Incidental findings of retained VAD catheter fragments on CT scans must be investigated. Fibroblastic sleeves may be seen on CT imaging and do not require intervention. [N,12,13]

Standard 21.5 HCPs must be aware of the risk and management of VAD-associated air embolism.

Practice Guidance:

A. Air embolus is a dangerous complication more associated with CVAD, arterial access and infusion therapy. The presence of air in the vascular system obstructs blood flow to the lungs or brain. This occurs when a pressure gradient between the atmosphere and the intravascular space causes air to enter the vessel via the unprotected VAD catheter or insertion site. [N,2]

B. All CVAD lumens, introducers and sheaths must be primed with sodium chloride 0.9% prior to insertion. [N,2]

C. All infusion systems must be primed to purge air from the tubing before connection to the patient. [N,2]

D. All VAD lumens must have clamps or valves, and an NFC must be attached to prevent air entrainment

into the catheter. Lumen clamps must remain closed when the catheter is not in use. [N,2]

E. Arterial catheters not connected to a transducer must have NFCs attached to prevent air entrainment into the catheter. [N]
F. When disconnecting infusion giving sets or syringes, HCPs must ensure the NFC is not inadvertently disconnected and discarded with the infusion set. [N]
G. When removing a CVAD, HCPs must ensure the patient is in the Trendelenburg position and if able, perform the Valsalva manoeuvre to reduce the risk of air embolism.[1,2]
H. Symptoms of air embolus are dependent on the volume and speed of air entering the circulation. If air embolism is suspected emergency action is required, the patient should be placed in the lateral decubitus Trendelenburg position to encourage air out of the right ventricular outflow tract.[14,15]
I. A protocol should be in place for HCPs to recognise and initiate emergency escalation of the patient if air embolism is suspected. [N]

Standard 21.6 CVAD catheter salvage must only be considered when clinically indicated following a risk vs. benefit assessment.

Practice Guidance:

A. PIVC, midline, arterial catheter and NT-CVC salvage must not be attempted; these catheters must be removed if a complication arises. [N,2]
B. PICC, STC-VAD or TIVAD catheter salvage can be considered if clinically indicated. [N,2]
C. In the presence of CABSI, catheter locks can be utilised following a risk vs benefit assessment. A multidisciplinary approach involving the clinical team and microbiology should be followed, for CRBSI catheter salvage may not be appropriate. [N,2]
D. PICC salvage may be considered in patients with limited peripheral venous access or in the presence of ULDVT without infection. [N,2]

Standard 21.7 HCPs must be aware of the risk and management of VAD-associated cardiac arrhythmias.

Practice Guidance:

A. Transient cardiac arrhythmias, such as premature extra atrial and ventricular contractions, are common during the placement of CVADs and are often caused by the presence of guidewires or catheters inadvertently affecting the cardiac conduction system. These arrhythmias are usually self-terminating. [2,16]
B. Emergency resuscitation equipment must be immediately available during CVAD insertion. [N,2]
C. Continuous ECG monitoring must be undertaken during CVAD insertion. [N]
D. Withdraw the guidewire immediately if an arrhythmia occurs. [N,2,16]
E. Withdraw the CVAD catheter immediately if an arrhythmia occurs. [N,2]
F. HCPs who insert CVAD must be appropriately trained in immediate life support resuscitation to manage any persistent arrhythmias. [N]

Standard 21.8: Protocols must be in place to ensure guidewires are handled and removed safely during CVAD placement.

Practice Guidance:

A. Retained guidewires can cause a range of problems, including arrhythmia, vascular damage, cardiac perforation, tamponade or infection. [N,2,17]
B. HCPs and organisations must ensure CVAD placement practice is standardised following LocSSIPs to reduce the risk of retained guidewires. [N,1]
C. Guidewires removal and disposal during a procedure must be witnessed by a second HCP which must be documented in the patient record. [N,18]
D. A protocol must be in place to manage a patient with a retained wire to escalate the removal as soon as possible. This is likely going to involve the interventional radiology department. [N]
E. Retained guidewires (specifically CVAD guidewires) are classified as a Never Event in the NHS, meaning they are serious, largely preventable patient safety incidents that should not occur if national guidance is followed. They are included in the NHS England 2018 list as a sub-category of "retained foreign object post-procedure. A local incident report should document any retained guidewire, and the patient must be informed under duty of candour. [N,19,20,58]

Standard 21.9 Protocols must be in place to avoid and manage CVAD occlusion.

Practice Guidance:

A. VAD catheter occlusion can be partial or total and are commonly caused by the following: [N,2]
   - Kinked external portion of a catheter which can be avoided by curving the catheter under the dressing. [N,21]
   - By using a subcutaneous fixation that is smaller than the catheter diameter. [N]
   - Precipitation of medications or parenteral nutrition, which can cause partial or total occlusion. [N,22]
   - Fibroblastic sheath. [N,23]
   - Thrombosis due to poor flushing technique. [N,2]

B. CVAD occlusion is more likely to occur if the catheter tip is not placed centrally in the lower 3rd of the SVC or at the cavo-atrial junction. [N,1,2,26]
C. Mispositioned catheter tips can sit on vessel walls, leading to mural thrombus formation. [N]
D. Poor flushing practice can also increase the risk of occlusion – in an adult, each CVAD lumen must be flushed with a 10 mL sodium chloride 0.9% flush; for paediatrics, a 10 mL, 5 mL or 3 mL sodium chloride 0.9% flush should be used depending on weight, in all cases a 10 mL-equivalent barrel should be used to reduce pressure and align with the manufacturer's recommendation.[N,2,24]
E. Poor practice when taking blood samples from CVAD can lead to occlusion – CVAD lumens must be flushed immediately after blood sample draw. [N]
F. Blood reflux at the catheter tip can cause catheter occlusion; anti-reflux NFC can reduce the risk of catheter occlusion. [N,59]
G. Pinch-off syndrome (POS) occurs when the CVAD catheter is compressed between the clavicle and the first rib. This can lead to catheter obstruction, potential fracture, and embolisation of catheter fragments. POS is more likely with infraclavicular CVAD placement in the subclavian vein and can be avoided by using the internal jugular as a preferred CVAD vein access. [N,2]
H. Antithrombotic locks can be used to prevent and clear occluded catheter lumens following the manufacturer's SmPC. [N,2,24]

Standard 21.10 Protocols must be in place to avoid, recognise and manage cardiac tamponade associated with CVAD placement.

Practice Guidance:

A. Myocardial perforation followed by cardiac tamponade is a rare life-threatening complication of central venous access; it occurs acutely during the passage of guidewires and dilators or more gradually by catheter erosion over time. It is characterised by the accumulation of fluid in the pericardium, which impairs cardiac filling and thus ejection of blood, resulting in cardiogenic shock. [N,32]
A. Using J tipped guidewire and limiting the depth that dilators are advanced into the central veins can reduce the risk. [N,33,34,36]
B. Ensure the correct location of the catheter tip in the SVC. [N,1,2,35]
C. The incidence of this complication is reported to be higher in paediatric practice due to the relatively short distance between the puncture site and the heart as well as thin cardiac muscle. The clinical course may be slow or rapid, resulting in sudden death. [N,33]
D. Avoid intracardiac catheter tip location in neonates and infants less than 1 year of age, as this tip location has been associated with vessel erosion and cardiac tamponade.[2]
E. Clinical signs include shock, tachycardia and distended neck veins. The diagnosis may be confirmed by an enlarged heart shadow on X-ray or echocardiography. [N]
F. The mortality is high, so treatment must be started urgently; all infusions must be stopped and the catheter aspirated to remove fluid from the pericardium. [N]
G. The patient must be escalated to the cardiology team for urgent treatment. [N]

Standard 21.11 Protocols must be in place to avoid, recognised and manage pneumothorax associated with CVAD placement.

Practice Guidance:

A. Pneumothorax may occur during CVAD placement if the cannulating needle traverses the visceral pleura, causing air to leak from the lung into the pleural space, causing lung collapse. [2,33]
B. The diagnosis may be suspected clinically (dyspnoea and hypoxia) and is usually confirmed by X-ray imaging.[33]
C. The use of ultrasound-guided needle access into the central vein can reduce the risk.[2,33]
D. Blind subclavian vein placement should be avoided as this can increase the risk.[2,33]
E. Small asymptomatic pneumothoraxes require close observation and monitoring, with supplemental oxygen administered, as necessary.[33]
F. Larger pneumothoraxes may require needle aspiration or chest drain insertion.[33]
G. Patient escalation is essential. [N,26]

Standard 22.12 Protocols must be in place to avoid, recognised and manage Haemothorax associated with CVAD placement.

Practice Guidance:

A. Haemothorax can be life-threatening, especially if the bleeding is massive. CVAD insertion, when performed in the internal jugular or subclavian veins, can lead to haemothorax if the guidewire or dilator accidentally punctures the pleural space.[26,29,30]
B. Incorrect placement of the guidewire within the brachiocephalic/SVC vein can lead to dilator-induced haemothorax.[26,29,30]
C. A left-sided approach via the internal jugular or SCV into the left brachiocephalic vein/SVC can increase the risk.[26]

D. Left-sided long-term CVAD insertion should be undertaken with fluoroscopy imaging.[26,29]
E. Clinical signs and symptoms include hypotension, tachycardia, respiratory distress, decreased oxygen saturation and general decline in the patient's condition. [26,29,30]
F. Confirming the guidewire is properly positioned in the SVC with the tip below the diaphragm in the IVC can help prevent Haemothorax.[28]
G. Avoid fully inserting dilators and sheaths into the vessel; only pass them enough to access the vessel.[26,28]

Standard 21.13 HCPs must be aware of anatomical abnormalities affecting CVAD insertion.

Practice guidance:

A. HCPs must review the patient's previous clinical records and imaging and identify any anatomical abnormalities that may affect safe and successful CVAD placement. [N]
B. Persistent left-sided SVC is a common variation where a left-sided SVC drains into the coronary sinus, potentially leading to CVAD malposition or other complications.[31]
C. Dextrocardia with or without situs inversus: This is where the heart and other organs are on the opposite side of the body.[26,32]
D. IVC and azygos drainage variations in the inferior vena cava and azygos vein can affect CVAD placement and tip location. [26,28,31]
E. Partial anomalous pulmonary venous drainage, where some pulmonary veins do not drain directly into the left atrium, can lead to misplacement of the CVAD tip.[26,31]
F. Compression caused by masses, including malignant or benign lesions, can compress central veins, hindering CVAD placement and potentially leading to vein occlusion.[26]
G. Mediastinal shift caused by pneumonectomy, lung collapse, or effusions can shift mediastinal structures, affect the location of the SVC and potentially lead to catheter misplacement.[33]
H. CVAD placement should be avoided on the side of the body affected by stroke due to potential complications arising from altered sensation of the limb, which can impede blood flow.[34]

Standard 21.14 Protocols must be in place to avoid, recognised and manage bleeding and hematoma associated with CVAD placement.

Practice guidance:

A. Prior to CVAD insertion and removal, the patient's coagulation and platelet count should be reviewed to be within safe limits for device removal. [N,1]
B. Patients with severely low platelet counts (thrombocytopenia) or abnormal coagulation studies may require prophylactic platelet transfusions or clotting factors before the procedure.[1]
C. Complex coagulation abnormalities may require haematology team advice.[1]
D. Bleeding during CVAD insertion can be managed using simple digital pressure, haemostatic dressings and for surgical placements involving an incision, disposable diathermy pens. [N]
E. Bleeding during CVAD removal can be managed using simple digital pressure and haemostatic dressings. [N]
F. Bleeding post insertion can be managed with digital pressure at the puncture site, haemostatic dressings, pressure dressings or tissue adhesive to control exit site bleeding. [N]
G. Large haematoma's post VAD removal may require review and management from the vascular surgical team. [N]

Standard 21.15 HCPs must be aware of the risk and prevention of nerve damage during VAD placement.

Practice Guidance:

A. Vessel puncture during VAD insertion is associated with potential nerve injury. Peripherally inserted VADs are more likely to be involved in accidental nerve damage due to the proximity of peripheral nerves to veins.[2,35]
B. Nerve damage can be temporary or long-lasting. [N]
C. HCPs who inserted VADs must have anatomical knowledge of veins, arteries, nerves and surrounding structures to reduce the risk of VAD-associated nerve injury. [N,2]
D. Multiple attempts of vessel puncture, improper vessel puncture technique and subcutaneous probing techniques are associated with increased risk of nerve damage.[2,]
E. Symptoms of nerve injury include altered sensation and pain. [N]
F. Development of these symptoms during catheter insertion requires immediate removal of the needle/catheter and patient assessment.[2]
G. Further investigations may be required following suspected nerve injury. [N]
H. Nerve compression injuries may occur following infiltration of large volumes of fluid. [N]

Standard 21.16 HCPs must be aware of the risk and prevention of lymphatic vessel puncture during VAD placement.

Practice Guidance:

A. Lymphatic puncture may occur as a complication of PIVC or CVAD insertion.[36,37]
B. Lymphatic puncture may manifest as a clear or yellowish, thin fluid drainage from the catheter exit site.[36,37]
C. Catheter removal and replacement is advised if lymphatic puncture is suspected. [N]
D. Chylothorax is a possible complication, which is an accumulation of lymphatic fluid in the pleural space. It may require chest drainage if associated with respiratory distress. If chylothorax does not resolve following catheter removal and conservative management, lymphatic angiography and referral is advised.[35]

Standard 21.17 HCPs must be aware of the risk and prevention of accidental arterial puncture during VAD placement.

Practice Guidance:

A. Inadvertent arterial puncture is a relatively common complication of VAD placement and is usually associated with minimal harm in peripherally inserted devices. In the case of CVAD placement, if the arterial puncture is not recognised, the subsequent advancement of a dilator or catheter into the artery may be associated with serious complications including arterial emboli, arterial dissection, haemorrhage, and stroke.[35,38]
B. The appearance of bright red pulsatile blood from the cannulating needle is suggestive of arterial puncture and must be managed by withdrawal of the needle followed by firm digital pressure to minimise haematoma formation. [N]
C. The use of ultrasound guidance during VAD insertion reduces the risk of accidental arterial puncture. Hematoma can be extensive in those with abnormal coagulation and there is the potential for arterial pseudoaneurysm formation.[1]
D. Advancement of a CVAD dilator and passage of the catheter into the carotid artery is associated with significant morbidity and mortality.[35,38]
E. If arterial puncture is suspected after the CVAD has been sited, it must be left in place and specialist help summoned to manage the patient as catheter withdrawal and application of pressure is associated with stroke if the carotid artery is affected.[35]
F. Blood gas analysis and pressure manometry may be confirmatory of inadvertent arterial VAD placement, but often a definitive diagnosis is only made with the use of fluoroscopy or CT angiography. [N]
G. Urgent referral must be made to interventional radiology or vascular surgeons who may be able to remove the device in a safe manner using interventional techniques or open vascular repair. [N]

Standard 21.18 HCPs must be aware of the risk and prevention of fibroblastic tissue growth associated with indwelling VADs.

Practice Guidance:

A. Fibroblastic tissue formation is a common phenomenon that develops around the outside of the VAD catheter. Connective tissue formed by fibroblasts, smooth muscle cells, and other components develop in response to the catheter's presence in the bloodstream. [39]
B. HCPs must be aware of following fibroblastic complication so they can recognise and respond to accordingly.
   - Fibroblastic tissue formation can occur very soon after catheter placement, sometimes within 24 hours.[39]
   - A fibrin tail can develop on the tip of the catheter causing a persistent withdrawal occlusion meaning blood aspiration becomes difficult or impossible although the catheter will still flush effectively.[2]
   - The fibroblastic tissue can create a sleeve that partially or totally encapsulates the catheter. Accumulation at the distal end of the catheter may lead to partial or total withdrawal occlusion.[23,39]
   - Fibroblastic tissue can be identified on ultrasound, showing a layer around the catheter, often with a slightly hyperechoic appearance.[12,13]
   - PIVC and midline catheter fibroblastic sleeves can capsulate the whole catheter leading to leakage at the exit site during catheter use, removal and replacement of the device if still required, it is recommended.[40]
   - Fibroblastic sheaths can be retained after catheter removal, which can be seen on CT/MRI and mistakenly reported as retained portions of catheters. These will not be seen on chest x-ray as they are not radiopaque.[12,13]
C. Push/pause pulsatile flushing technique may assist in reducing the build-up of fibroblastic tissue at the distal end of the catheter. [N,2]
D. Treatment of fibrin sheaths includes fibrinolytic pharmacologic therapy such as tissue plasminogen activator (tPA), balloon angioplasty, catheter exchange, and mechanical stripping.[41,42]

Standard 21.19 HCPs must be aware of the risk and prevention of TIVAD erosion and insertion site pouch infection.

Practice Guidance:

A. TIVAD erosion occurs when there is a skin opening over the port hub of the suture line, which has not healed post insertion, this can be a secondary complication of port hub infection.[43,44]

B. TIVAD erosion requires immediate device removal.[45,47]

C. Delayed insertion site healing post TIVAD insertion is associated with the administration of SACT and may increase the risk of pouch infection or TIVAD erosion. [45,46]

D. TIVAD placement involves ensuring the port pouch is positioned at a sufficient distance from the incision site to minimise pressure on the overlying skin, thus reducing the risk of erosion.[47]

E. Insertion site infection requires prompt antibiotic treatment if this is unsuccessful removal will be required. [48]

F. Repeated punctures at the same skin access site over the TIVAD can increase the risk of TIVAD erosion due to delayed puncture site healing. Where possible, the puncture site must be rotated to different areas of the skin over the TIVAD. [N]

Standard 21.20 HCPs must be aware of the risk and prevention of Medical Adhesive-Related Skin Injury (MARSI) associated with indwelling VADs

Practice Guidance:

A. MARSI refers to skin damage that can occur when medical adhesives, such as film dressing, adhesive securement devices and medical tapes are repeatedly applied and removed from the skin.[49,50,51,52]

B. MARSI can occur when the adhesive either pulls away the superficial layers of skin, causing: [2, 49,50,51,52]

- Skin stripping: The removal of one or more layers of the stratum corneum.[49,50,51,52.]
- Tension blisters: Are fluid-filled blisters that can break open. [49,50,51,52]
- Skin tears: Are breaks or splits in the skin.
- Folliculitis: Small, inflamed, elevated skin pustules at the hair follicles. [49,50,51,52]

Or the skin reacts with the adhesive chemicals or skin decontamination solution causing: [2,49,50,51,52]

- Contact dermatitis: Skin irritation and inflammation. [49,50,51,52]
- Allergic dermatitis: Cell-mediated immunologic response to a component of adhesive chemicals. [49,50,51,52]
- Maceration: Skin injury caused by prolonged exposure to moisture; area may appear pale, white, grey, wrinkled; increases permeability and susceptibility to injury. [49,50,51,52]

C. There is an increased risk of MARSI in the following patient groups: [2,49,50,51,52]

- Extremes of age: Neonates, premature babies, and older adults who have more delicate skin.
- Patients with certain skin conditions: eczema, dermatitis, chronic exudative ulcers, and epidermolysis bullosa can increase risk. [49,50,51,52]
- Patients who have cancer and are undergoing SACT. [49,50,51,52]
- Patients who are taking steroids. [49,50,51,52]

D. HCPs must take action to prevent MARSI.[N]

- Following skin decontamination, the skin must be dry before applying adhesive VAD securement devices or dressings. [56,57,58,59]
- Dressing and VAD securement device adhesives that are appropriate for the patient's skin type and condition for example, silicone especially if they are risk of, or have a history of MARSI. [49,50,51,52]
- Adhesive dressings and VAD securement devices should be applied and removed gently using adhesive removers when indicated. [49,50,51,52]
- Regular skin assessment around the VAD site to identify MARSI signs early. [49,50,51,52]
- Only use adhesives when clinically indicated and avoid excessive use when skin adhesion is poor. [49,50,51,52]

E. Sterile single-use liquid film barriers should be used to protect the skin from MARSI and improve dressing adhesion.[50,52]

F. Sterile, single-use applicators of adhesive remover should be used when removing dressings and securement devices containing adhesives.[52]

G. Wet chlorhexidine-based skin decontamination product can cause MARSI and must be allowed to dry before applying dressings over VADS.[50,52]

H. Silicone-based adhesive dressings can be considered as an alternative option to conventional film VAD dressings.[49,50,51,52]

I. When a MARSI presents a skin swab for MC&S should be taken to exclude infection. If Infection is present, antibiotic therapy should be commenced following local protocols. [N,52]

J. If infection is not present, the MARSI site can be cleaned with sterile 0.9% sodium chloride as an alternative to chlorhexidine solution or povidone iodine solutions.[49,52]

K. CVAD can be left in situ while MARSI management is undertaken following a benefit vs risk assessment.

If the patient has limited CVAD site options, leaving the CVAD in situ and treating the MARSI may be indicated. [N]

L. Leaving the CVAD in situ should only be considered if there is no skin infection present that could increase the risk of CABSI. [N]

M. Where a MARSI is present and the CVAD is being salvaged, a double dressing can be used. This involves covering the catheter exit site with a silicone dressing and then attaching the adhesive securement device on top of that dressing. This minimises the number of adhesives touching the skin. [52]

N. Subcutaneous anchoring devices can be used to secure CVADS as an alternative to adhesive securement devices to prevent MARSI and reduce the risk of catheter migration.[49,52]

O. Adhesive medical tapes must not be used as a secondary securement for IV giving set tubing; mechanical or wearable secondary securement solutions can be used to reduce external force acting on the VAD dressing site.[60]

P. Additional gum mastic liquid adhesive solutions should not be used as a secondary securement for VAD film dressings, as according to product data sheets, repeated or prolonged contact may cause irritation, defatting and drying of skin also prolonged or widespread contact has reportedly resulted in the absorption of potentially harmful amounts. [N,50,53]

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22. INTRAVENOUS THERAPY

Standard 22.1 HCPs must ensure their intravenous therapy practice is up to date, evidence-based and safe.

Practice Guidance:

A. All registered HCPs must adhere to their professional bodies' code of professional conduct in relation to the administration of IV drugs and therapies.[1,2,5,14]
B. All registered HCPs administering IV medications must be appropriately trained and assessed for competency. [1,2,5,14]
C. A dedicated IV therapy training passport can be used to prove competency when practicing between organisations.[3]
D. IV therapy must be prescribed by a qualified prescriber; the prescription must be signed before administration.[5,6,14,16]
E. Prescriptions must be legible, including the patients' identifiable details, drug name, strength and dose. [5,6,16]
F. HCPs must adhere to the "five rights" of medication administration: right patient, right drug, right dose, right route, and right time.[7]
G. Patient allergies must be checked before every drug administration.[5,7,12]
H. HCPs must be aware of drug indications, dosage, precautions, contraindications and monitoring requirements before administration. [5,12]
I. Where second checking of IV therapy is indicated, two registered/qualified HCPs must independently check the five rights, including expiry dates of the therapy at the point of administration.[8,12,14]
J. Adding an additive to an infusion bag/syringe must be second checked by a qualified HCP in line with local policy. [N,8,12]
K. A drug additive label displaying the drug and patient details must be attached to the infusion bag, which must be signed and countersigned by both HCPs. [N]
L. Drugs should not be added to blood products, mannitol, or sodium bicarbonate infusions. [9,17]
M. Strict ANTT should be maintained throughout IV therapy preparation and administration. [18]
N. IV giving sets should not be used for more than 24 hours (for drug admixtures). [9,12]
O. Standard IV administration sets (crystalloids) should be changed no more frequently than every 96 hours (4 days), though some evidence supports 7 days. High-risk sets (blood, lipids, propofol) must be changed within 24 hours, while sets for intermittent infusions are changed every 24 hours.[19]
P. Only one drug should be added to an infusion; the components must be compatible. [9]
Q. If multiple infusions are being administered, complete the checks individually and initiate one infusion at a time. [N,16]
R. HCPs should have up to date knowledge related to the pharmacology of drugs they administer. [5,12,14]
S. HCPs must be familiar with drug information resources such as the British National Formulary (BNF), the NHS Injectables Medicine Guide (MEDUSA) and the manufacturer's SmPC. [5,8]
T. The safest recommended method of drug administration must be followed. [5,9,12,13]

Standard 22.2 The administration of intravenous medication must be documented following local and national standards.

Practice Guidance:

A. IV medication must be administered as prescribed, at the correct time and this must be documented clearly at the time of administration on the drug chart.[5,6,9,12]
B. Conscious patients with capacity must give informed consent to receive IV drugs and therapies. Patients should be aware of the intended benefits, risk and side effects and this should be documented. [5,12,16]

C. Any adverse IV therapy reactions must be documented, including any actions taken. An incident report must also be completed following local protocols.[5,10]
D. Adverse drug reactions and complications must be reported to the MHRA via the yellow card reporting portal.[10]
E. Justification for any deviation from administration protocols must be documented including rationale as to why the divergence was necessary.[5]

Standard 22.3 HCPs must ensure IV drugs and therapies are stored appropriately and safely.

Practice Guidance:

A. IV medication must be stored securely in suitable conditions.[11,14]
B. If appropriate, medication must be stored at the correct temperature and protected from light following manufacturers recommendations.[11]
C. Controlled drugs must be stored securely with systems in place to prevent drug diversion (abuse/theft).[11,14]
D. Drug diversion must be reported locally following local protocols. [N]

Standard 22.4: IV drugs and therapies must be prepared and administered correctly and safely.

Practice Guidance:

A. HCPs must not administer IV medication which is past the manufacturer's expiry date. [N,5,16]
B. Reconstitution diluents must be checked alongside the IV medication, including the expiry date. [N,516]
C. Injectable solutions must be inspected before use and if any particular matter, discoloration, turbidity or leaks that might compromise the product integrity are observed, it should be discarded. [N,16]
D. IV drug vials must not be used and discarded if particulate matter, discoloration, or turbidity is present. [N]
E. The rubber stopper of medication vials and the neck of glass ampoules must be decontaminated with a sterile 70% alcohol swab before inserting a sterile blunt fill filter needle. [N]
E. IV medication must be reconstituted with the correct diluent following the manufacturer's SmPC. [N,12,16]
F. Prefilled sodium chloride 0.9% flushes are medical devices and only indicated for flushing and must not be used for medicine reconstitution. Appropriate diluent ampoules must be used. [N]
G. IV medication must be prepared by the same HCP that will be administering them unless in an emergency where local protocols must be in place to mitigate risk. [5,12,16]
H. IV medication must not be prepared in advance and left unattended. [N,12]
F. Injectables must only be transported in a tray or trolley. HCPs must not transport prepared injectables inappropriately in pockets or clothing. [N]
I. IV medicines are single-patient use unless stated by the manufacturers and must not be used for multiple patients unless prepared and repackaged by a pharmacy. [N,16]
J. IV medication must not be prepared in advance for multiple patients. [N]
K. IV medication must be prepared using blunt fill needles for plastic ampoules and blunt fill filter needles for glass ampoules to prevent particles from being drawn up and administered intravenously. [N]
L. HMPs must be reconstituted, prepared, administered and disconnected using a Closed System Transfer Device (CSTD). Engineering controls (CSTDs for the full manipulation pathway; biological safety cabinets or pharmacy isolators for upstream preparation) are the primary risk-control measure under COSHH. SACT and monoclonal antibodies are examples of HMPs; the requirement also applies to other HMPs as listed in the RCN 2025 HMP guidance. [N,16,20,21]
M. For HMPs, PPE including chemotherapy-rated gloves (double-gloved where indicated), impermeable gown and eye/face protection, must be worn for all preparation, administration, disconnection and disposal, irrespective of whether the SmPC specifies it. PPE requirements for other IV drugs should follow the SmPC and local risk assessment. [N,12,20,21]
N. Routine use of gloves to prepare IV medication is not necessary unless the IV therapy poses a risk to the HCP. [N]
O. Communal bags of normal sodium chloride 0.9% must not be used to obtain flushing solutions for multiple episodes of IV administration for different patients. [N,16]
P. Closed system transfer devices must not be removed and reused once attached to the medication bag or bottle. [N,16]
Q. Blunt fill needles must not be left in the septum of a medication bottle/vial for intermittent drug use, as this provides a direct route for microorganisms to enter the vial and contaminate the fluid. [N]
R. Reconstituted medication must be administered without delay and within 24 hours unless otherwise stated in the drug manufacturer's SmPC. [N,16]

Standard 22.5 HCPs must ensure the correct method of IV therapy administration delivery is used.

Practice Guidance:

A. The method of IV medication administration must be undertaken following guidance from the drug SmPC, the NHS injectable medicines guide (MEDUSA) or the BNF. [N,16]

B. The method of administration is determined by the indication and characteristics of the medication and must provide optimal patient safety. The following administration methods can be used:
   - IV Injection – direct injection into the vein via a VAD. A bolus is injected over 3 to 5 minutes unless otherwise stated in the summary of product characteristics (SmPC).[N,12]
   - Intermittent Infusion – small volume infusion administered at regular intervals.
   - Continuous infusion – administer continuously at a rate that may vary until the end of the therapy.
   - Subcutaneous infusion – bolus or continuous infusions into the subcutaneous tissue.

Standard 22.6 IV giving sets must be flushed to ensure the residual medicine within the set is fully administered.

Practice Guidance:

A. A system must be in place to ensure the remaining drug contained within the intravenous giving set tubing is administered once the infusion bag is empty, ensuring the total dose of treatment prescribed is given.[13,15]

B. Infusion sets containing residuals of Hazardous Medicinal Products (HMPs) must NOT be flushed by disconnecting the infusion bag from IV giving set. For HMP-containing lines, flushing and disconnection must be performed without breaking the closed system, using a closed system transfer device (CSTD) or pump-specific closed-system giving set. [20,21]

C. Non-HMP Flushing residual volumes can be achieved by using ANTT to detach the empty infusion bag from the giving set and attaching a new 50 mL or 100 mL bag of sodium chloride 0.9% or other compatible fluid and infusing at least 20 mL to clear the giving set. [13,15,18]

D. Pump-specific IV giving sets are available, which enable additional flushing of the IV giving set once the infusion bag is empty, using a closed system. [13,15]

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23. INTRAVENOUS FLUIDS, BLOOD AND BLOOD PRODUCTS

Standard 23.1 HCPs must follow protocols for safe administration of IV fluids.

Practice Guidelines:

A. HCPs must ensure IV fluids are administered following the National Institute for Clinical Evidence (NICE) IV fluid therapy guidelines for adults and children. [1,2]

B. HCPs must ensure the correct type of IV fluid is prescribed and administered. [1,2]

- Crystalloid fluids are a type of IV solution containing small, water-soluble molecules such as inorganic salts and glucose. These fluids distribute throughout the extracellular fluid (ECF) space, bringing water along with the solutes. [1,2,10]
- Colloid fluids are solutions of larger molecules which maintain a high osmotic pressure in the blood, they are primarily used for intravenous fluid replacement. [1,2,10]

C. IV fluid therapy should only be administered when hydration or electrolyte therapy cannot be adequately delivered through oral or enteral routes. [17,18]

D. A thorough assessment of the patient's hydration and electrolyte status should be undertaken before, during, and after IV fluid administration following the 5 Rs of IV Fluid Therapy: [1,2]
    - Resuscitation
    - Routine maintenance
    - Replacement
    - Redistribution
    - Reassessment

E. A detailed patient management plan should be developed outlining the type, rate, and volume of fluids, ensuring they meet the patient's fluid needs and maintains patient safely. [1,2]

F. IV fluid, including blood products, should only be administered if they have been prescribed by HCPs with prescribing competence and expertise. [1,2,3]

G. IV fluids must be discontinued once the patient's needs can be met via the oral or enteral route. [1,2]

H. Blood administration sets with integrated filters must be used in accordance with manufacturers guidance and local protocols.[4] Normal IV fluid giving sets must never be used for blood administration. [N]

I. Blood warmers must be used when indicated, using the correct giving set in line with manufacturer's guidance. HCPs must be trained to use this equipment. [4]

J. Specific sharp safe soft cannula subcutaneous infusion sets should be used for subcutaneous infusions. Metal needles must not be used for subcutaneous infusions. [N,11]

K. IV infusion set air inlets must always be shut unless there is a glass bottle or non-collapsible container is used. [N]

L. The drip chamber on infusion sets must always be filled up to halfway when priming a line and whenever a new bag/bottle is being installed to prevent air being infused into the tubing. [N]

M. When infusions via an infusion pump are stopped and then restarted, the date, time and volume of fluid infused when stopped and restarted should be documented to ensure accurate infusion records are kept. [N]

N. Accurate IV fluid input records must be documented, including gravity infusions and bolus IV drug administrations in line with local protocols to ensure fluid balance is recorded. [N]

O. IV administration sets must have a clamp which should be closed when not infusing or disconnected. [N]

P. Infusion sets must not be clamped by manually kinked infusion set tubing. [N]

Standard 23.2 HCPs must ensure VADs are flushed after IV therapy infusions are disconnected.

Practice guidance:

A. HCPs must ensure VADs are flushed after IV infusions are disconnected to ensure drug residue is cleared from the VAD to prevent accidental bolus drug delivery at a later time when the VAD is used. [N,12]

B. HCPs must ensure the flushing solution is compatible with the infusion therapy, where the flushing solution is glucose 5% a final sodium chloride 0.9% flush must be used.[5,6]

C. To prevent IV fluid contamination, ongoing infusion must not be disconnected and reconnected, even if the infusion is incomplete.

Standard 23.3 HCPs must ensure in-line IV filters are used when clinically indicated.

Practice Guidelines:

A. In-line IV filters are used to prevent plastic and glass particles, drug precipitates, microorganisms and endotoxins from infusion solutions and drugs being administered into the venous system.[7,8]

B. HCPs must ensure in-line IV filters are used when clinically indicated for specific drugs and therapies and are responsible for reviewing the drug SmPC to check this requirement before adminstration.[6,7,8]

C. Specific filter specifications must be checked for appropriate performance and duration of use. [8]

D. In-line IV filters must be connected between the VAD and the IV-infusion set.[8]

E. Types of in-line IV filters:[7,8]

0.2-micron filters:

- Commonly used for clear IV fluids, and medication.
- Can remove bacteria, particulate/aggregates and air.
- Low protein-binding 0.2-micron filters must always be used for administration of IV medicines.

- Positively charged 0.2-micron filters may also allow extended use by removing endotoxin.

1.2-micron filters:[7,8]

- Recommended to be used for lipid emulsions and total parenteral nutrition (TPN) solutions.
- Can remove fungi, solution particulates, large lipid globules and air.

5-micron filters:[7,8]

- Can be required for specialised applications, such as medicines with liposomal formulation.
- Remove larger particulates and air, for example glass ampoule particles.
- Blunt fill filter needles contain these filters.

F. Anti-syphon infusion devices should be added to infusion sets when clinically indicated to prevent free flow of intravenous solutions when the administration set is removed from the infusion device. [N]

Standard 23.4 HCPs must be trained and competent to administer blood and blood products.

Practice Guidance:

A. All staff involved in blood administration, from prescribing to administration, must be competent and complete specific annual mandatory training.[9]
B. Training must be documented and recorded following national and local protocols.[9]
C. HCPs must be assessed as competent and often undergo re-assessment every two years to ensure continued skills.[9]
D. HCP blood administration training and competency records must be retained to ensure local and national compliance with safety, quality, and legal requirements.[9]
E. Blood administration sets with integrated filters must be used in accordance with manufacturers guidance and local protocols. [4]
F. HCPs must be trained to manage patient reactions to blood and blood components which must also be reported follow local protocols. [N]
G. Blood and blood products can be administered using a gravity blood infusion set or by an electronic infusion pump, both of which must be appropriate for blood administration. A pressure infusion device or blood warmer may be indicated and must be used following local protocols and manufacturers SmPC. [N]

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24. PARENTERAL NUTRITION

Standard 24.1 HCPs must be aware of the benefits, risks and complications associated with the administration of parenteral nutrition (PN).

Practice Guidelines:

A. HCPs must have up-to-date knowledge and competency associated with administration of PN and follow local protocols.[1,2,3]
B. The use of PN must be a multidisciplinary decision involving dieticians.[1,3]
C. HCPs must follow standard ANTT principles when setting up, administering, and disconnecting PN.[2,4,5,7,8]
D. HCPs must ensure effective hand washing is undertaken before, during and after preparing and setting up PN. [N,6]
E. Sterile gloves and sterile fields are not required when preparing and administering PN. [N,6]
F. PN should be administered using a dedicated single-lumen CVAD to reduce the risk of infection associated with multiple-lumen CVADs. [2,3,4]
G. For inpatients with a multiple-lumen CVAD, one lumen must be dedicated and visually identifiable for PN use only.[2,3,4]
H. PN infusion sets must not be disconnected and reconnected at any point during the infusion, if disconnection occurs the infusion set must be

discarded, and a new infusion restarted if clinically indicated. [N,2]

I. PN must be administer via an infusion pump. [N,2,4]
J. 1.2-micron in-line IV filters must be attached to the infusion set for PN infusions containing lipids in adults and paediatrics. For aqueous PN solution, a 0.2 micron is used in paediatrics. [N,2,4,7]
K. The PN infusion and giving set must be discarded after 24 hours or 48 hours in paediatrics aqueous PN solution. [N,2,4]
L. PN infusion bags must be protected from direct light, following manufacturer's instructions [7]
M. Parenteral nutrition has a high osmolarity over 600 mOsm/L and should be administered via a CVAD into a central vein to avoid extravasation injuries. [N,9]
N. Only consider using PIVC to administer paediatric and neonatal PN to avoid delays and interruptions or if PN is being used for less than 5 days.[7]
O. Consider line locking CVAD lumens to prevent infection. [N,4]
P. Blood sampling from a PN lumen must be avoided where possible.
Q. Where a patient has PN infusing via a single-lumen CVAD, blood collection must be taken peripherally to avoid contamination of the blood sample. [N,4]
R. Where the CVAD has multiple lumens, blood samples should only be collected from the non-PN lumen if no other method of taking the blood sample is available. [N]
S. If blood sampling is necessary from the PN lumen, the PN infusion should be paused for no longer than 5 minutes to avoid CVAD lumen occlusion. [N]
T. The lumen must be flushed pre and post taking the blood sampling with 10 mL of sodium chloride 0.9%. [N,4]
U. 3 mL of blood should be discarded before taking the required blood sample. [N]

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25. INTRAVENOUS THERAPY RISKS AND COMPLICATIONS

Standard 25.1 HCPs must be aware of the risk, prevention and management of IV therapy-related complications.

Practice Guidance:

A. Local protocols and guidelines must be in place to reduce the risk of IV therapy-related complications and enable HCPs to manage complications if they occur. [N]
B. Complications must be reported locally and audited to enable safety improvements in clinical practice. [N]
C. HCPs who practice IV therapy administration must ensure they keep their knowledge of complication avoidance and management up to date. [N]
D. HCPs must follow protocols for medication reconstitution to prevent the formation of drug precipitates, which can lead to serious patient harm, including catheter occlusion, embolism, organ failure, or death. Using an incorrect diluent—such as using sodium chloride 0.9% instead of sterile water for Injection, or vice versa—can trigger physical and chemical incompatibilities.[8]
E. Wrong route drug administration is a never event. HCPs must ensure enteral feeding tubes, intrathecal and epidural infusion sets, IV administration sets and CVAD lumens are visually identifiable.[9] Examples of wrong route drug administration include:
   - Enteral to Parenteral: Administering enteral (oral/tube) nutrition, drugs, or flushes into a CVAD or other parenteral routes can cause severe harm or death.[9]
   - Intrathecal/epidural misconnection: Injecting IV medication intrathecally or via an epidural can cause catastrophic harm, including paraplegia or death. [9]
   - Specific agents: Inadvertent administration of vinca alkaloids (e.g., vincristine) by the intrathecal route is fatal. [9]
F. HCPs must ensure the correct compatible type of giving sets and syringes are used (IV, enteral, epidural, intrathecal) and not adapted to enable unintended use. [N]

Standard 25.2 HCPs who practice IV therapy administration must be trained in how to manage anaphylaxis.

Practice Guidance:

A. Anaphylaxis is a potentially life-threatening allergic reaction. Recognition of anaphylaxis is based on:
   - Sudden onset and rapid progression of symptoms.[1]
   - Airway and/or breathing and/or circulation problems.[1]
   - Skin and/or mucosal changes (flushing, urticaria, angioedema) – but these may be absent in up to 20% of cases.[1]
   - The diagnosis is supported if a patient has been exposed to an allergen known to affect them.[1]

B. HCPs must assess patients having an allergic reaction using the Airway, Breathing, Circulation, Disability, Exposure (ABCDE) approach. If Anaphylaxis is suspected, call for help early following local protocols.[1]

C. Adrenaline is the first-line treatment for anaphylaxis. Give intramuscular (IM) adrenaline injection early (in the anterolateral thigh) for airway/breathing/circulation problems.[1]

D. Adrenaline 1:1000 IM injection must be readily available in all clinical areas where IV medications are administered.[1]

E. A single dose of IM adrenaline is well-tolerated and poses minimal risk to an individual having an allergic reaction. If in doubt, give IM adrenaline.[1]

F. Community teams who administer IV drugs/therapy must have systems in place to manage anaphylaxis.[1]

G. For up-to-date guidance, follow link to Resuscitation Council UK.[1]

Standard 25.3 HCPs must adhere to ANTT principles when reconstituting, administering and disconnecting IV drugs, therapies and infusions to avoid infection.

Practice Guidance:

A. Effective hand washing is essential to reduce the risk of infection; gloves are not required to reduce the risk of infection when administering IV therapy. [N,5]

B. IV giving sets must be attached to a VAD using a NFC, and this must be decontaminated before connection and when disconnecting. [N,2,3,6]

C. IV giving sets are single-use and must never be used for multiple patients. [N,4]

D. IV giving sets/infusions must not be reconnected after disconnection. [N,2]

Standard 25.4 Healthcare organisations must follow local guidelines and protocols to prevent and manage infiltration and extravasation injuries.

Practice Guidance:

A. Infiltration is the inadvertent administration of IV drugs/therapy into extravascular tissue. This can occur with the use of any VAD; however, the risk can be higher with PIVC due to the short catheter.[7]
   - Extravasation occurs when the infiltrated IV medication is a vesicant, which can result in serious injury.[7]
   - There are 4 main groups of vesicant drugs commonly associated with extravasation: [7]
     - SACT
     - Drugs with non-physiological pH – (high or low pH)
     - Vasopressors
     - Hyperosmolar solutions

B. Healthcare organisations must establish comprehensive guidelines and protocols to effectively prevent and manage all types of infiltration and extravasation injuries, including for non-SACT medication.[7]

C. Infiltration and extravasation awareness and prevention must be included in IV therapy training and organisational annual IV updates. [N]

D. Medication with a pH range between 5-9 are safe to administer into a peripheral vein; IV medicines with an extreme pH value must be administered via a CVAD.[7]

E. IV medication with an osmolarity above 600 mOsm/L should not be administered into a PIVC, due to the risk of extravasation injury, a CVAD must be used.[7]

F. Vesicant medication should not be routinely administered through a PIVC due to the risk of extravasation injury. [7]

G. Vesicant medication must never be administered through a midline due to the risk of severe extravasation injury. [N,10]

H. IV iron can cause permanent skin staining if infiltrated into the tissue. Patients must be made aware of this risk and give informed consent prior to treatment.[7]

I. Organisational infiltration and extravasation protocols and guidelines must have the following core elements: [7]
   - **Prevention** – Promote safe IV therapy administration and vascular access practice to reduce the risk of infiltration and extravasation injuries.

- **Recognition** – Recognise the early stages of infiltration and extravasation injuries.
- **Treatment** – Early intervention and treatment of infiltration and extravasation injuries can prevent or reduce tissue damage.
- **Follow up** – Ensure the patient is followed up and supported post infiltration and extravasation injury.
- **Reporting** – Standardised incident reporting of infiltration and extravasation.

J. Most infiltration and extravasation injuries are associated with PIVC placement transfixation or device dislodgment.[7]

K. HCPs must continually monitor VAD sites for pain, swelling, erythema and leakage from the VAD exit site, which are all signs of infiltration and extravasation. [7]

L. IV medication should be administered using an infusion pump which must be monitored hourly.[7]

M. Infusion site surveillance technology can be used to monitor the VAD site for signs of infiltration.[7]

N. IV medication which can leak out of the PIVC vein puncture site. HCPs must regularly monitor PIVC sites for signs of infiltration or extravasation.[7]

O. When undertaking PIVC insertion, HCPs must avoid transfixation, which occurs when the PIVC needle passes through both the front and back walls of the vein. To avoid transfixation HCPs must ensure that once a flashback is achieved, the PIVC is lowered almost parallel to the skin before only advancing the cannula into the vein.[7]

P. The PIVC and integrated needle must never be reintroduced into the vein after a failed insertion attempt as this causes vessel trauma which can lead to infiltration or extravasation .[7]

Q. HCPs must ensure all VADs are adequately secured to the skin using IV dressings and securement devices as indicated, to avoid catheter dislodgement. Catheter tip migration into surrounding issue can cause infiltration and extravasation.[7]

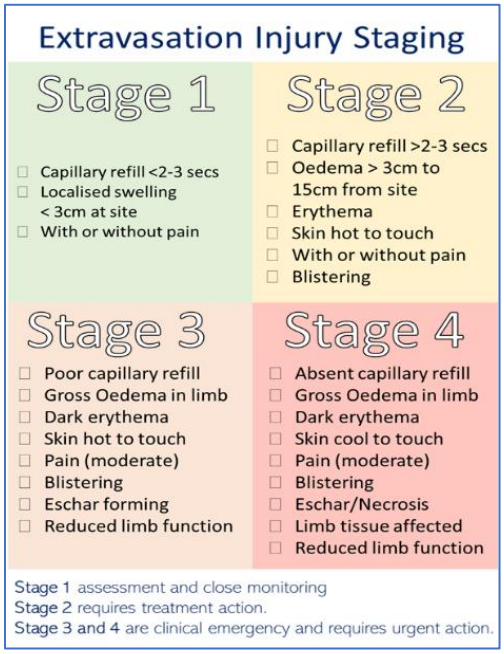
R. If the patient reports pain during device flushing or IV therapy administration, HCPs must stop using the VAD immediately as this may indicate an infiltration of extravasation injury is occurring. The VAD must be removed and re-sited as clinically indicated. [7]

S. Increased permeability in vein walls, often caused by inflammation, oedema, or medication such as vasopressors can cause IV fluids to leak out of the vessel into the surrounding tissue. This is known as vein porosity and can lead to IV infiltration and extravasation, especially in elderly or critically unwell patients. HCPs should regularly monitor for signs of vein porosity.[7]

T. PIVC placed in the antecubital fossa in CT scanning for power injection of contrast are at high risk of dislodgment due to mechanical obstruction, which can occur when the patient raises their arms above their head during the scan. This can result in contrast infiltration/extravasation.[7]

U. HCPs should escalated potential infiltration or extravasation injuries early on to ensure immediately treatment is commenced.[7]

V. HCPs should use a standardised assessment tool to stage the extent of injury. [7]



W. Infiltration of small volumes of non-vesicant solutions can be managed by elevating the affected limb in a Bradford sling, which will assist with absorption of the fluid.[7]

X. Areas of broken skin must be covered with a sterile occlusive dressing to avoid infection. [7]

Y. Patient pain must be managed effectively.[7]

Z. Cold compresses are recommended for the management of most extravasation injuries as they induce vasoconstriction, which helps contain the spread of the extravasated drug.[7]

AA. Cold compresses must not be used with vinca alkaloids, epipodophyllotoxins, oxaliplatin, and vasopressors that have extravasated, as they may exacerbate tissue damage and ulceration caused by these agents. Warm compresses are recommended as an alternative.[7]

BB. Apply compresses for 20 minutes, 3 or 4 times daily as clinically indicated.[7]

CC. Hyaluronidase can be infiltrated subcutaneously to treat extravasation, which is most effective if used as soon as the injury occurs. Local protocols must be followed. [7]

DD. Saline washout is a highly effective treatment for extravasation but is not available in every healthcare setting. A local protocol for saline wash out must be followed by competent HCPs.[7]

Standard 25.5. HCPs must be aware of the risks, prevention and management of compartment syndrome.

Practice Guidance:

A. Compartment syndrome may occur when IV fluid infiltration occurs within a fascial compartment leading to increased pressure which can cause tissue and nerve damage. It is a medical emergency and requires urgent treatment.[7]
B. HCPs must monitor infusions and infusion pumps hourly to detect infiltration before a compartment syndrome occurs.[7]
C. Compartment syndrome can cause intense pain, swelling, numbness, tingling, and discoloration of the affected area. In severe cases, there may be limb ischaemia or weakness. [7]
D. The primary treatment is urgent surgical fasciotomy, to relieve pressure and restore perfusion to the tissue. [7]

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26. INFUSION MEDICAL DEVICES

Standard 26.1 HCPs must be trained and competent in the use of medical devices used for IV administration.

Practice Guidance:

A. IV infusion devices are essential for safe delivery of fluids, medication, and nutrition into a patient's bloodstream at precise rates and volumes.[1,2,3,4,5]
B. Volumetric pumps are commonly used for the delivery of IV medication over a specific designated of time. These enable the rate of infusion to be set within alarmed parameters. [1,2,3,4,5]
C. Syringe pumps are designed for small-volume infusions, commonly used for patient-controlled analgesic or delivering medication from syringes in small variable doses.[1,2,3,4,5]
D. Patient-controlled analgesia pumps allow patients to self-administer pain medication boluses, providing pain relief on demand. These pumps should be administered through a dedicated PIVC or CVAD lumen and require dedicated infusion sets.[8]
E. Smart pumps can incorporate safety systems, such as dose error reduction systems and drug libraries, to help prevent medication errors and ensure accurate medicationdelivery.[1,2,3,4,5]
F. Ambulatory infusion pumps are designed to be portable or wearable, allowing patients to receive infusions while being ambulatory; these can be electric, mechanical or elastomeric.[6,7]
G. HCPs must undertake training and be competent to operate infusion devices used within their organisation. [N]
H. A training record of HCPs infusion pump competencies must be maintained locally. N
I. Safety alarms notify users of potential complications during infusions. HCPs must never disable safety alarms or turn the alarm volume off.[N,9,10]
J. Infusion pump pressure alarm settings must be set low, ensuring a low threshold for an occlusion to trigger the high-pressure alarm. [N]
K. Pump pressure alarms set too high can delay alarm activation when the pump detects an infusion pressure change, which could indicate a VAD tip malposition and increase the risk of infiltration and extravasation. [N]
L. All infusion devices must be well maintained and decontaminated between patient use following manufacturers' guidance and local protocols.[1,2,3,4,5]
M. Faulty infusion pumps must be taken out of use and reported to the local medical engineering department for analysis and services. [1,2,3,4,5]
N. Any incidents associated with infusion devices must be reported locally and via the MHRA yellow card reporting portal.[16]
O. HCPs must ensure they program infusion devices correctly. Where possible, two qualified HCPs should check the pump rate and volume to be infused before the infusion pump is started. [N]

Standard 26.2. The use of infusion site surveillance technology should be considered to prevent infiltration extravasation injuries.

Practice Guidance:

A. This technology uses visible and near-infrared light combined with a predictive algorithm to detect infiltration at the infusion site.[11,12,13]
B. A sensor is attached close to the infusion site, which can detect an infiltration of as little as 0.2 mL of drug/fluid. The sensor must only be placed over the film part of the IV dressing to allow the sensor light to penetrate the tissue. [11,12,13]
C. If the device detects an infiltration action must be taken to stop the infusion immediately. There may be no visible signs of infiltration. [11,12,13]

Standard 26.3 HCPs must be competent to use blood and fluid warmers when clinically indicated.

Practice Guidance:

A. IV blood warmers are used to increase the temperature of blood before administration and are the only acceptable way to warm blood. [N]
B. Blood warmers should be used as clinically indicated following manufacturer's instructions. [N]
C. IV fluid warmers are also used in neonatal care and a variety of other clinical settings for temperature management. [N]
D. Blood warmer giving sets are single-use. [N]
E. Blood components must not be warmed above 41°C to avoid damage to red blood cells. [N]
F. Blood warmers require regular decontamination before and after use. [N]

Standard 26.4. Elastomeric infusion devices can be safely used as an alternative to electric infusion pumps especially for ambulatory care.

Practice Guidance:

A. Elastomeric infusion devices, also known as balloon pumps or ball pumps, are used to deliver IV medications in a controlled and continuous manner and are a safe alternative to electronic infusion pumps for home IV therapy. HCPs and patients using these devices must be competent to do so. [N,14,15]
B. Elastomeric infusion devices can be prefilled, for example, in an aseptic pharmacy unit or in the clinical setting; protocols must be in place to ensure only compatible and stable drugs are used in these devices and that they maintain a closed infusion system. [N,15]
C. ANTT must be adhered to when filling elastomeric infusion devices outside of an aseptic unit. [N,16]
D. Patients must be given training and information about potential complications associated with elastomeric infusion devices. [N]
E. HCPs should monitor and report any devices which fail to deliver the full dose of IV therapy or if leakage occurs, this should be incident reported locally and reported to the MHRA via the yellow card reporting portal. [N,17]
F. Elastomeric infusion devices should always be connected to a needle-free device and never directly to the (C)VAD hub to reduce infection risk from poor adherence to ANTT. [N]
G. Disconnection and disposal of elastomeric devices containing HMPs must be undertaken using a CSTD where feasible, with appropriate PPE, and in accordance with local protocols, COSHH 2002 and the RCN 2025 HMP guidance. Where patients, carers or family members are involved in disconnection in the community, they must receive training on safe handling, be provided with HMP spill kits, and have access to a single point of contact for incident reporting. [N,18,19]

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27. SPECIALIST PATIENT GROUPS

Standard 27.1 HCPs must consider the needs and complexities of patients who are needle phobic in relation to vascular access and IV therapy.

Practice Guidance:

A. Where possible, an alternative to venepuncture and VAD insertion should be considered, for example, taking capillary blood tests or other medication administration routes. [N]
B. Needle-phobic patients can be managed using a 4-stage approach. The 4-stage approach is:
   - Pain management – vapo-coolant spray or topical local anaesthetic creams can be used to reduce cannulation and venepuncture pain; these should be avoided in neonates.[2]
   - Patient comfort - the patient should it be sitting or lying comfortably with their arm supported, allowing the patient to be as relaxed as possible. [N]
   - Vein finding technology – ultrasound or near infrared devices can improve first insertion success rates. [3,4,5]
   - HCP comfort – HCPs must position themselves so that the intended cannulation site is easily accessible, this can be achieved by sitting by the patient's side or raising a bed to waist height. Standing/bending over the patient can cause back strain to the HCP, the HCP is more likely to be successful in PIVC placement if they are comfortable. [N]

Standard 27.2 HCPs must consider the needs and complexities of people who inject drugs (PWID) in relation to their vascular access and IV therapy needs.

Practice Guidance:

A. Where possible, an alternative to the IV route must be considered for administration of medication. [N]
B. PWID often present with infection or thrombosis and have a history of difficult IV access which can delay treatment. A difficult IV access pathway should be in place to offer ultrasound guided cannulation and venepuncture for the first insertion attempt.[1,6,11]
C. Long term CVAD should be avoided as the risk of self-injecting is high and can lead to serious complications. [N,22]
D. PWID can self-introduce bacteria into the bloodstream if they inject into their VAD and must be made aware of this risk. [N,8,11]
E. A risk assessment must be undertaken to evaluate if the patient is actively injecting IV drugs or likely to restart during their treatment. PWID must be supported to manage their addiction while in hospital and in the community. Delays in receiving addition medication can lead to relapse. [N]
F. Some IV drug use patients may have difficulty adhering to IV antibiotic treatment regimens. These patients may be more likely to leave the hospital against medical advice or not adhere to treatment protocols.[8]
G. Outpatient parenteral antimicrobial therapy (OPAT) has a high complication rate for PWID due to the associated non-compliance of the treatment regime which can be exacerbated by the continued use of injectable recreational drugs, often leading to infection relapse and hospital readmission. Alternative methods of treating the patient in the community should be considered to ensure compliance. [N,37]
H. For antibiotic management for skin and soft tissue infections, often associated with PWID, lipoglycopeptide antibiotics with a prolonged half-life are available that can be given intravenously as a single dose, negating the need for OPAT.[9,10]
I. PWID must be warned that following a prolonged period of inpatient stay, where they have not injected their usual dose of recreational drug, there is a risk of overdose if they relapse and inject the previously tolerated amount.[7,10]

Standard 27.3 HCPs must consider the impact of placing VADs in patients who may require dialysis and IV therapy.

Practice Guidance:

A. National and international guidelines recommend against the use of peripherally inserted central catheters (PICC lines) in patients with Stage 3-5 chronic kidney disease to preserve arm veins for potential future arteriovenous fistula or graft creation. for haemodialysis.[1,12,13,14,]
B. HCPs should avoid use of forearm and upper arm veins, including the antecubital fossa, for phlebotomy or PIVC placement in patients with an actual or planned dialysis fistula or graft.[1,12,13,14,]
C. Where PIVC or PICC insertion is essential and clinically indicated, the dominant arm should be

used, the non-dominant arm should be preserved as a potential site for arteriovenous fistulas or grafts. Before any VAD placement the patient's renal team should be consulted. [1,12,13,14,]

D. Where a patient already has an arteriovenous fistula or graft in situ, the patient's renal team must be consulted prior to placing a VAD in the opposite arm. [N]
E. Where a patient has a CVAD for dialysis in situ, this catheter must not be used for IV therapy administration or blood sampling except during dialysis to preserve the catheter and reduce complications. [N]
F. Restrict venipuncture blood sampling to the dorsum of the hand whenever possible, regardless of hand dominance, in patients with an actual or planned dialysis fistula or graft.[1,12,13,14]
G. Care and maintenance of the renal CVAD should include infection prevention measures as standard. This includes catheter exit site management with chlorhexidine gluconate or silver-impregnated dressings, CVAD lumen locks, NFC protective caps and regular daily surveillance for signs of infection. [N,1]
H. Only competent HCPS should undertake care and maintenance of renal CVADs. [N]

Standard 27.4 HCPs must consider the needs and complexities of patients with disabilities in relation to vascular access and IV therapy needs.

Practice Guidance:

A. Patients with learning disabilities are often vulnerable and require careful vascular access planning due to potential communication and mental capacity difficulties, the need for tailored approaches to care is essential and should involve specific local learning disability services.[15,16,17]
B. Assessing individual needs, using resources such as learning disability specialist nurses, in-hospital patient passports/patient-centred care plans, GP records, and support from family and carers is essential.[16,17]
C. A 4-stage approach must be used when planning to insert a VAD in patients with learning disabilities. [N]
   - Pain management – vapo-coolant spray or topical local anaesthetic creams can be used to reduce cannulation and venepuncture pain; these should be avoided in neonates.[2]
   - Patient comfort – the patient should it be sitting or lying comfortably with their arm supported, allowing the patient to be as relaxed as possible. [N]
   - Vein finding technology – ultrasound or near infrared devices can improve first insertion success rates. [3,4,5]
   - HCP comfort – HCPs must position themselves so that the intended cannulation site is easily accessible; this can be achieved by sitting by the patient's side or raising a bed to waist height. Standing/bending over the patient can cause back strain to the HCP, the HCP is more likely to be successful in PIVC placement if they are comfortable. [N]
D. Collaboration with anaesthesiology may be necessary for complex vascular access procedures requiring sedation. [N]
E. HCPs must ensure the VAD is secured adequately to avoid accidental removal. [N]
F. The Equality Act 2010 and the NHS 2020 reasonable adjustments framework legally require healthcare providers to make reasonable adjustments for disabled patients, ensuring equal access to services, information, and communication. These adjustments, which are tailored to individual needs, include providing easy-read formats, longer appointments, quiet waiting areas, and communication support like sign language interpreters.[16,17,18,19,20]

Standard 27.5 HCPs must consider the needs and complexities of patients with delirium and dementia in relation to vascular access and IV therapy.

Practice Guidance:

A. Establishing vascular access in patients with delirium or dementia requires a careful approach due to the potential for behavioural changes, cognitive decline, and increased risk of sharps injury for the HCP during insertion due to patients' compliance. [N]
B. HCPs should explore all alternative medication routes before using the IV route. [N]
C. HCPs must maintain the patient's safety while respecting their autonomy and dignity, by using non-restraint strategies and focusing on effective communication and reassurance. [N]
D. Patients with delirium or dementia may be more prone to dislodging VADs, developing CABSI, or experiencing other related complications. [N]
E. A 4-stage approach must be used when planning to insert a VAD. [N]
   - Pain management – vapo-coolant spray or topical local anaesthetic creams can be used to reduce cannulation and venepuncture pain; these should be avoided in neonates.[2]
   - Patient comfort – the patient should it be sitting or lying comfortably with their arm supported, allowing the patient to be as relaxed as possible. [N]

- Vein finding technology – ultrasound or near infrared devices can improve first insertion success rates. [3,4,5]
- HCP comfort – HCPs must position themselves so that the intended cannulation site is easily accessible. This can be achieved by sitting by the patient's side or raising a bed to waist height. Standing/bending over the patient can cause back strain to the HCP; the HCP is more likely to be successful in PIVC placement if they are comfortable. [N]

F. Patients must not be physically restrained when placing a VAD. If no other route apart from IV is available, chemical restraints may be considered following a local risk assessment and escalation to the critical care team for management alongside discussion with the patient's next of kin or advocate. This must be in the patient's best interest and fully documented, including any deprivation of liberty assessments. [19,20]

G. If chemical restraint is indicated, following local policy and with the assistance of the critical care team, the lowest effective dose of sedation should be used for the shortest duration possible.[20]

H. Post VAD insertion care and maintenance strategies must be considered to avoid accidental removal. This can be achieved through one-to-one nursing. [N]

I. Fidget mitts and sleeves can be used as a distraction technique in patients with dementia or delirium.[21]

Standard 27.6 HCPs must consider the patients cultural diversity in relation to vascular access and IV therapy.

Practice Guidelines:

A. HCPs must integrate cultural competence into vascular access and IV therapy practice to ensure patient safety, reduce disparities, and improve clinical outcomes. Culturally sensitive care goes beyond standardised procedures, adapting interventions to align with the unique values, beliefs, and practices of diverse patient populations.[22,23]

B. Translation services and interpreters must be utilised to ensure effective communication and understanding of the procedure prior to gaining informed consent; family members must not be relied upon to translate consent.[24]

C. All patients have the right to a chaperone which should be an HCP of the same sex as the patient, during intimate examinations, consultations, or treatments to provide reassurance and safeguard both the patient and the HCP undertaking the procedure.[25]

D. Chest and femoral vascular access placement must be undertaken sensitively, maintaining the patient's privacy and dignity as much as possible, a chaperone should be present during these procedures.[25]

E. Religious beliefs and individual patient choice regarding blood transfusion must be respected, and in cases of refusal by a competent adult, this right is protected by law. Local policies are required to ensure that when patients decline blood products, they receive high-quality care that includes proactive mitigation of bleeding risks before any CVAD procedure. The HCP can decide not to undertake the CVAD procedure if the risk of bleeding is high and the risk outweighs the benefit. [27,28]

F. HCPs should not administer blood or blood products without the patient's informed consent in line with local protocols. [26,27]

Standard 27.7 HCPs must consider the needs of patients in relation to gender and sexual identity.

Practice Guidance:

A. HCPs must be respectful of patients' individual preferences in relation to sexual orientation and gender, focusing on patient-centred care, utilising inclusive language.[28,29]

B. HCPs should confirm the patient's identity matches the clinical notes while consistently using the patient's preferred name and pronouns during the clinical interaction. [28,29]

C. HCPs must ensure that discussing sensitive information with the patient about gender identity and sexual orientation is undertaken privately to maintain confidentiality. [28,29]

D. Chest and femoral vascular access placement must be undertaken sensitively, maintaining the patient's privacy and dignity as much as possible; a chaperone must be present with the patient's consent.[25,28,29]

E. The chaperone must be of the patient's preferred gender.[25]

F. HCPs must be aware of any gender reassignment surgery involving breast implants to ensure these are not damaged during CVAD placement. [28,29]

Standard 27.8 HCPs must consider all safety aspects for patients who are self-accessing VAD devices and self-administering IV therapy.

Practice Guidance:

A. HCPs must ensure that any patient or carer who is self-accessing a VAD or self-administering IV therapy is cognitively and physically able to do so. [N,37,38,39]

B. HCPs must provide structured, effective education to carers and patients who are self-accessing VADs and self-administering IV therapy at home.

C. Competency must be demonstrated to prove the patient, or carer can undertake self-accessing of the VAD and self-administering of IV therapy practice safely. [N,37,38,39]
D. The carer or patient must fully consent to undertake self-accessing of the VAD and self-administering of IV therapy and must be competency assessed by a registered, IV competent HCP. [N,37,38,39]
E. HCPs must provide documentation to carers and patients, which sign posts them to support for any complications that may arise during self-administration of IV therapy. [N,37,38,39]

Standard 27.9 HCPs must consider the needs and complexities of patients with factitious disorder imposed on self in relation to vascular access and IV therapy.

Practice Guidance:

A. Factitious disorder imposed on self (FDIOS), sometimes referred to as Munchausen syndrome, can pose significant challenges in the context of vascular access. [31,32,33]
B. HCPs managing vascular access and IV therapy for patients with FDIOS face immense challenges in preventing self-inflicted harm and maintaining the patient's safety. Patients with this condition may deliberately tamper with VADs or IV sets, causing malfunctions or inducing severe infections to feign or exacerbate illnesses.[31,32,33]
C. Nursing care involved being vigilant and non-judgmental while monitoring the patient's VAD or IV infusion.[31,32,33]
D. FDIOS patients may actively seek invasive procedures, including VAD placement, to simulate or worsen medical conditions.[31,32,33]
E. HCPs working in vascular access service teams (VAST) must ensure that patients' clinical history, including multiple admissions to the emergency department or other local healthcare systems, is reviewed, updated and discussed within the multidisciplinary team prior to VAD placement. Multiple admissions and vague clinical back stories could indicate a patient with FDIOS. [31,32,33]
F. Long-term CVAD placement should be avoided in patients with FDIOS. Patients should be managed with PIVC where possible.[31,32,33]
G. Long-term CVAD use must be agreed by all members of the multidisciplinary team prior to placement.[31]
H. IV drugs with a high risk of physical dependence or misuse, such as IV cyclizine, are often requested by patients who have FDIOS, which is a contributing factor for why these patients seek a long-term CVAD. Where possible, an alternative to the IV route for medication administration must be the first consideration.[34,35]
I. A clinical psychologist should be part of the multidisciplinary team overseeing the FDIOS patient. [N]

Standard 27.10 HCPs must be aware of special consideration in obstetrics associated with IV therapy and vascular access insertion.

Practice Guidance:

A. HCPs must adapt IV therapy practices in pregnancy to account for significant maternal physiological changes and the needs of the developing foetus and follow local protocols.[36]
B. HCPs must ensure pregnant patients are aware of the potential impact, risks, and benefits of each medication used during pregnancy.[36]
C. Prenatal care health professionals must be involved in decision-making associated with IV therapy and vascular access during pregnancy. [N]
D. HCPs must consult with a prenatal care health professional before using IV conscious sedation for CVAD insertion. [N]
E. HCPs should consult their local pharmacists and prenatal care health professionals about using Lidocaine for CVAD insertion during pregnancy following local protocols. [N]
F. X-ray Imaging should only be performed when clinically essential in pregnancy, following local guidelines, where IC-ECG should be used where possible for CVAD placement catheter tip confirmation. [N]
G. Consider indication-only PIVC insertion rather than "just in case" PIVCs in pregnant patients at low risk for adverse outcomes during labour or during birth.[36]

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28. VASCULAR ACCESS TEAMS

Standard 28.1 Healthcare organisations must consider the development of a dedicated vascular access service team (VAST).

Practice Guidance:

A. A dedicated VAST can ensure timely expert-led VAD insertion and complication management in support of best practice and patient safety.[1]

B. Benefits of a VAST include:

- **Improved patient experience:** Specifically for patients with difficult IV access , specialist teams offer a positive patient experience, reducing complications from multiple insertion attempts.[1]
- **Reduced complication rates:** Expert CVAD insertion and organisational oversight of care and maintenance practice can significantly lower rates of catheter-related bloodstream infections, thrombosis, and vein inflammation.[1]
- **Increased efficiency & cost savings:** Nurse or allied health professional-led vascular access teams can be cost-effective by reducing complications, and free up doctor, surgeon and interventional radiology resources.[1]
- **Reduced waiting times:** Prompt, bedside insertion of PICCs using ECG-based tip location confirmation can speed up treatment, avoiding delays in patient care. Difficult IV access pathways can reduce delays in gaining IV access which reduces delays in IV therapy administration.[1]
- **Optimised device selection:** A VAST can ensure the right device is chosen for the patient, which can be inserted at the start of the IV-medication regime, reducing the need for repeated, more invasive procedures.[1]
- **Education and Training:** A VAST can provide organisation oversight of training to staff, promoting best practices in care and maintenance and reduce overall, long-term complications.[1]

C. The benefits of a nurse-led vascular access team are outlined in the NIVAS white paper.[1]

References:

1. NIVAS 2022 The Benefits of a Nursing Led Vascular Access Service Team: A White Paper to outline a standardised structure and approach for the NHS to deliver vascular access services in every hospital. Available at: NIVAS-White-paper-final-27.7.22-ready-for-print.pdf [Accessed:20/02/2026].

29. VASCULAR ACCESS IN RADIOLOGY

Standard 29.1 Radiology services must have protocols in place to manage difficult IV access.

Practice Guidance:

A. Patients having CT contrast administration are at high risk of infiltration/extravasation due to PIVC dislodgment, due to the high-pressure contrast injection.[1]

B. HCPs must follow the manufacturer's SmPC regarding flow rates and pressure ratings for all VADs to maintain device integrity, prevent catheter failure, and avoid tip dislodgment. Exceeding these specifications, particularly during power injections, can result in equipment malfunction and serious patient harm.[1,2]

C. The smallest bore PIVC should be used which can accommodate the required flow rate. [N,1,3]

D. Placing a PIVC in the antecubital fossa is common practice for CT contrast administration due to the required flow rate and vein diameter, but it presents significant risks for mechanical occlusion and extravasation, especially when patients are in the "arms up" position. [1,5]

E. Placing the patient in the "arms up" or final scanning position for contrast injection is essential to ensure optimal vascular flow and image quality. This practice prevents the compression of vascular structures, such as the subclavian vein, which can cause poor contrast bolus formation and beam-hardening artifacts. To ensure antecubital fossa PIVC patency, the high flow sodium chloride 0.9% flush should be administered with the patient's arms in the final scanning position. [N]

F. If a patient has a CVAD in situ, the power injection rating of the device must be confirmed before use. For PICC, this is usually printed on the lumen. For TIVAD, power injection can be confirmed by visualising the letters CT or P on the port chest X-ray image. HCPs should refer to the manufacturer's IFU for power injection confirmation. [N]

G. Where patients have a power injectable CVAD this should be used instead of placing a PIVC following a local protocol to ensure vessel health and preservation. [N]

H. TIVAD used for power injection must be accessed with a safety non-coring needle that is also power injectable, following manufacturer's IFU. [N]

I. Complications associated with VAD used for CT procedures must be reported on local incident reporting systems and, if necessary, via the MHRA yellow card reporting portal online. [N,4]

J. PIVCs being used for the administration of radiopharmaceuticals in nuclear medicine should be removed as soon as they are no longer required, typically immediately after the procedure or once the tracer injection is complete, as these devices become radioactive. They must be handled with care and disposed of following local protocols to maintain the safety of the HCP. [N]

References:

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30. SPECIALIST INFUSION GROUPS

Standard 30.1 HCPs must be aware of the risks and benefits of peripheral vasopressor administration.

Practice Standard:

A. Vasopressor drugs are classed as vesicants and should be administered via a CVAD. Administration via a PIVC can be considered only when clinically indicated to initiate treatment when CVAD insertion will delay treatment and the benefits outweigh the risk. [1,3,4,5,6]

B. HCPs must be aware of the risk of serious extravasation injury when using vasopressors through a PIVC.[1,7]

C. PIVC vasopressor is only clinically indicated for up to 24 hours as a bridging measure until CVAD placement is established.[1,8]

D. Vasopressors must never be administered via a midline catheter.[7]

E. A protocol must be in place to reduce the risk of vasopressor extravasation, including prevention, recognition and treatment pathways. Vasopressor extravasation must be treated as an emergency.[7]

F. PIVC for peripheral vasopressor administration must only be sited in the arm, below the ACF, away from joints and points of flexion to reduce the risk of phlebitis and extravasation. [N,7]

G. PIVC placed with ultrasound can increase placement success rate and reduce the risk of extravasation.[1,7]

H. The smallest bore PIVC should be used to increase blood flow over the catheter in the vessel to prevent phlebitis to the tunica intima.[1,7]

I. Prior to peripheral vasopressor administration, the PIVC should aspirate blood to confirm patency.[1]

J. Consider an IO placement for vasopressor administration in difficult IV access.[1,9,10,11]
K. Limit administration to 1 vasopressor infusion per PIVC site.[1,2]
L. The lowest concentration of vasopressor should be administered peripherally. Severe extravasation is associated with higher concentrations of peripherally administered vascopressors.[1]
M. All vasopressor infusions must be administered through an infusion pump with at least one hourly infusion site check.[1]

Standard 30.2 HCPs must be aware of the risks and benefits associated with subcutaneous infusions.

Practice Standard:

A. Subcutaneous fluid administration, also known as hypodermoclysis, involves infusing fluids under the skin to maintain hydration or administer compatible medication as an alternative to the IV route.[1]
B. Subcutaneous infusions are not suitable for fluid resuscitation. [N]
C. Common infusion sites include the abdomen, thighs or back of the arm.[1]
D. Avoid infusion rates greater than 5 mL/hour unless recommended by the manufacturer (subcutaneous immunoglobulin).[1]
E. An integrated subcutaneous infusion set or 22g to 24g cannula should be used for subcutaneous infusions.[1]
F. Metal-winged needles are not recommended for subcutaneous infusions.[1]
G. ANTT must be used for setting up and removing subcutaneous infusions.[1]
H. The infusion site should be decontaminated with 1 mL or more of chlorhexidine 2% w/v with alcohol 70% v/v for 30 seconds and allowed to dry. The infusion site and infusion sets must be covered with a sterile film dressing following the same standards used for PIVC.[1]
I. Dwell times for subcutaneous infusion sets is up to 48 hours following manufacturers guidelines.[1]

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31. INJECTABLE ANAESTHETICS AND CONSIOUS SEDATION DURING VASCULAR ACECSS PELACEMNT.

Standard 31.1 HCPs must be trained and competent in the use of Injectable local anaesthetics.

Practice Guidance:

A. Subcutaneously injected Lidocaine 1% or 2% is the most commonly used local anaesthetic for placement of VADs.[1]
B. The optimum effect of subcutaneously infiltrated lidocaine is approximately 2 minutes.[2]
C. HCPs must be aware of the side effects, toxicity, contraindications and maximum dose of Lidocaine that can safely be injected subcutaneously.[3,4]
D. Adult dose of infiltrated Lidocaine must be given according to the patient's weight and nature of procedure; max. 200 mg, max. dose 500 mg if given in solutions containing adrenaline.[5]
E. Neonate dose of infiltrated Lidocaine is up to 3 mg/kg, dose to be given according to patient's weight and nature of procedure, dose may be repeated not more often than every 4 hours, 3 mg/kg equivalent to 0.3 mL/kg of 1% solution.[6]
F. Child 1 month–11 years dose of infiltrated Lidocaine is up to 3 mg/kg, dose to be given according to patient's weight and nature of procedure, dose may be repeated not more often than every 4 hours, 3 mg/kg equivalent to 0.3 mL/kg of 1% solution.[6]
G. Child 12–17 years (max. per dose 200 mg), dose to be given according to child's weight and nature of procedure, dose may be repeated not more often than every 4 hours.[6]
A. If the patient is allergic to lidocaine, it must not be administered.[3]
B. Lidocaine is a prescription-only drug and must be prescribed or used under a local patient group directive. [N] A Patient Group Direction is a written, legal framework in the UK allowing specific registered health professionals (e.g., nurses, pharmacists) to supply or administer prescription-only medicines to pre-defined patient groups without a doctor's individual prescription. [N]
C. HCPs should infiltrate the lowest amount of lidocaine required as clinically indicated. [N]
D. Excessive lidocaine infiltration can obscure ultrasound imaging of the vessel, making needling of the vein more difficult. Massaging the infiltrated area while maintaining asepsis will disperse the

lidocaine into the subcutaneous tissue and allow better visualisation of the vessel with ultrasound. [N]

Standard 31.2 HCPs must be trained and competent if using conscious sedation for CVAD placement.

Practice Guidance:

A. Conscious sedation (also known as moderate or procedural sedation) CVAD placement can be used to minimise patient anxiety, discomfort, and pain. The aim is to make the patient sleepy and relaxed, while remaining awake, responsive to commands, and able to maintain their own airway.[6]
B. Conscious sedation must only be used if clinically indicated and justified.[6]
C. HCPs must be competent to administer sedation during VAD placement and must follow an agreed local protocol. [6]
D. A risk assessment must be undertaken prior to the CVAD procedure to evaluate if sedation is appropriate for the patient and the procedure; this must include any relevant medical history and allergies. [6]
E. Conscious sedation must be prescribed before administration. [6]
F. Sedation reversal agents and resuscitation equipment must be available in the location the sedation is being given. [6]
G. HCPs must be trained in immediate life support and the administration of reversal agents when administering conscious sedation.[6]
H. Written consent for the administration of conscious sedation must be obtained alongside consent for the CVAD procedure. [N]
I. Pre-and post-conscious sedation care instructions must be given to the patient. [N]

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NIVAS Resources Links:

Infiltration and Extravasation Toolkit – A practical Guide.
https://vascular-access.files.svdcdn.com/production/images/NIVAS-Infiltration-and-Extravasation-toolkit-version-1-Feb-2024.pdf?dm=1734434682

NIVAS Extravasation Campaign Posters
https://vascular-access.files.svdcdn.com/production/images/NIVAS-Extravasation-campaign-posters.pdf?dm=1736356027

NIVAS Extravasation Action Card 1
https://vascular-access.files.svdcdn.com/production/images/NIVAS-Extravasation-action-card-1-National.pdf?dm=1736356042

NIVAS Extravasation Card 2
https://vascular-access.files.svdcdn.com/production/images/NIVAS-Extravasation-action-card-2-National.pdf?dm=1736356055

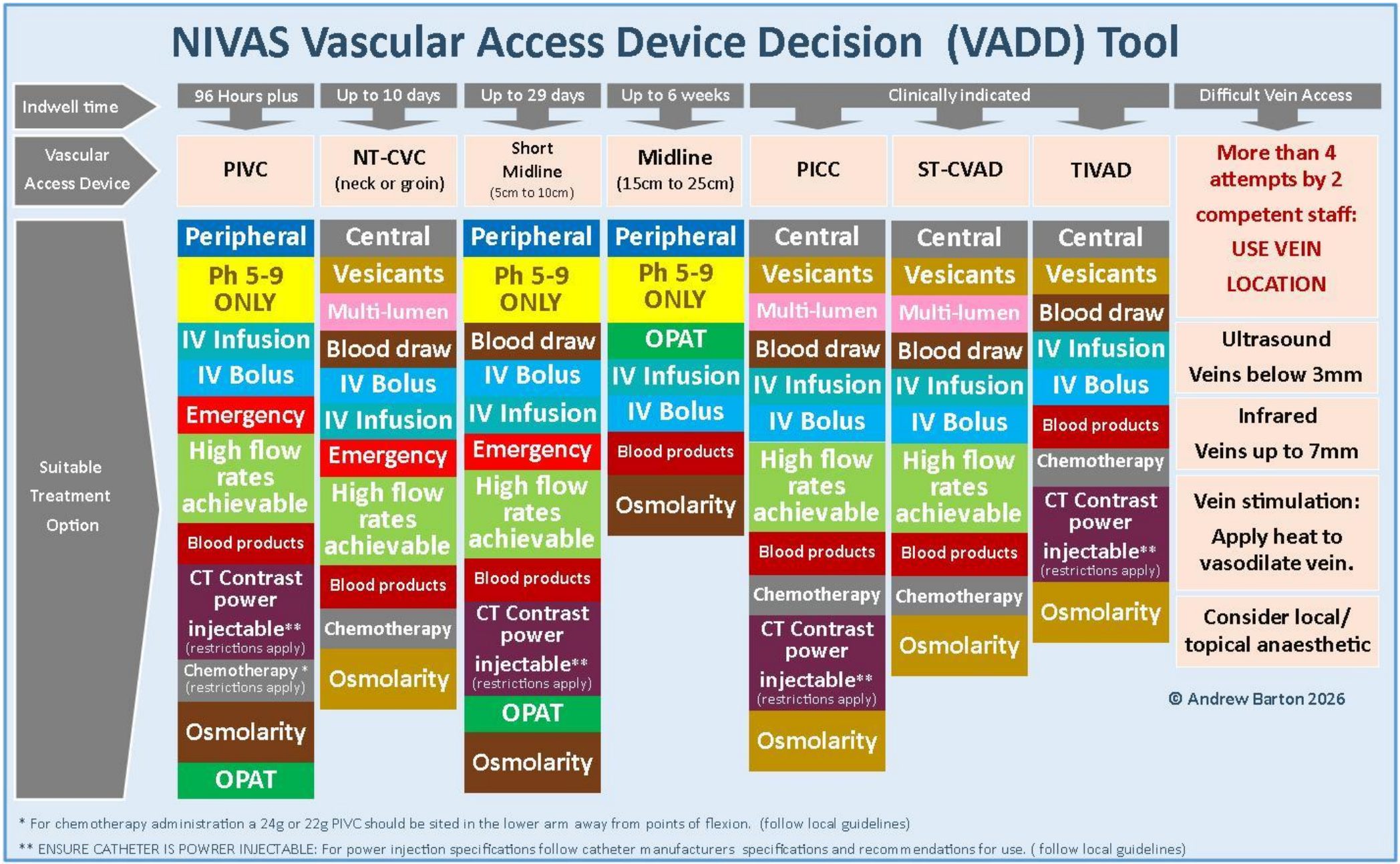
Guidance for Vascular Access Device Flushing and Locking in Paediatric Patients.
https://vascular-access.files.svdcdn.com/production/images/UPDATED-GUIDANCE-FOR-VASCULAR-ACCESS-DEVICE-FLUSHING-AND-LOCKING-IN-PAEDIATRIC-PATIENTS-003.pdf?dm=1737728458

Intravenous Administration of Medicines to adults: Guidance on "IV-line flushing." V5.
https://vascular-access.files.svdcdn.com/production/images/NIVAS-flushing-guidelines-V5-June-2023.pdf?dm=1737534964

NIVAS Practice Guidelines on Locking vascular access devices with heparinised saline.
https://vascular-access.files.svdcdn.com/production/images/NIVAS-guidance-on-Heparin-locks-V3-July2020.pdf?dm=1736356149

A White Paper to outline a standardised structure and approach for the NHS to deliver vascular access services in every hospital.
https://vascular-access.files.svdcdn.com/production/images/NIVAS-White-paper-final-27.7.22-ready-for-print.pdf?dm=1737536035

APPENDIX 1


NIVAS Vascular Access Device Decision (VADD) Tool
Indwell time
96 Hours plus
Up to 10 days
Up to 29 days
Up to 6 weeks
Clinically indicated
Difficult Vein Access
Vascular Access Device
PIVC
NT-CVC (neck or groin)
Short Midline (5cm to 10cm)
Midline (15cm to 25cm)
PICC
ST-CVAD
TIVAD
More than 4 attempts by 2 competent staff: USE VEIN LOCATION
Suitable Treatment Option
Peripheral
Ph 5-9 ONLY
IV Infusion
IV Bolus
Emergency
High flow rates achievable
Blood products
CT Contrast power injectable** (restrictions apply)
Chemotherapy * (restrictions apply)
Osmolarity
OPAT
Central
Vesicants
Multi-lumen
Blood draw
IV Bolus
IV Infusion
Emergency
High flow rates achievable
Blood products
Chemotherapy
Osmolarity
Peripheral
Ph 5-9 ONLY
Blood draw
IV Bolus
IV Infusion
Emergency
High flow rates achievable
Blood products
CT Contrast power injectable** (restrictions apply)
OPAT
Osmolarity
Peripheral
Ph 5-9 ONLY
OPAT
IV Infusion
IV Bolus
Blood products
Osmolarity
Central
Vesicants
Multi-lumen
Blood draw
IV Infusion
IV Bolus
High flow rates achievable
Blood products
Chemotherapy
CT Contrast power injectable** (restrictions apply)
Osmolarity
Central
Vesicants
Multi-lumen
Blood draw
IV Infusion
IV Bolus
High flow rates achievable
Blood products
Chemotherapy
Osmolarity
Central
Vesicants
Blood draw
IV Infusion
IV Bolus
Blood products
Chemotherapy
CT Contrast power injectable** (restrictions apply)
Osmolarity
Ultrasound
Veins below 3mm
Infrared
Veins up to 7mm
Vein stimulation:
Apply heat to vasodilate vein.
Consider local/ topical anaesthetic
© Andrew Barton 2026
* For chemotherapy administration a 24g or 22g PIVC should be sited in the lower arm away from points of flexion. (follow local guidelines)
** ENSURE CATHETER IS POWRER INJECTABLE: For power injection specifications follow catheter manufacturers specifications and recommendations for use. (follow local guidelines)

DRIPP
Device-Related Infection Prevention Practice

Scan for more information

Vascular Access Device Patient Pathway Guidance

Assessment

Assess need for device incorporating potential risk and vessel health and preservation[1,2,3]

- Select the most appropriate device with the fewest lumens needed for the prescribed treatment[1,2]
- Select smallest gauge catheter to minimise trauma[1,3]

Insertion

- Use ANTT (or other standardised aseptic technique)[1,2,3]
- Use maximal sterile barrier precautions for CVAD[1,2,3]
- Disinfect the skin with a single use application of 2% CHG* in 70% isopropyl alcohol and allow to dry[1,2,3]
- Sterile gel and sterile probe cover must be used for vascular access ultrasound procedures[1]
- Use sterile transparent semi-permeable adhesive dressing and document insertion*[1,2,3] minimise trauma[1,3]

Administration of medicines

- Use ANTT (or other standardised aseptic technique)[1,2,3]
- Decontaminate hub with 2% CHG in 70% isopropyl alcohol for 15 seconds and allow to dry[2,3]
- Designate a lumen for parenteral nutrition (PN) (lipids or non-lipids)[2]
- Change administration sets
  - 96 hours for continuous infusion[2,3]
  - 12 hours for blood or when complete or to infuse platelets[2,3]
  - At completion of each bag of PN infusion[2,3]
- Flush with single use sterile sodium chloride 0.9% (or compatible solutions) before and after administration[3]

On going maintenance

- Use ANTT (or other standardised aseptic technique)[1,2,3]
- Dressing to be changed every 7 days or sooner if compromised (e.g., loose, or wet)[1,2,3]
- Consider CHG dressing for CVAD as a strategy to reduce CRBSI[2]
- Consider securement device to prevent complications[3]
- Change needle-free connectors if the integrity of the device is compromised or according to manufacturer's guidance[3]
- Follow manufacturer's guidance/local policy for flushing lumens not in frequent use[1,3]

Daily assessment

- Inspect insertion site for signs of infection and other complications at least each shift[1,2,3]
- Assess if the device is still required, if not remove[2]
- Continue to observe the insertion site for signs of infection for 48 hours after removal[1]
- Document findings and actions[1,3]

Removal of device

- Re-site PIVC when clinically indicated and not routinely[1,2,3]
- Do not routinely remove and replace CVAD[1,2,3]
- Remove when no longer required, or not prescribed by treatment plan[1,2,3]

Healthcare practitioners (HCP) should have the skills and knowledge and be competent to carry out all vascular access procedures that they undertake[1,2,3]

Information and education should be provided for patients and carers[1,2,3]

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*N.B. for patients with CHG sensitivity, alternatives should be determined locally

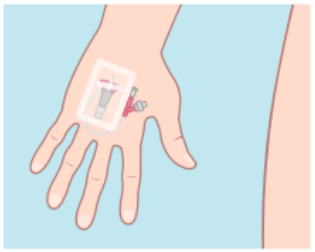
DRIPP is supported by an unrestricted educational grant from BD. BD have no input into the scientific content of the DRIPP resources (CSD2631, 2022, V2)

DRIPP is Supported by:

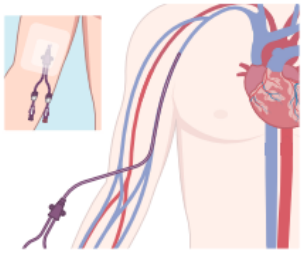
IPS Infection Prevention Society · NIVAS · ANTT · BAUN · Association for Continence Professionals · NNNG · NHS England · BD

APPENDIX 2

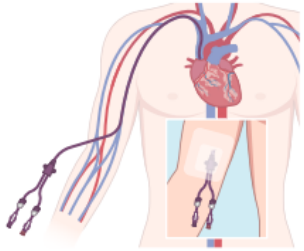
Vascular Access Device (VAD) definitions[7]



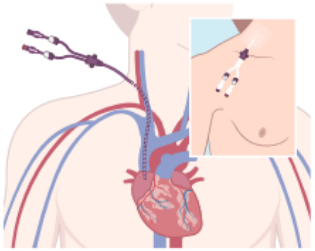
Peripheral intravenous cannula (PIVC):
A catheter which terminates in the peripheral veins. PIVCs are often inserted in the veins of upper extremities or alternative locations (with / without ultrasound guidance).



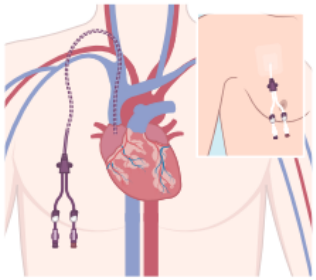
Midline catheter (ML):
A catheter intended for short to intermediate term use, inserted into a peripheral vein in the upper arm via the basilic, cephalic, or brachial vein. The catheter tip terminates in a large peripheral vein distal to the axilla, outside the thoracic cavity.



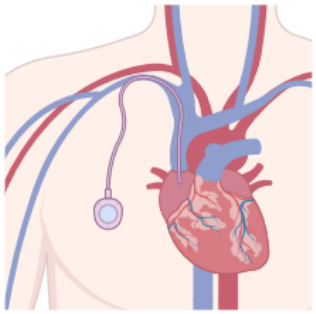
Peripherally inserted catheter (PICC):
A peripherally inserted central catheter is a device (central venous catheter) that is placed in the peripheral veins and whose tip terminates in the veins of the central circulation (e.g. cavoatrial junction).



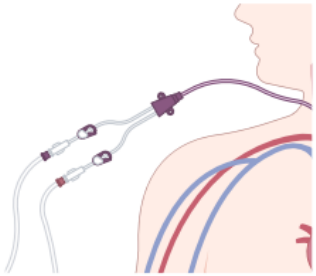
Non-tunnelled Central Venous Catheter (nt-CVC):
A nt-CVC is a device (central venous catheter) that is directly inserted in the central veins whose tip terminates in the veins of the central circulation (e.g. cavoatrial junction).



Tunnelled Central Venous Catheter (t-CVC):
A t-CVC is a device (central venous catheter) that is placed such that the skin entry site and the vein entry site are separated by a subcutaneous space (e.g., tunnel). The tip of the catheter terminates in the central veins of the circulation (e.g. cavoatrial junction). The catheter may or may not have a tissue ingrowth cuff.



Totally implanted venous access device:
A TIVAD (or Ti-CVC) is a device (central venous catheter) that has a septum / chamber / reservoir [that requires percutaneous/needle access] and is implanted in a subcutaneous tissue/pocket attached to a catheter whose tip terminates in the central veins of the circulation (e.g. cavoatrial junction), also referred to as a port or implanted port.



Haemodialysis catheter (HDC):
A HDC is a device (central venous catheter) designed to allow high flow rates to permit haemodialysis or apheresis. The catheter tip may be staggered or have a splitter tip to prevent blood mixing at the inflow and outflow portions. The catheter may be non-tunnelled or tunnelled, with or without a tissue ingrowth cuff.

DRIPP
Device-Related Infection Prevention Practice

Scan for more information

Infective Phlebitis

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Infective phlebitis **Description:** Inflammation of the intimal lining of the vein associated with a bacterial infection. *Also see Exit Site Infection*	PIVC, Midline, CVAD, PICC	• Tracking • Pain or tenderness • Erythema • Warmth • Swelling • Purulent discharge • Fever	• Poor adherence to hand hygiene and patient skin asepsis • Repalpating site after skin decontamination • Poor adherence to ANTT (or other standardised technique) during insertion, administration or site maintenance • Lack of appropriate securement and/or dressing of site • Inadequate decontamination of hubs and connectors • Haematogenous seeding from another site of infection	• Hand hygiene[1,2,12] • Decontaminate skin for 30 seconds with 2% Chlorhexidine Gluconate (CHG) in 70% alcohol (single use, sterile) and allow to air dry. • Adherence to ANTT (or other standardised technique) and not repalpating after skin decontamination • Good securement to prevent pistoning of the device allowing microbial ingress. • Scrubbing the hub for 15 seconds and allowing to air dry[1,2,10]	• Regular assessment of the site, use a standardised VIP score. • Methods used to secure the device should not interfere with the ability to routinely assess and monitor the access site • Provide education to the patient and caregivers. • Document actions and patients' response • Educate patient to observe and report any adverse reactions for 48 hours post removal of device[2].

APPENDIX 2

Mechanical Phlebitis

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Mechanical Phlebitis **Description:** A reaction associated with the placement of a VAD causing inflammation of the endothelial lining of the vein.	PIVC, Midline, PICC, non-tunnelled CVAD	• Tracking • Pain or tenderness • Erythema • Warmth • Swelling	• Trauma during insertion • Poor securement causing movement of the device. • Inappropriate site of placement (whenever possible avoid insertion over bony prominences or areas of flexion) • Catheter diameter too big for the size of the vein (see Thrombosis also)	• Correct stabilisation of the device • Appropriate site for placement of device using smallest gauge catheter for intended therapy. • Training and experienced healthcare professionals to insert VADs. • Measure catheter to vein ratio to less than 45%, where ultrasound is utilised[2,11]. • Use ultrasound for insertion of Midlines, PICCs, tunnelled and non-tunnelled CVCs and for difficult to access patients requiring PIVCs. • Use Seldinger or modified Seldinger method for insertion. Advanced Seldinger technique can also be used for midline insertion.	• If immediately post insertion, treat by stabilising the VAD, applying heat, elevating the limb and monitoring for 24 hours post insertion: if signs and symptoms persist, remove device. • VIP score should be observed at each shift change whether in use of not • Methods used to secure the device should not interfere with the ability to routinely assess and monitor the access site. • Use a standardised phlebitis score. • Provide education to the patient and caregivers to report any pain or redness at the site. • Application of a warm compress • Oral analgesia as required. • Consider alternative securement. • Remove device if clinically indicated. • Document actions and patients' response • Educate patient to observe and report any adverse reactions for 48 hours post removal

APPENDIX 2

Chemical / Infusional Phlebitis

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Chemical / Infusional Phlebitis **Description:** A reaction of the endothelial lining of the vein to the chemical composition of the infusate. *Also see Infiltration Extravasation*	PIVC Midline	• Tracking • Pain or tenderness • Erythema • Warmth • Swelling • Palpable cord	• Infusate solutions outside normal range (pH >5 or <9, Osmolarity greater than 600 mOsm/L • Inadequate haemodilution due to VAD placed in too small a vein, with lower flow rate. • Not allowing skin decontamination fluid to dry, this may then be tracked into the vein.	• Ensure therapy is suitable for peripheral administration. • Smallest gauge catheter selected for intended therapy to facilitate adequate haemodilution. • Allow skin preparation to dry.	• Regular assessment of the site, using a standardised VIP score. • Methods used to secure the device should not interfere the ability to routinely assess and monitor the access site. • Provide education to the patient and caregivers to report any pain, stinging, burning, redness or swelling at the site. • Use of a standardised phlebitis score. • Provide education to the patient and caregivers. • Remove device as per VIP score and/or when clinically indicated. • Document actions and patients' response • Educate patient to observe and report any adverse reactions for 48 hours post device removal.

APPENDIX 2

Catheter Lumen Infection

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Catheter Lumen Infection	All VADs	• Presents similar to a general infection with fevers, rigors and signs of sepsis. • There is often no outward sign of infection at the exit site. • The patient may have fevers and rigor within an hour after the catheter is flushed.	There are four recognised routes for contamination of catheters[2]. 1. Migration of organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonisation of the catheter tip. 2. Direct contamination of the catheter or catheter hub by contact with hands or contaminated fluids or devices. 3. Catheters may become haematogenously seeded from another focus of infection. 4. Rarely, infusate contamination might lead to catheter related infection.	• Hand hygiene[1,2,12] • Use of maximal barrier precautions, including sterile gloves on insertion[1,2,13] • ANTT (or other standardised aseptic technique) during dressing changes and manipulation / administration through the VAD[3]. • Thorough examination of exit site on each access for any signs of exit site infection[2] • Scrubbing the hub 15 seconds, allow to air dry[1,2,8] • Consider use of passive disinfection caps[2] • Avoid routine exchange for CVADs[2pS159]. • Consider CVAD exchange in the setting of an actual or suspected infection when there is limited vascular access[2pS159].	• If the patient is having systemic anti-cancer therapy, then neutropenic sepsis needs to be excluded as a matter of urgency (See local neutropenic sepsis policy). • Take blood cultures from each lumen of the VAD and also peripherally: **clearly label all as to their origin**. • Exclude other sources of infection: e.g., local septic screen. • Treat with parenteral antibiotics: catheter salvage as per local policy with catheter locking antimicrobial/ antiseptic solution[2]. • Dependant on the clinical condition of the patient, the VAD may need to be removed: discuss with patient's attending consultant or microbiology if required to decide on best timing for replacement[2]. • If catheter related bacteraemia is suspected (pyrexia >38^{0C}, rigors) then manage as per hospital policy for catheter related bacteraemia[2]. • Consider using the DRIPP surveillance tool available at: https://dripp.org.uk/Resources/

APPENDIX 2

Local Infection

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Local Infection e.g. at catheter skin junction, VAD exit site, along skin tunnel, or within the TIVAD pocket.	All VAD's Can also present as infective phlebitis in a midline / PIVC or non-tunnelled PICC	Symptoms include: • erythema, oedema, at exit site, at port access site, and /or tracking along skin tunnel. • Tenderness, swelling, pain. • Discharge, pus, exudate at exit site or within port pocket, • Pyrexia above 38.0˚C • Reflects symptoms associated with infective phlebitis.	• Migration of organisms at the insertion site into the cutaneous catheter tract and along the surface of the catheter with colonisation of the catheter tip. • Inadequate exit site dressing and technique. • Poor ANTT during the manipulation of the device.	• Hand hygiene[1,2,12] • Use maximal barrier precautions and Surgical-ANTT technique (or other standardised aseptic technique) on insertion and use of Standard-ANTT (or other standardised aseptic technique) during manipulation of the catheter[1,2,3,13] • Thorough examination, including palpation of exit site on each visit for any signs of exit site infection. • Decontaminate skin for 30 seconds with 2% CHG in 70% alcohol (single use, sterile) and allow to air dry, at the VAD site prior to placement and as part of routine site care [1,2,14]. • Use chlorhexidine-impregnated dressings for all short term, non-tunnelled CVADs and arterial lines for patients 18 years and older[2].	• Swab exit site for culture and sensitivity and take full set of bloods including blood cultures if systemic symptoms e.g., fever or in case of suspected sepsis. • Culture the reservoir contents of a TIVAD and the catheter tip when it is removed for suspected CABSI. It is advised that the TIVAD is not accessed if a pocket infection is suspected. • After swabs have been taken commence appropriate systemic antibiotics as per local antibiotic policy (oral or intravenous dependant on the patient's clinical situation). • Do not remove a functioning CVAD solely on suspicion of infection, when there is no other confirmatory evidence of catheter-related infection other than an elevation in core body temperature. Remove the CVAD if there is clinical deterioration or persisting or relapsing bacteraemia[2] • Observe exit site at each shift change and document findings. Increase frequency of exit site dressings as clinically indicated and document actions. • If catheter related bacteraemia is suspected (pyrexia >38OC, rigors) then manage as per hospital policy for catheter related bacteraemia

APPENDIX 2

Catheter Migration / Malposition

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Catheter migration /malposition	All CVADs	• Dacron cuff visible outside skin tunnel and/or increased external catheter length. • 'Ear gurgling' when catheter is flushed. • Arrhythmias, headache / chest / back / shoulder pain with infusion • Signs of extravasation • Ipsilateral extremity oedema	• Secondary intravascular malposition of CVADs, also known as tip migration, can occur at any time during the dwell and is related to sporadic changes in intrathoracic pressure (e.g., coughing, vomiting); original tip located high in the SVC; DVT; congestive heart failure; neck or arm movement; and positive pressure ventilation. • Forceful flushing • Inadequate securement of the device • Disconnection of securement device. • Incorrect removal of dressings.	• Adequate securement of catheter • Patient and staff education on best practice guidelines	• Never re-advance a catheter that has migrated externally. • CXR or ECG tip confirmation on CVAD placement to confirm correct tip position. Repeat CXR should migration be suspected or occur after placement. • If the CVAD tip is not in the correct position (e.g., the tip is not in the lower third of the superior vena cava (SVC) at the cavo-atrial junction (CAJ) or in the upper right atrium (RA) it should be replaced.

APPENDIX 2

Persistent Withdrawal Occlusion (PWO)

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Persistent withdrawal occlusion (PWO)	All CVADs and Midlines	The inability to aspirate blood, but still able to instil fluid	• Malposition of catheter tip due to incorrect placement or migration after placement • Catheter tip abutting the vein wall restricting aspiration. • Fibrin sheath around catheter tip. • Pinch off syndrome (if subclavian placement)	• Placement of catheter tip at cavo-atrial junction. • Correct securement to prevent migration. • Routine flushing of catheter as per manufacturers IFU with correct flushing technique (push/pause and positive pressure) when disconnecting syringe after flushing the catheter, or removing a port needle. • Ensure VAD is always flushed with 0.9% sodium chloride after any attempt to aspirate blood • PWO Can lead to complete occlusion so treat early.	• Get patient to change position/cough to alter intrathoracic pressure and alter tip position. • If subclavian insertion, ask patient to lift arm on side of catheter placement to exclude 'pinch off' syndrome. • Confirm correct tip position on chest X-ray / Fluoroscopy before use of VAD • If appropriate and following local guidance challenge affected lumen with 250mls normal saline over 15 minutes via a pump to test for patency. (this is not appropriate in neonatal and paediatric populations and caution in fluid/sodium restricted patients) • Do not use VAD for drug administration if patency cannot be confirmed • Use of thrombolytic agents to disperse fibrin sheath as per hospital policy or consider infusion if this fails[2] • Removal / replacement of the catheter may be required[2]. • Request support from vascular access service, if available • Consider discussion with IR for a lineogram.

Scan for more information

APPENDIX 2

Complete Catheter Occlusion

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Complete catheter Occlusion	All CVADs	The inability to both aspirate blood and infuse fluid.	• Possible thrombus formation within catheter lumen, the catheter can become blocked if not correctly or adequately flushed, especially after blood sampling. • Solution precipitate, the catheter can become blocked if fluids are incompatible. • The catheter is kinked. • Catheter migration: The catheter tip is in the incorrect position.	• Use proper flushing and locking procedures[2] (i.e. Push / pause positive pressure technique when disconnecting syringes) • Assess VAD patency by aspirating for blood return and flush each lumen prior to administering any solution[2]. • Effective flushing of VAD between and after drug administration, or blood sampling to prevent build-up of precipitate in catheter lumen.	• Manipulation of clamp and site to check line is not kinked or clamped. • Consider replacing needle free device and dressing in case of kinking of the catheter using ANTT or other standardised technique. • Gently attempt to flush with saline using push/pull technique, always with a 10ml syringe, NEVER use force to flush a catheter as this can result in catheter fracture and potential embolus. • Confirm correct tip position on chest X-ray. • Use of thrombolytic agent (as per hospital policy) using either 3-way tap technique or bolus to instil thrombolytic agent or to dissolve precipitate[16]. • Consider discussion with Interventional Radiology for a lineogram. • Removal / replacement of the catheter may be required. • Recognize that bacteria may adhere to thrombi in and around the CVAD, increasing the risk of potential infection.

APPENDIX 2

Compartment Syndrome

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Compartment Syndrome	PIVC, PICC, Midline	• More prevalent in PICC's placed in the antecubital fossa. • Hand/arm: Numb, tingling & cyanosed. • Occurs within 24 hours of PICC insertion.	• Fluid accumulating in the tissue can lead to nerve compression injuries. Fluid can originate from infiltrated IV solutions, hematoma, and oedema associated with the inflammatory process of phlebitis and thrombophlebitis[2]. • Structures at risk: median and ulnar nerves; radial and ulnar arteries.	• Use ultrasound for placement to prevent inadvertent puncture of artery.	• Treatment is ESSENTIAL and URGENT for surgical relief of pressure. • Use appropriate means to control bleeding at attempted and successful sites to reduce the risk of hematoma that can lead to nerve injury due to compression[2]. • Urgent decompression is required to prevent severe ischaemia. • Early referral for assessment as per hospital policy (i.e. orthopaedics/ plastics team) and continuous compartment pressure monitoring are required.

APPENDIX 2

Infiltration and Extravasation

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Infiltration and Extravasation **Definition:** **Infiltration:** inadvertent administration of non-vesicant medication or solution into the surrounding subcutaneous or subdermal tissue instead of the intended vascular pathway[4]. **Extravasation:** inadvertent administration of vesicant medication or solution into the surrounding subcutaneous or subdermal tissue instead of the intended vascular pathway[4].	All VAD's	Infiltration / Extravasation should be suspected if any of these symptoms are present: • Evidence of induration, erythema, swelling, altered sensation, tightness of the skin or leakage around a PIVC site, at exit site or along skin tunnel of CVAD at exit site or around TIVAD insertion pocket[2] • The patient complains of burning, stinging, pain or any acute change around the VAD site, entry or exit site of a CVAD, along any part of the skin tunnelled section or around the site of an implanted TIVAD[2] • Patients may be at higher risk due to sedation, altered sensation, mental status or cognition require frequent monitoring of the site[2]	• Catheter fracture in the skin tunnel • Dislodgement of PIVC or TIVAD needle • Inadequate securement or bandaging of site. • Venous thrombosis or stenosis proximal to insertion site • Fibrin sheath formation along the catheter to the exit site	• Provide education to patients, caregivers and healthcare professions. • Always use a 10ml syringe or larger - do not apply force flush if resistance felt • Assess ability to aspirate blood return and no resistance to flushing prior to use. • Correct positioning of TIVAD needle • Adequate anchorage of TIVAD needle • Confirmation of catheter patency (using 0.9% sodium chloride or other compatible fluid), before use	• Provide education to the patient and caregivers to report any pain at the site. • Early recognition and prompt management is vital. • Immediately stop the infusion and initiate appropriate interventions according to your Trust extravasation policy[2]. • **General Principles:** [2pS143] - Aspirate if possible (do not aspirate contrast media) - Do not flush VAD. - Assess site, outline the area suspected. - Avoid pressure to the site. - Elevate limb (if appropriate) . - Photograph the area. - Estimate the volume of solution infiltrated / extravasated. - Remove VAD once the appropriate intervention has been initiated and keep for investigation (if appropriate) - Do not use affected extremity for subsequent VAD insertion wherever possible. • Extravasation of a vesicant drug must be treated as a medical emergency.

APPENDIX 2

NIVAS Infiltration and Extravasation Strategy

Prevention

Safe IV therapy administration and vascular access practice is essential to preventing infiltration and extravasation occurring in the first instance. All healthcare professionals involved in the delivery of intravenous therapies and the use of vascular access devices should be aware of the preventative measures associated with infiltration and extravasation, vessel health and preservation and the principles of vascular access.

Recognition

Recognising the early stages of extravasation is vital, early diagnosis can reduce the amount of damage done to the patient's tissue.

Treatment

Early intervention and treatment to reduce or stop tissue damage. Hot or cold compress, injectable antidotes, tissue wash out and referral to plastics should be considered as part of the treatment pathway for extravasation.

Follow-up

Ensure the patient is followed up the appropriate department, either IVAS, Plastics or tissue viability and supported. Clinical photography should be used to continuously document the extravasation injury. The patient may need psychological support depending on the extent of the injury. Social support may also be necessary on discharge.

Reporting

Standardised local incident reporting of the infiltration and extravasation should be undertaken.

APPENDIX 2

Catheter fracture / Air embolus / Catheter embolus

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Catheter fracture / Air embolus / Catheter embolus	All VAD's	• Damage to the catheter may be visible, such as fluid leaking out or air bubbles in syringe if withdrawing fluid[2]. • If embolised, patient may looks unwell with obvious signs of shock[2] • Extreme shortness of breath or cyanosis, hypotension, tachycardia[2] • Be aware of catheter pinch-off and potential for fracture if catheter has been inserted via subclavian vein[2].	• Re-sheathing of PIVC stylet during insertion[2] • Damage to CVAD caused by forceful flushing. • Incorrect CVAD removal technique • Use of scissors or blades. • Non-priming of extension sets. • Using a non-power rated catheter for CT/MRI injection[2].	• Never re-sheath a stylete[2] • Avoid frequent bending or friction against the catheter (e.g., rotate location pf integrated clamp/s)[2]. • Don't pull or stretch CVAD during removal, if resistance felt on removing catheter STOP, rest, relax, heat, 0.9% sodium chloride flush and then restart slowly. • Tunnelled CVCs to be removed by experienced practitioner (cut down) • No syringes smaller than • 10ml for assessing patency. • Do not forcibly push against resistance[2]. • Limit contrast power injections to VAD and add-on devices with labelled indication for power injection[2] • No scissors!	• External fracture of a CVAD: Immediately kink / clamp line and tape securely using sterile tape or dressing[2] • Stop infusions and label 'Do Not Use' while awaiting referral for intervention[2]. • Recognise signs and symptoms of "pinch off" syndrome in patients with subclavian veins.[2pS157] • If Embolism suspected, treat as medical emergency, place patient on left side in Trendelenburg position (unless contraindicated (i.e., cranial pressure, eye surgery, cardiac and respiratory disease) and apply pressure to limb or consider applying a tourniquet above the site[2]. • Internal fracture will require referral to surgery or interventional radiology[2]. • Keep patient calm and stay with patient until help arrives. • Document as per Trust policy for patient safety incident.

APPENDIX 2

Medical Adhesive Related Skin Injury: (MARSI)

Complication	Device	Signs and Symptoms	Cause	Prevention	Action
Medical Adhesive Related Skin Injury: (MARSI)	All Devices	• Blistering • Skin Excoriation • Itching • Redness • Blanching • Stripping • Skin tears – partial or full thickness	• Skin irritation due to inadequate time interval between skin cleansing with chlorhexidine & alcohol solution and application of the Transparent Semipermeable Membrane dressing[17]. • If the alcohol solution is not allowed to completely dry it increases the risk of causing a chemical skin burn underneath the TSM dressing[2] • Sensitivity to skin preparation, TSM dressing, adhesive glue on anchorage device etc[2,17]	• Identify patients at risk and take precautions with site care 9eg malnutrition, dehydration, elderly/neonates, dermatologic conditions, low/ high humidity, radiation therapy, medications i.e., chemotherapy, anti-inflammatories, including long term corticosteroid use, anticoagulants)[17] • Correct dressing technique: allowing a minimum 30 seconds for the Chlorhexidine Gluconate 2% in 70% alcohol to air dry[1]. • Risk assessment of each individual case to determine allergy status[2]	• Educate staff/caregivers on appropriate application of skin decontamination, atraumatic application/removal of dressings and to assess VAD sites for signs and symptoms of skin injury [2pS168,17] • Rule out infiltration/extravasation, thrombophlebitis and other skin conditions (e.g. eczema, impetigo)[17] • Apply protective barrier film at all dressing change, particularly for high risk patients[2]. • Alternative non-alcoholic cleansing agent (saline to clean followed by application of Povidone iodine spray)[2] • If skin flap present, approximate viable skin flap edges prior to dressing application[17] • Consider use of sterile, medical adhesive removal product to minimise discomfort and skin damage associated with removal of dressing [2,10,17] • Alternative dressings as per hospital policy. • Discuss with tissue viability. • If an occlusive dressing is used the dressing must be changed every 24 hours[1, 5] • Consider anti-inflammatory, anti-pruritic, antihistamine and/or analgesia; cool compress (applied on top of dressing) [1,17]

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APPENDIX 3

iDECIDED®
device assessment and decision tool

I **IDENTIFY if a device is present**

D **DOES the patient need the device?**
If no longer in active use, consider device removal.

E **EFFECTIVE function?**
Is the device functioning as intended?
If not, troubleshoot as per policy or remove device.

C **COMPLICATION-FREE?**
If complications are noted, troubleshoot or remove device.

I **INFECTION prevention**
Hand hygiene before and after patient and device care.
Careful handling and disinfection of device access points.

D **DRESSING & securement**
Ensure dressings are clean, dry and intact.
Secure devices to prevent tugging or patient injury.

E **EVALUATE & EDUCATE**
Discuss device plan with patient & family. Educate as needed.

D **DOCUMENT your decision**
Continue, troubleshoot, change dressing, or remove device.

Always consider local policy,
and consult with team & patient as required.

AVATAR Alliance for Vascular Access Teaching and Research

Griffith UNIVERSITY
Queensland, Australia

[I-DECIDED assessment and decision tool]

INVASIVE DEVICE ASSESSMENT FORM

.... Hospital, Ward:

(Affix patient identification label here)
URN:
Family Name:
Given Names:
Address:
Date of Birth: Sex: M F

I-DECIDED® DEVICE ASSESSMENT & DECISION TOOL
If the invasive device is not needed, not working, or has any complications, it should be removed as soon as possible.
Always consider local policy and consult with team & patient as required.

Mark device position with an X

Device insertion details
Date: Time:
Size/Gauge: Site/Location:
Indication:
Number of insertion attempts:
Inserted by (person or department):
Comments:

Device removal:
Date:
Reason:
Removed by:

Device assessment and decision record Tick when completed	**Date**	Insertion day			Day 1			Day 2			Day 3			Day 4		
		AM	PM	ND	AM	PM	ND	AM	PM	ND	AM	PM	ND	AM	PM	ND
IDENTIFY if a device is present If an IV has been removed in past 48 hrs, observe site for post-infusion phlebitis.																
DOES patient need the device? If not used in past 24 hrs, or unlikely to be used in next 24 hrs, consider removal.																
EFFECTIVE function? Is the device functioning as intended? If not, troubleshoot as per policy or remove device.																
COMPLICATION-free? If complications are noted, troubleshoot or remove the device. (e.g. pain ≥ 2/10, redness, swelling, infiltration, hardness, palpable cord or purulence). **Phlebitis score**																
INFECTION prevention Hand hygiene before & after patient & device care. Careful handling and disinfection of device access points.																
DRESSING & securement Ensure dressings are clean, dry and intact. Secure devices to prevent tugging or patient injury.																
EVALUATE & EDUCATE Evaluate concerns. Educate as needed. Discuss device plan with patient & family.																
DOCUMENT your decision, based on this assessment																
Continue to monitor																
Dressing/securement change																
Remove device																
Initials																

DOCUMENT CONCERNS IN THE PATIENT MEDICAL RECORD.

Device Assessment form with Phlebitis score, 23 Sept 2020

[Invasive-devices-Assessment-form-with-Phlebitis-score.pdf]