Policy Compliance Procedure

HNEkidshealth Children, Young People & Families

NSW GOVERNMENT Health Hunter New England Local Health District

Central Venous Access Devices (CVADs) in Paediatrics

Sites where PCP applies	All Hunter New England Local Health District (HNELHD) facilities providing care to paediatric patients with central venous access devices in situ.
This PCP applies to:	
1. Adults	No
2. Children up to 16 years	Yes
3. Neonates – less than 29 days	Yes – if patient is outside of NICU
Target audience	Registered Nurses, Registered Midwives, Endorsed Enrolled Nurses, Medical Officers.
Description	All aspects of caring for a paediatric patient with a CVAD.

Go to Procedure

Keywords	Central Venous Access Device, CVAD, Totally Implantable Venous Access Device, TIVAD, Portacath, PORT, PICC, paediatric, CVC, Central Venous Catheter
This PCP relates to NSW Ministry of Health Policy Directive	NSW Ministry of Health (MoH) Intravascular Access Device (IVAD) Infection Prevention and Control Policy Directive (hyperlink) [PD2019_040]
PCP number	PD2019_040:PCP 5
Replaces existing document?	No

Related Legislation, Australian Standard, NSW Ministry of Health Policy Directive or Guideline, National Safety and Quality Health Service Standard (NSQHSS) and/or other, HNE Health Document, Professional Guideline, Code of Practice or Ethics:

- NSW Ministry of Health (MoH) Intravascular Access Device (IVAD) Infection Prevention and Control Policy Directive
- Aseptic Technique for Level 1 to Level 2 Procedures Conducted in Clinical Settings HNELHD Pol 18_03]
- NSW Health PD2017_013 Infection Prevention and Control Policy

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Date authorised	20 June 2021
This document contains advice on therapeutics	Yes, Approval gained from HNELHD Quality Use of Medicines Committee on 4 May 2021
Issue date	21 June 2021
Review date	21 June 2024

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PURPOSE AND RISKS

PURPOSE:

The purpose of this document is to promote the safe management of CVAD devices in paediatrics to prevent harm and minimise risks related to their use. This document reflects the NSW Ministry of Health (MoH) Intravascular Access Device (IVAD) Infection Prevention and Control Policy Directive (hyperlink) [PD2019_040] for minimum standards for the management of CVADs.

RISKS:

CVADs are considered high risk invasive devices. There are many risks involved in the management of these devices

- Central Line Associated Blood Stream Infection (CLABSI)
- Pneumothorax
- Exit site infection, tunnel infection, Port pocket infection
- Air embolism or thromboembolism
- Occlusion Superior Vena Cava Thrombosis
- Extravasation of CVAD
- Cardiac arrhythmia or decreased cardiac output
- Accidental CVAD removal
- Cardiac tamponade
- Pinch-off Syndrome
- Breaking or splitting of the external component of CVAD

These risks are minimised by*:*

1. Radiological confirmation of CVAD tip placement must be performed prior to first use
2. Performance of hand hygiene and use of Aseptic Technique (AT)
3. Ensuring a closed system to air is maintained
4. Ensuring all intravenous (IV) equipment is primed with appropriate fluid
5. Ensuring CVAD dressing is intact and secured appropriately

Risk Category*:* *Clinical Care and Patient Safety*

SCOPE:

The document outlines the minimum standards to ensure the safe use of central venous access devices (CVAD). It should be used in conjunction with the manufacturer's instructions for use.

This PCP applies to all patient care settings and patients within the Hunter New England Local Health District (HNELHD) in which such devices are inserted, managed, or removed.

This PCP contains information on the following devices:

- Tunnelled cuffed and non-cuffed central venous catheter (CVC)

- Non-tunnelled central venous catheter (CVC)
- Totally implantable venous access devices (TIVAD)
- Peripherally inserted central catheter (PICC)

This document is intended to be a usable resource to identify the minimum standard in delivering safe care and use of CVADs. Not all sections are relevant to all clinicians caring for patients with a CVAD. This document should be used in conjunction with the manufacturer's instructions relating to the individual catheter, connections, administration set dwell times, and compatibility with antiseptics, medications and other fluids. The minimum requirement is that staff involved in the clinical management of CVADs must read and acknowledge the relevant sections prior to delivering an identified aspect of care. This PCP provides step-by-step instructions on how to perform certain procedures, with links throughout the document.

Individualised plans of care may be relevant to a specific patient or clinical situation. Any deviation from this PCP must be made in consultation with the patient's Attending Medical Officer/Consultant and the reasons for practice variation must be documented in the patient's Healthcare record.

Midline (Powerwands) and renal CVADs, (Permcath/Vascath) have not been included in this document.

For information about the care of Midlines (Powerwands) please refer to:

- Nursing Management of Powerwand JHCH 20.1

For information about the care of renal CVADs, Permcath/Vascath, for dialysis, please refer to the following documents;

- Renal: Blood Collection via Haemodialysis Access HNELHD CP 18_19
- Renal: Changing Luer Access Device on Central Venous Dialysis Catheter (Permcath/Vascath) HNELHD CP 20_01
- Renal: Commencement of Haemodialysis using Central Venous Dialysis Catheters (Permcath/Vascath) with Luer Access Device HNELHD CP 20_05
- Renal: Completion of Haemodialysis – Disconnection of Central Venous Dialysis Catheter (Permcath/Vascath) with Luer Access Device HNELHD CP 20_04

GLOSSARY

Acronym or Term	Definition
AMO	Admitting Medical Officer
Asepsis	Free from pathogenic organisms.
Aseptic fields	Aseptic fields provide a controlled working space to protect key parts and key sites. Aseptic fields are increased in size and sterile drapes added on the basis of procedure complexity.
Aseptic Technique (AT)	AT protects patients during invasive clinical procedures by employing infection control measures that minimise, as far as practicably possible, the presence of microorganisms. In AT, asepsis is ensured by identifying and then protecting key parts and key sites from contamination. While the principles of aseptic AT remain constant for all procedures, the level of practice will change depending upon risk assessment. There are two different levels of AT, **standard** AT and **surgical** AT. In order to maintain an aseptic field during procedures, a dressing trolley is required. The trolley must be cleaned using Clinell® wipes. Start from the back left hand corner across and down to the front of the trolley using an S-shaped motion.
Bifurcation	Soft molded triangle on external CVC where lumens divide into two or more.
Breaking the closed system	Refers to any instance when the integrity of the CVAD and IV infusion set is compromised or the CVAD catheter hub is exposed.
Child Life Therapy	A child life therapist provides age and developmentally appropriate education, procedure preparation, distraction and support pre, during and post procedures.
Closed system	IV administration system with no mechanism for external entry after initial set-up and assembly.
Central Line Associated Blood Stream Infection (CLABSI)	Central Line Associated Blood Stream Infection (CLABSI), occurs following pathogenic colonisation of the CVAD.
Central Venous Access Device (CVAD)	**C**entral **V**enous **A**ccess **D**evice. Overall term that refers to CVC (tunnelled and non-tunnelled), PICC, and Port. CVAD is an intravascular access device whose catheter tip is situated in the superior vena cava, inferior vena cava or right atrium.
Central Venous Catheter (CVC)	**C**entral **V**enous **C**atheter. A CVC has a skin entry point in the neck, trunk, or groin and whose catheter tip is situated in the superior/inferior vena cava or right atrium. These CVCs can be classified as either tunnelled, non-tunnelled, cuffed or un-cuffed.
Hand hygiene	Perform hand hygiene with a 60 second hand-wash using 2% chlorhexidine gluconate in 70% alcohol soap. Dry hands with clean paper towels. Alternatively, using an alcohol-based hand-rub for 30 seconds (until hands are dry) will achieve proper hand antisepsis, as long as the hands are not visibly soiled or contaminated with organic materials.
Key parts	**KeyParts** are the critical parts of the procedure equipment that come into direct or indirect contact with active Key-Parts connected to the patient, any liquid infusion or Key-Site (i.e. hubs of CVADs, needless access connectors and extension sets, needle and syringe tips, tips of IV infusion sets, and dressings).
Key sites	**Key Sites** are open wounds, including insertion and puncture sites.

Needleless Access Device (NAD)	**N**eedleless **A**ccess **D**evice. Luer activated needleless access device NAD. These devices are also known as bungs. NAD will be used for the remainder of this document.
Parental Nutrition (PN)	Parenteral nutrition (PN) refers to the intravenous infusion of specialised nutrition solution. This method of feeding may be required when the gastrointestinal tract is not functional or leaking, cannot be accessed, or the patient cannot be adequately nourished by oral or enteral means.
Peripherally Inserted Central Catheter (PICC)	**P**eripherally **I**nserted **C**entral **C**atheter. A PICC has a skin entry point in the upper arm or lower leg and is advanced through to the central circulation.
Positive Pressure Locking Technique	Refers to the CVAD locking technique whereby the clinician locking the device is required to clamp the CVAD off whilst instilling the last 0.5-1ml of locking solution. This technique creates positive pressure within the CVAD lumen and prevents backflow of blood into the catheter tip and subsequent thrombus formation.
Power Injectable Port needle	Power Injectable needles allow for higher pressure and flow rate for power injections (i.e. CT contrast injection), when used in a Port which has power injection capabilities.
Pulsating Technique	Refers to the CVAD flushing technique whereby the clinician uses a pulsing (push-pause-push) action to flush the CVAD following the administration of medications, withdrawal of blood, and prior to connecting IV infusion sets. This technique creates turbulence within the CVAD lumen and is used to assist in the prevention of fibrin sheath formation and drug precipitation.
Recombinant Tissue Plasminogen Activator (rt-PA) Alteplase	Alteplase (rt-PA – recombinant tissue Plasminogen Activator) is a fibrinolytic drug used to manage thrombotic occlusions.
Septic Shower	A sudden systemic influx of pathogens that have colonised in an inserted device. The 'shower' is triggered by the infusion of fluids into the device and has the potential to cause septic shock in the patient. This is a life-threatening condition and requires urgent medical attention.
Totally Implantable Venous Access Device (TIVAD)/Port	**T**otally **I**mplantable **V**enous **A**ccess **D**evice (TIVAD). Also colloquially known as a 'Port'. The term Port will be used for the remainder of this document.
Standard aseptic technique	• Technically simple procedures • Short duration (less than 20 minutes) • Involves one or two key sites e.g. wound/s or IV cannula site • Few key parts e.g. basic dressing pack items • Uses general and/or micro critical aseptic fields to maintain AT • Generally uses non-sterile gloves with a non-touch technique.
Surgical aseptic technique	• Technically difficult procedures • Long duration • Large open wound/s • Equipment with a large number of key parts • Critical aseptic field (dressing pack) and sterile gloves are required

1. Introduction to Central Venous Access Devices

1.1 Types of CVADs

A Central Venous Access Device (CVAD) is an intravascular device designed for long-term infusion treatment. They are essential for the management of children requiring intensive treatment such as long-term parenteral nutrition (PN), multi-drug chemotherapy, and intensive support agents such as analgesics, antimicrobials and blood products.

They also minimise the discomfort of frequent venepuncture and cannulation. The main sites for CVADs are the internal jugular and subclavian veins with the desired location for the catheter tip being the junction between the right atrium and superior vena cava (SVC). The femoral vein is also commonly used in the acute and critical care setting.

1.1.1 Tunnelled Cuffed CVC

- A tunnelled CVC is inserted through one point and then “tunnelled” under the skin to a remote exit site, usually the anterior chest. The skin exit site and the vein entry site are separated by the subcutaneous tunnel.

- The catheter is usually inserted into the internal jugular or subclavian vein, with the tip located at the cavoatrial junction between the superior vena cava (SVC) and the right atrium.

- A tunnelled cuffed CVC has a Dacron cuff which stimulates the subcutaneous tissue growth/adhesion around the cuff to offer additional securement of the catheter.

- Used for patients requiring frequent or continuous long-term venous access, they are available in single, double and triple lumen options, for patients who require intensive treatment or multiple concurrent infusions.

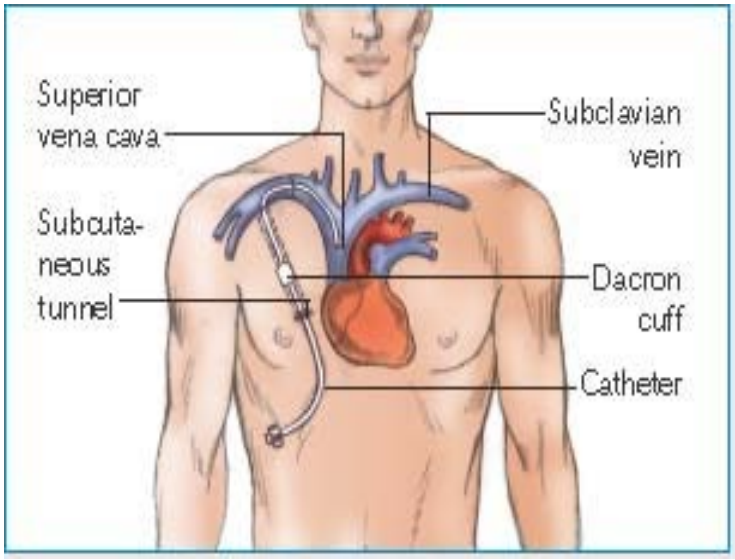
- They are inserted and removed under general anaesthetic.

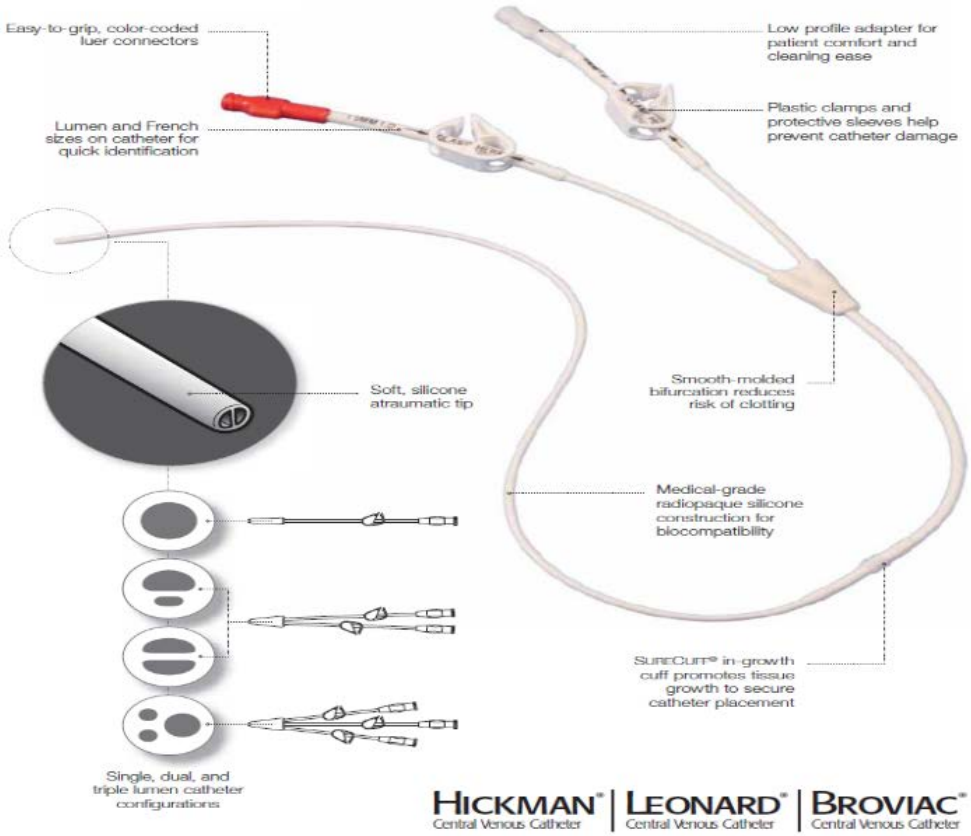
1.1.2 Tunnelled non-cuffed CVC

- A tunnelled non-cuffed CVC requires extra care during dressing changes to avoid migration or dislodgement, due to the lack of internal anchor which is provided via the cuff. External securement devices are recommended.

- A tunnelled non-cuffed CVC is usually inserted for patients requiring short to medium-term venous access. External catheter length should be measured once per shift to assess for migration.

- Usually inserted under general anaesthetic or under sedation in Paediatric Intensive Care Unit (PICU). They can be removed without surgery or anaesthesia as it has no cuff. Please refer to treating team for removal.

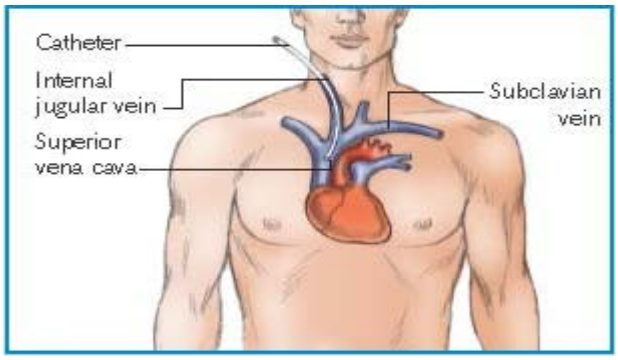


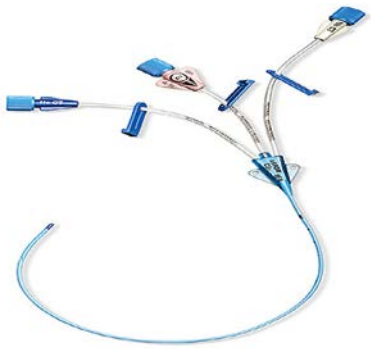


Bard Hickman® Leonard® Broviac® CVC

1.1.3 Non-tunnelled (percutaneously inserted) CVC

- These devices enter directly into the venous system. They are primarily inserted directly into the internal jugular, subclavian or femoral veins.
- They are a short term CVC, used mainly for acute/emergency access, and should ideally be kept in situ for no longer than 1-2 weeks as per manufacturer's recommendations.
- They require external securement, and usually sutured in place. Extra care is required when attending to dressing changes to avoid dislodgement or migration.
- External catheter lengths should be measured routinely to monitor for line migration. If prolonged access is required they are often swapped for a more permanent CVC i.e. TIVAD or a tunnelled CVC.

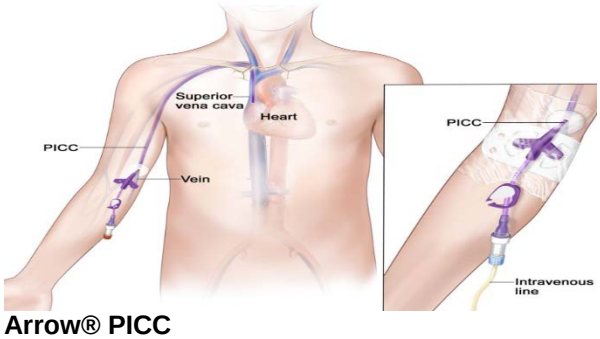


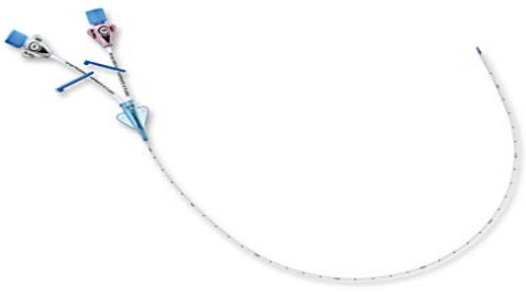


Arrow® CVC

1.1.4 PICC

- Contain a long fine bore catheter inserted into a peripheral vein (usually the brachial or basilic) in the mid upper arm or the cephalic vein in the forearm, with the internal catheter tip located at the cavoatrial junction between the superior vena cava (SVC) and the right atrium.
- PICCs are mid to long term devices, with a usual duration of 2 -12 weeks or longer. If prolonged access is required they are often swapped for a more permanent CVC.
- PICCs often have external sutures to anchor the catheter in place. However, they also require an external securement device and extra care during dressing changes to avoid migration or dislodgement.
- External catheter lengths should be measured once per shift to monitor for line migration.
- PICCs may have single or double lumen and can be valved or non-valved.
- **Valved PICCs** do not have an external clamp, due to the presence of a pressure-activate valve within the proximal hub.
- PICCs are usually inserted under ultrasound guidance either by an Anaesthetist or in PICU by an accredited Medical Officer and can be removed by an accredited staff member.

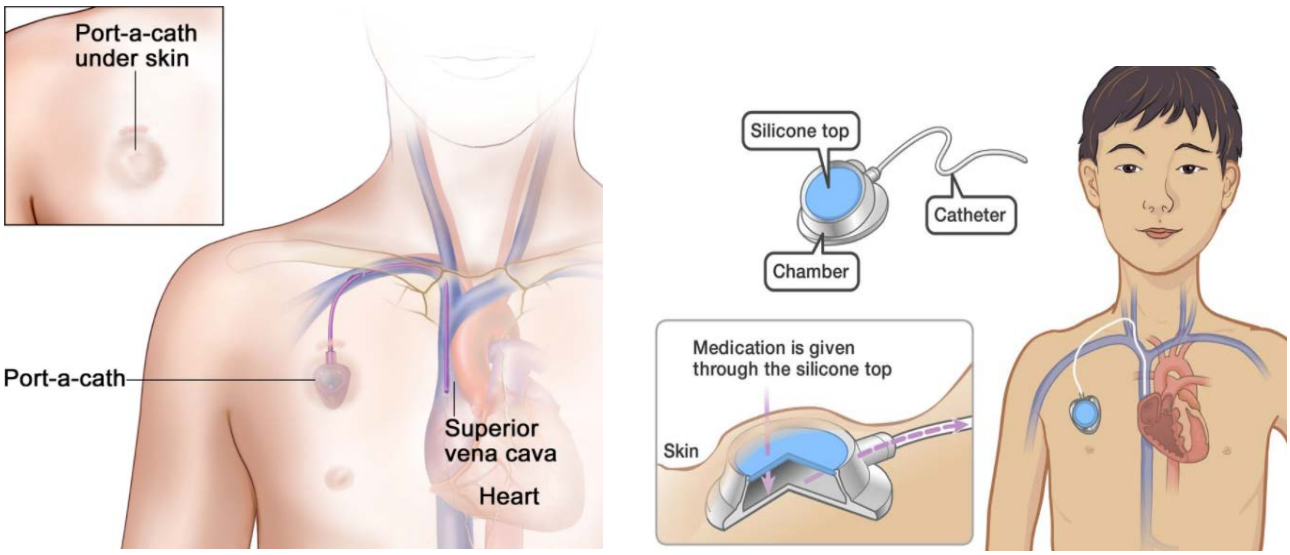




Arrow® PICC

1.1.5 TIVAD/Port

- A Port is a totally implantable vascular access device (TIVAD) which consists of a chamber and a catheter. Ports can contain either a single or dual chamber.
- The chamber is implanted in a 'pocket' which is surgically created primarily on the anterior chest wall. They can also be implanted in the abdomen, thigh and inner bicep.
- The catheter is then tunnelled subcutaneously where it is then inserted into the internal jugular or subclavian vein, with the tip located at the cavoatrial junction between the superior vena cava (SVC) and the right atrium.
- The chamber is made commonly of titanium, plastic, silicone rubber, polyurethane or a combination of these and the septum is usually filled with silicone rubber. The catheter is either radiopaque silicone rubber or polyurethane.
- Ports are a long term venous access device and can last for many years. The life of a Port is determined on the life of the septum, which is dependent on how many times the Port is accessed with a non-coring needle, and the gauge of the needle used. The larger the gauge of the needle the fewer amount of punctures the septum can take prior to wearing out.
- Inserted and removed under general anaesthetic.



Smart Port® Low-profile CT **Smart Port® Mini CT**

1.2 Insertion of CVADs

Prior to the insertion of a CVAD, care needs to be taken to ensure the most appropriate CVAD is chosen, this requires careful consideration of many factors, including:

- Therapeutic purpose – does the therapy need central venous access?
- Estimated duration of treatment
- Medical history (including cardiac anomalies, haematological disorders and/or previous history of line complications (such as thrombosis)
- Vein status (difficult peripheral IV access should be a flag for early insertion of a CVAD)
- Patient age, weight and size
- Number of lumens required. Every extra lumen is associated with an increased risk of infection. Use a CVAD with the minimum number of Ports or lumens essential for the management of the patient
- Line size. Using the smallest diameter line required decreases the rate of thrombus formation in the vein and permanent vein blockage. A vascular ultrasound may be required to assist the Proceduralist/Surgeon to, choose the most appropriate vein and size of CVAD.

1.2.1 Consent

Written consent is required for CVAD insertion as it is a clinical procedure Level 2-3 (dependant on patient location for insertion). The patient/the patient's parent/guardian should have explained to them the benefits and risks associated with CVAD insertion. Where possible, the patient/parent/carer will be shown the CVAD, if a long-term device, using a simulation dummy, and the device to be shown and explained to the patient with the help of a Child Life Therapist.

The person inserting the line should ideally be the person gaining consent for it, and ensuring the risks have been understood. The consent will need to be documented in the patients' Healthcare record.

1.2.2 Insertion Guidelines

- Paediatric CVADs can be difficult to insert, especially in a child under 4 years.
- Predictors of difficultly include: age <2 years, weight <15 kg, previous difficult lines, multiple previous lines.
- All clinicians whose scope of practice includes insertion of CVADS except for surgeons in the operating theatre must meet the requirements for credentialing as outlined in Credentialing Clinicians for CVAD Insertion. Paediatric surgeons, Anaesthetist, Intensivist, or Medical Officers who are accredited by their internal accreditation process may insert CVADs into paediatric patients.
- It is imperative that the inserting proceduralist be aware of all complications and the necessary steps prior to inserting a line.
- Every line has subtle differences in insertion technique, and the product information should be read and understood prior to use.
- If additional wires are used, the inserting proceduralist should be aware of complications specific to these extra wires and their characteristics.
- Knowledge of venous anatomy and competency with the use of ultrasound are prerequisites for most insertions.
- It is the responsibility of the manager of the inserting proceduralist to decide if the inserter has the necessary experience to insert a line. Most departments will require a trainee to be supervised for several lines prior to attempting solo insertion.
- Short term and medium term CVADs (CVCs/PICCs/ Midlines / Tunnelled non-cuffed lines) are usually inserted in the operating theatre or critical care areas.

- Long term venous CVADs (Tunnelled, Cuffed and Ports) are usually placed by surgeons but may be placed by interventional radiologists and Anaesthetists.

- The proceduralist needs to ensure that all guide wire(s) used are removed and that the number of wires used and discarded is documented.

- X-ray should be performed prior to use. A transducer or blood gas can also be used to assist in the determination of position.

- For PICC/ Tunnelled CVAD and Ports, tip position should be determined during insertion via Fluoroscopy imaging.

1.2.3 How to request CVAD insertion

- For short and medium term CVADs (CVCs/PICCs/ Tunnelled non-cuffed lines) contact the duty Anaesthetist, PICU registrar and/or Consultant.

- For long term venous CVADs (Tunnelled, Cuffed and Ports) refer initially to the paediatric surgeon on call via switch. If the patient is >16 years it is likely that an adult surgeon or an interventional radiologists or Anaesthetists may be required for line insertion.

1.2.4 Line Insertion Documentation

Minimum documentation requirements at insertion by the proceduralist/procedure assistant must be recorded using the 'Central Venous Line Insertion Record SMR090200'. This must be completed for all CVADs by the proceduralist inserting the device or their assistant and should include the below information:

- Patient education and informed written consent.

- Date and time of insertion, number of attempts, reason for insertion, local anaesthetic (if used), and the technique used, including visualisation and guidance technologies.

- Site preparation, infection prevention and safety precautions taken.

- The type, length, and gauge/size of the device including the lot number for all CVADs and implanted devices.

- Identification of the insertion site by anatomical descriptors and landmarks.

- Confirmation of the location of the catheter tip for all CVADs prior to initial use.

- Confirmation of patency and ready for use.

This must be documented in the patient's Healthcare record.

1.3 CVAD Removal

The planned removal of long term venous CVADs (Tunnelled, Cuffed and Ports) is attended by the proceduralist who inserted the device. The treating team will need to write a referral to the proceduralist requesting the removal of the CVAD, explaining why the device is no longer required.

- For unplanned emergency removal of a long term CVAD please contact the on-call Paediatric Surgeon on call.

The planned removal of short and medium term CVADs (CVCs/PICCs/ Midlines / Tunnelled non-cuffed lines) can be attended by staff accredited to do so. Please refer to the following policy compliance procedures for further information:

- HNELHD Central Venous Catheter (CVC) Removal PD2019_040:PCP 1

- HNELHD Peripherally Inserted Central Catheters (PICC) Removal PD2019_040:PCP 2

1.4 Staff education and training

Please refer to Section 2.1 in PD2019_040.

1.4.1 CVAD Accreditation Pathway Nursing

Read and acknowledge

- HNELHD Central Venous Access Devices in Paediatrics PCP
- HNELHD Aseptic Technique for level 1 to level 2 procedures conducted in clinical settings HNELHD PoI 18_03

Complete online modules

- Aseptic Technique Module (My Health Learning (MHL) course code 40027445)
- Invasive Device Protocols module (MHL course code 42364545)
- Central Venous Access Devices: The Fundamentals (MHL course code 92708229)
- Hand Hygiene (MHL course Code 42063430)
- Waste Management (MHL course code 39966595)
- Infection Prevention & Control Practices (MHL course code 46777047)

Attend CVAD workshop

- PowerPoint resource with video demonstration of:
- IV administration & NAD change
- Dressing change
- Port accessing/deaccessing
- Vidoes are available on the HNEkidsHealth website.
- Learner performs 'IV administration & NAD change' + 'Dressing change' competency assessment either simulated or performed on a patient (see Appendix 1 & 2)

Port accessing competency

- Complete Port accessing competency assessment - if deemed relevent by clinical area
- Complete the Port accessing Flow Chart (see Appendix 4) to determine if learner can be granted RPL or is required to complete PORT accessing competency assessment (see Appendix 3) on a patient or a simulation on Chester manniquin.

Modified re-accreditation at 3 years

- Read and acknowledge any NSW Health and HNELHD documents with any policy revision
- Complete online module Central Venous Access Devices: the fundamentals (MHL course code 92708229)
- Attend CVAD workshop related to policy changes (if applicable)
- Complete a minimum of one clinical competency assessment in one CVAD skill (additional assessments can be completed at the discretion of CNE/NE)

1.4.2 Recognition of prior learning

- For staff who are already credentialed according Central Venous Access Device (CVAD) Dressing HNELHD GandP 20_18 and CVAD Intravenous Administration Set Change HNELHD GandP 20_19 recognition of prior learning can be granted.

1.5 Parent/Caregiver/Patient education and homecare

- The clinician should educate the patient and/or caregiver while in hospital or hospital in the home and before discharge on:
    - The procedure and need for the device
    - Signs and symptoms of infection
    - Signs of air embolism
    - What to do if the device becomes disconnected or accidentally removed
    - Practice and principles of caring for the device
    - Infection prevention strategies for their device.

- Patients and/or caregivers in the community must be provided with appropriate material that includes who to contact for advice or in the case of an emergency.

- Patients and/or caregivers **must** present to closest hospital in the event of a fever ≥ 38°C in accordance with treating medical team and local facility guidelines.

1.5.1 Bathing, Showering, and Swimming with CVADs

CVCs, and PICCs:

There are potential risks of infection if the area underneath the CVC/PICC dressing and/or the exit site becomes wet. It is recommended not to submerge the catheter under water, therefore swimming is not advised. If a patient prefers to swim, consider inserting a Port as they can be safely submerged when not accessed.

- **Bathing and showering** is permitted however, the CVAD and IV infusion set connections MUST NOT be submerged in water or the CVAD site should not be in the direct flow of water. If dressings become wet during bathing/showering, they should be changed immediately post bathing/showering to minimise the risk of infection.

- **Swimming** is **NOT** recommended with CVC or PICC.

Refer to Section 3.3 CVC PICC – dressing changes.

Ports:

- If the Port is not accessed, patients are able to shower, bathe and swim.

- Patients are required to wait 24 hours prior to swimming after being de-accessed.

- For inpatients with an accessed Port, care must to be taken to ensure no part of the dressing or IV infusion set is submerged in water. In the accidental event of submersion, the dressing needs to be changed and the site re-assessed.

1.6 Documentation

- Refer to Section 2.3 MoH PD2019_040 for minimum documentation requirements.

- Record of insertion must be completed for each CVAD inserted AND removed using **Central Venous Line Insertion Record SMR090200** .

- CVADs must be comprehensively assessed **at least once per nursing shift** and documented on the **CVAD care plan (HNE029200)**.

- IV Administration sets must be labeled as per NSW Health Policy Directive User-applied Labelling of Injectable Medicines, Fluids and Lines PD2016_058.

2. General Management of CVADs

Goals of clinical management of CVADs are:

- Maintenance of catheter patency
- Prevention of catheter and tunnel infection
- Prevention of systemic sepsis
- Avoidance of dislodgement or displacement

General principles of CVAD care:

- All procedures related to the long-term management should be performed using Aseptic Technique (AT).
- Aim of AT is to prevent susceptible sites from being contaminated by microorganisms carried on hands, equipment and surfaces. AT is a set of practices aimed at minimising contamination during procedures
- There are two types of AT, standard and surgical:
    - Standard AT- straight forward procedure, involving one or two key parts and sites, short in duration.
    - Surgical AT- Technically complex, involving many key parts, long in duration, requires the use of sterile gloves.
- Key parts must be protected **AT ALL TIMES**. Key parts include syringe tips, catheter hub, and exposed catheter tip during bung change, connection pieces, and needles, tops of ampules, NADs and Port skin site.
- All staff caring for CVADs must adhere to 'Bare-Below-Elbows' and AT as detailed in the Principles of Aseptic Technique factsheet.

2.1 Post-operative nursing management (24 hours following insertion)

CONFIRMATION OF CVAD TIP POSITION MUST BE CONFIRMED PRIOR TO FIRST USE

- For CVCs, there are usually two surgical incisions for tunnelled cuffed and un-cuffed CVADs; at the vein entry site (usually the neck) and a second at the exit site (usually on the anterior chest).
- For Ports, there are two surgical incisions at the vein entry site (usually the neck) and a second where the Port pocket was created on the anterior chest wall.
- Registered and Enrolled Nurses must be aware of potential complications related to CVAD insertion.

Table 1. Potential Complications related to CVAD Insertion

Bleeding	Haematoma formation
Infection	Arterial Injury
Dislodgement/ Tip migration	Nerve injury
Thrombosis	Pneumothorax

- A full A-G assessment must be attended on return to the ward and attended minimum hourly for 4 hours or as indicated by the patient's clinical condition. Observations should include:

- Temperature, pulse, respiratory rate (TPR), oxygen saturation
- Blood pressure
- Surgical site check
  - **Bleeding** (swelling, ooze early after insertion)
  - **Infection** (heat, redness, swelling pain)
  - **CVC dislodgement** (exposed cuffs, increased length of catheter exposed) - call for immediate medical assistance.
- Pain assessment

NOTE: If there are any changes in the patient's condition postoperatively that breach Between the Flags (BTF) criteria, escalate patient management as per BTF: Clinical Emergency Response System (CERS) Procedure. As per the Recognition of the Deteriorating Paediatric Patient JHCH PCP 3.19. Contact the surgical team/on call anaesthetist responsible for insertion and document in the patients' Healthcare record.

- Dressings applied during insertion of a CVC should ideally be left in place for 7 days. Dressings must be changed if heavily soiled, or if the dressing is lifting.
- Should the dressing need to be changed within the 7 days period post insertion, extra caution must be taken in order to prevent dislodgement of the CVC.
- Prior to discharge, ensure that patients and/or parents/caregiver have received CVC/Port education (see Section 1.5).
- If present, exit site sutures should be removed 1 month post insertion. Exit site sutures should not remain intact for extended periods of time as this increases the risk of infection. Nursing staff can remove sutures or contact the treating team for instruction.

2.2 Daily Nursing Management

- All CVADs must be checked at least once per shift, to assess for ongoing need for CVAD and promptly removed when no longer required.
- The insertion site must be visually inspected by the clinician **at least hourly** with continuous infusion, and at least every eight hours if no infusion (see Table 1 for daily assessment reference MoH PD2019_040).

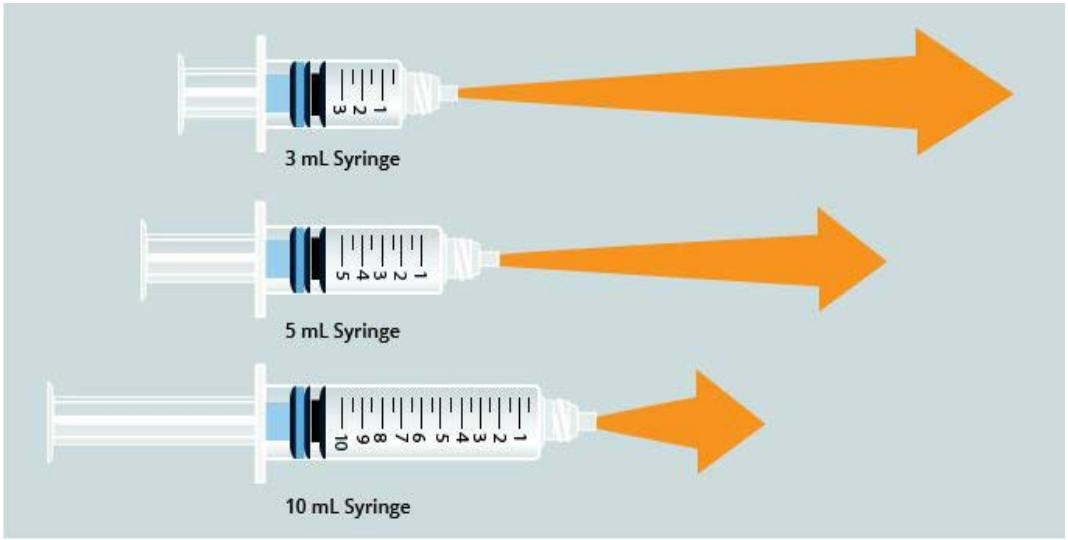
Table 2. Daily Assessment Table (table source – MoH PD2019_040)

Daily Assessment			
Phlebitis - Erythema - Tenderness - Swelling - Pain - Palpable venous cord - Purulent discharge	Systemic Infection - Rigor - Fever - Tachycardia - Hypotension - Malaise - Nausea/vomiting	Infiltration/extravasation • Insertion Site - Blanched, taut skin - Oedema - IV fluid leaking - Burning/stinging pain • Change in infusion flow	• Catheter position • Integrity of suture • Dressing integrity • Occlusion/patency • Ongoing need for line
For PICCs & Midlines, if limb swelling is suspected, compare the mid-upper limb circumference with the initial value recorded on the CVAD Insertion Record to quantify this. If a significant increase in circumference is confirmed, venous thrombosis should be considered and investigated appropriately.			

- **Document observations** in CVAD care plan **(HNE029200)** each shift. This includes:
    - IV administration set labelled as per NSW Health Policy Directive User-applied Labelling of Injectable Medicines, Fluids and Lines PD2016_058
    - Dressing intact
    - Insertion site assessed (inflammation, haematoma, excessive accumulation of blood or moisture under dressing).
    - CVAD secure and intact
    - External catheter length (cm) – for PICCs, un-cuffed tunnelled CVCs, non-tunnelled CVCs.
    - Integrity of CVAD catheter.
- Additional documentation includes:
    - CVC dressing changed
    - IV admin set/s and NAD changed
    - Non-coring needle changed
    - For **PICCs**: Arm circumference (cm) if swelling suspected.
- All procedures pertaining to IV therapy (e.g. IV administration set changes, medication preparation, medication administration) for long term CVADs should be performed:
    - In a dedicated medication room or an area as close to the patient as possible and/or practicable
    - As close to the time of connection to the CVAD or medication administration.

2.3 Minimum Syringe Size

- The use of **≥10 mL syringe barrel** is strongly recommended in order to minimise the risk of catheter rupture following intraluminal over pressurisation (where pressures reach ≥ 40 psi). If using a barrel smaller than 10 mL the AMO must be consulted
    - The larger syringe barrel (i.e. ≥ 10 mL) produces significantly lower pressure than smaller syringe barrels, which exert a higher pressure and may cause possible catheter rupture or dislodge an occlusion.



(Source NSW Health My Health Learning: Central Venous Access Devices: the fundamentals module)

2.4 Needleless Access Device (NAD)

- Any procedures pertaining to care of/removal of NADs must be performed using AT.
- All CVAD's must have a NAD connected to the CVAD hub at all times.
- Vigorously cleaning the NAD or catheter hub with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allowing to dry prior to access is a critical step in decreasing the transmission of organisms acquired from the patient's skin, respiratory and oral secretions, wounds and the clinician's hands.
- The NAD (including surface and sides) must be cleaned vigorously with **one** 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry each time the device is accessed.

Table 3. NAD change intervals

	Frequency of change
Accessed patient with continuous IV therapy	Changed with IV administration set change at 96 hours, no more frequently
Accessed patient with Lipid containing solutions and parenteral nutrition (PN)	Changed every 24 hours
Accessed patient with lipid containing medications (e.g. propofol)	Changed every 12 hours
Non-accessed patient	Changed with CVAD cares at least every 7 days

- **NADs should also be changed if:**
    - The integrity of the NAD is compromised (e.g. presence of residual blood or visibly soiled)
    - If patient presents to hospital and requires their CVC to be accessed (e.g. for CVC cares or fever).

Note:

To **minimise the risk of air embolism**, extreme care must be taken to **ensure all clamps on CVADs are engaged** when changing NADs, including during IV administration set change and general CVAD cares**.**

2.5 Intravenous (IV) Administration Sets

Note:
Disconnected IV infusion sets MUST be discarded and NOT reconnected.

IV administration set changes should be done in accordance with Intravenous Fluid Management Practice Guideline and Intravascular Access Devices (IVAD) – Infection Prevention & Control PD2019_040.

Table 7 (see page 23) in Intravascular Access Devices (IVAD) - Infection & Prevention Control PD2019_040 for provides information regarding frequency of line changes.

- Ensure all components of the administration system are compatible (including sideline syringe infusion pump or burettes and needleless injection Ports) to the devices to minimise leaks and breaks in the system.
- All connections must be Luer-lock.
- An extension piece with bleedable valve/s should be placed between the CVC hub and the IV infusion set as the portal for blood collection and administering medications whilst acting to maintain a closed system.

Note:
Once CVAD is connected to an IV administration set, it is referred to as a **closed system**.

This system remains closed for procedures that can be performed through an extension piece with bleedable valves, such as flushing, withdrawing blood and administering medications.

- A continuous system should be maintained as intermittent disconnections of administration sets increase the risk of infection. If disconnected, IV lines **must** be replaced.
- The closed system should only be broken for procedures such as changing IV infusion sets, changing NADs, disconnecting IV administration sets or locking the CVAD.
- The set up and priming of IV infusion sets should be performed in close proximity to the patient and close to time of connection to CVAD.
- When in TKVO mode, CVAD IV infusion sets should infuse through an infusion pump at a minimum volume dependent on the pump type. Minimum amount may vary according to patient age and condition as well as infusion pump device used.
- In general, minimum infusion pump rates are approximately:
    - Volumetric pumps - 10- 20 mL/hr
    - Syringe driver – 2 mL/hr

Refer to MoH Policy Directive User-applied Labelling of Injectable Medicines, Fluids and Lines PD2016_058 for labelling requirements.

Table 4. IV administration set change intervals (adapted from table 7 contained within MoH PD2019_040

Administration Set Use	Frequency of Change
Continuous use (NOT containing lipids, blood or blood products)	Do not need to be replaced more frequently than every 96 hours unless device-specific recommendations from the manufacturer indicate otherwise. Change intermittent infusion sets without a primary infusion every 24 hours or whenever their sterility is in question.
Blood and blood products	Must be changed when the transfusion is complete, or every 12 hours if the transfusion is not complete. The maximum number of blood products as per the manufacturer's recommendations has been reached. Any number of red cell units may be transfused during a 12-hour period, provided the flow rate remains adequate. Platelets must be transfused via a new blood administration set. Note: Manufacturer's recommendations defining the maximum number of units per blood administration set must not be exceeded
Lipid containing solutions and parenteral nutrition	Changed every 24 hours or as recommended by the manufacturer.
Lipid containing medications (e.g. propofol, clevidipine)	Changed at minimum every 12 hours or as per the manufacturer's instruction
Chemotherapeutic agents	Remove immediately after use, on completion of infusion episode (including the line flush). NB The chemotherapy infusion episode may include more than one agent, it is common practice to utilise the same administration set, with line flush in between in order to ensure the full dose has been administered.

Compliance with this PCP is mandatory.

Note:
IV fluid bags which contain additives, (e.g. 5% dextrose, potassium etc.) should be changed every 24 hrs. Sodium chloride bags with nil additives can remain in situ until empty, however it is recommended to change these bags every 24 hrs.

Ensure that bag spike is vigorously cleaned with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry prior to removing and spiking new IV bag.

2.6 Blood Collection from a CVAD

ALERT: There is a risk of delivering a septic shower to patients when CVADs are accessed. This is due to the colonisation of microbes within the lumens of the CVADs that are flushed into the circulation when the lumens are accessed. Signs and symptoms of septic showers include rigors, fever and hypotension.

Practice Point:
The small diameter of PICCs have an increased likelihood of clot formation. PICCs may be used for blood collection under the direction of the treating Medical team.

It is advisable to bleed only **≥ 4 Fr/18 gauge** lumen size due to the increased risk of occlusion.

- The use of CVADs for routine blood collection increases the risk of central line associated blood stream infections (CLABSI), catheter colonisation, catheter occlusion, nosocomial blood loss, and increases the potential for inaccurate laboratory results.
    - Ensure that AT is maintained at all times during blood collection.
    - Where possible, ensure that blood collection is consolidated to once per day.
    - Ensure that only the volume of blood needed for accurate testing is obtained and use low volume blood collection tubes or Microtainers. A discard of 3 mL provides sufficient volume to clear a CVAD catheter of any contaminants prior to blood collection.

Table 5. Blood Volumes Required

Patient Population	Minimum Volume Required
General blood collection	3mL
Blood Cultures	Use discard: • **Aerobic** (BD BACTEC Peds Plus/F, pink cap) 1-3 mL optimal (0.5-5 mL range). • **Anaerobic** (BD BACTEC Lytic/10 anaerobic/F, purple cap) 8-10 mL optimal (3-10 mL range).

    - If collecting bloods from multiple lumen CVADs, the largest / distal lumen should be used for withdrawing blood wherever possible.
    - CVADs must be flushed using a pulsating technique.

- It is not recommended to obtain coagulation studies from CVAD which has been locked with heparinised saline, as the results are not considered accurate. If coagulation studies are taken from a CVAD which has been locked with heparinised saline, it must be documented on the laboratory request form.

- If IV therapy is being administered:
  - Ensure alternate lumens and extension tubing is clamped during collection
  - Collection must be performed via a luer lock valve of the extension tubing. Do NOT disconnect IV tubing for the purpose of blood collection.

- For procedure, refer to section 3.1 Accessing a CVC/PICC - not in use or 3.2 Accessing a Port.

2.6.1 Blood Culture Collection

ALERT: There is a risk of delivering a septic shower to patients when CVADs are accessed. This is due to the colonisation of microbes within the lumens of the CVADs that are flushed into the circulation when the lumens are accessed. Signs and symptoms of septic showers include rigors, fever and hypotension.

- The discard should be used for blood culture collection.
- A minimum of **TWO** blood culture (BC) sets should be taken prior to the 1st antibiotic dose. If patient is hemodynamically unstable, take 1 set prior to commencement of antimicrobials. Do not delay the administration of antimicrobials in patients with severe sepsis or septic shock.
- Collect one set from the pre-existing device and one set from a peripheral site.
  - If a peripheral set is not possible, a blood culture set from each of 2 or more lumens is required.
- If volume of blood to be collected is an issue, preference should be given to **aerobic bottles**.
  - In neonates, collect an aerobic blood culture with 0.1-1 mL.

Table 6. Pre-antibiotic blood cultures

CVC/Port with 1 lumen	2 BC sets taken by separate draws
CVC/Port with ≥ 2 lumens	1 BC set from each lumen
≥ 2 CVADs (i.e. Port + Hickman)	1 BC set from each lumen of both CVADs

Practice Point: Taurolodine (Taurolock®) should be discarded when accessing a CVAD and should **NOT** be used for blood culturing. If a blood culture is taken from a CVAD locked with Taurolock®, discard the lock (3 mL) and THEN withdraw the blood culture sample.

2.7 Flushing a CVAD

CVAD maintenance involves flushing with 0.9% sodium chloride to maintain patency of the CVAD. The techniques to employ when performing a flush is a **pulsating action.**

- **A pulsating action** is utilising a rapid start or push pause action when injecting the flush. It clears the line of blood or drugs that may be adhered to the internal surface of the catheter. The turbulent flow will remove any blood from the catheter wall which in turn reduces infection risk. It also assists with the prevention of fibrin sheath formation, internal lumen thrombosis and the possibility of drug precipitation.

- Minimum volume recommended to be used for a flush is 5-10 mL of 0.9% sodium chloride. This may differ depending on the patient's age and or care requirements and should be discussed with the treating team if required.

- Flushing of the catheter should be performed: after placement, pre and post each infusion or injection and after drawing blood.

Table 7. Flushing volumes

FLUSHING PROCEDURE	VOLUME
Intermittent medication e.g. drug push	3 mL
After blood sampling	5-10 mL
Syringe driver with minimum volume extension tubing	3 mL
Standard infusion set	20 mL

2.8 Locking a CVAD

Locks maintain and promote CVAD lumen patency. Flush volumes and lock type depend on the type of CVAD being utilised and treating team preference. The following table is to be utilised prior to preparation of solution**.**

- The most important part of locking a CVAD is the technique utilised.

- **Positive Pressure Lock Technique** maintains positive pressure inside the catheter and discourages the backflow of blood within the catheter. Pooling of blood is additionally discouraged-decreasing the risk of thrombotic occlusion.

- **Positive Pressure Lock technique** involves clamping the catheter whilst instilling the flush, so that 1 mL of solution remains in the syringe immediately after the pressure has been released on the syringe.

- If using a valved PICC that does not contain an external clamp, flush using a pulsating technique.

- All locks must be ordered appropriately as a medication order.

- A NAD is to be utilised when locking a CVAD. No cap is to be used.

2.8.1 Lock Solutions

- 0.9% sodium chloride is considered appropriate for locking any CVAD. In patients with long-term CVADs or situations where the CVAD will be locked for greater than 24hrs, alternative lock solutions may be considered.

- Taurolock (taurolidine-citrate) is an antimicrobial and anticoagulant lock solution that has been shown to exhibit antibacterial and antifungal properties. Taurolock has shown to minimise potential Catheter Related Blood Stream Infections (CLABSI) in some paediatric populations.

- Heparinised Saline is used as an anticoagulant lock solution in reducing the risk of thrombotic occlusion.

Table 8. Lock Solutions, frequency and volumes

Type	Minimum Recommended Lock Frequency	Volume of lock solution	0.9% sodium chloride^ ***(less than 24 hrs)***	Taurolock* Taurolidine 1.35% + 4% citrate ***(greater than 24 hrs)***	Heparinised saline# 10 units/mL ***(greater than 24 hrs)***
Non-tunnelled percutaneous CVC	CVC not in use up to 7 days	1 mL per lumen	√	X	√
Tunnelled uncuffed CVC PICC	CVC not in use up to 7 days	1 mL per lumen	√	√	√
Tunnelled cuffed CVC	CVC not in use up to 7 days	2 mL per lumen	√	√	√
Port/TIVAD	Port not in use up to 1 month	3 mL	√	√	√

^ 0.9% sodium chloride is considered appropriate for locking any CVAD. In patients with long-term CVADs or situations where the CVAD will be locked for greater than 24hrs, alternative lock solutions may be considered.

*****Taurolock© (taurolidine-citrate) is an antimicrobial and anticoagulant lock solution that has been shown to exhibit antibacterial and antifungal properties. Taurolock© has shown to minimise potential Catheter Related Blood Stream Infections (CRBSI) in some paediatric populations.

#Heparinised Saline is used as an anticoagulant lock solution in reducing the risk of thrombotic occlusion.

Note:
Regardless of the lock solution used, the most important part of locking a CVAD is the technique. Always use a **Pulsatile flush** and **Positive Pressure Lock technique.**

3. Clinical Procedures for CVADs

CLINICAL PROCEDURE SAFETY LEVEL

Every clinician involved in the procedure is responsible for ensuring the processes for clinical procedure safety are followed. The following level applies to this procedure (click on the link for more information):
Level 2 procedure

Staff Preparation

It is mandatory for staff to follow relevant: “five moments of hand hygiene”, infection control, moving safely/safe manual handling, documentation practices and to use HAIDET for patient/carer communication: (Hand hygiene, Acknowledge, Introduce, Duration, Explanation, Thank you or closing comment).

Patient Preparation

Pre-procedure (including Team Time Out)

STOP and confirm the following before commencing the procedure:

- Proceduralist/assisting proceduralist/s introductions, where appropriate
- Patient identification using three core patient identifiers (Name – family and given names, date of birth and Healthcare record Number - MRN)
- Procedure verification - procedure + site/side/level, where appropriate, matches consent
- Patient position
- Essential imaging reviewed
- Allergy/adverse reaction check
- Special medication/s administered
- Antibiotics
- Anticipated critical events
- If required, ensure Child Life Therapy are contacted prior to procedure.

Verbal consent is required for this procedure.

Post -procedure

- Document procedure in patient’s Healthcare record
- Provide advice for clinical handover to staff caring for patient
- Equipment problems/issues
- Specimens/images labelled correctly
- Arrange post procedure tests where clinically relevant

3.1 Accessing a CVC, PICC - not in use

ALERT: There is a risk of delivering a septic shower to patients when CVADs are accessed. This is due to the colonisation of microbes within the lumens of the CVADs that are flushed into the circulation when the lumens are accessed. Signs and symptoms of septic showers include rigors, fever and hypotension.

PROCEDURE: Accessing a CVC, PICC – not in use

Equipment Requirements

- Gather equipment as per Standard AT and appropriate PPE
- 2 x pre filled 0.9% sodium chloride 10 mL syringes (2 per lumen 1x for flushing line 1x for priming NAD and extension pieces). Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10 mL syringe
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs
- 1 x needleless access device (NAD) per lumen
- Extension set primed with compatible fluids, all valves must be primed individually
- 1 x 10 mL luer lock syringe (used for discard) per lumen
- Prescribed IV fluids and IV infusion set and extension set primed as per AT and IV pole

Additional Equipment Requirements for Blood Culture Collection

- 3 x 10 mL luer lock syringes
- 1 x 0.9% sodium chloride ampoule
- 2 x 2% chlorhexidine gluconate in 70% alcohol swabs
- 1 x blunt fill needles for drawing up 0.9% sodium chloride
- 4 x vacutainer blood culture holder
- 4 x 70% alcohol swabs
- 2 x anaerobic and 2 x aerobic blood culture bottles

Procedure Steps

1. Set up as per standard AT
2. Prime NAD with 0.9% sodium chloride and attach empty 10 mL leur lock syringe to NAD
3. Perform hand hygiene and don gloves and appropriate PPE
4. Vigorously clean the entire NAD in situ and hub of CVC/PCC with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.
5. Ensure CVC/PICC clamp is engaged (if possible). Remove old NAD and discard.
6. While holding the CVC/PICC in a downward position take new 2% chlorhexidine gluconate in 70% alcohol swab and scrub the hub vigorously for 20 seconds. Do not place the end of the 2% chlorhexidine gluconate in 70% alcohol swab into the open hub. Allow to dry.
7. Attach primed NAD with empty syringe attached.
8. Disengage clamp, withdraw 3 mL of blood for discard. Engage clamp and remove syringe. If blood cultures are required, do not discard. If blood cultures are required:
    a. Withdraw 8-10 mL of blood. Engage clamp. Remove syringe containing discard volume. This will inoculate the first blood culture set.
    b. Vigorously clean NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry.

c. Attach 10 mL luer lock syringe with 0.9% sodium chloride, disengage clamp, and flush using a pulsating technique. Engage clamp.

d. Attach 10 mL luer lock syringe, disengage clamp, and withdraw a further 8-10 mL. Engage clamp. Remove syringe. This will inoculate the second blood culture set.

e. Vigorously clean NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry.

f. Attach 10 mL luer lock syringe with 0.9% sodium chloride, disengage clamp, and flush using a pulsating technique. Engage clamp. Remove syringe.

g. Remove dust covers from blood culture bottles.

h. Clean rubber top of blood culture bottle using 70% alcohol swabs and allow to dry.

i. Attach 1 x vacutainer to each blood culture bottle.

a. Attach syringe containing blood sample to vacutainer and inoculate with appropriate volume for either aerobic or anaerobic blood culture bottle.

j. Ensure blood culture bottles are labelled as a set with 'first' or 'second' draw and specify device (i.e. CVC/PICC).

Note:

For CVC/PICCs with multiple lumens, **only 1 x anaerobic and 1 x aerobic blood culture bottle is required per lumen**.

Ensure blood culture bottles are labelled as a set and specify CVC/PICC lumen (e.g. red lumen and white lumen)

Practice Point:
It is recommended that line lock is aspirated and discarded.

There may be circumstances where the line lock is unable to be withdrawn. If resistance is encountered, reposition the patient, ask them to cough, take a deep breath or raise their arms above their head.

If clinician is unable to withdraw lock, consider attempting to flush no more than 5 mL of 0.9% sodium chloride then re-attempt aspiration. In this situation, observe patient closely for signs and symptoms of septic shower.

9. If bloods are required, attach second 10 mL luer lock syringe to the end of the NAD, and withdraw required amount of blood. Clamp CVC/PICC and remove syringe.

10. Vigorously clean NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

11. Attach 10 mL 0.9% sodium chloride syringe and flush using a pulsating technique. Clamp CVC/PICC and remove syringe from NAD.

12. Attach primed IV administration set if required. Unclamp CVC/PICC and commence IV fluids as prescribed.

13. Complete process for multiple lumens if required.

14. Remove gloves and perform hand hygiene.

15. Discard waste appropriately.

16. Document in patient's Healthcare record as per minimum documentation requirements in Section 1.6 in CVAD Guideline.

3.2 Accessing a Port

ALERT: There is a risk of delivering a septic shower to patients when CVADs are accessed. This is due to the colonisation of microbes within the lumens of the CVADs that are flushed into the circulation when the lumens are accessed. Signs and symptoms of septic showers include rigors, fever and hypotension.

Prior to collecting equipment and commencing procedure, palpate the Port to locate the position if possible. This is patient dependant and may not be possible if child is particularly anxious with accessing. Ensure Child Life Therapy involvement if required.

PROCEDURE: Accessing a Port

Equipment Requirements

- Gather equipment as per Surgical AT and appropriate PPE
- 2 x 10 mL luer lock syringes
- 1 x 10 mL 0.9% sodium chloride ampoule
- 2 x 2% chlorhexidine gluconate in 70% alcohol swab sticks. If child is < 2 months use 0.5% chlorhexidine gluconate in 70% alcohol swab sticks
- 2 x 2% chlorhexidine gluconate in 70% alcohol swabs
- 1 x blunt fill needles for drawing up 0.9% sodium chloride
- 2 x needleless access device (NAD)
- Non-coring needle with extension set/power injectable needle required for contrast CT
- Transparent semi-permeable dressing
- Primed IV infusion set (use AT to prime the IV infusion set prior to commencing this procedure) if required

Additional Equipment Requirements for Blood Culture Collection

- 3 x 10 mL luer lock syringes
- 1 x 0.9% sodium chloride ampoule
- 2 x 2% chlorhexidine gluconate in 70% alcohol swabs
- 1 x blunt fill needles for drawing up 0.9% sodium chloride
- 4 x vacutainer blood culture holder
- 4 x 70% alcohol swabs
- 2 x anaerobic and 2 x aerobic blood culture bottles

Procedure Steps

2. Set up as per surgical AT – direct palpation on key site palpate the Port site to determine Port location, size and depth.

3. Perform hand hygiene apply appropriate PPE, and then don sterile gloves.

4. Attach a NAD to the Port needle access point/s and prime with syringe containing 0.9% sodium chloride, engage clamp and remove syringe. Attach empty 10 mL luer lock syringe to distal NAD of the Port extension set in preparation for aspirating lock solution.

5. With >0.5- 2% chlorhexidine in 70% alcohol swab stick clean around the Port site using a scrubbing motion (repeated back-and-forth and side-to-side motion) with friction for 30 seconds. Ensure whole area to be covered with dressing is cleaned. If site is overly soiled, use second swab stick and repeat. Discard stick. Allow to dry.

Practice Point: DO NOT wipe dry with gauze or fan dry. Antimicrobial action occurs during drying process of cleaning solution.

6. Identify the Port chamber under the skin by palpation and stabilise Port chamber with thumb and index finger using non-dominant hand.

7. Insert primed non-coring needle at 90 degree angle into the center of the Port chamber membrane, avoiding any old access sites or scar tissue. Correct needle placement will be indicated by the clinician feeling the non-coring needle pass through the silicone dome of the Port and the tip of the needle making contact with the back of the Port chamber.

8. Unclamp lumen, withdraw 3 mL of blood for discard. Clamp CVC/PICC and remove syringe. If blood cultures are required, do not discard. If blood cultures are required:

a. Withdraw 8-10 mL of blood. Engage clamp. Remove syringe containing discard volume. This will inoculate the first blood culture set.

b. Vigorously clean NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry.

c. Attach 10 mL luer lock syringe with 0.9% sodium chloride, disengage clamp and flush using a pulsating technique. Engage clamp.

d. Attach 10mL luer lock syringe, disengage clamp and withdraw a further 8-10 mL. Remove syringe. This will inoculate the second blood culture set.

e. Vigorously clean NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry.

f. Attach 10 mL luer lock syringe with 0.9% sodium chloride, disengage clamp, and flush using a pulsating technique.

g. Remove dust covers from blood culture bottles.

h. Clean rubber top of blood culture bottle using 70% alcohol swabs and allow to dry.

i. Attach 1 x vacutainer to each blood culture bottle.

j. Attach syringe to containing blood sample vacutainer and inoculate with appropriate volume for either aerobic or anaerobic blood culture bottle.

k. Ensure blood culture bottles are labelled as a set with ‘first’ or ‘second’ draw and specify device (i.e. CVC/PICC).

Practice Point:
It is recommended that line lock is aspirated and discarded.

There may be circumstances where the line lock is unable to be withdrawn. If resistance is encountered, reposition the patient, ask them to cough, take a deep breath or raise their arms above their head.

If clinician is confident with needle placement, consider attempting to flush no more than 5mL of 0.9% sodium chloride then re-attempt aspiration. In this situation, observe patient closely for signs and symptoms of septic shower.

If unsuccessful, abandon procedure and refer to patient treating team for further management.

9. If bloods are required, attach second 10 mL luer lock syringe to end of NAD, disengage clamp and withdraw appropriate amount of blood required for sampling. Engage clamp and remove syringe.

10. Vigorously clean NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allow to dry.

11. Attach 10 mL luer lock syringe with 0.9% sodium chloride, disengage clamp and flush using a pulsating technique. Engage clamp and remove syringe.

12. Apply sterile semi-permeable transparent dressing over Port site, ensuring that edges are sealed.

13. Attach primed IV administration set to the Port extension set if required.

14. Remove gloves and perform hand hygiene.

15. Commence IV fluids if required.

16. Discard waste appropriately.

17. Document in patient's Healthcare record as per Section 1.6.

3.3 CVC, PICC dressing change

Practice Points:

- All dressings must be replaced if they become damp, loosened, no longer adherent, soiled, there is evidence of inflammation and/or there is an accumulation of fluid.
- Use a sterile, transparent semi-permeable dressing to protect the insertion site from contamination. Allow continuous observation of the site and to stabilise and secure the device.
- Dressing must be placed so the insertion site is visible for regular inspection, therefore do not place non-sterile or opaque tape directly over the insertion site.
- When the patient is diaphoretic or has excessive bleeding or oozing from the site, use sterile gauze secured with a sterile transparent, semi-permeable dressing until this is resolved.
- The exit site should be cleaned with >0.5- 2% chlorhexidine gluconate in 70% alcohol swab stick.
- Consider the use of a barrier film in the prevention of Medical Adhesive-Related Skin Injury (MARSI).
- The external portion including the bifurcation of the tunnelled cuffed CVC should contain a loop or 'S' shape, underneath the transparent dressing to assist in preventing the catheter from being accidentally pulled out.
- If adhesive removal wipes are used they should be removed from the skin with 0.9% sodium chloride and site dried prior to skin cleansing to ensure all product is removed from the skin. If left under dressing this can cause skin irritation.
- Ensure Child Life Therapy involvement if required.

Note: Chlorhexidine should not come into contact with 0.9% sodium chloride, as precipitation will occur, leading to the deactivation of the chlorhexidine. If using 0.9% sodium chloride to clean the skin, ensure it is dry prior to applying the chlorhexidine.

Table 9. Dressing Change Intervals (adapted from Table 6 contained within MoH PD2019_040)

Dressing Type	Replacement Intervals
Transparent, semi-permeable, self-adhesive polyurethane	Every **7 days** or sooner if the dressing is no longer in-tact, evidence of inflammation is present or dressing become moist.
Dry dressing (gauze)	Every 24-48 hours or whenever loose, soiled or moist.

PROCEDURE: CVC, PICC dressing change

Equipment Requirements

- Gather equipment as per AT risk assessment – standard or surgical and appropriate PPE
- 2 x 2% chlorhexidine gluconate in 70% alcohol swab sticks. If child is < 2 months use 0.5% chlorhexidine gluconate in 70% alcohol swab sticks. For neonates < 29 days 0.5% chlorhexidine alcohol free swab sticks should be used.
- 2 x 2% chlorhexidine gluconate in 70% alcohol swabs
- Sterile, semi-permeable transparent dressing
- 1 x barrier film (e.g. Cavilon™ wipe) (optional)
- Dressing removal products (optional)
- Securement device (if required)
- Paper tape measure.

Procedure Steps

1. Set up as per AT risk assessment –standard or surgical

2. Perform hand hygiene and don gloves and appropriate PPE

Practice Point: Assess CVC/PICC for catheter migration.

- Measure the external portion of the CVAD from exit site at the skin to the last visible marking on the catheter and check against insertion documentation. Document in the CVAD Care Plan (HNE029200) and notify treating team if there is any variation from original measurement.
- If the cuff of the tunnelled CVC is visible externally, this is an indication of catheter migration. Inform treating team immediately.

3. Remove old dressing without touching the insertion site and discard. Remove dressing starting distally and carefully work towards the insertion site to reduce the risk of accidental dislodgement of the catheter (removal products may assist at this point). If dressing removal products are used, clean from the skin with 0.9% sodium chloride-soaked gauze then dry with dry gauze to ensure no product residue remains on skin.

4. Assess exit site for signs of infection (redness, swelling, exudate, tenderness). If any sign of infection, perform bacterial swab for investigation and inform treating team for review. If present, ensure sutures are intact and free from infection.

5. If site is heavily soiled (e.g. with blood or exudate), clean with 0.9% sodium chloride and sterile gauze using concentric circle technique (i.e. clean to dirty). Ensure that skin is completely dry prior to skin preparation with chlorhexidine, as chlorhexidine can be deactivated by 0.9% sodium chloride.

6. Remove securement device if positioned underneath the dressing, overly soiled or no longer secure.

7. Remove dirty gloves, perform hand hygiene and don clean gloves.

8. Hold CVAD at distal end and clean site, using a 0.5-2% chlorhexidine in 0-70% alcohol swab stick clean around the exit site in a side to side, top to bottom cross-hatching motion. Ensure that the whole area that is to be covered with dressing is cleaned using this motion. If the site is overly soiled, repeat using a second swab stick. Discard stick.

Practice Point: DO NOT wipe dry with gauze or fan dry. Antimicrobial action occurs during drying process of cleaning solution.

9. Continue to hold CVAD with the other hand, using a 2% chlorhexidine in 70% alcohol swab, clean along the catheter starting from the exit site moving towards the hub. Allow to dry.

Practice Point: Caution is required when cleaning the lumen. Ensure CVAD is not pulled creating pain or discomfort to patient and the potential movement of the catheter tip.

A barrier film may be applied (e.g. Cavilon) where able to protect skin from adhesion. If using, avoid the exit site by 1 cm and allow to dry.

10. Loop the external catheter around the exit site if CVAD is a tunnelled cuffed CVC (Hickman or Broviac).

11. If required, apply securement device to CVAD prior to securing to skin to minimise need to reposition once in place.

12. Apply dressing, keeping the exit site in the center of the dressing and ensuring the CVAD, and securement device, is covered.

13. Remove gloves and perform hand hygiene.

14. Discard waste appropriately.

15. Document in patient's Healthcare record as per minimum documentation requirements in Section 1.6.

3.4 De-accessing a PORT

PROCEDURE: De-accessing a PORT

Equipment Requirements

- Gather equipment as per Standard AT and appropriate PPE
- Adhesive remover wipes
- 2 x 10 mL luer lock syringes
- 2 x blunt fill needles
- 1 x 10 mL 0.9% sodium chloride ampoule
- Locking solution
- 2 x 2% chlorhexidine gluconate in 70% alcohol swabs
- Sterile IV pressure dot/band aid.

Procedure Steps

1. Set up as per standard AT.

2. Draw up 0.9% sodium chloride and lock solution using AT.

3. Perform hand hygiene and don gloves and appropriate PPE.

4. Using a 2% chlorhexidine gluconate in 70% alcohol swab, clamp remove IV line if present, remove and discard.

5. Using a new 2% chlorhexidine gluconate in 70% alcohol swab, vigorously clean the NAD for 20 seconds and allow to dry.

6. Attach 0.9% sodium chloride syringe to NAD. Flush Port using a pulsating technique. Remove syringe from NAD.

7. Attach lock solution syringe to NAD, instill lock solution using positive pressure lock technique whilst clamping Port needle extension during instillation of the last 0.5mL of lock solution.

Practice Point:
Positive pressure instillation of lock solution is achieved by continuous flushing of solution while clamping extension line during instillation of last 0.5 mL.

If assistance is required e.g. with difficult patient, consider gaining assistance from second nurse with de-accessing.

The use of a pulsating technique will not create a positive pressure lock.

8. Remove Port dressing.
9. Remove Port needle. If using a Gripper ™ safety needle, hold base of needle with dominant hand and pull back on needle lever with non-dominant hand until safety mechanism clicks into place.
10. If bleeding occurs, apply pressure to site with sterile gauze until resolved. Apply IV pressure dot/band-aid™.
11. Remove gloves and perform hand hygiene.
12. Discard waste appropriately.
13. Document in patient's Healthcare record as per Section 1.6.

3.5 Intravenous (IV) Administration Set with NAD Change

PROCEDURE: Intravenous (IV) Administration set with NAD Change

Equipment Requirements

- Gather equipment as per Standard AT and appropriate PPE
- 1 x Pre filled 0.9% sodium chloride 10 mL. Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10 mL syringe
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs.
- Prescribed IV fluids
- 1 x burette per lumen
- 1 x IV giving set per lumen
- 1 x single or triple valve extension piece with bleedable valve per lumen
- 1 x Needleless access device (NAD) per lumen.

Procedure Steps

1. Set up as per standard AT.
2. Perform hand hygiene and don appropriate PPE.
3. Pierce IV fluid bag with burette spike using AT, ensuring roller clamp on burette remains closed.
4. Connect IV giving set to burette, ensuring all clamps remain closed.
5. Allow 20-30 mL of IV fluid to enter burette by opening roller clamp.
6. Gently squeeze drip chamber in order to fill chamber prior to priming IV giving set.
7. Open clamps on IV giving set and prime line, ensuring to remove all air from the line.
8. Attach single or triple valve extension piece to IV giving set and prime.

9. Prime NAD using AT with pre filled 0.9% sodium chloride and leave syringe attached.

10. Move to patient bedside with prepared IV administration set and primed NAD.

11. Perform hand hygiene.

12. Ensure that CVAD lumen is clamped.

13. Disconnect old IV administration set from NAD and dispose of waste appropriately.

14. Perform hand hygiene and don non-sterile gloves.

15. Vigorously clean the entire NAD in situ and hub of CVC/PCC with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

16. Ensure CVC/PICC lumen is clamped. Remove old NAD and discard.

17. While holding the CVC/PICC in a downward position take new 2% chlorhexidine gluconate in 70% alcohol swab and scrub the hub vigorously for 20 seconds. Do not place the end of the 2% chlorhexidine gluconate in 70% alcohol swab into the open hub. Allow to dry.

18. Attach primed NAD with the 0.9% sodium chloride syringe and flush CVC/PICC using a pulsating technique. Ensure clamps are engaged (if present) and remove syringe from NAD.

19. Vigorously clean the entire NAD in situ with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

20. Using AT attach IV administration set.

21. Ensure clamps are opened.

22. Commence IV therapy as prescribed. Ensure that IV administration sets are labelled as per IV administration set labelled as per NSW Health Policy Directive User-applied Labelling of Injectable Medicines, Fluids and Lines..

23. Perform hand hygiene and dispose of waste appropriately.

24. Document in CVAD care plan.

3.6 Locking CVAD, PICC

PROCEDURE: Locking CVAD, PICC

Equipment Requirements

- Gather equipment as per standard AT and appropriate PPE
- Lock Solution + 10 mL luer lock syringe (1 per lumen)
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs
- 1x Pre filled 0.9% sodium chloride 10 mL syringes. Alternatively use 0.9%
- sodium chloride ampoule, drawing up needle and 10 mL syringe (1 per lumen)
- Needleless access device (NAD) (1 per lumen)

Procedure Steps

1. Set up as per standard AT
2. Perform hand hygiene and appropriate PPE
3. Draw up lock solution as per **Locking solutions, frequency, and volume table** Section 2.8.1.
4. Prime NAD with 0.9% sodium chloride syringe and leave NAD attached.
5. Stop infusion and ensure lines are clamped.
6. Using 2% chlorhexidine gluconate in 70% alcohol swab vigorously clean the entire NAD in situ and hub of CVC for 20 seconds then allow to dry.
7. Remove NAD and line and discard.
8. While holding the CVC in a downward position take a new 2% chlorhexidine gluconate in 70% alcohol swab and vigorously clean the outside of the hub for 20 seconds. Do not place the end of the 2% chlorhexidine gluconate in 70% alcohol swab into the open hub. Allow to dry.
9. Attach primed NAD and 0.9% sodium chloride syringe onto the hub of CVC.
10. Unclamp and flush using a pulsating technique.
11. Remove syringe from NAD.
12. Instill lock solution using positive pressure lock technique whilst clamping lumen. Remove syringe. Complete process for 2nd lumen if required.
13. Remove gloves and perform hand hygiene.
14. Discard waste appropriately.
15. Document in patient's Healthcare record as per minimum documentation requirements in Section 1.6.

4. Complications Related to CVADs

4.1 Infections Associated with CVADs

Infection is the most common life-threatening complication of CVADs. Limiting the frequency of access to the device to essential procedures only, is vital in attempting to decrease the risk of infection.

- CVAD infections can occur due to contamination by:
    - Skin flora on insertion
    - Skin bacteria migration down the catheter
    - Bacteria transfer through the hub during manipulation
    - Transient bacteraemia from translocated organisms from other parts of the body (e.g. mouth, gastrointestinal tract or skin).
- The types of CVAD-related infections are:
    - Colonisation of the CVAD
    - Exit-site infection
    - Pocket infection (Port) / Tunnel infection (CVC).

Catheter removal is recommended for central line-associated blood stream infection (CLABSI) due to *Staphylococcus aureus* and *Candida* species, as well as treatment with systemic antibiotics (see Flowchart). Treating the catheter with hydrochloric acid locks is NOT recommended for these organisms, unless there are unusual extenuating circumstances (e.g., no alternative catheter insertion site).

Incidents of infection/phlebitis at the insertion site, or a catheter related site infection or Blood Stream Infection (BSI) it must be recorded in the patients Healthcare record, cultures/swabs obtained, treating team informed and also recorded in the Incident Information Management System +.

Note:
Antibiotic locks are not to be used routinely to prevent infections (i.e. for prophylaxis), but can be utilised to sterilise confirmed CVAD infections in conjunction with systemic antibiotic therapy.

Refer to Section 4.1.2 Antibiotic Locks to sterilise Infected CVAD and contact Infectious Diseases. (ID). ID Consult is required for all antibiotic locks.

4.1.1 Central line-associated Blood Stream Infection (CLABSI).

Although CVADs provide necessary vascular access in the paediatric patient, CLABSI remains an inherent risk and can be difficult to treat. CLABSIs are major contributors of morbidity, mortality, exposure to antibiotics, increased length of stay, and hospital costs. Children are especially vulnerable. CLABSIs are the most common hospital-acquired infections in critically ill children, and prevention is integral to patient safety.

CLABSI occurs due to pathogenic colonisation of the CVAD. Microbial contamination of catheter hubs and subsequent intraluminal migration and colonisation of the catheter tip is an important portal of entry for microorganisms and is recognised as a frequent cause of CLABSI, particularly in CVADs used for long-term venous access.

Extraluminal infections can begin in the soft tissues and spread along the external surface or subcutaneous tunnel of the CVAD and enter directly into the bloodstream. Extraluminal infections can develop within 7 days after catheter insertion because of heavy colonisation of the external catheter surface, but most likely after insertion through inadequately cleansing of skin during CVAD cares. Intraluminal infections generally occur after 7 to 10 days and are related to microorganisms contaminating the catheter hub, lumen, or needleless connectors during the care and access of CVADs.

Biofilm formation is a process whereby microorganisms attach to and grow on the external and internal surface of the catheter in a microbial community and produce a 3-dimensional structure called an extracellular polymer substance matrix. Biofilms have been reported to form within days of catheter insertion, and they play a crucial role in the pathogenesis and treatment of CLABSI. Organisms in a biofilm may serve as a persistent source of infection, act as a physical barrier to antibiotic penetration, and promote antimicrobial resistance.

Note:
If a patient has a CVAD in situ and develops a fever without any obvious signs of infection, a CLABSI must be considered and remain as the key source of infection until proven otherwise.

If confirmed infection satisfies the CLABSI surveillance definition (Table 8), complete an IMS+ report.

Note also, that as of November 2020, CLABSI events so designated by the Infection Prevention Service are displayed on the CAP eMR record for the patient.

If CLABSI is considered, perform the following:

1. Take peripheral blood cultures where possible to assist in identifying colonisation of catheter vs. sepsis.

2. Take blood cultures from CVAD (all lumens). Refer to section 2.6.1. Label blood cultures with each lumen.

3. Start IV antibiotics as charted. Each IV antibiotic dose should be administered through alternate lumens of the CVAD; therefore all lumens of the CVAD are connected to IV infusion sets. In cases where continuous infusions of chemotherapy or inotropes are in progress, alternating each dose of antibiotic may not be possible. Similarly, in cases where PN is in progress consider stopping PN for a period of time or discuss compatibility of antibiotics with Pharmacy.

4. Notify treating team and consider CVAD removal if appropriate.

5. If in doubt treat as infected for 48-72 hours until blood culture results are available.

Management of Suspected or Proven Infection of Tunnelled Central Venous Catheters (Paediatrics)

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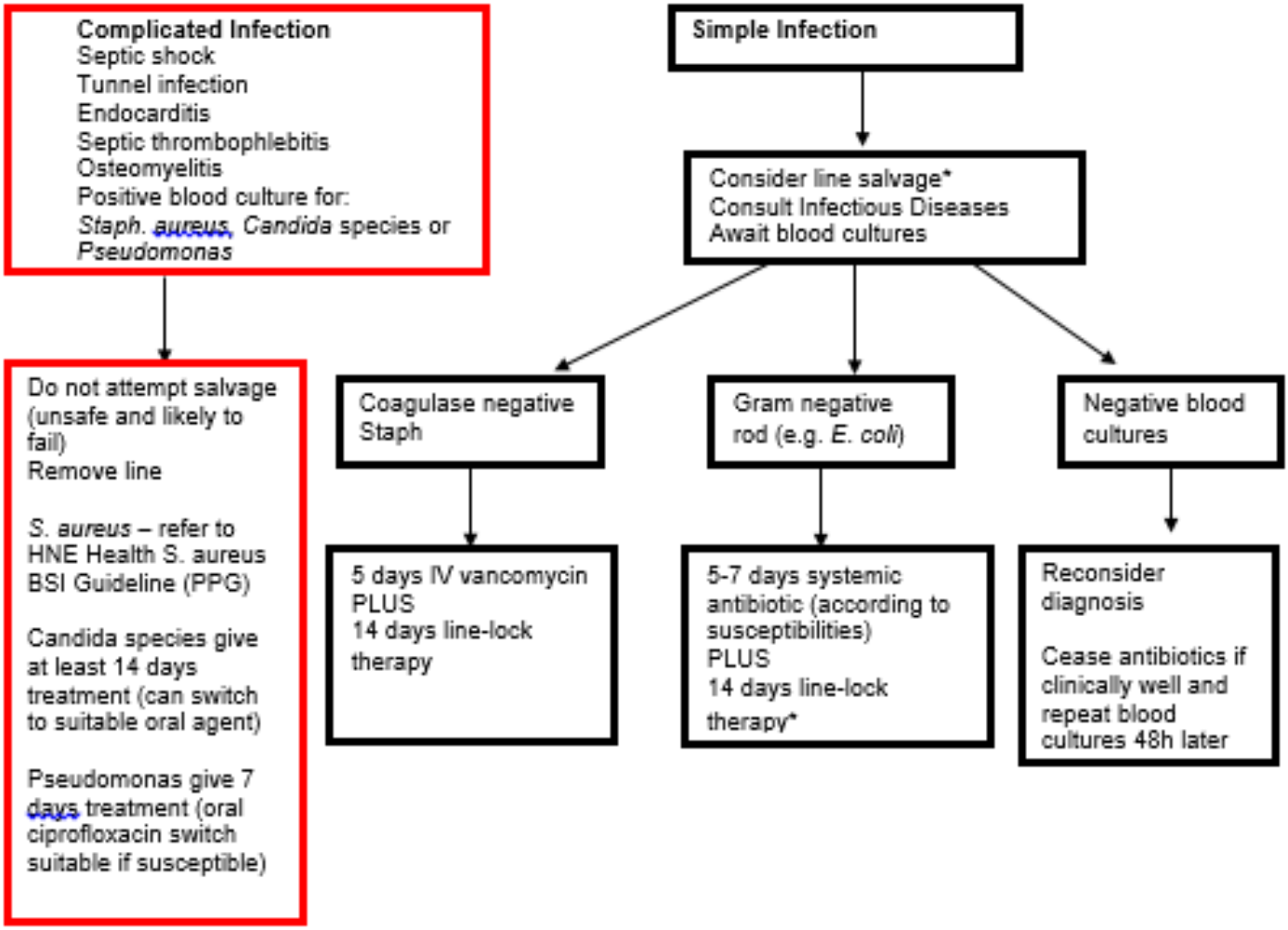
Look for other foci of infection – if none evident:

- Take ≥ 2 sets blood cultures (one peripheral, one central)
    - If a peripheral set is not possible, a blood culture set from each of 2 or more lumens is required.
- Give stat dose of IV vancomycin 15-20mg/kg and IV gentamicin 4-5mg/kg. Paediatric Oncology patients 7.5 mg/kg (as per Infants and Children – Initial Management of Fever or Suspected Infection in Oncology and Stem Cell Transplantation Patients. Clinical Practice Guidelines. 1ST Ed. 2015. GL2015_013)
- For advice on ongoing doses, see Therapeutic Guidelines: Antibiotic, version 16.



*If failure to defervesce at 72 hours, consider removal. This is at the discretion of the treating team.

Table 10. CLABSI Surveillance definition

Criteria required to meet the definition

The blood stream infection **must** meet one of the following criteria:

Criterion 1
Patient has a recognised bacterial or fungal pathogen cultured from one or more blood cultures
and
The organism cultured from blood is not related to an infection at another site
OR
Criterion 2
Patient has at least one of the following signs or symptoms: fever (>38^{0}C), chills or hypotension
and
Signs and symptoms and positive laboratory results are not related to an infection at another site
and
A potential contaminant bacteria species is cultured from two or more blood cultures drawn on separate occasions within 48 hours
OR
Criterion 3 (for a patient < 1 year of age where criteria 1 or 2 are not met)
At least one of the following signs or symptoms: fever (>38^{0}C core), hypothermia (<36^{0}C core), apnoea or bradycardia
and
Signs and symptoms and positive laboratory results are not related to an infection at another site
and
A potential contaminant organism (e.g. coagulase negative staphylococcus) is cultured from two or more blood cultures drawn on separate occasions within 48 hours
AND
Criterion elements must occur within a 24-hour timeframe of the positive blood culture; for example, positive blood cultures and fever.

4.1.2 Antibiotic Locks to Sterilise an Infected CVAD

- Antibiotic locks may be used to sterilise an infected CVAD, however, antibiotic prophylaxis is NOT recommended to prevent CLABSIs.
- If salvage of the catheter is the primary goal, antibiotic lock therapy is the first line of treatment.
- Antibiotic lock therapy MUST be discussed with the Infectious Diseases (ID) team and follow local Antibiotic Stewardship policy.

4.2 CVAD Occlusions

- A functioning CVAD is defined as a catheter that:
    - Flushes easily
    - Infuses without difficulty
    - Has free-flowing blood return
- The inability to aspirate AND/OR flush CVAD occlusions may be thrombotic or non-thrombotic (mechanical) in origin. Occlusions can be classified as partial, complete or as a withdrawal occlusion.
- Thrombotic occlusions occur when blood or blood elements accumulate within, surrounding or at the tip of the catheter.

Table 11. CVAD Occlusion Types, and the Signs and Symptoms

Type of Occlusion	Signs and Symptoms
Withdrawal occlusion	Inability to aspirate but able to flush without resistance
Partial occlusion	Resistance or sluggish flow on aspiration AND flushing
Complete occlusion	Inability to aspirate AND flush

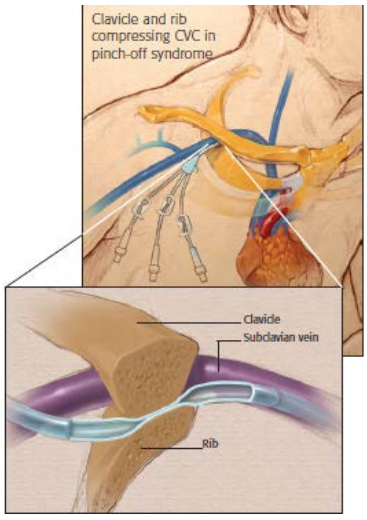
- Using force to attempt aspiration or flushing increases the risk of catheter rupture or dislodgement of a thrombosis/clot or fibrin. If resistance is encountered, STOP and investigate the cause.

4.2.1 Signs of an occluded CVAD;

- Little or no free flowing blood return
- Inability to withdraw fluids
- Inability to infuse fluids
- Increased resistance during flushing
- Sluggish fluid flow through catheter.

4.2.2 Causes of Occlusions

Table 12. Mechanical Occlusions

Type of Mechanical Occlusion	Image	Description
Catheter Pinch-off Syndrome		Is a rare occurrence and usually occurs with catheters inserted in the subclavian vein. Compression of the catheter between the first rib and the clavicle can cause intermittent or constant inability to aspirate or flush. Reposition patient, move arms, turn head away from insertion site, sit upright.

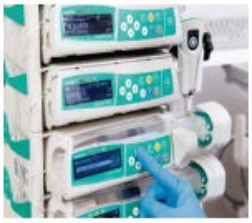
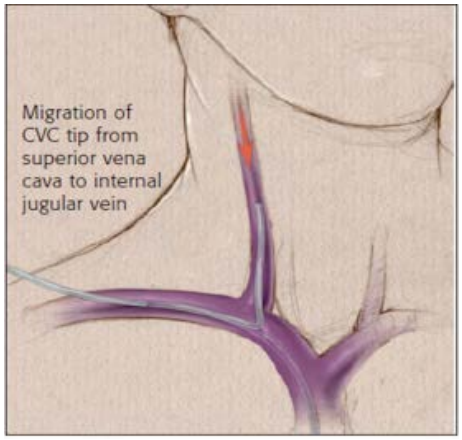
Clamps, IV tubing, pumps, NADs, tight sutures or external securement devices	   	Check all connections for any clamps or kinks. Check NADs and IV tubing for any signs of blood, lipid or chemical precipitate residue that may result in occlusion. Check exit site sutures or external securement devices to ensure it is not causing pinching of catheter.
Catheter migration		Specific to CVCs. Internal catheter tip migrates without the external catheter length changing. Can cause retrograde flow of the infusion in the direction opposite to that of the blood flow resulting in obstruction. Patient may describe a gurgling sound during infusion of fluids.

Table 13. Chemical Occlusions

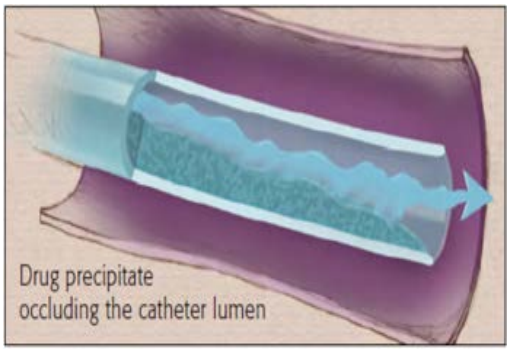
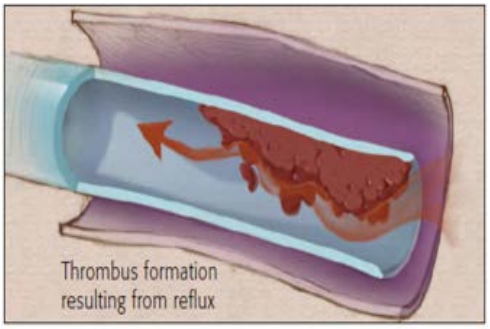
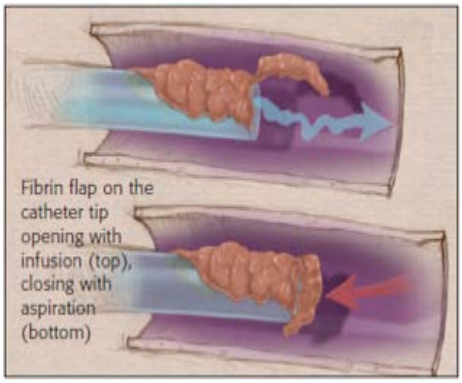
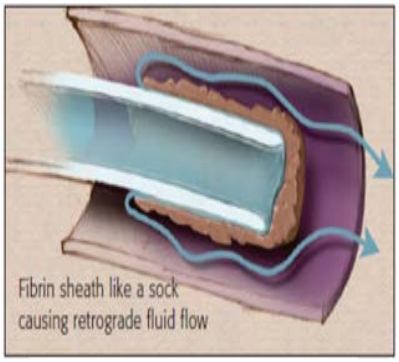
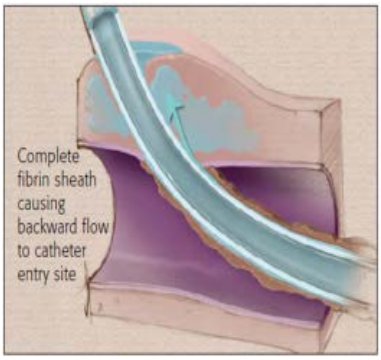
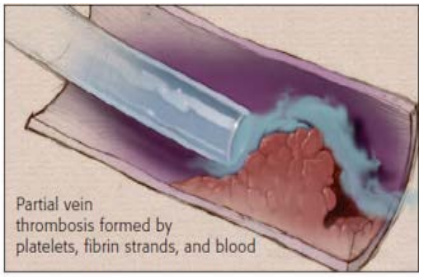
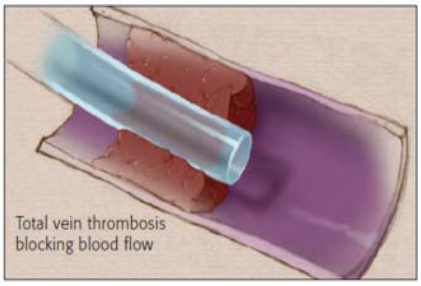
Type of Occlusion	Image	Description
Drug precipitate		Often a sudden and complete occlusion following administration of incompatible medications or lipid accumulation. Check recently administered medications for any potential incompatibility. CVAD removal may be necessary.

Table 14. Thrombotic Occlusions

Type of Thrombotic Occlusion	Image	Description
Partial or Complete Occlusion **Intraluminal thrombus**		Thrombus forms within the catheter lumen. Associated with blood build up as a result of insufficient flushing, inadequate flow through the catheter, or frequent blood sampling from CVC. Results in 'stiffness' during flushing and sluggish blood return on aspiration.
Withdrawal Occlusion **Fibrin Tail/flap**		Fibrin adheres to the end of the catheter tip, extending into the blood stream. More cells and other blood products attach to the tail, which can become quite long. The tail/flap acts as a one way valve allowing infusion of fluid through the catheter, however sluggish blood return or the inability to aspirate at all occurs as the tail/flap is 'sucked back' over the opening of the catheter.
Fibrin Sheath	 	Fibrin adheres to the external surface of the catheter, encasing part of the catheter and its tip like a 'sock'. Fluid can usually be infused through the catheter, however blood return is either sluggish or not able to be obtained. If the fibrin sheath completely covers the catheter, serious extravasation/infiltration injury can occur as the fluid flows in a retrograde direction 'up' the fibrin sheath back to the insertion site.

Venous Thrombus Non-occlusive and occlusive thrombosis	 	Non-occlusive venous thrombosis may be asymptomatic if there is still a path for blood to flow through the vein lumen. The CVAD may exhibit a partial or withdrawal occlusion if the thrombus is also adhered to the catheter lumen. Occlusive venous thrombosis often presents with localised oedema and pain to the CVAD insertion site or in the surrounding areas e.g. lower arm if a PICC is in situ. This is due to the occlusion of blood flow in the vein caused by venous obstruction resulting in impaired blood flow. Non-occlusive thrombus may also demonstrate similar symptoms. Venous thrombosis is usually confirmed on Doppler ultrasound or venogram**.**

Images sourced from: Hadaway, L. N., (2005). Reopen the pipeline, Nursing, 35(8), pp. 55-61. Retrieved from http://hadawayassociates.com/uploads/3/5/0/1/3501992/9331.pdf.

Burns-Gibson, S. et al. (2013). Occlusion Management Guideline for Central Venous Access Devices (CVADs). Journal of the Canadian Vascular Access Association. Vol 7 (1). Andrew John Publishing Inc. Available at http://www.improvepicc.com/uploads/5/6/5/0/56503399/omg_2013_final_revised.pdf

4.2.3 Clearing a Thrombotic Occlusion from a CVAD

Alteplase (rt-PA; recombinant tissue Plasminogen Activator) is a fibrinolytic drug used to manage thrombotic occlusions.

- Alteplase binds avidly and specifically to fibrin, one of the major components of a blood clot.
- Alteplase is NOT to be used in attempt to resolve occlusions secondary to chemical precipitate or mechanical occlusions.
- Consider risks and benefits of attempting CVAD salvage with alteplase over CVAD removal.
- Alteplase is most effective in clearing a thrombus of recent origin, therefore treatment should not be delayed.
- Consider full blood count and coagulation profile if known haematological disorder or concerns related to haemorrhage risk. Otherwise, routine baseline blood tests prior to administration are not required.

PROCEDURE: Clearing a Thrombotic Occlusion from a CVAD- Partial Occlusion

Table 15. Alteplase (rt-PA) administration

Concentration	1 mg/mL
Volume to instill	Maximum standard dose is: • Patient < 30 kg = 1.5 mg (1.5 mL) • Patient > 30 kg = 2 mg (2 mL) Alternatively, use volume equal to the 110% internal volume of the lumen if known if treating suspected intraluminal thrombus.
Dwell time	2-4 hours (standard) Consider 24-72 hours for fibrin sheath or mural thrombus
Instillations	Maximum 2 instillations in 24 hours (seek advice from Paediatric Haematologist/Proceduralist who inserted CVAD)

Partial occlusion – Using direct instillation technique

- Reconstitute alteplase to 1 mg/mL as per preparation instructions
- If alteplase cannot be aspirated consider extending dwell time as per above Table 15
- If alteplase cannot be aspirated after extended dwell time or patency is not fully restored consider a second instillation
- Procedure should be performed within a hospital setting to minimise risk if complications were to occur.

Instillation of Alteplase - Partial Occlusion

Equipment Requirements

- Gather equipment as per standard AT and appropriate PPE
- 1x Pre filled 0.9% sodium chloride 10 mL syringes (1 per lumen 1x for flushing line 1x for priming NAD). Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10mL syringe
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs.
- 2 x 10 mL luer lock syringe (used for discard and alteplase reconstitution)
- 1 x 10 mL water for injection ampoule
- 1 x drawing up needle
- 1 x vial access needle
- Prescribed alteplase vial

Procedure Steps

1. Set up as per Standard AT
2. Perform hand hygiene and don gloves and appropriate PPE
3. Reconstitute prescribed altelpase to 1 mg/mL (as per Australian Injectable Drug Handbook) and draw up required dose as per table 15 above.
4. Vigorously clean the NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

5. Unclamp, and if able withdraw 3mL of blood for discard. Clamp CVC/PICC and remove syringe.
6. Vigorously clean the NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.
7. Flush with 10 mL 0.9% sodium chloride using pulsating technique.
8. Instill required volume of alteplase into lumen, clamping under positive pressure.
9. Ensure NAD remains on the end of the CVAD lumen.
10. Label lumen with alteplase 1 mg/mL – 'Do not flush' and date and time of instillation
11. Discard waste appropriately.
12. Document in the patient's Healthcare record as per Section 1.6

Aspiration of Alteplase - Partial Occlusion (after appropriate dwell time)

Equipment Requirements

- Gather equipment as per Standard AT and appropriate PPE
- 1x Pre filled 0.9% sodium chloride 10 mL syringes (1 per lumen 1x for flushing line 1x for priming NAD). Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10 mL syringe
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs.
- 1 x 10 mL luer lock syringe (used for discard)

Procedure Steps

1. Set up as per standard AT
2. Perform hand hygiene and don gloves and appropriate PPE.
3. Vigorously clean the entire NAD in situ with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds then allow to dry.
4. Gently aspirate the Alteplase from treated lumen, and if able withdraw 3 mL of blood for discard Clamp CVC/PICC and remove syringe. **NB: If unable to aspirate alteplase, consider second dose. Contact treating team for further advice.**
5. Vigorously clean the NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.
6. Flush with 10 mL 0.9% sodium chloride using a pulsating technique.
7. Attach fluid line or lock lumen as required.
8. Discard waste appropriately
9. Document in patient's healthcare record as per minimum documentation requirements in Section 1.6

PROCEDURE: Clearing a thrombotic Occlusion from a CVAD- Complete Occlusion

Complete Occlusion- Using negative-pressure technique

- Management of complete thrombotic occlusions may require creating a negative pressure vacuum inside the catheter lumen, enabling instillation into the dead space.
- Complete thrombotic occlusions usually require more than 1 treatment.
- Reconstitute prescribed altelpase to 1 mg/mL (as per Australian Injectable Drug Handbook) and draw up required dose as per table 15 above.
- If alteplase cannot be aspirated consider extending dwell time as per Table 15 above.
- If alteplase cannot be aspirated after extended dwell time or patency is not fully restored consider a second instillation.
- Procedure should be performed within a hospital setting to minimise risk if complications were to occur.

Instillation of Alteplase- Complete Occlusion – Using negative-pressure technique

Equipment Requirements

- Gather equipment as per AT risk assessment –Standard or Surgical and appropriate PPE
- 3x Pre filled 0.9% sodium chloride 10 mL syringes (1 per lumen 1x for flushing line 1x for priming NAD). Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10 mL syringe
- 4 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs.
- 3 x 10 mL luer lock syringe (used for discard and altepase reconstitution)
- 1 x 10 mL water for injection ampoule
- 1 x drawing up needle
- 1 x vial access needle
- Prescribed Alteplase vial
- 2 x needleless access devices (NAD)
- 3-way tap

Procedure Steps

1. Gather equipment as per AT risk assessment –standard or surgical
2. Perform hand hygiene and don gloves and appropriate PPE
3. Reconstitute prescribed altelpase to 1 mg/mL (as per Australian Injectable Drug Handbook) and draw up required dose as per table 15 above.
4. Attached 2x NADs to side ports of 3-way tap and prime tap ports with 0.9% sodium chloride
5. Attach empty 10 mL syringe to one port of 3-way tap and alteplase syringe to the other
6. Vigorously clean the hub of the NAD in situ with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

7. Attach the 3-way tap to the NAD on the CVAD lumen as indicated in (Figure 1)

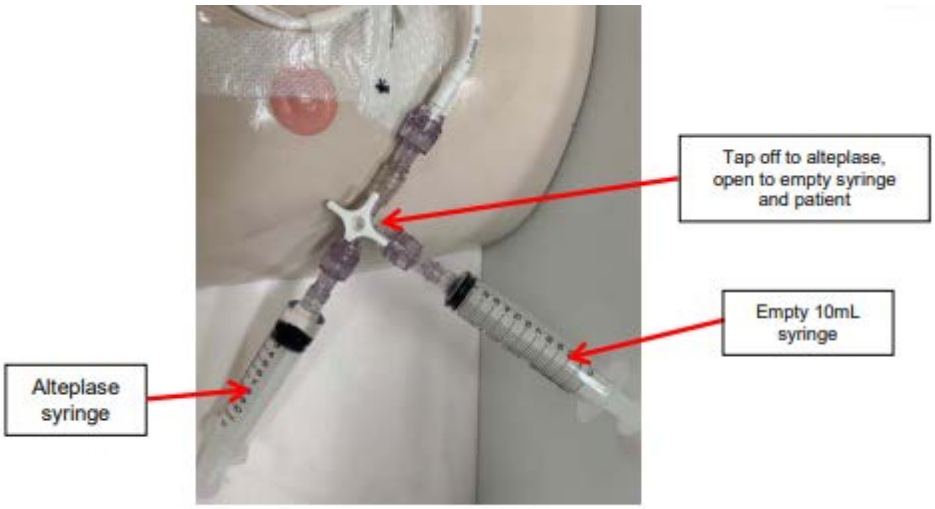


Figure 1.

Image source: CVAD Guideline number: 2013-9037 v6 Local CVAD Procedure: Treatment of Thrombotic Occlusions

8. Turn tap open to empty syringe and CVAD lumen. Pull plunger back 2-4 mL as depicted in (Figure 2)

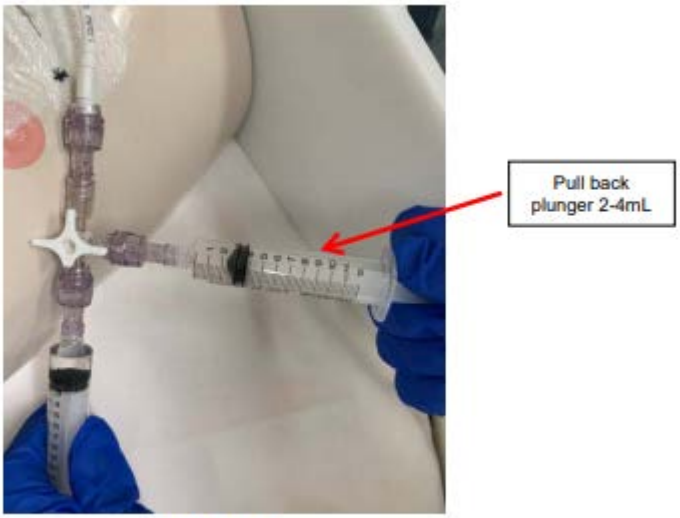


Figure 2.

Image source: CVAD Guideline number: 2013-9037 v6 Local CVAD Procedure: Treatment of Thrombotic Occlusions

9. While holding plunger of empty syringe, turn tap open to alteplase syringe and CVAD lumen. Alteplase should be withdrawn into catheter lumen as depicted in (see Figure 3)

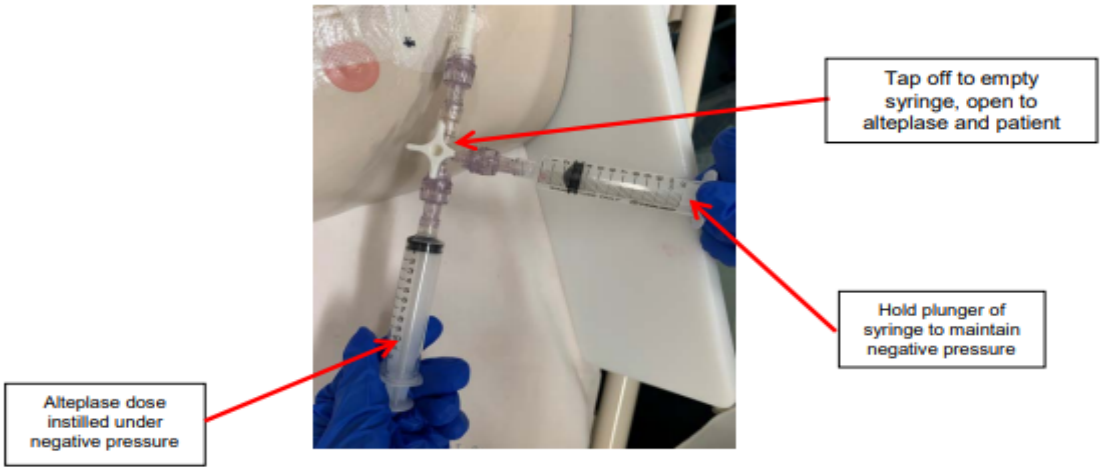


Figure 3.

Image source: CVAD Guideline number: 2013-9037 v6 Local CVAD Procedure: Treatment of Thrombotic Occlusions

10. If instillation of alteplase is not achieved, repeat steps 8 and 9.

11. Clamp lumen and remove 3-way tap, ensuring NAD remains on the end of the CVAD lumen

12. Discard waste in appropriate receptacles and return equipment to designated areas

13. Label lumen and document in patient's Healthcare record as per minimum documentation requirements in Section 1.6 in CVAD Guideline.

Aspiration of Alteplase- Complete Occlusion (after appropriate dwell time)

Equipment Requirements

- Gather equipment as per AT risk assessment –standard or surgical
- 1x Pre filled 0.9% sodium chloride 10 mL syringes (1 per lumen 1x for flushing line 1x for priming NAD). Alternatively use 0.9% sodium chloride ampoule, drawing up needle and 10 mL syringe
- 2 x 2% chlorhexidine gluconate in 70% alcohol (large) swabs.
- 1 x 10 mL luer lock syringe (used for discard)

Procedure Steps

1. Gather equipment as per AT risk assessment – standard or surgical

2. Perform hand hygiene and don gloves.

3. Vigorously clean the NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds then allow to dry.

4. Gently aspirate the alteplase from treated lumen, and if able withdraw 3 mL of blood for discard Clamp CVC/PICC and remove syringe. **NB: If unable to aspirate Alteplase, consider second dose. Contact treating team for further advice.**

5. Vigorously clean the NAD with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allow to dry.

6. Flush with 10 mL 0.9% sodium chloride using a pulsating technique.
7. Attach fluid line or lock lumen as required.
8. Discard waste appropriately
9. Document in patient's Healthcare record as per minimum documentation requirements in Section 1.6.

4.3 Other CVAD Complications

Table 16. Other CVAD Complications

Problem	Signs & and Symptoms	Causes	Management
Bleeding	Insertion / exit site bleeding Subcutaneous tunnel bleeding	Delayed haemostasis at catheter exit site, venous insertion site and/or subcutaneous pocket (Ports)	• Apply pressure dressing • Notify inserting team (Surgical, Anaesthetics, Interventional Radiology) • Check coags and full blood count
Pneumothorax	Shortness of breath – shortly after insertion Decreased breath sounds Chest pain cyanosis	Thoracic cavity puncture during subclavian or internal jugular insertion	• Confirm with chest X-Ray • Seek surgical and/or cardiothoracic consultation • Insert intercostal drain
Septic showers	Fever Hypotension post access Tachycardia Decrease LOC Diaphoresis Rigors	Accessing CVAD and flushing pathogens into patient's circulation, intraluminal infection	• **Urgent medical review – Activate CERS** • Blood cultures, commence IVAB • Consider stop using CVAD for administration of fluid and antibiotics. • Fluid resuscitation • Cardiovascular monitoring • PICU review as required • Consult Paediatric Sepsis Pathway
Air embolism or thromboembolism	Shortness of breath Cyanosis Tachypnoea Hypotension Cardiovascular collapse	CVC being open and unclamped, without syringe attached. Air drawn in during inspiration. Thrombus attached to catheter	• **Urgent action - Clamp catheter** • **Activate CERS** • Apply oxygen • Place patient head down in the Trendelenburg position - Investigate causes • Consult cardiologist urgently
Breaking or splitting of the external component of CVAD	Leakage of fluid or blood onto dressing and/or skin. Leakage of blood or fluid from external catheter	Accidental damage to catheter	• Clamp CVC with atraumatic clamps between exit site and site of leak. • Wrap the CVC in sterile gauze and notify surgical registrar to repair lumen (only tunnelled cuffed CVCs). • Identify the type and size of tunnelled CVC to notify repairer. This is found on the CVC bifurcation. • Collect blood culture only if indicated
Exit site infection, tunnel infection, Port pocket infection	Fever Erythema Swelling Pain Tracking exudate	Subcutaneous migration of pathogens from exit site Inadequate skin cleansing practices	• Swab for microbiology • Oral or IV antibiotics – Seek ID advice • Consider increasing frequency of dressings • Consider CVC removal if unable to control infection

			Long-term salvage of infected CVC is unlikely due to bacterial persistence in the face of a foreign body. Short term suppression may sometimes be achieved, but ultimately CVC removal is usually necessary.
Extravasation of CVAD	Local oedema Redness Localised burning or pain fluid leakage Swelling along tunnel or neck Localised pain on infusion	Dislodgment of Port needle Catheter tip migration (intravascular or extravascular) Catheter rupture	• Stop infusion immediately • Notify Medical Officer • Identify type of fluid infusing to obtain procedure for extravasation of drug, consult with Pharmacy • In Ports, ensure needle is correctly sited, if not consider re-siting. Do not wait for topical anaesthesia • Withdraw residual drug up to 5 mL
Superior Vena Cava Thrombosis	Shoulder or retrosternal pain Facial or trunk oedema - prominent neck veins Difficulty in aspirating or flushing CVAD	Mechanical trauma to vein Infection High osmolality infusate. Proximal placement of CVAD Previous multiple CVAD insertions Large catheter in small vein Hypercoagulation states History of DVT Recent surgery and/or trauma	• Monitor vital signs • Possible fibrinolytic and anticoagulant therapy • Consider catheter exchange or removal • Consider radiological investigation (Doppler ultrasound / line-o-gram)
Cardiac Arrhythmia **Decreased cardiac output**	Pulse rate change or ECG rhythm change. Depending upon the rhythm, there may be hemodynamic instability and signs of shock.	Mal-positioned catheter tip within right atrium or ventricle. Arrhythmia most often occurs during insertion however can occur at any time if the CVAD tip is located within the heart.	• Notify team who inserted CVAD • ECG monitoring • Attend formal ECG If there is an unstable arrhythmia, activate CERS and commence APLS algorithm prior to repositioning. • Treat decreased cardiac output and arrhythmia. As above plus review medications ordered for patient.
Cardiac tamponade **Potentially fatal complication of CVC insertion**	Tachycardia Diminished pulses Pulsus paradoxus Hypotension Pallor Cool extremities Clamminess Eventually altered level of consciousness Jugular venous distension Increased CVP Heart sounds may be muffled CXR may show an enlarged cardiac shadow	Occurs during insertion due to guide-wire or catheter perforation. Can be late complication due to erosion of CVC into pericardial space when it abuts a vessel or cardiac chamber wall (usually the right atrium).	• **Medical emergency- Activate CERS** • The pericardial collection usually needs to be drained using ultrasound guidance. • If required, commence APLS algorithm Administration of fluid, which is a common emergency treatment for evolving tamponade, may

			exacerbate the problem if given via the offending CVAD.
Pinch off syndrome	Inability to withdraw or infuse substances which may improve with repositioning of the patient.	Compression of the catheter between the clavicle and the first rib, usually in CVADs inserted in the subclavian vein.	• Reposition patient • Chest x-ray to confirm position and exclude catheter tip migration.
Phlebitis	Redness Pain Warmth Swelling Ooze Irritation Skin breakdown at CVAD exit site	Skin reaction to CVAD material, skin cleansing solutions, securement device material or dressing material.	• Assess site regularly as part of CVAD observations and try to identify cause of irritation e.g. catheter material, dressing, skin cleansing solution. • If ooze is present at exit site, consider skin swab and/or scraping. • Seek advice from treating team, senior nursing staff and Dermatology.
Nerve injury	Respiratory difficulty, unusual pain or sensation (e.g. tingling, burning, numbness)	Nerve damage on insertion	• Stop infusion • Medical and/or surgical review

4.4 Accidental Removal of a CVAD

- If a tunnelled cuffed and un-cuffed CVC is accidentally removed, **apply firm pressure to both the catheter entry site in the neck vein and the external exit site in the chest** regardless of how long the tunnelled CVC has been in situ. Do not release pressure until reviewed by medical team. Severe bleeding can often be controlled by pressure and sitting the patient up to lower the venous pressure.

- Contact surgical and treating team **immediately.** Activate CERS if clinically indicated.

- Monitor vital signs and estimate blood loss if any.

- If an un-cuffed tunnelled and non-tunnelled CVC or PICC is accidentally removed, it is important to establish whether ongoing therapy can be provided with a peripheral cannula alone or whether there is a need to re-site the CVAD. If this is the case the child should be fasted immediately and contact Anaesthetics/General Surgery.

- Accidental removal of a CVAD must be documented in the CVAD Care Plan and an ims+ completed.

APPENDIX 1 – IV ADMINISTRATION SET AND NAD CHANGE COMPETENCY

HNELHD Central Venous Access Device IV Administration Set and Needleless Access Device Change - Paediatric HETI Code: Assessment of Practice

CVAD IV ADMINISTRATION SET and NEEDLELESS ACCESS DEVICE CHANGE -						
Pre-requisites prior to undertaking assessment:						
Central Venous Access Devices: the fundamentals (MHL code: 92712530)						
Aseptic Technique: Foundation skills (MHL code: 40027445)						
Invasive Device Protocols (MHL code: 42364545)						
Hand hygiene (MHL code: 42063430)						
Waste management (MHL code: 39966595)						
Infection Prevention & Control Practices (MHL code: 46777047)						
Performance Criteria and Elements of practice	**Circle one number**					
1. Demonstrates effective communication with patient and/or family and/or carer						
1.1 Performs HAIDET. 1.2 Identifies potential barriers to communication and engages appropriate services as required. 1.3 Explains procedure to patient/family/carer and gains verbal consent. 1.4 Checks for allergies.	1	2	3	4	5	N/A
2. Demonstrates adherence to Infection Prevention and control policy						
2.1 Perform five moments of hand hygiene. 2.2 Performs correct aseptic non-touch technique throughout procedure. 2.3 Performs environmental cleaning before and after procedure. 2.4 Disposes of contaminated waste and sharps appropriately	1	2	3	4	5	N/A
3. Demonstrates adherence to Work Health and Safety						
3.1 Dons Personal Protective Equipment (PPE) as per patient and environmental requirements 3.2 Follows correct manual handling principles throughout procedure 3.3 Positions the patient appropriately whilst maintaining patient privacy and dignity.	1	2	3	4	5	N/A
4. Demonstration of correct CVAD IV administration set/needleless access device change technique						
4.1 Correctly identifies when IV administration sets and/or needleless access device need to be changed 4.2 Performs hand hygiene and prepares new IV administration set with extension piece using standard AT, checking medications against MedChart/CHARM/ fluid order chart with a second clinician 4.3 Primes NAD using 0.9% sodium chloride and leaves syringe in situ 4.4 Ceases infusions as required and engages clamps on all non-valved CVAD lumens 4.5 Performs hand hygiene 4.6 Disconnect old IV administration set from NAD and disposes of waste appropriately 4.7 Performs hand hygiene and dons non-sterile gloves 4.8 Cleans the entire NAD in situ and hub of CVAD vigorously using a 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds and allows to dry 4.9 Removes old NAD and discard 4.10 Whilst holding the CVC/PICC catheter in a downward position, takes new 2% chlorhexidine gluconate in 70% alcohol swab and scrubs the hub vigorously for 20 seconds. **NB Must not place the 2% chlorhexidine gluconate in 70% alcohol swab into the open hub.** Allows to dry 4.11 Attaches primed NAD with the 0.9% sodium chloride syringe and flushes CVC/PICC using a pulsating technique. Ensure clamps are engaged (if present) and remove syringe from NAD. 4.12 Vigorously clean the entire NAD in situ with 2% chlorhexidine gluconate in 70% alcohol swab for 20 seconds. Allows to dry. 4.13 Using AT attach IV administration set and opens clamps 4.14 Commence IV therapy as prescribed. 4.15 Performs hand hygiene and disposes of waste appropriately.	1	2	3	4	5	N/A
5. Demonstrates correct legal documentation						
5.1 Documents procedure in the patient's health care record/CVAD care plan (HSMR90)/flow chart 5.2 Accurately labels all infusions and IV administration sets as per NSW Health Policy Directive User-applied Labelling of Injectable Medicines, Fluids and Lines 5.3 Document new infusions on National Inpatient Medication Chart/Fluid order chart and on Fluid balance chart/CHARM	1	2	3	4	5	N/A

HNELHD Central Venous Access Device IV Administration Set and Needleless Access Device Change - Paediatric HETI Code: Assessment of Practice

Overall assessment outcome: In your opinion as an assessor of clinician performance, the overall performance of this person was (please circle one) Unsafe practice Requires reassessment Safe practice Proficient Excellent			
Assessor Name		**Clinicians Name**	
Assessors Signature		**Employee Number**	
Date of Assessment		**Participants Signature**	

Background/Risk Statement

Changing IV Administration sets and Needless connectors connected to Central Venous Access Device (CVADs) is a high risk procedure associated with the potential for introduction of infection, body substance exposure, catheter malposition, arrhythmia, mechanical phlebitis and Vascular Air Embolus (VAE).

This clinical procedure assessment process has been developed to set a minimum standard of practice and training for all clinicians who are required to change IV administration sets and needleless connectors connected to CVADs. This process will ensure that all staff are adequately trained and assessed which will minimise adverse outcomes.

Assessment process

The achievement of the skill to a minimum standard (must score 3 or more) is demonstrated by performance of stated criteria in either a clinical or simulated environment, observed by a trained assessor. For the purposes of CVAD Administration set/needleless connector change, a HNELHD trained assessor, is a clinician skilled in CVAD IV administration set/needleless connector change and considered to practice this skill at a proficient or excellent standard (must score 4 or 5) according to the performance criteria within the assessment of practice tool.

It is recognised that some clinicians have expertise in this clinical skill and can have this acknowledged through RPL (recognition of prior learning). The RPL process is outlined in the HNELHD CVADs in Paediatrics PCP.

It is the responsibility of the participant to identify any restriction that may have an impact on their demonstration of the practical procedure. The assessor is to document any reasonable adjustment taken.

Learning outcomes

- Practices in accordance with HNLEHD policies and procedures and scope of practice
- Safely performs CVAD Intravenous Administration set and needleless connector change and demonstrates underpinning knowledge and skills

Key: Performance standards

- To achieve a score of 3 or above in any performance criteria, all listed elements of practice for that performance criteria must be demonstrated.

1 = Expected behaviours and practices not performed (Unsafe, requires constant verbal and physical guidance)	2 = Expected behaviours and practices performed below the acceptable/ satisfactory standard (Needs guidance to be safe, constant verbal cues)
3 = Expected behaviours and practices performed at a minimum/satisfactory standard (Safe, Independent with occasional supportive cues)	4 = Expected behaviours and practices performed at a proficient standard (Above minimum standard, infrequent cues)
5 = Expected behaviours and practices performed at an excellent standard (no supportive cues, displays excellence/sophistication in specific criterion, competently links theory to practise, displays appropriate reflection and insight)	N/A = Not assessed

APPENDIX 2 – DRESSING CHANGE COMPETENCY

HNELHD Central Venous Access Device Dressing Change - Paediatric

HETI Code: Assessment of Practice

CVAD DRESSING CHANGE -						
Pre-requisites prior to undertaking assessment:						
Central Venous Access Devices: the fundamentals (MHL code: 92712530)						
Aseptic Technique: Foundation skills (MHL code: 40027445)						
Invasive Device Protocols (MHL code: 42364545)						
Hand hygiene (MHL code: 42063430)						
Waste management (MHL code: 39966595)						
Infection Prevention & Control Practices (MHL code: 46777047)						
Performance Criteria and Elements of practice	**Circle one number**					
1. Demonstrates effective communication with patient and/or family and/or carer						
1.1 Performs HAIDET. 1.2 Identifies potential barriers to communication and engages appropriate services as required. 1.3 Explains procedure to patient/family/carer and gains verbal consent. 1.4 Checks for allergies.	1	2	3	4	5	N/A
2. Demonstrates adherence to Infection Prevention and Control policy						
2.1 Perform five moments of hand hygiene. 2.2 Performs correct aseptic non-touch technique throughout procedure. 2.3 Performs environmental cleaning before and after procedure. 2.4 Disposes of contaminated waste and sharps appropriately	1	2	3	4	5	N/A
3. Demonstrates adherence to Work Health and Safety						
3.1 Dons Personal Protective Equipment (PPE) as per patient and environmental requirements 3.2 Follows correct manual handling principles throughout procedure 3.3 Positions the patient appropriately whilst maintaining patient privacy and dignity.	1	2	3	4	5	N/A
4. Demonstration of correct CVAD dressing change technique						
4.1 Assesses the CVAD insertion site and need for dressing change 4.2 Assembles appropriate equipment 4.3 Performs hand hygiene and dons non-sterile gloves, removes existing dressing without complication, and using AT safely removes and replaces anchoring device (if present, does not include sutures) ensuring the CVAD is secure at all time. Removes and disposes of gloves and old dressing appropriately 4.4 Performs hand hygiene and dons non-sterile gloves 4.5 Measures length of catheter to ensure no migration has occurred 4.6 Holding CVAD at distal end, cleans site using a 2% chlorhexidine in 70% alcohol swab stick for 20 seconds using side to side, top to bottom "S" shape motion and allow to air dry. If heavily soiled, repeats with second swab stick 4.8 Continues to hold CVAD at distal end and cleans CVAD catheter using a 2% chlorhexidine in 70% alcohol swab starting from exit site and moving towards the hub and allows to dry (caution must be taken to ensure CVAD is not pulled) 4.8 Loops the external catheter around the exit site if CVAD is a tunnelled cuffed CVC. If required, apply securement device to CVAD prior to securing to skin. 4.9 Applies sterile new occlusive dressing keeping the insertion site in the centre of the dressing. 4.10 Removes gloves, performs hand hygiene and discard waste appropriately.	1	2	3	4	5	N/A
5. Demonstrates correct legal documentation						
5.1. Documents procedure in the patient's health care record/CVAD care plan (HSMR90)/flow chart, including any difficulties and the management plan.	1	2	3	4	5	N/A

HNELHD Central Venous Access Device Dressing Change - Paediatric

HETI Code: Assessment of Practice

Overall assessment outcome: In your opinion as an assessor of clinician performance, the overall performance of this person was (please circle one) **Unsafe practice** **Requires reassessment** **Safe practice** **Proficient** **Excellent**			
Assessor Name		**Clinicians Name**	
Assessors Signature		**Employee Number**	
Date of Assessment		**Participants Signature**	

Background/ Risk Statement

Central Venous Access Device (CVAD) dressing change is a high risk procedure associated with the potential for body substance exposure, catheter malposition, arrhythmia, mechanical phlebitis, infection and Vascular Air Embolus (VAE). This clinical procedure assessment process has been developed to set a minimum standard of practice and training for all clinicians who are required to Change a CVAD dressing. This process will ensure that all staff are adequately trained and assessed which will minimise adverse outcomes.

Assessment process

The achievement of the skill to a minimum standard (must score 3 or more) is demonstrated by performance of stated criteria in either a clinical or simulated environment, observed by a trained assessor. For the purposes of changing a CVAD dressing, a HNELHD trained assessor is a clinician skilled in the CVAD dressing change procedure, considered to practice this skill at a proficient or excellent standard (must score 4 or 5) according to the performance criteria within the assessment of practice tool.

It is recognised that some clinicians have expertise in this clinical skill and can have this acknowledged through RPL (recognition of prior learning). The RPL process is outlined in the HNELHD Central Venous Access Devices (CVADs) in Paediatrics PCP.

It is the responsibility of the participant to identify any restriction that may have an impact on their demonstration of the practical procedure. The assessor is to document any reasonable adjustment taken.

Learning outcomes

- Practices in accordance with HNLEHD policies and procedures and scope of practice
- Safely performs the CVAD dressing change and demonstrates underpinning knowledge and skills

Key: Performance standards

- To achieve a score of 3 or above in any performance criteria, all listed elements of practice for that performance criteria must be demonstrated.

1 = Expected behaviours and practices not performed (Unsafe, requires constant verbal and physical guidance)	2 = Expected behaviours and practices performed below the acceptable/ satisfactory standard (Needs guidance to be safe, constant verbal cues)
3 = Expected behaviours and practices performed at a minimum/satisfactory standard (Safe, Independent with occasional supportive cues)	4 = Expected behaviours and practices performed at a proficient standard (Above minimum standard, infrequent cues)
5 = Expected behaviours and practices performed at an excellent standard (no supportive cues, displays excellence/sophistication in specific criterion, competently links theory to practise, displays appropriate reflection and insight)	N/A = Not assessed

APPENDIX 3 – PORT ACCESSING

HNELHD Paediatric Totally Implantable Venous Access Device/Port Accessing Assessment

HETI Code: Assessment of Practice

Totally Implantable Venous Access Device/Port Accessing						
Pre-requisites prior to undertaking assessment:						
Central Venous Access Devices: the fundamentals (MHL code: 92712530)						
Aseptic Technique: Foundation skills (MHL code: 40027445)						
Invasive Device Protocols (MHL code: 42364545)						
Hand hygiene (MHL code: 42063430)						
Waste management (MHL code: 39966595)						
Infection Prevention & Control Practices (MHL code: 46777047)						
Performance Criteria and Elements of practice	**Circle one number**					
1. Demonstrates effective communication with patient and/or family and/or carer						
1.1 Performs HAIDET. 1.2 Identifies potential barriers to communication and engages appropriate services as required. 1.3 Explains procedure to patient/family/carer and gains verbal consent. 1.4 Checks for allergies.	1	2	3	4	5	N/A
2. Demonstrates adherence to Infection Prevention and control policy						
2.1 Perform five moments of hand hygiene. 2.2 Performs correct aseptic non-touch technique throughout procedure. 2.3 Performs environmental cleaning before and after procedure. 2.4 Disposes of contaminated waste and sharps appropriately	1	2	3	4	5	N/A
3. Demonstrates adherence to Work Health and Safety						
3.1 Dons Personal Protective Equipment (PPE) as per patient and environmental requirements 3.2 Follows correct manual handling principles throughout procedure 3.3 Positions the patient appropriately whilst maintaining patient privacy and dignity.	1	2	3	4	5	N/A
4. Demonstration of correct TIVAD/Port accessing technique						
4.1 Sets up as per surgical AT 4.2 Performs hand hygiene for surgical AT and applies sterile gloves without contamination 4.3 Applies NAD to Port needle access point/s and primes with 0.9% sodium chloride ensuring all air bubbles are removed and engages clamps on extension piece 4.4 Attaches empty 10mL luer lock syringe to distal NAD of Port extension set in preparation for aspirating lock solution 4.5 Whilst maintaining sterility, moves to patient 4.6 Using 0.5%-2% chlorhexidine in 70% alcohol swab stick, cleans around the Port site using a scrubbing motion (repeated back-and-forth and side-to-side motion) with friction for 30 seconds. Ensures whole area to be covered with dressing is cleaned. If site is overly soiled, repeats cleaning process with second swab stick. Allows to air dry (does not wipe with gauze or fan dry) 4.7 Identifies the Port chamber under the skin by palpation and stabilises with thumb and index finger using non-dominant hand 4.8 Inserts primed non-coring needle at 90 degree angle into the center of the Port chamber membrane, avoiding any old access sites or scar tissue. Correct needle placement will be indicated by the clinician feeling the non-coring needle pass through the silicone dome of the Port and the tip of the needle making contact with the back of the Port chamber 4.9 Aspirates minimum of 3mL of blood to ensure lock solution is aspirated. 4.10 Engages clamps before disconnecting syringe. Attaches new syringe for blood collection as required. Reengages clamps before disconnecting syringe 4.11 Vigorously cleans NAD with 2% chlorhexidine in 70% alcohol swab for 20 seconds and allows to dry 4.12 Attaches 10mL luer lock syringe with 0.9% sodium chloride and flushes using a pulsating technique. Engages clamps before disconnecting syringe 4.13 Applies sterile semi-permeable transparent dressing over Port site, ensuring edges are sealed 4.14 Attaches primed IV administration set to the Port extension set if required 4.15 Removes gloves and performs hand hygiene 4.16 Commences IV fluids if required 4.17 Discards waste appropriately	1	2	3	4	5	N/A
5. Demonstrates correct legal documentation						
5.1 Documents procedure in the patient's health care record/CVAD care plan (HSMR90)/flow chart 5.2 Accurately labels all infusions and IV administration sets according to the user applied labelling standards 5.3 Document new infusions on National Inpatient Medication Chart/ Fluid order chart and on Fluid balance chart.	1	2	3	4	5	N/A

HNELHD Paediatric Totally Implantable Venous Access Device/Port Accessing Assessment

HETI Code: Assessment of Practice

Overall assessment outcome: In your opinion as an assessor of clinician performance, the overall performance of this person was (please circle one) **Unsafe practice** **Requires reassessment** **Safe practice** **Proficient** **Excellent**			
Comments:			
Assessor Name		**Clinicians Name**	
Assessors Signature		**Employee Number**	
Date of Assessment		**Participants Signature**	

Background/ Risk Statement

Accessing Ports is a high risk procedure associated with the potential for introduction of infection, body substance exposure, catheter malposition, arrhythmia, mechanical phlebitis and Vascular Air Embolus (VAE).

This clinical procedure assessment process has been developed to set a minimum standard of practice and training for all clinicians who are required to change IV administration sets and needleless connectors connected to CVADs. This process will ensure that all staff are adequately trained and assessed which will minimise adverse outcomes.

Assessment process

The achievement of the skill to a minimum standard (must score 3 or more) is demonstrated by performance of stated criteria in either a clinical or simulated environment, observed by a trained assessor. For the purposes of Port accessing, a HNELHD trained assessor, is a clinician skilled in Port accessing and is considered to practice this skill at a proficient or excellent standard (must score 4 or 5) according to the performance criteria within the assessment of practice tool.

It is recognised that some clinicians have expertise in this clinical skill and can have this acknowledged through RPL (recognition of prior learning). The RPL process is outlined in the HNELHD Central Venous Access Devices (CVADs) in Paediatrics PCP.

It is the responsibility of the participant to identify any restriction that may have an impact on their demonstration of the practical procedure. The assessor is to document any reasonable adjustment taken.

Learning outcomes:

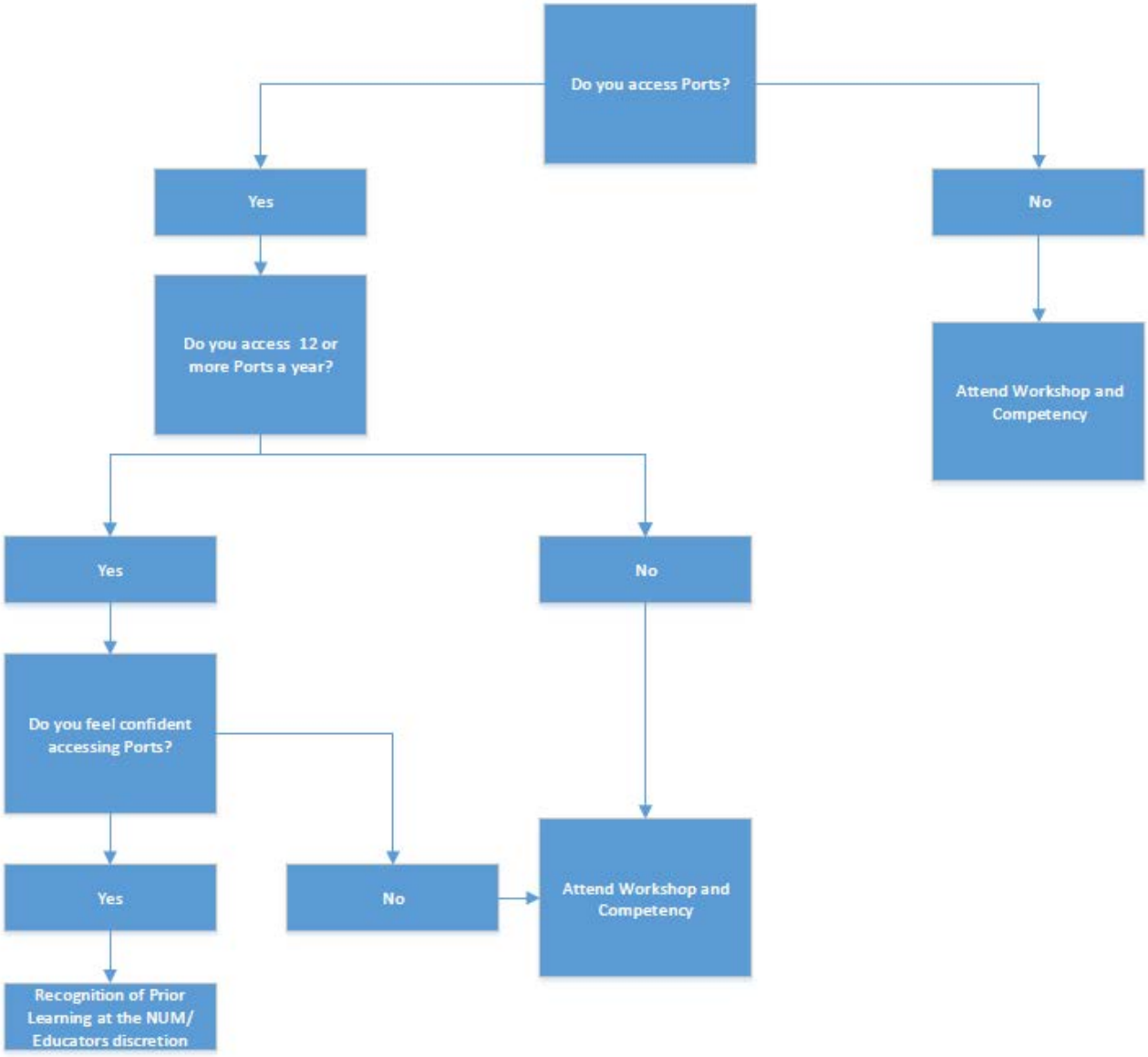
- Practices in accordance with HNLEHD policies and procedures and scope of practice
- Safely performs Port access and demonstrates underpinning knowledge and skills

Key: Performance standards

- To achieve a score of 3 or above in any performance criteria, all listed elements of practice for that performance criteria must be demonstrated.

1 = Expected behaviours and practices not performed (Unsafe, requires constant verbal and physical guidance)	2 = Expected behaviours and practices performed below the acceptable/ satisfactory standard (Needs guidance to be safe, constant verbal cues)
3 = Expected behaviours and practices performed at a minimum/satisfactory standard (Safe, Independent with occasional supportive cues)	4 = Expected behaviours and practices performed at a proficient standard (Above minimum standard, infrequent cues)
5 = Expected behaviours and practices performed at an excellent standard (no supportive cues, displays excellence/sophistication in specific criterion, competently links theory to practise, displays appropriate reflection and insight)	N/A = Not assessed

APPENDIX 4 - PORT ACCESSING FLOW CHART



IMPLEMENTATION, MONITOING COMPLIANCE AND AUDIT

Communication:

1. Awareness of this Guideline and Procedure will be promoted through the CE Newsletter.
2. The Guideline and Procedure will be communicated via email to Executive Director, Greater Metropolitan Health Service, Executive Director, Rural and Regional Health Services and Senior Nursing and Midwifery Managers and is to be tabled at the relevant Clinical Quality Committee, District Intravascular Committee, District Nurse Educators and CNC Network and ward meetings at each facility.
3. New and revised Clinical Guidelines, Procedures, Policy Directives and PCP's are posted on the HNE Policy, Procedure and Guideline Directory.

Implementation and Monitoring:

1. Education will be delivered to relevant clinical staff
2. Incident investigations associated with this Guideline and Procedure will include a review of process.
3. The Guideline and Procedure will be amended in line with the recommendations.
4. The person or leadership team who has approved the Guideline and Procedure is responsible for ensuring timely and effective review of the Clinical Procedure.
5. Evaluation will include a review of the most current evidence as well as a consideration of the experience of HNE Health staff in the implementation of the Guideline and Procedure.

Auditing:

1. Invasive device Audit
2. Documentation audit of CVAD care plan and Hourly rounding document.

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Other Useful links

- Medications in Paediatrics PD2013_043:PCP 47
- Paediatric Intravenous Cannula Care HNELHD GandP 17_16
- HNELHD Aseptic technique resource page
- HNELHD Central Venous Catheter (CVC) Removal PD2019_040:PCP 1
- HNELHD Peripherally Inserted Central Catheters (PICC) Removal PD2019_040:PCP 2
- NSW Health Policy Directive PD2016_058 Managing User-applied Labelling of Injectable Medicines, Fluids and Lines
- NSW Health Guideline GL2015_008 Standards for Paediatric IV Fluids (second edition)
- Managing User-Applied Labelling of Injectable Medicines, Fluids and Lines [PD2016_058:PCP 1] [PD2016_058:PCP 1]

FEEDBACK

Any feedback on this document should be sent to the Contact Officer listed on the front page.