

Central Venous Catheter (CVC) Care for an Infant, Child or Young Person

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1. Introduction

This guideline is intended to support and direct clinical staff in the safe and effective management of central venous catheters (CVC) in children. This includes minimising potential risks and early detection and management of complications.

The guideline is not intended to replace clinical judgement, rather the intent is to provide a consistent, evidence based approach to insertion, maintenance and removal of CVC, while highlighting the role of 'care bundles' in catheter management.

2. Principles

- The careful preparation of family/whānau/caregivers and children, using age appropriate therapeutic play techniques and utilising play specialists, is recommended with all CVC management.
- Where a child has a CVC in situ, this is to be used for intravenous therapy in preference to inserting a peripheral cannula.
- It is the responsibility of all clinical staff caring for an infant, child or young person with a CVC to familiarise themselves with this guideline and other associated documents.
- CVC insertion should only be undertaken by trained personnel who demonstrate competence in the insertion of central venous catheters.
- CVC maintenance and removal of PICC and Percutaneous CVCs is undertaken by registered nurses who have been assessed as competent to do so by designated staff members.

- **Exception:**

The procedures below should only be undertaken by staff members who have received additional training and demonstrated the required skill:



- unblocking CVC
- repairing CVC



Outside of PICU, each child must have a CVC Safety Kit containing 1 pack of gauze swabs, replacement dressing and 1-2 clamps, available in close proximity at all times. Ensure this pack is sent home with the child.



To reduce the risk of a potentially life threatening septic shower, when initially accessing all CVC which do not have a continuous infusion running, aspirate 2-5mL of blood and discard.

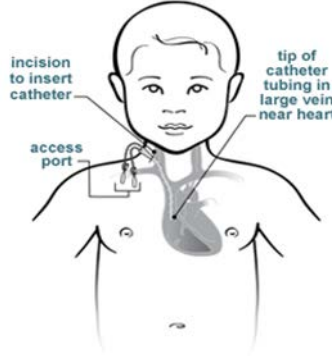
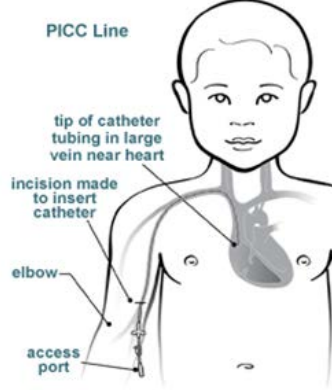
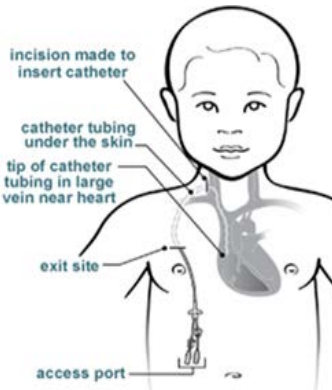
- It is recognised that the recommended practices within this document may at times differ within speciality areas and under emergency situations.

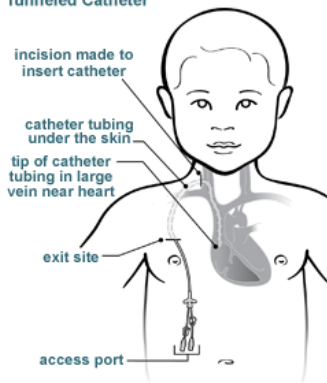
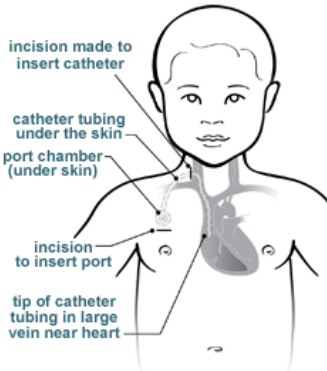
3. Definitions

Term	Description
Aseptic non touch technique (ANTT)	ANTT refers to an antiseptic hand wash (30 seconds with antimicrobial soap and water OR alcohol hand rub), use of an aseptic field, appropriate gloves, and the maintenance of a non-touch technique throughout the entire procedure
Antibiotic lock	Instillation of a high concentration of an antibiotic for a pre-determined dwell time for treatment of a central line infection
Central Venous Catheter (CVC)	For the purpose of this document, the term 'central venous catheter' refers to: <ul style="list-style-type: none"> • Percutaneously inserted central venous catheter • Peripherally inserted central venous catheter (PICC) • Tunnelled uncuffed brachiocephalic line • Tunnelled cuffed central venous catheter • Subcutaneously implanted vascular device (e.g. PortaCath) • Percutaneous and Tunnelled apheresis/haemodialysis type catheter (e.g. VasCath)
'Child'	For the purposes of this document the term 'child' refers to infants, children and young people
CLAB	Central line associated bacteraemia
Ethanol lock	Instillation of ethanol for prevention of CLAB in children with recurrent central line infections
Extravasation	Inadvertent administration of a vesicant solution/medication into the extra-vascular space
Heparin lock	The instillation of heparin into the CVC lumen whenever a CVC is not in continuous use
Infiltration	Inadvertent administration of a non-vesicant solution /medication into the extra-vascular space
Positive pressure technique	<p>While instilling the last 0.1 mL of solution, clamp the catheter. Disconnect the syringe. The clamp should not be released once the solution is in place. This will maintain a constant even force within the CVC lumen to prevent any reflux of blood back into the CVC.</p> <p>This technique is not required when a positive displacement valve is in situ (see below)</p>
Positive displacement valve (positive pressure valve or positive bolus valve)	<p>Instil solution. Disconnect the syringe. Clamp the catheter. On removal of the syringe from the valve, a bolus of fluid is displaced out the end of the catheter to help clear the catheter lumen and prevent retrograde flow of blood into the catheter.</p> <p>A positive displacement device is to be used for all PICC catheters and only as clinically indicated for any other central line</p>

Term	Description
Recommended cleaning solution	<p>Use chlorhexidine gluconate 2% / ethanol 70%. This is available as either, solution, wipes or swab sticks.</p> <p>Povidone iodine 10%, alcoholic tinctures of iodine, ethanol 70% alone or chlorhexidine 2% alone are acceptable if there is a contraindication to one or other component.</p>
Recommended dressing	<p>A transparent, high moisture vapour transmission rate dressing (e.g. Tegaderm IV or IV 3000 1 Hand).</p> <p>The use of an alternative transparent high moisture transmission rate dressing may be considered for patients with allergy to above or sensitive skin (e.g. Mepore IV or Polyskin).</p> <p>The use of a chlorhexidine dressing (e.g. Biopatch or Tegaderm CHG) may be considered for individual patients identified as high risk of CLAB in collaboration with the paediatric infectious disease team.</p> <p>The use of a more absorbent transparent dressing (e.g. Opsite Postop Visible) may be considered where there is serous/blood ooze from site.</p>
Recommended flush volume	<p>The volume of the flush solution (sodium chloride 0.9%) should be equal to twice the volume of the catheter and add-on devices with a maximum volume of 10 mL.</p>
Scrub the hub	<p>Scrub the needleless connector with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before every access</p>
Septic shower	<p>A septic shower is the sudden systemic influx of pathogens that have colonized in a central venous catheter, causing septic shock in the patient. This is a life threatening condition and requires urgent medical attention”.</p>
Syringe	<p>Use syringes with a diameter at least that of a standard 10mL syringe</p>
Trendelenburg position	<p>Patient lies flat on their back with the feet higher than the head by 15-30 degrees. Used when removing non-tunnelled, non- cuffed CVCs</p>
Turbulent flow flushing technique	<p>Using a ‘push-pause-push’ technique while flushing a CVC with sodium chloride 0.9% e.g.</p> <ul style="list-style-type: none"> • Following administration of a medication • Prior to connection of an administration set • Following the withdrawal of a blood sample • Prior to heparin locking <p>This technique will create a turbulent flow within the CVC lumen assisting in the prevention of fibrin deposits and drug precipitation.</p>
Vesicant	<p>An agent capable of causing blistering, tissue sloughing, or necrosis when it escapes from the intended vascular pathway into surrounding tissue</p>

4. CVC types

Category		Characteristics
<p>Short Term maximum 10 days – 2 weeks</p> <ul style="list-style-type: none"> • Percutaneously inserted • Non tunnelled • Non-cuffed • Single or multiple lumen <p>e.g. Arrow</p>	<p>Temporary Central Line</p> 	<ul style="list-style-type: none"> • Suitable for acute care needs, e.g. operating theatre, intensive care • Direct entry into vein associated with increased risk of complications when used on a longer term basis • Antimicrobial coated and impregnated catheters may be considered for individual patients identified as high risk of CLAB in collaboration with the paediatric infectious disease team
<p>Medium Term Catheters weeks – months</p> <ul style="list-style-type: none"> • Peripherally inserted central catheter (PICC) • Commonly inserted via basilic or cephalic vein • Single or double lumen 	<p>PICC Line</p> 	<ul style="list-style-type: none"> • Suitable for medium term use in some patient groups e.g. home antibiotic therapy • Reduced risk of infection compared to short term catheters
<p>Medium Term Catheters weeks – 3 months</p> <ul style="list-style-type: none"> • Tunnelled uncuffed brachiocephalic venous catheter • Single lumen • Same catheters as PICC are often used. • Commonly inserted via LEFT brachiocephalic vein <p>Note diagram shows right sided line</p>	<p>Tunnelled Uncuffed Catheter</p> 	<ul style="list-style-type: none"> • Suitable for up to 3 months for intravenous antibiotic treatment for infants under 6 month of age • Care for these lines are similar to PICC. They can be removed on the ward by nursing or medical staff as these catheters are uncuffed. • If there is any swelling or leakage at the neck or exit site. Please contact the on call paediatric anaesthesia registrar.

Category		Characteristics
<p>Long Term Catheter months - years</p> <ul style="list-style-type: none"> • Tunnelled cuffed catheters • Single or double lumen <p>e.g. Hickman or Broviac</p>	<p>Tunneled Catheter</p> 	<ul style="list-style-type: none"> • Used when long term and frequent access is required • Catheter is tracked subcutaneously to entry site of chosen vein and a dacron polyester fibre cuff is placed approximately 2cm from exit site in order to reduce risk of infection and to secure line
<p>Long Term Catheter years</p> <ul style="list-style-type: none"> • Subcutaneous venous access device (SVAD) • implantable venous port <p>e.g. Port-a-Cath</p>	<p>Implantable Venous Port</p> 	<ul style="list-style-type: none"> • Used when cyclical access required • Minimal maintenance between use • Avoids repeat catheter insertion and associated anaesthesia • May be compatible with CT power injector
<p>Haemodialysis / apheresis catheters</p> <ul style="list-style-type: none"> • Percutaneous catheter e.g. Medcomp, Gamcath, Mahurkar, Bard • Tunnelled catheter e.g. Medcomp, Quinton permacath 	<p>Short term</p> <p>Long term</p>	<ul style="list-style-type: none"> • Indicated for specific therapy e.g. haemodialysis, apheresis or continuous renal replacement therapy

Haemodialysis / apheresis catheters

Some children may require a specialised large bore central venous catheter, commonly referred to as a vascath although a variety of brands are used.

- For patients within the paediatric renal service this catheter is only accessed for haemodialysis/apheresis and managed by haemodialysis/blood bank staff members unless agreed to by the on call paediatric nephrologist.
- Children who have a short term, uncuffed large bore catheter are not able to be discharged with the catheter in situ but may move around within the hospital. The exception is where the catheter is positioned in a femoral vein as the patient requires bed rest or wheelchair on the ward only.

5. CVC insertion bundle

Prior to CVC insertion, consideration of the reason for the CVC and likely duration of use should determine the type of CVC and the number of lumens required.

Percutaneous CVCs and PICCS may be inserted in either the operating rooms, NICU or PICU.

Tunnelled cuffed and subcutaneously implanted CVCs are inserted in the operating room.

The tip of a CVC should be intrathoracic and ideally lie at the right atrium /superior vena cava (RA/SVC) junction. The correct position should be confirmed by X-ray prior to use.

All insertions of CVCs are underpinned by adhering to the Insertion bundle:

Optimal catheter site selection

The risk and benefit of both infectious and non-infectious complications must all be considered on an individual basis when determining CVC insertion site

Hand hygiene

To decrease the likelihood of CLAB, hand hygiene using an alcohol based hand product or an antiseptic soap and water is required prior to donning sterile gloves.

Chlorhexidine skin antisepsis

Use chlorhexidine gluconate 2% in ethanol 70% and allow to dry prior to inserting the CVC.

Maximal barrier precautions

For the person inserting the CVC:

- Cap
- Mask
- Sterile gown
- Sterile gloves

For the patient:

- Cover the patient, as much as is safe to do so, with a large sterile drape with a small opening for the site of insertion.

For equipment used:

- Ensure that the catheter or guide wire remains on the sterile field and is not exposed to contamination during the insertion procedure.
- If an ultrasound is used to guide insertion of the catheter, the probe should be inserted into a sterile sleeve.

Insertion bundle compliance

Compliance with maximal barrier precautions is a shared clinical responsibility.

If the healthcare professional assisting with the procedure highlights a breach in aseptic technique including inadequate hand hygiene, skin antisepsis or maximal barrier precautions, then the clinician inserting a CVC should stop the procedure and correct (if safe to do so).

Insertion bundle documentation

For other than surgically placed central venous catheters, use the central line insertion and care bundle checklist (CR4030) to facilitate:

- adherence to the bundle components at the time of CVC placement
- documentation of catheter details, insertion site etc
- on-going audit and feedback on adherence to infection prevention practices.

For surgically placed central lines, catheter details and insertion site are recorded in the clinical record and transcribed onto the central line insertion and care bundle continuation form (CR4032)

Exceptions to insertion bundle practice



In acute resuscitation circumstances, where a patient's life is at risk and urgent CVC placement is required, adherence to all elements of the insertion bundle may not be possible.

Breaches of best practice in such situations should be recorded and notified to the medical team caring for the patient, and the CVC should be replaced with a catheter inserted according to best practice as soon as it is safe and practical to do so.

6. CVC care bundle

All CVC management is underpinned by the components of the CVC Care Bundle.

ANTT for all procedures

Scrub the needleless connector with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before every access

Administration sets and any add on devices are changed every 96 hours or weekly if lumen not in use.

Dry and occlusive transparent, high moisture vapour transmission rate dressing which is changed weekly or if integrity compromised

Daily (or as service agreed for long term lines) review of line necessity

Site check each shift (hourly for percutaneous & PICC). Notify medical staff if any signs of inflammation

All children with a CVC insitu require 4 hourly observations or as PEWS score dictates. If the temperature is > 38°C and the patient exhibits clinical signs of sepsis (chills, rigors, hypotension, or tachycardia) 2 sets (sequentially or within 12 hours) of blood cultures should be taken; one peripherally and one from the CVC. Refer to ADHB [Blood Culture](#) guideline

Do not remove the CVC on the basis of fever alone, clinical judgment and further evaluation of the patient is necessary. Consult with the paediatric infectious disease team as appropriate

Safety pack present at bedside

Do not access lines with syringes less than 10 mL

Avoid BP cuffs or tourniquet on arm with PICC in situ

Intravenous Nutrition (IVN) administration

Minimise the number of times the lumen with IVN is manipulated. Where possible, use a new dedicated single lumen CVC or dedicate a previously unused lumen on a multi-lumen CVC to IVN.



For the instances where it is desirable to administer an antibiotic via the IVN lumen (or if limited IV access), add a short Y extension or 3 way tap to the IVN administration set prior to connecting to the patient. This will enable the administration of additional medications without disconnecting the IVN administration set.

Care bundle documentation

Use the central line insertion and care bundle checklist and continuation checklist (CR4030 & CR4032) to record:

- adherence to the CVC care bundle components
- record on-going CVC management, including complications and removal details
- on-going audit and feedback on adherence to infection prevention practices.

7. Nursing Management

Preoperative nursing management

Ensure:

- the child has fasted as per Starship guideline and goes to the operating room in clean clothes or pyjamas
- that the pre-anaesthesia assessment has been completed by the child's guardian and that the child's weight and base line recordings have been recorded (CR8815)
- informed consent (CR 0111) for the procedure has been obtained by medical staff members and is available in the patients notes.
- a full blood count (FBC) has been taken and documented (CR8815), within the last 24 hours where appropriate and a "Group and Hold" is completed in the instance where blood products may be required

Prepare one parent or caregiver to enter the operating room during anaesthetic induction where appropriate

Postoperative nursing management

Ensure:

- The CVC insertion record (CR4030) is completed and added to the patient's clinical record
- Where a PICC has been inserted, ensure documentation of length of PICC is recorded on the insertion form
- Assess and record vital signs on return to the ward and then as the child's condition dictates
- Observe insertion and exit sites and dressings for bleeding, on return to the ward and at least 4 hourly. Document assessment findings at least each shift.
- Prior to using the CVC, ensure correct placement of CVC has been confirmed by x-ray and documented as such by a medical staff member
- If continuous fluids are not in progress ensure that the CVC has a heparin lock (refer to section 7 f. CVC heparin lock instillation)

Note that subcutaneously implanted CVCs remain accessed as required.

For surgically placed central venous catheters, commence maintenance bundle record (CR4032) and transcribe insertion and catheter details

Use of infusion pumps with a CVC



To minimise the risk of potential complications from CVC therapy within Starship Child Health, all children receiving continuous intravenous fluids via a CVC must have their infusion controlled by an infusion pump. The programmed volume to be infused should be set and is not to exceed 2 hours.

CVC exit site dressing

Usually a transparent, high moisture vapour transmission rate dressing is used. Transparent, high moisture vapour transmission rate dressings are routinely changed weekly or as required where dressing is compromised or blood is present at exit site.

If there is excessive ooze on the dressing within the first 24 hours of catheter placement contact appropriate staff as below to assess the dressing re further management :

- For tunnelled CVCs contact the surgical registrar
- For PICCs contact the anaesthetic registrar

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If a tunnelled catheter has a non-transparent dressing insitu, contact the surgical registrar for guidance re management.

The neck wound site dressing can be removed once site is healed.

If the child is discharged less than 24 hours post insertion with a non-transparent dressing, arrange for the community nursing service to change to a transparent, high moisture vapour transmission rate dressing.

Note:

- On well healed, tunnelled cuffed CVCs it may not be necessary to apply a dressing. This should be decided and clearly documented on an individual basis.
- In exceptional circumstances where the [recommended dressing](#) is not used, the frequency of dressing changes are as per manufacturer's instruction.

CVC exit site dressing procedure

Collect and prepare equipment

- Gloves (non-sterile)
- Chlorhexidine gluconate 2% in ethanol 70%(solution, wipe or swab-stick)
- Aseptic field (reusable tray if using wipe/swabstick, dressing pack if using solution)
- [Recommended dressing](#)

Procedure

- Follow an aseptic non touch technique and hand hygiene moments throughout the procedure
- Remove previous dressing and discard
- Inspect exit site for signs of infection
- Pick up the distal end of the CVC and clean CVC from the exit site to the CVC hub and allow to dry
- Clean site starting from the exit site extending to the area which should be covered by the dressing
- Allow area to dry and apply [recommended dressing](#)
- Ensure that the dressing is sealed around the CVC site. Catheters and extensions can be looped under the dressing for extra security
- Do not apply gauze around the catheter or exit site as this will inhibit vision of the site and alter the moisture transmission rate of the [recommended dressing](#)
- Dispose of all waste as per individual area practices
- Document the date of dressing change, physical condition of the site and any nursing intervention in the clinical record
- Report any signs of infection or changes in skin integrity to a member of the primary medical team.

CVC administration set change

To reduce the risk of infection:

Continuous CVC administration sets are changed:

- On completion of blood product infusion
- Following accidental disconnection
- Every 24 hours if IVN is in progress
- As indicated for medication infusions.
- Every 96 hours in all other instances

Intermittent CVC administration sets can be changed every 24 hours as long as:

- The intermittent administration set is capped securely with a blind end cap between use

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- The needleless access device is cleaned with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allowed to dry before re-connection of intermittent administration set
- The time and date of first use are recorded on the administration set

CVC administration set change

Collect and prepare equipment

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe or swab-stick)
- Aseptic field (cleaned reusable tray)
- Sodium chloride 0.9% or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required
- New administration set/intravenous fluid

Procedure

- Follow hand hygiene moments, aseptic non touch technique and scrub the hub throughout the procedure
- Draw up sodium chloride 0.9% in a 10 mL syringe, or use prefilled syringe.
- Prime new administration set and clamp set
- Prepare patient **by placing supine** and **ensure clamps on catheter** are closed and any infusion in progress is stopped.

Where there is a current infusion in progress

- Disconnect the current administration set
- Scrub the needleless connector with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry
- Connect 10 mL syringe containing sodium chloride 0.9% and assess patency of catheter.
- Disconnect syringe, scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before connecting primed administration set.

Where the catheter has a heparin lock in situ

- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry
- Connect an empty syringe, remove 2-5 mL of blood from the catheter and discard (removes heparin and reduces risk of 'septic shower').
- Scrub the needleless access device with chlorhexidine gluconate 2%/ethanol 70% for 30 seconds and allow to dry before connecting a 10 mL syringe with 0.9% sodium chloride.
- Flush CVC using a 'turbulent flow' technique.
- Remove syringe, scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before connecting new administration set to CVC

NB If you are unable to remove the heparin lock from the CVC, stop the procedure, and inform a member of the primary medical team that the heparin lock (200 units/2 mL or 5000 unit/5 mL) is unable to be withdrawn.

- Place new administration set in appropriate volumetric pump or syringe driver
- Verify pump setting is correct as per prescription, independently double check with a colleague if required
- Open clamps and commence infusion at prescribed rate
- Ensure that all lines are clearly labelled
- Dispose of all waste as per individual area practices
- Document the date of administration set change in the patient's clinical record and on the administration set

CVC needleless access device

CVC needleless access devices are changed:

- Every 96 hours when being regularly accessed in hospital
- Weekly if not being regularly accessed. This should coincide with catheter flush, heparin lock instillation and exit site dressing change.

CVC needleless access device change

Collect and prepare equipment

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- Needleless access device (s)
- sodium chloride 0.9% or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required

Procedure

- Follow hand hygiene moments, aseptic non touch technique and scrub the hub throughout the procedure
- Prime new administration set if required
- Prime new needleless access device with 0.9% sodium chloride
- **Prepare patient by placing supine and ensure clamps on catheter are closed** and any infusion in progress is stopped.

Where there is an infusion in progress

- Disconnect the current administration set.
- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry.
- Remove the needleless access device, scrub the hub of the CVC and replace with a new primed needleless access device.
- Connect 10 mL syringe containing sodium chloride 0.9% and assess patency of catheter by first bleeding and then flushing the line.
- Disconnect syringe, scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before connecting new primed administration set.

Where the catheter has a heparin lock in situ

- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry.
- Remove the needleless access device, scrub the hub of the CVC then replace with a new primed needleless access device.
- Connect an empty syringe, remove 2-5 mL of blood from the catheter and discard (removes heparin and reduces risk of 'septic shower').
- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry and connect a 10 mL syringe with sodium chloride 0.9%.
- Flush CVC using a 'turbulent flow' technique.
- Remove syringe, scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry
- Attach syringe and instil heparin lock.
- Where 200 units/2 mL or 5000 units/5 mL strength of heparin is instilled, clearly label the catheter indicating this

NB If you are unable to remove the heparin lock from the CVC, stop the procedure, and inform a member of the primary medical team that the heparin lock (200 units/2 mL or 5000 units/5 mL) is unable to be withdrawn.

NB: A positive displacement needleless access device is to be used for all PICC lines and as clinically indicated for any other central line. This negates the need for a positive pressure technique

- Dispose of all waste at point of care
- Document the date of needleless access device change in the patient's clinical record

CVC heparin lock instillation

When a continuous infusion is not in progress it is necessary to instil a heparin lock to maintain CVC patency. The strength of the heparin will depend on various factors such as, catheter type, the time between heparin instillation, and patient characteristics.

Contraindications for heparin use - Anaphylaxis to heparin.

Heparin strength during regular use:

- All CVCs having regular intermittent use should be locked with heparin 50 units/5 mL at least 8 hourly.
- Where a PICC line, tunnelled or subcutaneous access device is being accessed less frequently than 8 hourly, use heparin 200 units/2 mL.

Except:

- For haemophilia patients - always use heparin 50 units/5 mL
- For apheresis catheters - always use heparin 5000 units/5 mL
- Infants less than 5 kg in PICU (Paediatric Intensive Care Unit) and PCCS (Paediatric Congenital and Cardiac Services) - have a continuous low dose heparin infusion administered as prescribed via their CVC until removal of the CVC.
- Children under the PCCS require a low rate continuous intravenous infusion via one or both of their CVC lumens, rather than heparin locking, (unless otherwise documented by a medical officer).
- In the Starship Blood & Cancer Centre, lumens which require intermittent medication infusions may have a continuous TKVO (to keep vein open) infusion
- The rate of either of these infusions should be agreed upon in line with speciality service and prescribed accordingly.

Heparin strength/volume when long term CVC are not in regular use:

Weekly or monthly, flushing and heparin lock instillation should be timed to coincide with needleless access device change and exit site dressing changes.

Type of line	Heparin volume	Heparin strength
SVAD	2 mL	200 units/2 mL monthly
Tunnelled	<1yr = 0.5 mL (each lumen) >1yr = 1 mL (each lumen)	200 units/2 mL every 7 days
PICC	<1yr = 0.5 mL (each lumen) >1yr = 1 mL (each lumen)	200 units/2 mL every 7 days
Haemodialysis/ Apheresis Catheters	Use intraluminal volumes specified on the catheters. Use exact volumes taking into consideration any 'add-ons' such as needleless access device.	5000 units/5 mL between therapy up to weekly

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Equipment required for CVC heparin lock instillation

- Gloves (non-sterile)
- Chlorhexidine gluconate 2% in ethanol 70%(wipe or swab-stick)
- Aseptic field (cleaned reusable tray)
- Sodium chloride 0.9% ampule or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required
- Heparin as prescribed
- Needleless access device

Procedure

- Follow hand hygiene moments, aseptic non touch technique and scrub the hub throughout the procedure
- Prepare equipment, using an independent double check procedure
- **Prepare patient by placing supine and ensure clamps on catheter are closed** and any infusion in progress is stopped.

Where there is a current infusion in progress

- Disconnect the current administration set
- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry. If a new needleless access device is required, prime the device and attach to the CVC
- Connect 10 mL syringe containing sodium chloride 0.9% and flush CVC using a turbulent flow technique.
- Disconnect sodium chloride syringe, connect and instil heparin solution using a positive pressure technique.
- Clearly label the catheter indicating the presence of heparin lock

Where the catheter has a heparin lock in situ

- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry. If a new needleless access device is required, prime the device and attach to the CVC
- Connect an empty syringe, remove 2–5 mL of blood from the catheter and discard (removes heparin and reduces risk of 'septic shower').
- Scrub the needleless access device with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry before connecting a 10 mL syringe with sodium chloride 0.9%.
- Flush CVC using a 'turbulent flow' technique.
- Instil new heparin lock using a positive pressure technique
- Clearly label the catheter indicating the presence of heparin lock

NB If you are unable to remove the heparin lock from the CVC, stop the procedure, and inform a member of the primary medical team that the heparin lock (200 units/2 mL or 5000 units/5 mL) is unable to be withdrawn.

NB A positive displacement needlless access device is to be used for all PICC lines and as clinically indicated for any other central line. This negates the need for a positive pressure technique.

Dispose of all waste at point of care

Document the procedure in the patient's clinical record

Sign medication administration record for the heparin administered

Blood sampling from a CVC

While blood samples can be obtained from a CVC, it is advisable to assess the appropriateness of sampling from the CVC as per individual area practices as some tests are not advised to be taken from CVC lines as follows:

- Serum levels should not be obtained from the same lumen as medication administration
- No samples should be routinely taken from renal dialysis catheters by members of the ward nursing staff
- A finger prick should be considered rather than taking blood off a central line when it is not in use. Discuss within speciality.

Equipment

- Gloves
- chlorhexidine gluconate 2% in ethanol 70%(wipe or swab-stick)
- Aseptic field (cleaned reusable tray)
- sodium chloride 0.9% or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required
- Needleless access device
- Labelled specimen containers as required

Procedure

- Follow hand hygiene moments, aseptic non touch technique and scrub the hub throughout the procedure
- Where possible, blood sampling should be taken without breaking the line e.g. via a designated needleless access device.
- When obtaining a blood culture, use sterile gloves and change the needleless access device immediately prior to aspirating the blood sample.
- Prepare equipment and patient, discontinuing any infusions in progress via all lumens
- Scrub the needleless access device and catheter hub (if changing device) with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry.
- Aspirate initial 2-5 mL and discard (to improve accuracy of results and reduce risk of septic shower). If blood cultures are to be taken, this initial blood draw should be used as the specimen for children greater than 30 kg.
- Obtain blood specimens as requested (blood culture bottles should be filled first)
- Flush CVC with sodium chloride 0.9% using turbulent flow technique prior to either instilling a heparin lock or continuing with infusion
- Ensure no blood remains in the needleless access device
- Fill specimen containers and label containers at the bedside.
- Verify patient ID label on specimen container matches the patient ID on the laboratory form prior to sending to the laboratory
- Dispose of all waste at point of care
- Document the procedure in the patient's clinical record

Accessing a subcutaneously implanted port

When a subcutaneously implanted port is accessed for treatment, port needles are changed every 7 days. When a subcutaneously implanted port is not being used regularly, it is accessed monthly to flush the catheter and replace the heparin lock.

Within Starship, power ports are inserted. These ports are able to with-stand 300 pounds per square inch (psi) and can therefore be used for a power injection of contrast media. For a contrast injection to be administered via the port a POWER LOC Needle needs to be inserted. The nurse must also attach

the sticker provided in the pack onto the extension set which signifies that contrast can be administered.

At all other times a gripper needle is inserted. Both gripper and power loc needles are non-coring and have an extension set attachment.

Collect and prepare equipment

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- Needleless access device (s)
- sodium chloride 0.9% and 10 mL syringes and needles as required or pre filled sodium chloride 0.9% syringe
- Gauze swab (for monthly flush and heparin lock)
- Port needle with luer lock extension (e.g. Gripper needle or POWER LOC needle)
- Recommended dressing
- Heparin as prescribed (50 units/5 mL if lock administered more frequently than daily or for haemophiliac patient or 200 units/2 mL if monthly heparin lock)

Procedure

- Follow aseptic non touch technique throughout the procedure
- Draw up sodium chloride 0.9% using a 10 mL syringe, (or prefilled syringe)
- Draw up heparin using an independent double check procedure
- Attach needleless access device to the non-coring needle and extension set; prime with 0.9% sodium chloride
- Prepare patient by removing any clothing that obscures port site and raise the child's arm above head if necessary or position the child as appropriate
- Remove topical anaesthetic if applicable
- Clean the skin with recommended cleaning solution starting in the centre over the implanted CVC site, using a friction motion, clean in concentric circles, extend out to include the area that will be covered by the dressing
- Using the non-dominant hand, locate the port identifying the three palpation points which are arranged in a triangle, stabilise the port with two or three fingers to stop the port moving under the skin during the procedure
- With the dominant hand, insert the needle at a right angle into the middle of the port. Push the needle slowly but firmly through the child's skin into the septum of the port
- Connect an empty 10 mL syringe to the luer lock at the end of the port extension tubing.
- Draw back 5 mL of blood and discard. If blood is unable to be withdrawn:
 - reposition child
 - reposition needle
- If blood is still unable to be withdrawn, stop the procedure and discuss with a member of the primary medical team regarding need for radiological examination prior to further action
- Once blood is withdrawn, or position is confirmed by radiological examination, or by a member of the primary medical team, remove syringe from extension set and discard. Flush with 10 mL of sodium chloride 0.9% using turbulent flow technique
- If port is being used more frequently than 8 hourly, lock with heparin (50 units/5 mL) as prescribed
- If port is being used less frequently than 8 hourly, lock with heparin (200 units/2 mL) as prescribed
- Remove wings from gripper needle and discard. (Note: if using a Power port needle, wings are not removable). Apply dressing securely and firmly over the port needle, ensuring all edges of dressing are sealed securely to prevent dressing lifting. Younger children may need a securing

- device (e.g. Flexi track) to prevent accidental needle removal
- Record the procedure and confirmation of correct needle placement in the patient's clinical record
- If port is being accessed for monthly maintenance only, lock with heparin (200 units/2 mL) as prescribed.

De-accessing a subcutaneously implanted port

To safely remove a needle from a subcutaneously implanted CVC when the needle is being changed every 7 days or cessation of continuous therapy

Collect and prepare equipment

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- sodium chloride 0.9% and 10 mL syringes and needles as required or pre filled sodium chloride 0.9% syringe
- Heparin as prescribed
- Small adhesive dressing (e.g. band aid)

Procedure

- Follow hand hygiene, aseptic non touch and scrub the hub techniques throughout the procedure
- Draw up sodium chloride 0.9% in a 10 mL syringe, or use prefilled syringe
- Draw up heparin in a 10 mL syringe as prescribed, using an independent double check procedure
- Prepare the patient and remove any clothing that obscures the port site
- Loosen the edges of the dressing, leaving the dressing around the port needle
- Connect syringe and flush with 10 mL of sodium chloride 0.9% using turbulent flow technique
- Attach the syringe with the prescribed heparin and administer clamping with the final 0.1 mL to create a positive pressure within the port
- The port needle and remaining dressing should be removed vertically with the non-dominant hand stabilising the port. Using gauze swab, apply pressure to exit site
- Report any changes to a member of the primary medical team;
- Consider covering the exit site with a small dressing
- Document procedure in the patient's clinical record
- Dispose of all waste as per individual area practice.

8. Potential complications

Complication	Action
<p>Air embolism</p> <p>An air embolism in a CVC is a medical emergency. Notify the primary medical team if the child becomes:</p> <ul style="list-style-type: none"> Tachycardic Dyspnoeic or Cardiovascular collapse <p>Initiate resuscitation and call a paediatric code blue as required</p>	<p>To reduce the risk of air embolism:</p> <ul style="list-style-type: none"> Ensure all CVC administration sets have luer lock connections. Ensure all CVC administration set connections are secure at the commencement of each shift, and checked a minimum of 4 hourly and following administration set change Ensure administration sets are primed prior to connection to CVC Ensure a CVC safety kit containing 1 pack of gauze swabs and 2 clamps, is available in close proximity at all times Ensure the CVC is protected from breakage or rupture, which may result in air entering the line Instruct the child and family to notify nursing staff members immediately if air is seen in the administration set

	<p>If air is present in the administration set:</p> <ul style="list-style-type: none"> • Clamp the catheter and stop the infusion • Position the child supine with head down or on their left side with head down and attempt to aspirate the air from the CVC immediately • If able, aspirate the air from the administration set using a syringe via the needleless access port (remove the set from the pump and use the manual control to allow fluid and air to run into syringe) • Recommence the infusion, monitoring the child closely • If unable to aspirate the air, change the administration set
Potential for strangulation from IV lines	<p>There is a risk to young children, 6 months to 5 years of age, getting tangled in their IV lines due to turning in bed while asleep. The risk in hospital is ameliorated by hourly IV site and line checks.</p> <ul style="list-style-type: none"> • Ensure that sleeping children are visible (e.g. curtains pulled back). • Limit the length of IV tubing • Ensure lines are well secured • Track the line down a singlet or PJ top or leg (to exit at the furthest point from the neck) • Place the IV pole at the foot end of the bed
Infection	<ul style="list-style-type: none"> • CVCs breach the body's skin defences and can be associated with increased rates of bacteraemia. Use daily care bundle and checklist (CR4032)
Phlebitis	<ul style="list-style-type: none"> • For patients with a CVC in situ their CVC exit site should be assessed for sign of phlebitis using the phlebitis score from the Intravenous Catheters – Peripheral guideline • Percutaneous and Peripherally inserted CVCs should be assessed and documented hourly • Surgically placed CVCs should be assessed and documented at least once per shift • Following PICC insertion, upper arm mechanical phlebitis is common and is evidenced by redness, warmth, and tenderness. This is not an indication to remove the line. Any inflammation/phlebitis of a PICC line should be assessed by a member of the anaesthesia or infectious disease team prior to any decision to remove. • Phlebitis is managed with limb elevation and application of warm heat packs. • The medical team should always be advised and consulted.
Occlusion	<p>Occlusion is the most common complication. The majority of occlusions are due to thrombosis. Catheter occlusions can be complete or partial</p> <p>Catheter occlusion can lead to infiltration, extravasation, infection or venous thrombosis (complete blockage of vein with potential for embolus). To reduce the risk of occlusion:</p> <ul style="list-style-type: none"> • Ensure a heparin lock is administered as prescribed when the CVC is not in continuous use.

	<ul style="list-style-type: none"> • Ensure all CVCs are flushed with sodium chloride 0.9%(S) before and after administration of all medications (A), blood withdrawal (B) and prior to heparin lock instillation (H), (SASH or SBSH). • Ensure a turbulent flow flushing technique is carried out. • Ensure either a positive pressure technique or positive displacement valve is used. • Ensure any symptoms of a potential thrombus are identified early and reported to a member of the primary medical team. Symptoms include: <ul style="list-style-type: none"> ○ Swelling or compromised perfusion to a limb distal to the site of a central line ○ Resistance to infusion ○ Instances where blood cannot be drawn back on a catheter. The line can continue to be used if able to flush and approved by a member of the primary medical team ○ Leaking from the site of a central venous catheter ○ Instances where IV therapy administered via the central catheter is not having the expected affect e.g.: <ul style="list-style-type: none"> ○ Not achieving therapeutic levels of medication ○ Paralysis medications not working • Initiate early discussion with the primary medical team regarding the need for radiological investigation. • Manage occlusions according to Section 10 Fibrinolytic agent administration
<p>Accidental disconnection of administration set</p>	<p>To manage an accidental disconnection:</p> <ul style="list-style-type: none"> • Clamp the CVC proximal to the area of disconnection obtained from safety kit kept at bedside • Assess the child's condition and amount of blood loss • Notify the primary medical team • Aspirate CVC to ensure blood withdrawal • Send blood for culture as requested • Flush line with sodium chloride 0.9% when patency confirmed • Change administration set

<p>Infiltration</p>	<p>Be aware of potential for internal infiltration/extravasation to occur, particularly with left femoral percutaneous catheters or due to a misplaced/dislodged implanted port needle.</p> <p>Pain/discomfort may be a key sign as swelling may initially be difficult to detect. Be vigilant when administering potential vesicants e.g. cytotoxic therapy, parenteral nutrition.</p> <p>To reduce the risk of infiltration and extravasation:</p> <ul style="list-style-type: none"> • Carry out and document an hourly site assessment, using the Infiltration score from the Intravenous Catheters – Peripheral guideline, • Ensure catheters are taped securely minimising movement. • DO NOT take blood pressure recordings on a patients arm with a PICC in situ • Consider the use of vests and mittens on infants and small children <p>If infiltration/extravasation is suspected:</p> <ul style="list-style-type: none"> • Stop infusion • Notify the primary medical team immediately
<p>If CVC falls out completely</p>	<ul style="list-style-type: none"> • Apply pressure to the skin exit site and vein entry site until haemostasis is achieved and apply a sterile occlusive dressing to the skin exit site. • For percutaneous lines and non-tunnelled PICCs the skin exit site and vein entry site are the same. • For tunnelled catheters, the vein entry site will be different to the skin exit site. Refer to CVC catheter types diagram • Obtain medical assistance immediately
<p>Rupture of CVC</p>	<p>To reduce the risk of catheter rupture:</p> <ul style="list-style-type: none"> • Use syringes with a diameter of at least that of a standard 10 mL syringe when accessing a CVC so that no undue pressure is exerted on the CVC • Ensure that the CVC is protected from sharp objects, twisting, stretching and tension placed on the line <p>If CVC rupture occurs:</p> <ul style="list-style-type: none"> • Clamp the CVC proximal (closer to the patient) to the area of rupture • Lie patient on left side, head down • Notify the primary medical team immediately • Do not remove CVC without a senior medical staff members' advice <p>If able to be repaired,(tunnelled cuffed catheters only) obtain a CVC repair kit from the Starship operating rooms. Repair kits are designated for the particular catheter brand, size and lumen (e.g. Broviac 4french brown lumen).</p>

	<p>CVC repair should only be undertaken by:</p> <ul style="list-style-type: none"> • Designated trained clinical staff <p>Document any CVC complications and interventions carried out in the patient's clinical record.</p>
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9. Antibiotic/ethanol lock administration

Antibiotic lock

An antibiotic lock is the installation of a high concentration of an antibiotic, to which the causative organism is susceptible, into the catheter lumen.

An antibiotic lock is used to **treat** central line associated blood stream infections in long term CVC with no signs of exit site or tunnel infection for which catheter salvage rather than catheter removal is the goal.

The decision to initiate antibiotic lock therapy is a collaborative decision by the primary medical team, the paediatric infectious diseases service and the paediatric pharmacist. The paediatric infectious diseases team in collaboration with the paediatric pharmacist will determine the appropriate solution, dwell time and duration of therapy. The antibiotic lock should be used in conjunction with systemic antimicrobial therapy.

An antibiotic lock may be considered for

- Recurrent infections
- Multiple previous lines with limited vascular access
- Polymicrobial infections
- Unable to change catheter (e.g. patient with haemophilia)

Contraindications for antibiotic locks

- Infants less than 6 months, including neonates
- Non-patent lumens
- Pocket, tunnel or exit site infection
- Anaphylaxis to antibiotic
- Abnormal renal function test for aminoglycoside locks

Dwell time and duration of antibiotic locks

- ADHB, antibiotic locks can be dwelled for 1 hour every other day or left in the line between use for up to 24 hours.
- Dwell times should not exceed 48 hours between installations of lock solution because antibiotic concentration may reduce rapidly over time.
- Children undergoing haemodialysis, the lock solution with the addition of heparin can be renewed after every dialysis session (refer to associated ADHB documents section).
- For multi-lumen catheters, ideally all lumens should be locked at the same time.
- If this is not possible the antibiotic lock should be instilled into alternating lumens every 24 hours.
- Antibiotic locks must be prescribed on the medication chart as gentamicin 5 mg/mL line lock or vancomycin 5 mg/mL line lock, which lumens to instil antibiotic into, volume of lumen, and dwell time.

Collect and prepare equipment for antibiotic lock

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- Needleless access device (s)
- sodium chloride 0.9% or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required
- Gentamicin 80 mg/2 mL ampoule (as required)
- Vancomycin lock (as required)

Procedure for making gentamicin 5 mg/mL line lock

- Draw up 1 mL from a gentamicin 80 mg/2 mL ampoule into a 10 mL syringe. Discard remaining gentamicin. Attach a new drawing up needle to the syringe & make up to 8 mL with sodium chloride 0.9%. This gives 8 mL of gentamicin 5 mg/mL
- Use the lock syringes immediately after making up. Discard any remainder. Do not store.
- If the CVC has two lumens, split the 8 mL into 2 syringes.

Vancomycin 5 mg/mL line lock

- Vancomycin 15 mg/3 mL lock syringes are available from pharmacy. If not used immediately, syringes must be stored in the medication refrigerator. If the CVC has two lumens, split the 3 mL lock volume into 2 syringes

Procedure for instillation of antibiotic locks

- Follow aseptic non touch technique throughout
- Ensure the CVC is clamped
- Attach a sodium chloride 0.9% prefilled syringe to the needleless access device
- Unclamp the CVC and gently flush with sodium chloride 0.9% to ensure catheter patency
- Change syringes and instil volume of antibiotic lock equivalent to the intraluminal volume of the catheter (see table below). The required volume is inserted into one or two lumens as prescribed.
- Clamp the CVC and leave solution within the lumen for the prescribed dwell time. Clearly label the lumen with medication instilled and time of instillation. Do not use lumen during the dwell time period;
- After prescribed dwell time has elapsed the lock solution must be withdrawn. Attach clean syringe and withdraw 3-5mL and discard;
- Flush with sodium chloride 0.9% using a turbulent flow technique. Instil heparin lock or connect IV administration set as required.

Other antibiotic locks

Other antibiotic locks may be used as clinically indicated. The choice of appropriate lock solution will depend on reasons for use, isolate and susceptibility pattern, systemic antibiotic and underlying host factors. The paediatric infectious diseases team in collaboration with the paediatric pharmacist will determine the type of agent, dwell time and duration of therapy.

Antibiotic lock volumes



Type of line	Volume
SVAD	2 mL
Tunnelled	> 1year = 1mL and < 1year = 0.5 mL (each lumen if prescribed)
PICC	>1year = 1 mL and < 1year = 0.5 mL (each lumen if prescribed)
Haemodialysis/Apheresis Catheters	Use intraluminal volumes specified on the catheters.

Ethanol lock

An ethanol lock is used to **prevent** central line associated blood stream infections in children with recurrent infections with limited vascular access that require long term CVC use and have no evidence of active infection. However, it may have a negative impact on line integrity. Only silicone tunnelled central venous catheters (e.g. hickman, broviac) or silicone Peripherally Inserted Central Catheters (PICC) are compatible with ethanol.

The decision to initiate ethanol lock therapy is a collaborative decision by the primary team, the paediatric infectious diseases service and the paediatric pharmacist. The paediatric infectious diseases team in collaboration with the paediatric pharmacist will determine the appropriate solution, dwell time and duration of therapy.

Children on long term IVN may have 70% ethanol locks prescribed by the paediatric gastroenterology service as per the Starship Intravenous Nutrition Clinical Guidelines (see associated ADHB documents section).

An ethanol lock may be considered for

- Recurrent infections
- Multiple previous lines with limited vascular access
- Polymicrobial infections
- Unable to change catheter (e.g. patient with haemophilia)

Contraindications for ethanol lock

- Anaphylaxis to ethanol solution
- Non silicone catheters e.g. short term percutaneous CVC
- Subcutaneous vascular access device (port)
- Abnormal liver function test
- Heparin administration

Dwell time and duration of ethanol locks

Within ADHB, dwell times of a minimum of 2 and maximum of 6 hours are used. Ethanol is used weekly with a review at 3 months.

Ethanol locks must be prescribed on the medication chart as ethanol 70% line lock, which lumens to instil ethanol lock, volume of lumen, and dwell time.

Step	Action
Check compatibility of catheter	<p>Ensure the catheter is silicone</p> <p>Note: If the catheter has been percutaneously inserted or designated as suitable for use with the power autoinjector – it is unlikely to be silicone.</p>
Collect and prepare equipment	<ul style="list-style-type: none"> • Gloves (non-sterile) • chlorhexidine gluconate 2% in ethanol 70%(wipe) • Aseptic field (cleaned reusable tray) • Needleless access device (s) • sodium chloride 0.9%or pre filled sodium chloride 0.9%syringe • 10 mL syringes and needles as required • Ethanol 100% ampoule • 10 mL water for injection
Procedure for making ethanol 70% line lock	<ul style="list-style-type: none"> • Wear gloves. • Aseptic technique must be used at all times. • Draw up 5 mL from an ethanol 100% ampoule into a 10 mL syringe. • Attach a new needle to the syringe and make up to 7 mL with water for injection. This gives 7 mL of ethanol 70% (approximately)
Procedure for instillation of ethanol lock	<ul style="list-style-type: none"> • Follow aseptic non touch technique throughout. • Ensure the CVC is clamped and attach a syringe with sodium chloride 0.9%to the needleless access device on the end of the CVC • Unclamp the CVC and gently flush with sodium chloride 0.9%to ensure catheter patency • Instil volume equivalent to the intraluminal volume of the catheter (refer to table below) into one or two lumens as prescribed. • Clamp the CVC and leave solution within the lumen for the prescribed dwell time. Clearly label the lumen with medication instilled and time of instillation. Do not use lumen during the dwell time period; • After prescribed dwell time has elapsed, attach syringe and withdraw 3-5 mL and discard; • Flush with sodium chloride 0.9% using a turbulent flow technique. Instil heparin lock or connect IV administration set as required.



Type of line	Volume
Tunnelled	> 1year = 1mL and < 1year = 0.5 mL (each lumen)
PICC	>1year = 1mL and < 1year = 0.5 mL (each lumen)

10. Fibrinolytic agent administration

If partial or complete occlusion of a CVC is due to kinking, malposition, medication precipitation or lipid occlusion, these cannot be resolved by the administration of a fibrinolytic agent and should be ruled out as a potential cause of occlusion prior to instillation of a fibrinolytic agent.

Assess ability to aspirate/flush line while turning the child's head to the opposite side, elevate their arm, ask the child to cough or bear down in a valsalva manoeuvre, place the child's head down or change the port needle.

Occlusion of renal haemodialysis catheters should be managed by the renal haemodialysis team.

If a long term CVC is partially or completely occluded due to thrombosis or fibrin, patency may be restored with the instillation of a fibrinolytic agent. The fibrinolytic agent **must be withdrawn** and discarded at the end of the prescribed dwell time.

Caution should be exercised with patients who

- have any condition for which bleeding constitutes a significant hazard
- have had recent severe bleeding
- have had recent major trauma
- have active ulcerative GI disease
- have had a recent stroke
- are receiving warfarin therapy where INR > 1.3
- have had heparin administered on same day or APTT > 45
- have a platelet count < 80

Caution should be exercised in the presence of known or suspected infection in the catheter.



Alteplase must only be administered in consultation with the patient's primary consultant and must be prescribed on the patient's medication chart.

Fibrinolytic agent administration

Collect and prepare equipment

- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- Needleless access device (s)
- sodium chloride 0.9% or pre filled sodium chloride 0.9% syringe
- 10 mL syringes and needles as required
- Fibrinolytic agent as prescribed (alteplase 1 mg/mL)

Procedure for obtaining Alteplase 1mg/mL line lock

- Obtain a pre-prepared alteplase 1 mg/mL syringe using usual pharmacy process.
- 3 mL of alteplase 1 mg/mL in 10 mL syringes are aseptically manufactured in advance and are frozen at -20°C. The cold chain must be maintained during transportation. Syringes are thawed by leaving in room temperature for 10 minutes and must be used straight away and never refrozen
- Unblocking CVCs should be done during pharmacy opening hours.

- If the CVC blocks ‘after hours’, it may be necessary to attain temporary peripheral venous access to maintain therapy until the following morning.
- If unblocking the CVC after hours is deemed critical to maintaining the patient’s therapy, contact the on-call pharmacist via the Clinical Nurse Manager (CNM)

Procedure for instillation of Alteplase

- Follow aseptic non touch technique throughout the procedure;
- Draw up sodium chloride 0.9% in a 10 mL syringe or use prefilled sodium chloride 0.9% syringe
- Clamp the CVC lumen and disconnect the IV administration set if required
- Attach the 10 mL syringe containing sodium chloride 0.9% and attempt to gently aspirate blood/fluid from the CVC or to flush CVC;
- If CVC remains occluded attach the 10 mL syringe containing the fibrinolytic agent;
- Using a gentle alternation of irrigation/aspiration over a few minutes, attempt to instil the fibrinolytic agent. The fibrinolysis agent should be instilled slowly to allow it to cover the walls of the catheter;
- Volume to be instilled is the volume of the lumen
- DO NOT FORCE the fibrinolytic agent into the catheter lumen;
- If the fibrinolytic agent is unable to be instilled, stop the procedure and advise the primary medical team for further guidance;
- Once the fibrinolytic agent is instilled, clamp the CVC and leave in situ for 2 hours. Ensure the catheter is clearly labelled as having alteplase instilled. In case of emergency, a shorter dwell time may be attempted but a dwell of at least 30 minutes is recommended;
- Using a 10 mL syringe, attempt to aspirate fibrinolytic agent in 3-5 mL of blood. If aspiration is unsuccessful, advise the primary medical team for further guidance. It may be necessary to leave the fibrinolytic for a longer dwell time (up to 24 hours). DO NOT FLUSH the catheter as this will result in the administration of the fibrinolytic medication to the patient;
- If aspiration is successful, withdraw and discard 3-5 mL. Flush CVC with sodium chloride 0.9% using turbulent flow technique and resume infusion or heparin lock CVC using positive pressure technique, as per CVC heparin locking guideline;
- Consider application of a positive displacement needleless device;
- Dispose of all waste as per individual area practice;
- Record procedure in the patient’s clinical record and medication chart.

Fibrinolytic agent instillation volume

Type of line	Max volume
SVAD	2 mL
Tunnelled	> 1year = 1 mL and < 1year = 0.5 mL (each blocked lumen)
PICC	>1year = 1 mL and < 1year = 0.5 mL (each blocked lumen)

11. Percutaneous CVC removal

Removal of a percutaneous CVC should be undertaken by staff who are knowledgeable and skilled in this procedure.

All cuffed and surgically placed CVCs e.g. Hickman lines, Subcutaneous venous access device (Ports) must be removed in the operating room.



There is risk of air embolism during removal of internal jugular/subclavian non-tunnelled, non-cuffed CVC and large bore catheters.

In addition, some children are at increased risk of air embolism during catheter removal.

- Children with increased work of breathing (due to higher negative intrathoracic pressure than normal).
- Children with minimal subcutaneous tissue
- Children who have had catheters in situ for a longer period of time (associated with development of a well-formed tract in the tissues).

Ensure the below procedure is followed when removing these catheters:

Collect and prepare equipment

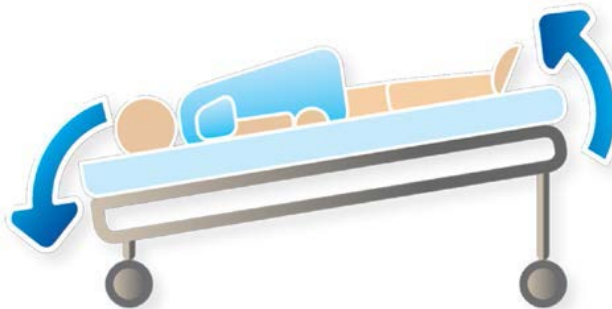
- Gloves (non-sterile)
- chlorhexidine gluconate 2% in ethanol 70%(wipe)
- Aseptic field (cleaned reusable tray)
- [Recommended occlusive dressing](#)
- Stitch cutter
- Paper tape measure (as required)
- Check removal is not contraindicated due to patient's coagulation status.

Position the patient

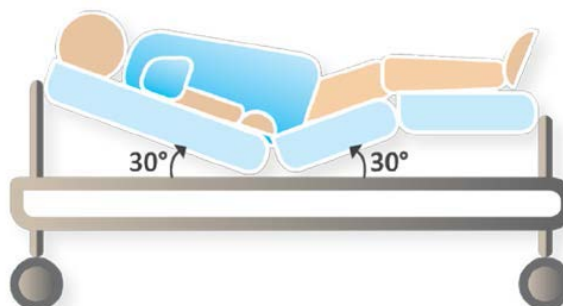


- CVCs must not be removed while a patient is sitting in a chair
- CVCs should only be removed when the patient is lying flat in bed preferably with the head of the bed tilted slightly down - the 'Trendelenburg position'.
- If the patient is unable to lie flat, e.g. they are too breathless in that position, then the low semi-Fowler position may be used.
- If this position is used they should be no greater than 30° head-up.

Trendelenburg



Low semi-Fowler



Breathing

If the child can cooperate, they should be instructed to breathe in, hold their breath and bear down (perform a Valsalva), and then the catheter should be removed. If they are not able to perform this manoeuvre reliably then the CVC should be removed during exhalation.

Procedure

Follow aseptic non touch technique throughout the procedure. Ensure an airtight occlusive dressing is ready to be applied before commencing removal of the CVC.

1. Clamp CVC and discontinue any infusion if in progress
2. Remove CVC site dressing and discard
3. Clean exit site with [recommended cleaning solution](#) and allow to dry
4. Remove any sutures that are present, (cut away from the patients skin)
5. Remove CVC briskly from the vein in a smooth consistent motion (NOT slowly or tentatively).
6. Apply the dressing to the exit site as the CVC is removed, aiming for immediate occlusion of exit site.
7. Pressure should be maintained on this dressing for 5 minutes to reduce the risk of air embolus and ensure haemostasis. (Do not remove the dressing to check if the blood has stopped as this increases the risk of air embolus).
8. Assess the patient regularly post CVC removal, ensuring the dressing is assessed to ensure it remains occlusive. If the dressing appears blood soaked consider changing the dressing, and/or a medical review dependant on the patients current coagulation status. of the patient

12. Peripherally Inserted Central Catheter (PICC) removal

Includes tunnelled uncuffed brachiocephalic catheters used for infants.

The nurse should:

- Perform hand hygiene and don non-sterile gloves
- Remove dressing and securement device
- Clean the site thoroughly with chlorhexidine gluconate 2% /ethanol 70% for 30 seconds and allow to dry prior to removal of catheter
- Apply simple traction to withdraw the catheter
- Cover the site with gauze and maintain pressure until haemostasis is achieved
- Apply transparent dressing and assess site every 24 hours until the site is epithelialized
- On removal the nurse should visually check the integrity of the line to ensure that the tip is present, the complete line has been removed and no breakage has occurred
- The removed line should be measured and its length documented and checked against the length documented on insertion

13. Discharge of a child with a long term CVC insitu

Ensure the careful preparation of family/whānau/caregivers and children where the child is being discharged with a long term CVC in situ, as per discharge checklist and parent teaching information.

- CR8877: Home IV Therapy Agreement and Training Record
- DD2909 Home IV therapy assessment
- CVC Safety Pack

14. Associated ADHB Documents

Associated Clinical Guidelines

- [Blood Cultures.pdf](#)
- [FastingAnaesthesiaParenteral.pdf](#)
- [AsepticNon-TouchTechnique.pdf](#)
- [Intravenous Catheters - Peripheral.pdf](#)

Associated Clinical Forms

- CR4030: Central Line Associated Bacteraemia (CLAB) Insertion Bundle Checklist
- CR4032: Central Line Associated Bacteraemia (CLAB) Maintenance Bundle Checklist Continuation Sheet

Associated Parent Information

- a. PICC and Antibiotic Bolus
- b. PICC and Antibiotic Infusion
- c. PICC and Antibiotic Infusor Therapy

Supporting Evidence

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