PROCEDURE	
Central Venous Access Device (CVAD) and Midline Management	
Scope (Staff):	Clinical Staff
Scope (Area):	CAHS

This document should be read in conjunction with this DISCLAIMER

Contents

PROCEDURES

Aim

The procedures outlined in this document aim to ensure safe and consistent practice in the management of patients with a Central Venous Access Device (CVAD) or Midline in the hospital and the home setting.

Background

Central venous access devices are used in a wide variety of settings and for diverse intravenous therapies. All intravenous devices are associated with complications, however CVADs have an increased risk of infection, ranging in severity from mild local infection to blood stream bacteraemia with significant morbidity and mortality.[1] Central line associated bloodstream infections (CLABSI) are a leading cause of healthcare associated infections (HAI) globally. CLABSI and other CVAD associated complications are largely preventable through the application of evidence-based practices.

Risk

Non-compliance with infection prevention measures and less than optimum CVAD care can result in significant adverse patient outcomes. As well as causing unnecessary suffering for patients and their families, CVAD related complications can prolong hospital stay and are extremely costly to the health system.

Scope of Practice [2, 3, 4,5]

It is imperative that all healthcare clinicians involved in the management of patients with a CVAD have the necessary knowledge and skills to competently provide care, as practice vigilance is critical in reducing and preventing complications.

Clinicians are to complete a theory-based education session appropriate for their expected scope of practice. This is to include at a minimum:

1. Recognising the different types of vascular access devices used at PMH and the indications for use.
2. Recognising and managing CVAD complications (Refer to Appendix 1 Quick Guide to Complications and the individual procedures in the appendices).
3. Infection prevention principles and demonstration of aseptic technique in practice. Practical assessments should include but are not restricted to:
    - Assessing the insertion/exit site for signs of complication
    - Administering IV medication/fluids
        - refer to Peripheral & Intravenous therapy Protocol (*aseptic technique*)
    - Correct flushing/locking technique
    - Changing a dressing (and securement device where applicable)
    - Blood sampling
    - Needling an implanted port (where applicable).

Key Management Principles

1. Perform hand hygiene prior to ALL CVAD and Midline interventions. [6]
2. Use aseptic technique when accessing and manipulating all intravenous devices. [6]
3. Minimise access and manipulation by grouping cares where possible. [6-8]
4. Use 2% chlorhexidine in 70% alcohol to: [7,9]
    - Disinfect line connections and needle-free devices prior to accessing lines
    - Cleanse skin during dressing changes and prior to inserting infusaport needles
        - Use povidone iodine as an alternative for patients with sensitivity to chlorhexidine
        - Refer to neonatal guidelines for preterm skin preparation agents
5. Use correct flushing and administration techniques to maintain line patency and prevent line rupture.
    - Use only 10mL syringe or larger for administration/flushing procedures[1-3,7,9,10.]
    - Use pulsatile flush technique and appropriate line locking techniques.[9, 10]
6. Recognise the early signs /symptoms of CVAD complication and implement mitigation measures promptly.
7. Review the need for the CVAD /midline daily or at each outpatient contact.
    - For patients no longer requiring treatment, consult with treating medical team for the earliest appropriate removal of the device.
8. Provide adequate patient/carer education and support to maintain optimum patient safety.

Vascular Access Devices and Indications

CVAD: includes all devices where the catheter is inserted into a major vein with the tip terminating in the distal superior vena cava (SVC) (or inferior vena cava (IVC) for lower body devices). The large vessels allow for greater haemodilution reducing the risk of vessel irritation and damage from vesicant and irritant solutions.

Midline: is a longer peripheral intravenous catheter (PIVC) inserted into a large vein in the upper arm (basilic, brachial or cephalic). The tip does not enter the central vasculature. Due to having a longer dwell time than a standard peripheral IV cannula the principles of CVAD infection and occlusion prevention also apply to midlines.

Refer to CVAD Referral, Booking Process and Insertion Guideline for more information on criteria for device selection.

Device	Suitable Therapies:	Intended Duration:	Additional comments
Midline *Peripheral intravenous catheter*	• As for peripheral IV • non-vesicant • pH 5 – 9; • Low osmolarity <600mOsm[11]	Short term (can be up to 4 weeks)	Tip terminates at or before the axilla line
Peripherally Inserted Central Catheter (PICC)	• All infusates	Medium to long term – weeks to months	Not recommended for *routine* blood withdrawal due to risk of causing thrombus occlusion.
Tunnelled central venous catheter (eg. Broviac)	• All infusates • Blood withdrawal	Long term - months to years	Surgically inserted devices. Aspiration before use recommended
Totally Implanted Vascular Access Device eg. Infusaport	• All infusates • Blood withdrawal	Long term - Years	Surgically inserted devices. Only **non-coring** needles to be used to access ports. Ensure correct size needle is used.

Complications

Refer to the appendices for individual management procedures:

Infection - can be mild local infection to serious bloodstream infection)

Occlusion - thrombus occlusion contributes to CLABSI if left untreated. Occlusions increase the risk of interrupted therapy, removal and reinsertion which can compromise the patient's vascular health.

Infiltration / Extravasation - leakage of vesicant fluids risks tissue damage

Venous thrombosis

Air embolism - increased risk at insertion and removal and accidental disconnection of lines

Pericardial effusion and cardiac tamponade - a rare but life threatening complication

Post Insertion Care

1. All CVADS are to have a post insertion X-ray unless correct catheter tip placement has been confirmed intra-operatively and documented by the proceduralist on the CVAD insertion record as safe for immediate use.[1,6]

    - An x-ray may otherwise need to be arranged by nursing/medical staff on the ward. A medical officer is to confirm correct tip placement and is to document on the CVAD Insertion and Removal Record that the device is safe for use.

    - Midlines do not require x-ray confirmation.

2. Unless needled in theatre for immediate treatment, implanted devices are not typically accessed until 5 to 7 days post insertion to allow the site to heal and for swelling to subside. Urgency of treatment will be decided by the treating medical consultant.
3. Assess the insertion and exit sites for amount of blood/ooze:
    - A small amount of ooze or blood may be expected in the acute postoperative period. Contact the proceduralist for advice if the ooze/bleed is ongoing, excessive or obscuring adequate observation of the CVAD insertion/exit site.
    - Consider applying a pressure dressing over the site for acute postoperative ooze and review within 24 hours. Ongoing or excessive ooze must be investigated by the treating medical team and reported to the proceduralist.
    - A temporary gauze dressing may be indicated for excessive ooze until resolved. Gauze dressings must be changed within 48 hours of application[7, 13] and replaced with a transparent dressing as early as possible.
    - Transparent dressings can stay in place for up to seven days if complication free. Use caution if dressing needs to be changed within 48 hours of insertion and discuss with proceduralist.
4. Tunnelled CVADs and implanted devices may be secured with sutures at the exit site. Follow postoperative instruction for planned removal (usually around 7-10 days).

    Non-tunnelled devices eg. jugular/femoral CVC (and occasionally a PICC) are secured in place with sutures which are to remain in situ for the duration of the device.
5. A needle-free access device is to be placed on each lumen/access port unless a dedicated continuous infusion is in progress.

Postoperative Observations

- Commence routine postoperative observations or as otherwise indicated by the patient's clinical status. Refer to Postoperative and Procedural Care.
- Continue at least 4 hourly observations of Temperature, Pulse and Respirations for 48 hours then as indicated by clinical status and the treating medical team.

ROUTINE CARE

- Commence a CVAD and Midline Management Record (MR852) following insertion or on hospital admission for patients with an existing CVAD. The record is to be continued for patients transitioned to HITH and filed with the nursing records.
    - Regular assessment of the insertion/exit site, verification of catheter position and patency status can help identify complications early.
    - Communication and accurate documentation can facilitate early intervention and reduce the risk of premature removal of the CVAD.

Site Assessment

Assessment of the insertion/exit site is to be documented:

- Each shift (nursing) for inpatients; at each HITH visit
- With each dressing change
- Each time the CVAD or midline is accessed.

Insertion/Exit Site

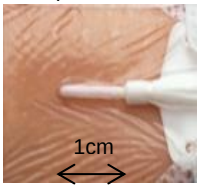
- Remove covering/bandage if present to perform a full skin inspection.
- Visualise the insertion/exit site, wash hands and palpate the surrounding skin for signs of:
    - Infection: erythema, swelling, tenderness; exudate
        - Obtain a wound swab if exudate present before cleansing the site and applying a new dressing. Inform treating medical team and consult with infectious diseases and/or clinical microbiology services for appropriate management
    - Infiltration/extravasation: leakage from insertion/exit site, swelling, burning, pain, redness or blanching to surrounding skin
    - Phlebitis: erythema, pain, swelling along catheter tract. More common with PICC or midline but can occur with any line. Phlebitis can occur from infective, mechanical or chemical irritation of the vein.
- For PICCs, midlines and femoral catheters monitor limb proximal and distal to the insertion site and observe for oedema, alteration in skin colour and skin temperature. Inform treating medical team of any of the above signs as this could indicate a venous thrombosis. Refer to haematologist if venous thrombosis suspected/confirmed for further investigation and management. [14, 15]

External Catheter Position

Migration of the tip out of the SVC can occur at any time and can be due to several factors eg. patient movement, inadequate securement of peripherally inserted devices, forceful flushing, vomiting, coughing, suctioning.

Movement of the tip out of the SVC has been associated with higher incidence of complications: occlusion, thrombosis, phlebitis and fatalities, although rare, have been reported. [16,17, 18]

PICC:



Measure and document external measurement each shift (as shown) or at each HITH/outpatient visit. Compare with previous measurements and if significant deviation (≥2cm) contact the treating medical team and consider anaesthetist review.

Tunnelled CVADs:

Monitor length of catheter from exit site. Report to treating medical team/surgical team if the Dacron cuff is visible and/or the catheter length has changed or the integrity of the catheter is impaired.

Implanted ports:

Check position of needle each shift and with each access. Assess the skin around the insertion site for leakage, erythema, pain and swelling. Remove displaced needle and replace with a new needle, ***unless extravasation is suspected.***

Refer to Extravasation of Cytotoxic Agents (Clinical Practice Manual) and Appendix 4 for management.

Radiological confirmation of tip placement, whilst the gold standard, may only be necessary after consideration of all factors: patient clinical status, degree of suspected catheter deviation and changes in patency.

ACCESSING A CVAD

Implanted CVAD (Infusaport)

- Only clinicians who have received appropriate education and skills training are to insert or remove an infusaport needle. Refer to procedure in Appendix 10.
- Only non-coring needles are to be used. Safety needles must be used in preference to other types of needle device - in accordance with CAHS Sharps Management Policy.
- Ensure the correct size needle (gauge and length) is used for the size of infusaport in situ and for the type of therapy prescribed.
    - If radiological contrast studies are requested, the radiologist is responsible for checking power injection capability of the infusaport and compatibility of the needle in situ.

All CVADs

- Access only when necessary to minimise manipulation and breaking of lines.
    - Group medication administration, line changes, blood sampling and routine flushing procedures.
- Observe hand hygiene and aseptic technique for all line access and manipulation.
- Before accessing the line swab the needle-free access bung with 2% chlorhexidine gluconate (CHG)/70% alcohol swab for 20 seconds - allow to dry for 30 seconds.
- Before administering any medication or fluid assess patency of the CVAD:
    - Attempt to aspirate blood from all tunnelled and implanted devices before commencing IV therapy:
    - Difficulties or reduced ability to withdraw blood on aspiration can be an indication of withdrawal occlusion, catheter tip malposition or the start of an intraluminal occlusion. Refer to identifying occlusion below.

Exemptions:

- Do not aspirate from midlines
- Avoid routine aspiration from PICCs as this can cause a thrombus occlusion[14]
    - If the infusate to be administered is a vesicant however (eg. chemotherapy, inotropes) aspiration can be attempted to visualise blood flashback prior to commencing administration.
- Assess ease of flushing – ***never*** use force if resistance is observed.
- Any change in patency or concerns about catheter tip position, must be documented and communicated promptly to the shift co-ordinator, treating medical team and the patient/carer.

Identifying Occlusion

Changes in patency must be investigated for:

- Mechanical obstruction/occlusion
- Catheter tip migration
- Thrombus occlusion, which can also contribute to CLABSI if left untreated
- Lipid build up
- Drug precipitation
- See Occlusion Management Summary (Appendix 3)

Mechanical occlusion

- Exclude external causes first:
    - Check clamps are open, tubing is free from kinks, connectors (or filters if present) are not clogged, and dressing is intact. Change if necessary.
- Investigate possible internal causes:
    - *Subclavian* catheters can become compressed or '*pinched off'* between the clavicle and first rib with the risk of breakage and catheter embolism.[13] Signs can include: intermittent and positional occlusion with frequent infusion pump alarms; difficulty with flushing, infusing, or aspirating. Patient may experience chest pain, palpitations or swelling in the area of the catheter.
    - Catheter tip migration: assess external catheter length/ measurements for deviation
    - Catheter tip can be resting against the vein wall:
        - aspiration can be facilitated by altering the child's position eg. lying down, sitting up, turning the head away from the line, moving the arm up/down, coughing and deep breathing
- Consider chest x-ray to confirm pinch-off or catheter malposition.
- Consult with anaesthetic department or surgical team for advice.

Thrombus Occlusion *(intraluminal blood clot formation, fibrin tail)*

- Intraluminal thrombus formation is a common preventable complication which can be caused by blood reflux into the catheter and improper flushing/ locking technique. If left untreated thrombus formation significantly contributes to the development of CLABSI.[12]
- A fibrin tail at the catheter tip or fibrin sheath can develop from the time of insertion and is characterised by 'withdrawal' occlusion. Application of negative pressure on aspiration pulls the fibrin tail over the catheter tip; positive pressure when infusing pushes the tail away from the tip hence the ability to infuse fluids but not withdraw blood.
- Thrombolytic therapy (eg. Alteplase) is an effective treatment for restoring patency to a CVAD with thrombus occlusion: [19-21]
    - Alteplase is to be prescribed by a medical officer on the front of the National Inpatient Medication Chart (NIMC) in the once only section.
    - 'In-hours' contact the ward pharmacist to arrange for a dose to be sent to the ward.
    - Out of hours: contact the oncology/haematology unit to obtain a dose.
    - Nursing and medical staff who are deemed competent in the procedure can administer alteplase
    - Follow the Alteplase Administration Procedure. (Appendix 11)
    - Document on the CVAD and Midline Management Record MR852 the date and time of alteplase instillation, and which lumen/s treated. Record intervention and outcomes in the patient's notes.
- Consider alternative causes of occlusion if CVAD unresponsive to treatment with Alteplase.

Drug precipitation

- Can occur when incompatible solutions come into contact causing precipitation and blockage of the lumen.
- Consult with ward pharmacist if there is any uncertainty or incompatibility concern in a patient's fluid or drug regimen or precipitation is suspected. Treatment will be guided by the type of drugs used and only after consultation with a pharmacist or the treating medical team.

Lipid build up

- Lipids can adhere to the intraluminal surface and gradually build up over time, which can lead to narrowing of the lumen and blockage.
- Flush lumens used to administer lipid-containing TPN every 24 hours when changing the administration set. Consult with pharmacist for appropriate treatment if lipid occlusion is suspected.

Labelling Non-functioning CVAD Lumens:

- If unable to restore functioning to a blocked lumen, place a white label on the lumen with 'Blocked: DO NOT USE' written clearly with date and time.
    - Document on MR852 in the special instructions section and in the patients' notes; ensure this is included in the nursing shift to shift clinical handover.

Maintaining Patency

Flushing Technique:

- Use a pulsatile, positive pressure technique ('push-pause') with every flush and locking procedure. This creates fluid turbulence within the lumen preventing the build-up of precipitate and biofilm on the inner surface of the catheter. Biofilm is thought to contribute to the development of CLABSI.[22]
- Use pre-filled saline flush syringes where possible in preference to drawing up saline from ampoule with syringe and needle.
- All sizes of the prefilled syringe (ie. BD™ 3mL, 5mL, and 10mL) can be used with CVADs and midlines as they all have the same diameter as a 10mL syringe.
    - Use a separate syringe for each flush.

Flush Volumes:

- Sodium chloride 0.9% is the preferred solution for flushing. However always check compatibility with the medication/fluid being administered.
- Flush before, between and after every medication/infusion to prevent contact of incompatible fluids that can cause precipitation and line blockage.
- Following medication infusions via a pump, consider the volume required to clear the administration set and additional add-on devices (eg. 3-way taps, Y-connectors)
- If discontinuing therapy, perform a manual positive pressure flush after clearing the administration line and administer lock solution if appropriate.

Table 1: Guide to flush volumes

Indication	Minimum volume (*guide only*)
Between bolus medications/infusions	3 - 5 mL
After Blood Draw/Blood products	10 - 20mL (10mL fluid restricted)
On completion of lipid containing TPN	10 –20mL (10mL fluid restricted)
Note: Larger volumes may be required to clear blood or lipid from catheters and bungs - change connectors if residual blood or lipid is visible.	

Continuous infusion to 'Keep Vein Open' ('KVO')

It may be appropriate for patients requiring multiple medications/infusions to maintain a continuous infusion to allow for concurrent administration and reduce manipulation of the CVAD.

There is no scientific evidence to recommend an optimal rate as multiple factors affect flow: fluid viscosity, venous resistance, temperature, catheter position in the vein, catheter diameter, presence of precipitate or clots and delivery device settings.[23]

- A medical officer is to prescribe a compatible fluid and the rate on a fluid order form. As a *general* guide: **3 - 5mL/hr** should be sufficient for most patients and devices.
  - Consult with medical team if rate needs to be adjusted to prevent reflux of blood into the infusion line and ensure infusion pump is positioned at or slightly above the patients' heart.
- Maintain a fluid balance chart for all children requiring continuous infusions and take into account total fluid intake for infants and children requiring fluid restriction.

HEPARIN LINE LOCKING

Midline:

- Hospital inpatients – do not require a heparin lock.
- HITH patients with access intervals > 8hours (eg. overnight) flush with 0.9% sodium chloride after administering medication and lock line with 0.5mL heparin 50units/5mL using pulsatile positive pressure technique and ensure line is clamped. It is not necessary to withdraw this volume of heparin when the midline is next accessed.

CVAD

- CVADs in use at PMH are recommended to be locked with heparinised-saline when not in use. The strength and volume is dependent on the type of device in situ, frequency of access and manufacturer instruction. See guide to volumes below.
- Taurolock® may be used as an alternative locking solution for children at high risk of a CVAD related blood stream infection. Approval from Infectious Disease Consultant is required for this treatment as per ChAMP guidelines:
  - Taurolock® prophylactic lock for central venous access devices
  - Taurolock® Monograph for administration procedure
- The volumes suggested in the table below should be sufficient to fill the intraluminal volume of CVADs inserted at PMH including volume of the positive displacement bung.
  - However, if the exact intraluminal volume is known administer 110% of the volume to ensure the catheter tip is in contact with the heparinised-saline or other lock solution.
- The volume of extension sets/3-way taps if present must also be taken into account.
- Lock solutions are to be withdrawn from tunnelled and implanted devices prior to infusing flushes, medications or fluids.
  - If unable to withdraw heparinised saline, Taurolock, Alteplase or any other de-clotting agent, liaise with ward pharmacist or ChAMP pharmacist and refer to the drug-specific protocols for instruction.

CVAD and MIDLINE LOCKING SOLUTIONS *(Table 2)*

Time between Access:	**Accessing every 6 hours or more frequently.**	**> 6 hours between access and** **After blood sampling.**	**>24 hours and when line not in use**
Solution	**0.9% Sodium Chloride Flush ***	**Short term Heparin Lock:** **50 units/5mL**	**Long term Heparin Lock:** **50 – 100 units/mL ****
Midline: Vygon Leaderflex 22g	3 - 5 mL 6 hourly flushes	Inpatients – n/a HITH patients only: 0.5mL if access interval >8hours[24]	n/a
PICC:	3 - 5 mL*	1 mL	n/a
Non-tunnelled CVAD	3 - 5 mL*	1 mL	n/a
Tunnelled CVAD (eg. Broviac)	5 - 10mL*	2 mL	**50units/mL** **2 mL each lumen weekly** Dilute 0.5 mL of 5000iu/5mL heparin with 9.5mL sodium chloride 0.9% *Withdraw from lumen prior to flushing*
Totally Implanted Device	10 - 20mL* 10mL fluid restricted	2 mL	**100units/mL** **2 mL each lumen monthly** Dilute 1mL of 5000iu/5mL heparin with 9mL sodium chloride 0.9% *Withdraw from lumen prior to flushing*
For Taurolock refer to ChAMP guideline and monograph For haemodialysis catheters refer to Renal/PICU protocols ***Minimum of 10mL flush post blood products, blood withdrawal and following lipid infusions. ****For patients with haemophilia use only heparin 10units/mL**			

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Needle-Free Bungs:

There is inconclusive evidence for the use of one type of needle-free bung over another for optimum prevention of both CLABSI and occlusion.[25] To promote consistent practice however the positive displacement device (Maxzero™) is to be used for all CVADs and midlines.

Needle-free bungs are to be distinguished from other valves in use in the hospital such as inline anti-reflux and back-check valves which are indicated for a different purpose.

Table 3: Summary of IV bungs and valves

Bungs:	**Purpose/Use**
Positive-displacement bung  *Maxzero™*	• **CVAD & Midlines** • Provides needle-free access to the CVAD • Maintains a closed system. • Displaces column of fluid from catheter into vein upon disconnection of syringe/administration set, reducing blood reflux. **Clamp** the line after disconnection. Tunnelled CVAD: Clamp over reinforced sleeve
Negative-displacement bung  *Smartsite™*	• **Peripheral IV Cannula (PIVC)** • Provides needle-free access to the PIVC • Maintains a closed system. • Requires clamping of the IV line *during* a positive-pressure flush to prevent blood reflux in the line.
Valves: Refer to Acute Pain Service Resources for use and placement of these valves for narcotic infusions.[26]	
Backcheck Valve 	• Allows one way flow only • To be placed on lines delivering critical drugs eg. narcotics, insulin. • IV occlusion or line kinking causes pressure to build up in the line – the valve and syringe pump settings prevent an uncontrolled and potentially fatal rapid bolus into the patient once the occlusion/kinking is cleared.
Anti-Reflux Valve 	• One way flow • Placed on main infusion line to prevent flow and accumulation of medication/lipids into the main line should a distal occlusion occur

Bung Change Intervals:

- Weekly when CVAD not in use - with scheduled flush and dressing change
- When changing continuous infusion administration sets.
- If unable to clear of residual blood or lipid solutions
- If the integrity of the bung is compromised
- If removed from the patients CVAD - **do not reattach**, replace with a new sterile bung.

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IV ADMINISTRATION LINES

- Administration lines are not to be disconnected and reattached to the patient at a later time eg. for purpose of patient bathing, showering. Consider timing of scheduled line/infusion changes in collaboration with the patient/carer to allow for hygiene activities wherever possible.
- A new infusion and administration line is to be prepared once disconnected from the patients CVAD.
- Label all infusion administration lines as per National Recommendations for User-Applied Injectable Medicines, Fluids and Lines [27]

Administration line change intervals (Table 4)

Solution	Change interval	Additional Information
Crystalloid solutions	96 hours [7, 28]	eg. glucose/saline hydration fluids; non-lipid parenteral nutrition. Change set sooner if integrity compromised or disconnected from patient CVAD or Midline
Lipid solutions	24 hours [7, 8, 28]	Flush line with 10-20mL sodium chloride 0.9% every 24 hours when changing TPN/lipid lines.
Blood Products	Discard at end of infusion or at least every 12 hours	Flush line with 10-20mL sodium chloride 0.9% post infusion. Refer to Transfusion Protocols

DRESSINGS and SECUREMENT

Dressing Type

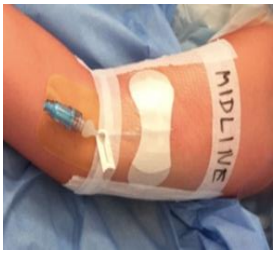
- A transparent, semi-permeable polyurethane dressing is to be used for all CVADS and midlines unless there is known sensitivity[4]. Liaise with nurse practitioner, Stomal and Wound Therapy if alternative dressings need to be sourced.
- Advanced bordered polyurethane dressings are available for securing infusaport access needles.
- Polyurethane dressing is to be changed every seven days, sooner if loose, soiled or wet. [6, 7, 13, 29, 30]
- Gauze and tape may be appropriate in the short term for patients with sensitivity or if there is significant postoperative ooze. This must be changed within 48 hours [7, 13] and changed to a transparent dressing as soon as possible.
- Use aseptic technique for all dressing change procedures. (Appendix 8)

Sutureless Securement Devices:

Midline: *(Grip-Lok®)*

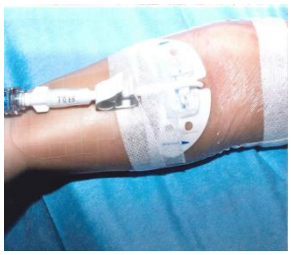
- The securement device is to remain intact for the duration of therapy, unless it becomes soiled or loose.

  A risk assessment must be undertaken and caution used when considering changing the device as there is high risk for dislodgement. Only staff who have received instruction, or are supervised by a suitably experienced clinician, should perform the procedure.[31]



PICC *(StatLock®)*

- The device is recommended by the manufacturer[27] to be changed weekly with the dressing.
- If the clinician considers there is significant risk of dislodgement due to the age or behaviour of the patient the securement device can remain intact if the integrity is not compromised and the site is free of complication.



- If infection is suspected the device must be removed for a full skin inspection.
- Seek assistance from experienced staff member/s before changing the device. Refer to ward resources and manufacturers guide to application and removal technique.

SKIN CLEANSING

- 2% chlorhexidine (CHG) in 70% isopropyl alcohol is recommended for optimal skin antisepsis for needle insertion and dressing change procedures. [6, 7, 29, 32]
- Use friction and a back and forth motion for at least 30 seconds when cleansing the skin prior to inserting an infusaport needle.
  - Use a circular motion to clean around the catheter insertion/exit site of indwelling devices during dressing change.
  - See Dressing Change Procedure (Appendix 8)
- Allow skin to air dry completely before puncturing the skin or applying a dressing. Drying time can take up to two minutes. Do not attempt to speed up the drying process by wafting or blotting.
  - A single application of CHG is sufficient: applying multiple layers and inadequate drying before applying dressings can increase the risk of skin irritation and chlorhexidine senstitivity.[33]
- If visibly soiled, clean the skin first with sterile normal saline.
- 10% Povidone iodine is an alternative for patients with chlorhexidine sensitivity.
- Refer to Neonatal Guidelines for appropriate skin cleansing solutions for preterm infants (Aseptic Technique in the NICU).

BLOOD SAMPLING (see Appendix 9)

- Midlines are not to be used for blood sampling
- Avoid blood sampling from a PICC where possible due to the increased risk of causing a thrombus occlusion.[34]
- Blood sampling procedures are only to be undertaken by clinicians who have received appropriate training and have the necessary knowledge and skills to perform the procedure.
- Adhere to occupational safety measures to minimise exposure to blood borne pathogens. Use safety engineered devices where available e.g. needleless blood collection and transfer devices, and dispose of equipment immediately after use into sharps waste containers. Refer to CAHS Sharps Management Policy
- Drug levels and coagulation studies should not be taken from a CVAD. [35]
    - Alternative methods (finger/heel prick; venepuncture) are to be considered first. Results must be interpreted with caution if it is unavoidable to obtain samples from lumens used to administer the drug or from heparinised lumens in the case of coagulation studies. [35, 36,]
- **Discard volume:**
    - Do not re-infuse the discard volume, unless clinically indicated and deemed appropriate for that patient by the treating clinician (eg. intensive care, neonatal patients) as this poses the risk of infusing pathogens and blood clots into the patient's circulation.[8, 35, 37]
    - Minimise blood loss by obtaining only the minimum discard volume and the minimum volume required for each test.
- A 5mL syringe can be used for aspirating blood if having difficulty with a 10mL syringe.[38,35] A smaller syringe will exert less *negative* pressure than a larger syringe and may prevent collapse of the catheter.

REMOVAL OF CVADs and MIDLINES

- Midlines can be removed by nursing staff as per peripheral IV using aseptic technique. HITH patients can have the midline removed at home by nursing staff providing the medical team have documented that the line can be removed upon cessation of therapy without prior medical review.
- Non-tunnelled CVC and PICC can be removed in the clinical area by medical or nursing staff deemed competent in this procedure:
    - *See* Removal of a PICC or Non Tunnelled CVC (Appendix 12)
- Removal must be documented by the clinician removing the CVC/PICC on the CVAD Insertion/Removal Record MR 852.01 and in the patient's notes.
    - Surgically implanted devices are removed by the surgeon under general anaesthesia in the operating theatre.

DOCUMENTATION

- The 'CVAD and Midline Insertion and Removal Record' (MR852.01) is to be commenced by the clinician at insertion and ceased upon removal by the clinician removing the device.
- The CVAD and Midline Management Record MR852 is to be completed by the clinician attending to CVAD cares and interventions as follows:

In-patients:

- At least once per nursing shift:
  - Observe and asses site(s) for signs of infection and that the dressing is dry and intact. Document findings. Where possible clinical handover should include both nurses observing the CVAD site at shift changeover.
- Document external PICC measurement each shift and before/after dressing changes.
- Patency check: To be assessed and documented only if it is necessary to access the line.
  - Record ability to obtain blood flashback/aspirate if appropriate and ease of flushing.
  - Record interventions if difficulties encountered and report to treating medical team.
- Document which solution was used to lock the line if relevant:
  - Attempt to withdraw heparinised-saline or antiseptic/antibiotic locks prior to administering medications/fluids.
  - Refer to individual drug monograph and/or liaise with pharmacist/treating medical team if unable to withdraw.
- Document date of add-on device changes (continuous administration sets/bungs/3-way taps).
  - Label administration lines with the appropriate intravenous labels and date of due line change.
- Document any concerns/signs of complication and inform treating medical team immediately. Consult with surgical or anaesthetic departments as appropriate.

HiTH and Out Patients:

- At every point of contact review the need for the CVAD and the insertion site/catheter position as above. Document observations and any interventions undertaken on the CVAD Management Record if present and/or the patients' medical record. Complications are to be reported to the treating medical team as soon as possible.

PATIENT DISCHARGE

- Children are not discharged home with a non-tunnelled CVAD due to the increased risk of infection and dislodgement.
- Refer to HITH team if patient is to continue IV therapy at home via a midline or CVAD. The decision to continue therapy at home must be made on individual assessment and in collaboration with the patient's medical team, the family and the HITH team.
- The HITH team are to continue the CVAD and Midline Management Record form MR852 for patients requiring ongoing treatment.

Parent Education

Parents/carers of patients with a CVAD or Midline who are being discharge home or going on leave must receive information and education on general care and safety. This must commence well in advance of the expected discharge date and include:

- Preventing the CVAD site getting wet
- Identifying signs and symptoms of complication.
- Emergency management in the event of accidental disconnection or line breakage. Provide an emergency pack:
    - One pack sterile gauze;
    - Swabs: 2% chlorhexidine gluconate/70% alcohol
    - Plastic non-serrated clamps (where available)
    - Spare sterile bung;
    - Sterile 10mL luer-lock syringe;
    - Saline ampoule and/or Posiflush saline syringe.
- Contact numbers for HITH or the Post Acute Care (PAC) team as appropriate.

Parent Competency

Parents/carers planning to undertake any form of intravenous therapy and/or other CVAD care at home must commence a competency-structured education plan and only after consultation with the treating consultant and the ward Clinical Manager.

All wards and departments responsible for teaching parent/carers must follow a PMH approved teaching and assessment plan (available via HITH) and take into account the specific IV therapy and equipment safety requirements at home.

All patients are to be referred to HITH or PAC prior to discharge for ongoing education and support.

In situations where parents decide at a later date that they wish to commence home care, HITH can provide education in the home setting after consultation with the treating Consultant. A register of parent teaching is to be maintained by the ward/ department or CVAD Clinical Nurse Specialist. Parental educational needs are to be reviewed at least annually.

Related policies, procedures, protocols and guidelines
CVAD and Midline: Indications, Referral, Booking, Insertion and Maintenance Guideline
Aseptic Technique (Infection Control Manual)
Sharps Management Policy (CAHS)
Taurolock® prophylactic lock for central venous access devices Taurolock® Monograph for administration procedure
Labelling of Injectable Infusions and Fluids

Resources

PICC Consumer information Sheet

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APPENDIX 1: Quick Guide to Complications and Actions

Possible complication	Signs/Symptoms may include	Possible actions
Infection	Fever Inflammation, redness and/ or exudate at the site. Rigor on accessing the CVAD.	Report to treating medical team for further investigation and treatment eg. blood cultures, IV antibiotics. Swab site if exudate present. Removal of the CVAD may be warranted following consultation with infectious diseases and/or clinical microbiology team.
Displacement: • Outwards • Inwards - into atrium or ventricle (risk of Cardiac Tamponade)	Length of external catheter increased; difficulty flushing/aspirating; infusion pump alarms; pain, swelling, leaking External PICC/CVC length reduced. Palpitations, chest pain; respiratory distress; arrhythmias; hypotension	Do not use. Inform shift coordinator and seek medical advice. Seek urgent medical attention if clinically indicated or cardiac complication suspected. Consider radiological imaging to assess tip position and confirm ongoing use of line.
Mechanical Obstruction/ 'Pinch Off' syndrome **Intraluminal Occlusion**	Frequent infusion pump alarms, positional obstruction can indicate 'pinch-off' for catheters in the subclavian vein Partial obstruction: Resistance felt on flushing and/or inability to aspirate. Complete obstruction: Inability to flush and/or aspirate blood.	Treatment depends on the cause eg. malposition, thrombus, anatomical obstruction, fibrin sheath formation. Check all potential external sources • Re-position patient, • Check for kinks in lines, clamps, securement devices, dressing and change if appropriate. Consider need to use Alteplase to clear thrombus occlusion.
Venous Thrombosis	Oedema/swelling in the arm, neck, shoulder and/or leg at/or near to the catheter location.	Inform shift coordinator and seek medical advice. Radiological Imaging: Ultrasound, Doppler. Consider referral to haematologist if DVT confirmed.
Air Embolism[1]	Sudden onset of chest pain, shortness of breath, Cyanosis Tachycardia Alteration in conscious state Abrupt fall in blood pressure	• Clamp the catheter immediately • Lie child on their left side with head lower than their heart • Administer 100% oxygen **Call 55 Code Blue immediately**

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APPENDIX 2: CVAD and Midline-Related Infection

Key Points

- Inadequate care of the patients CVAD significantly increases the risk of CVAD-related infections, including superficial skin or insertion site infections, deep tissue infections and invasive infections including central-line associated blood stream infection (CLABSI).
- Early recognition, diagnosis and prompt management is critical.

Routes of contamination[7,39]

- Migration of skin organisms from the insertion site along the catheter tract.
- Direct contamination of catheter hub by contact with hands or with contaminated devices.
- Contamination of fluids, medications during preparation.
- Spread from another focus of infection via the bloodstream.

Signs and symptoms

- Redness, swelling, tenderness at site of insertion or along the insertion path;
- Drainage/ooze at insertion/exit site;
- Fever;
- Rigor on flushing or manipulation of the CVAD

Actions

- If a CVAD infection is suspected, the following actions must be taken:
    - Urgent medical review
    - Blood culture from the CVAD and if possible, from another site
    - Swab insertion / exit site if exudate is present (request should state: ‘CVAD site infection - microscopy, culture and sensitivities’)
    - Following review, the following actions should be carefully considered:
        - Empiric antibiotics (see ChAMP Guidelines)
        - If possible, removal of a percutaneous CVAD
        - In the setting of an implantable CVAD, an urgent surgical review is recommended.

Clinical advice about suspected, possible or proven CVAD infections can be obtained from the Infectious Diseases or Clinical Microbiology team who can be contacted through switchboard.

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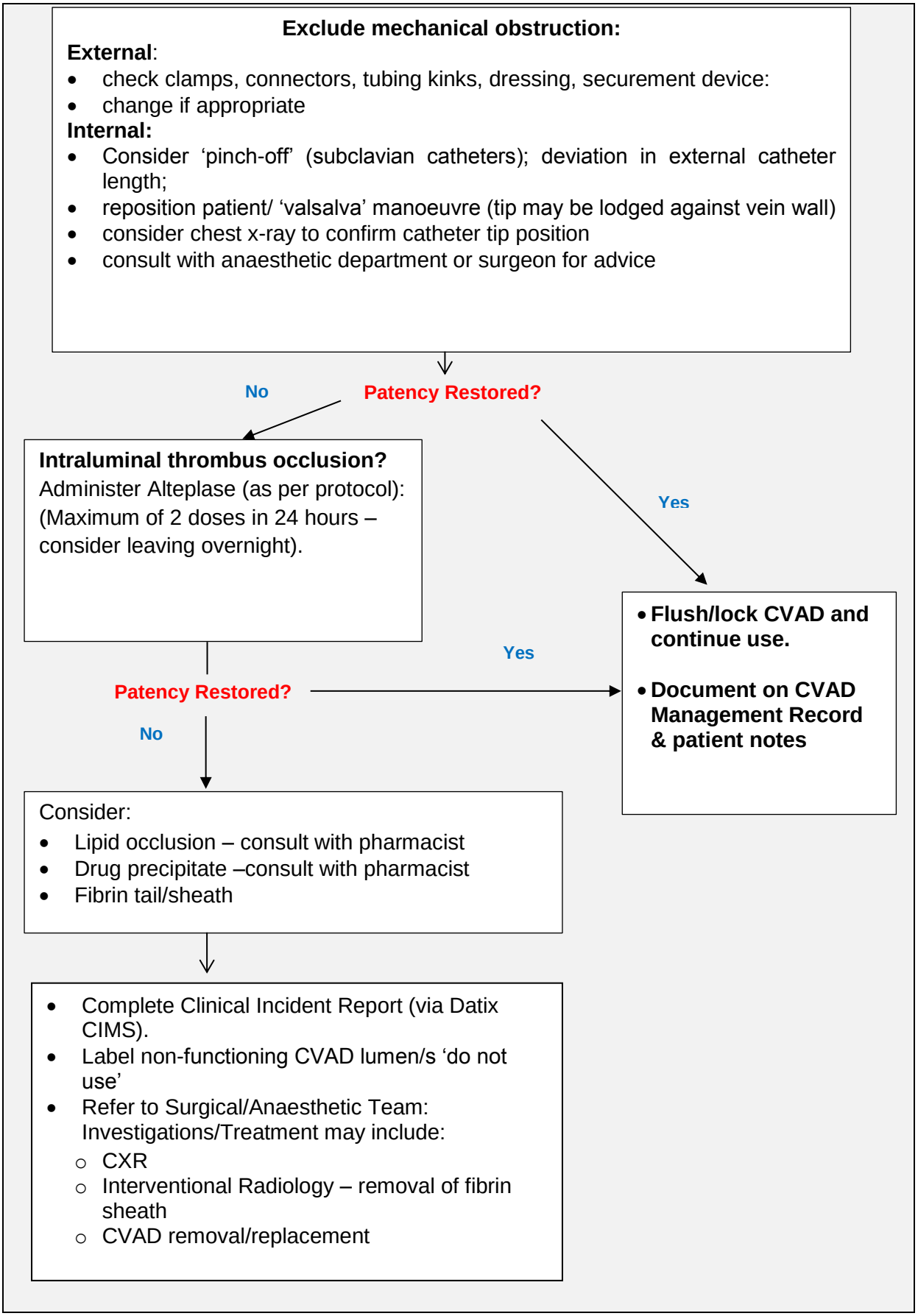
Appendix 3: Occlusion Management Summary



APPENDIX 4: CVAD and Midline Infiltration/Extravasation [39, 40]

'Extravasation' is the accidental leakage of drug or fluid out of the vein into the tissues with the potential to cause tissue injury and necrosis.

The degree of tissue damage is dependent upon the properties of the drug or fluid, the concentration and volume infiltrated.

Key Points

- The position and patency of the CVAD must be ascertained prior to infusing vesicant drugs or fluids. Sluggish or no blood return could indicate a problem.
- Vesicant drugs and fluids are not recommended for administration via a midline.
  - Refer to pharmacy protocol for management of non-cytotoxic extravasation (*in development)*
- Recognising the early signs and symptoms of infiltration/extravasation is essential to minimise tissue damage.

Potential causes:

- inadequately secured catheter and malposition of catheter tip
- dislodgement of infusaport needle
- fibrin sheath causing fluids to track to the insertion/exit site and accumulating in the subcutaneous tissue
- fracture or damage to the catheter
- excessive intraluminal pressure e.g. administering medications with a small gauge syringe

***Signs/symptoms*:** (also refer to the PIVAS tool)

- Leakage of fluid from insertion/exit site.
- Erythema and/or swelling at insertion/exit site
- Pain and burning sensation at site and during infusion
- Blistering or taut skin around insertion/exit site
- Change in skin temperature and colour: cold/blanching or hot/tender

Actions

1. Cease infusion(s)/injection immediately and disconnect from CVAD (keep bag/syringe and administration set to assess amount of drug/fluid infused).
2. **Do not flush**
3. If limb affected, elevate and immobilise
4. Mark and measure the area of skin affected
5. Attempt to aspirate any residual drug from the CVAD
6. Refer to treating medical team urgently – a referral to the plastic surgeon may be warranted
7. Leave infusaport needle in situ until further treatment confirmed
8. Liaise with pharmacist and treating medical team for appropriate treatment eg. heat/cold compress, antidote.

- Obtain extravasation kit from Oncology/Haematology Unit for cytotoxic agents and refer to Extravasation of Cytotoxic/Biotherapy Agents for management

9. Document incident and all actions taken in the patients notes
10. Complete a Clinical Incident report via Datix CIMS
11. Consider medical imaging of affected area.
12. Liaise with CNC Stomal and Wound Therapy for ongoing wound management

APPENDIX 5: CVAD-Related Venous Thrombosis

Key Points

- Reduced functioning of the CVAD can be an early sign of thrombus formation. Early recognition and prompt management can prevent adverse patient outcomes including infection and venous thromboembolism. Refer to clinical practice guideline Primary Prophylaxis of Venous Thromboembolism (VTE)
- Refer to a haematologist VTE is suspected or confirmed for ongoing management.
- The decision to remove a CVAD due to thrombosis is made after consultation with the haematologist and treating medical team.

***Potential cause of venous thrombosis**:*

Occurs when a blood clot develops in the vein around the catheter causing stenosis and obstruction of blood flow. Risk factors:

- Trauma and irritation of the vein leading to thrombi formation and narrowing or occlusion of the venous lumen [41]
- Patients with an underlying haematological diagnosis
- Migration of catheter tip [41, 42]
- Larger diameter catheters and multiple lumens
- Long term CVAD

Signs/symptoms:

- Pain;
- Distended veins; Swelling in neck (upper body catheters) or leg (femoral catheters);
- Reduced perfusion to extremities on affected side.

Actions

- Seek prompt medical attention.
- Radiological imaging eg. Ultrasound, Doppler may be required to confirm diagnosis
- Long term anticoagulation therapy may be required after consultation with haematologist.
- Complete Clinical Incident Report via Datix CIMS

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APPENDIX 6: CVAD-Related Air Embolism

Key Points

- Air embolism is a medical emergency – call Code Blue if suspected.
- Prevent air embolism by ensuring all CVAD connections are secure, manipulation is minimised and safety precautions are implemented during line changes and CVC/PICC removal procedures.
- Early recognition of signs and symptoms of air embolism is vital to prevent adverse patient outcomes.

Potential causes of air embolism:

- Caused by an inadvertent bolus of air entering the vascular system.
- Situations where this can occur include:[43]
    - Insertion and removal
    - Accidental disconnection between catheter and connections
    - Unclamped line during bung/administration set changes
    - Air in IV administration sets
    - Catheter fracture

Signs/ symptoms:

- Sudden onset of respiratory distress;
- Chest/shoulder pain;
- Change in neurological status/loss of consciousness/agitation;
- Palpitations; hypotension

Procedure: Accidental Disconnection of an Infusion Line from a CVAD
1. Immediately clamp the catheter as close as possible to the insertion/exit site and stop any infusions. Where practical observe hand hygiene and use aseptic technique. 2. **If bleeding back has occurred** and there is no visible damage to the catheter; • Clean end of catheter hub with 2% CHG/70% isopropyl alcohol swab and allow to dry.[37] • Flush the line with 10mL 0.9% sodium chloride using pulsatile positive pressure technique [38] and place a new needle-free device on lumen. • Prepare a new infusion and administration set using aseptic technique. • Document event on CVAD management record and in the patients' notes. • Monitor patient for signs of infection: 4 hourly TPR for 48 hours

3. **If bleeding back has *not* occurred: *there is a risk of air embolism***

- Clamp line immediately close to insertion/exit site as possible
- Call for immediate assistance
- Remove pillows, place bed flat and turn patient on left side.
- Clean catheter at point of disconnection with 2% CHG/ 70% alcohol swab and allow to dry.
- Attach sterile 10mL syringe and aspirate line until blood has been drawn.
- Observe child for changes in neurological, haemodynamic and respiratory status.
- Consider a medical review, MET call, CODE BLUE as indicated by the patient's clinical condition.
- Await further instructions for management.
- If the infusion is to be recommenced, prepare new infusion and administration set using aseptic technique.

4. **If catheter damage observed e.g. hole or break**

- Clamp CVAD immediately between damaged portion and the point of catheter exit/entry.
- Cover the hole/break with sterile gauze or alcohol swab.
- Call for immediate assistance and place patient in position stated above.
- Do not attempt to flush or aspirate and await medical instruction.
- Complete a Clinical Incident report via Datix CIMS

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APPENDIX 7: Pericardial Effusion and Cardiac Tamponade

Key Points

- A rare but significant complication; increased risk in infants with PICC/CVC.[44]
- *Early* recognition is critical in preventing adverse patient outcome

Potential Causes:

- Trauma at insertion.
- Migration of the catheter tip into the right atrium or ventricle with the risk of rupturing the heart wall or causing erosion from vesicant or irritant infusions. [39, 40]
- Consider catheter migration into the heart if sudden onset of clinical symptoms:

Signs/ symptoms:

- Reduced external catheter length (more common with PICC) associated with:
    - acute respiratory distress,
    - chest tightness,
    - tachycardia,
    - hypotension,
    - change in level of consciousness

Actions:

- Cease infusion immediately and clamp catheter
- Initiate life support measures as clinically indicated
- Seek emergency medical attention: **CALL 55 CODE BLUE**

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APPENDIX 8: CVAD Dressing Change Procedure

Key Points:

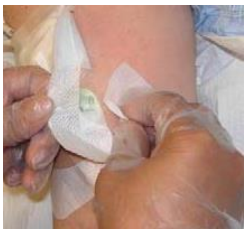
- CVAD procedures require strict adherence to hand hygiene and aseptic technique.
- Access CVAD only when necessary and minimise manipulation by grouping CVAD care procedures where possible.

Equipment

- Dressing trolley / sterile dressing pack
- PPE: apron and gloves (non-sterile and sterile)
- Skin cleansing swabs: 2% CHG/ 70% alcohol (consider povidone-iodine for patients with sensitivity)
- ± 0.9% sodium chloride
- Gauze swabs
- Large transparent semi-permeable dressing
- Adhesive tape for dressing securement
- ± Sutureless securement device (StatLock™ for PICC; GripLok™ for Midline)
- ± Sterile needle free bung
- Waste bag

Dressing Change Procedure
1. Position patient for clear access to the CVAD insertion/exit site. 2. Wash hands 3. Assess the insertion/exit site: visualise and palpate for signs of infection/tenderness • Note and record external length of catheter if applicable
4. Prepare Equipment: A large aseptic field is required for dressing changes. • Wash hands • Clean dressing trolley with detergent wipe and gather equipment. • Open dressing pack onto trolley and prepare equipment using non touch technique. • Repeat hand wash and put on apron & gloves

5. Remove transparent dressing carefully and dispose into waste bag
    - Alcohol swabs can assist with dressing removal - never use scissors to remove the dressing.
    - Inspect securement device (where applicable) and assess need to change. Remove with alcohol swabs if change is necessary. Assess risk/benefit of changing the device.



6. Repeat hand washing and put on sterile gloves.

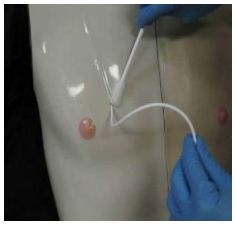
Cleanse the skin:

7. If visibly soiled clean the skin with 0.9% sodium chloride first and dry with sterile gauze.

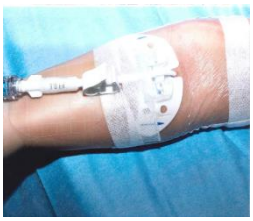
Consider taking a wound swab if exudate present.

8. Hold and support the catheter close to the insertion/exit site in non-dominant hand with a sterile gauze swab.

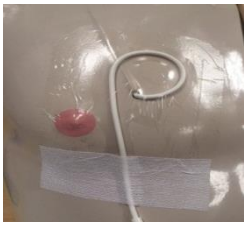
9. Cleanse the skin with 2% CHG/70% alcohol swab stick (or povidone iodine for patients with sensitivity). For preterm infants refer to Aseptic Technique in the NICU)
10. Using friction and a circular motion cleanse the skin from the insertion/exit site working outwards and extending beyond the area of the dressing.[5, 8, 36]
11. **Allow the skin dry**.[37, 38]



12. Clean the length of catheter from the insertion/exit site to end of hub with a separate chlorhexidine/alcohol swab.
13. Apply skin protection to area beneath the dressing where appropriate, avoiding direct contact with insertion/exit site.
14. Apply new securement device if applicable.



15. Apply transparent dressing, covering the insertion site and securement device if present.
16. For tunnelled CVAD, loop catheter under the dressing and avoid obscuring the exit site. Anchor the catheter with adhesive tape; reinforce edges of dressing with adhesive dressing if required.



17. Document dressing change on the CVAD Management Record MR852
    - Remeasure PICC external length to ensure catheter has not moved during dressing change.

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APPENDIX 9: CVAD BLOOD SAMPLING PROCEDURE

Key Points

- Inadequate CVAD care significantly increases the risk of CVAD-related complications including infection and occlusion. Procedures are only to be undertaken by clinicians with prior training in CVAD care.
- Access the CVAD only when necessary – group blood sampling with administration procedures or line changes where possible.
- A discard volume of 3-5mL is sufficient in most cases. [31] (Larger volumes may be required depending on the type of infusions in progress – check with pathology if in any doubt).
- Coagulation studies are not recommended to be taken from a heparinised CVAD. Results must be interpreted with caution if alternative access is not possible.

Equipment

Blue tray or dressing trolley – decontaminated with hospital sporacidal wipe

10mL sterile syringe

± Luer lock vacuum blood collection device (eg. BD Vacutainer)

Blood collection tubes/bottles

2% chlorhexidine (CHG)/70% isopropyl alcohol swabs

10mL sodium chloride 0.9%

Personal protective equipment (apron, gloves, ± goggles if risk of blood splash)

± Heparinised saline, 10mL sterile syringe, drawing up needle

± Sterile needle-free bung

Procedure
Confirm patient identification with the blood specimen request form. Check volume of blood required for requested specimen/s. Perform hand hygiene and prepare equipment using aseptic technique Don personal protective equipment. Cease infusions if in progress and clamp line (if appropriate to do so) Vigorously scrub the needle-free access device with 2% CHG/70% alcohol swab for 20 seconds and allow to air dry.
Syringe method: 1. Holding the end of the CVAD lumen with a new swab or sterile gauze, attach sterile 10mL luer lock syringe to hub or needle-free device and unclamp line.

2. Slowly withdraw blood (3-5mL in most cases) and discard syringe into sharps waste container, unless line cultures are required.
    - If having difficulty obtaining an aspirate try changing the patient's position, ask patient to cough, move arm up/ down. If blood still not flowing try using a 5mL syringe (a smaller syringe will exert less *negative* pressure and may prevent catheter collapsing on aspiration).
3. Attach new syringe and gently withdraw required volume of blood.
4. Remove syringe and swab the needle-free device with alcohol swab and allow to dry.
5. Flush the catheter with at least 10mL 0.9% sodium chloride using pulsatile, positive pressure technique.

6. Lock the line with heparinised-saline or resume infusions.
7. Transfer blood to appropriate collection bottles/tubes preferably using a blood transfer device if appropriate (refer to Pathwest Common Blood Collection Tubes)

8. Label blood specimen/s with patient details and write which lumen used.
9. Send to laboratory in biohazard specimen bag with blood request form.

CVAD Blood Collection Device: (Vacutainer® Luer-Lok Access Device)

1. Can only be used on CVADs with adequate and brisk blood flow.
2. Attach luer-lock blood collection device to cleansed needle-free bung and rotate clockwise to lock in place.

3. Insert discard blood collection tube (brown top) first in the centre of the holder – allow blood to flow into the tube (3-5mL is sufficient discard in most cases).
4. Remove discard tube and dispose into sharps waste container.
5. Insert blood sample tube(s) in turn and allow blood to flow into the bottle until the minimum volume required for the test is reached.
6. Remove sample tube/s and gently invert 8-10 times
7. On completion of sampling remove the collection device by turning anticlockwise, dispose directly into sharps waste container.
8. Swab needle-free device with alcohol wipe and allow to dry
9. Flush CVAD with 10mL 0.9% sodium chloride using a pulsatile technique.
10. Lock with heparinised-saline if required or continue infusion.
11. Label tubes accordingly and send to Laboratory in biohazard specimen bag with request form.

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APPENDIX 10: Needling and De-Needling an Infusaport

Key Points

- Care of the Infusaport is only to be undertaken by an experience clinician with prior training in Infusaport management.
- Needling/de-needling procedures and ongoing care of the infusaport require strict adherence to hand hygiene and aseptic technique.
- Access the infusaport only when necessary and minimise manipulation by grouping cares and procedures where possible.

Equipment

Dressing trolley, dressing pack and sterile gloves

Appropriate type and size of non-coring needle:

- Ideally the needle should rest as close to the skin as possible. Consider a shorter needle if the gap is greater than 2cm.

10 mL luer lock syringe

10mL 0.9% sodium chloride syringe

- Skin cleansing swabstick/solution: 2% chlorhexidine gluconate in 70% isopropyl alcohol consider alternative agent for patients with sensitivity to chlorhexidine)

Transparent, semi-permeable, polyurethane dressing, large (eg. Sorbaview)

Extension tubing/3 way tap & needle-free bung/s

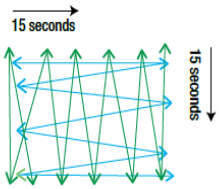
± Heparinised-saline ampoule, 10mL luer-lock syringe & drawing up needle

Needling an Infusaport

1. **Prepare Patient**
• Plan and implement age appropriate procedural pain/comfort measures:
  ○ Apply topical anaesthetic cream 45-60 minutes prior to needle insertion
  ○ Involve play leader and utilise play/distraction techniques throughout
• Position patient in a supine or semi supine position if possible.
• Identify infusaport site and palpate to identify the septum and outer perimeters
• Assess site for signs of infection including redness, swelling, and tenderness.
  ○ Do not continue with needle insertion if signs/symptoms present, report to treating medical team and await further instruction.

2. **Prepare equipment** • Decontaminate dressing trolley, wash hands and gather equipment • Using sterile gloves and non-touch technique assemble non-coring needle (± extension set/3-way tap if required) and attach needle-free bung(s) • Prime the entire set with 0.9% sodium chloride • Clamp the line

3. **Cleanse the skin:**



- Using a back and forth direction and applying friction clean the skin using 2% CHG/70% alcohol swabstick:
  - use opposite sides of swab stick for each direction or a separate swab stick
- Clean area of skin extending 1- 2cm beyond the dressing area.
- Allow skin to **air dry completely** (this can take up to 2 minutes).
- Once skin is dry, place sterile towel below insertion site (to prevent contact of extension set/syringe with patient skin).

4. **Insert the non-coring needle:** *(safety Lifeguard™ needle is preferred)*
   - Locate the base of the port with non- dominant hand.
   - Triangulate port between thumb and first two fingers to ensure stability during needle insertion.
   - Aiming for the centre of the port, insert needle at 90^{o} angle pushing firmly through the skin until tip touches bottom of portal chamber.
   - Do not manipulate sideways or rotate once in situ [45]

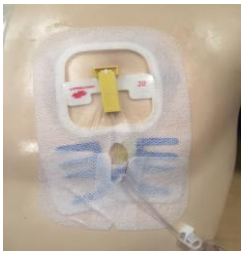
5. **Check line patency:**
   - Release clamp and/or turn the 3-way tap on to the syringe.
   - Aspirate the line using a 10mL syringe: withdraw heparin lock (2-3mL in most cases) and discard.
     - Obtain blood samples at this time if required.
   - Flush with 10-20mL sodium chloride 0.9%
   - If next access is > 6hours, administer heparinised-saline lock

6. **If unable to obtain blood**: check needle is inserted correctly

Aspiration can be facilitated by:

- asking patient to cough or take a deep breath (if age appropriate)
- repositioning – lying down/sitting up, lifting arm,
- If still unable to withdraw blood – seek senior nurse/medical review or,
- Remove needle and reattempt insertion with a new needle

7. **Dressing**
   - Cover the site with a large sterile transparent semi-permeable dressing: consider patient sensitivity and individual patient needs.
   - If sterile gauze is used to provide support and stability, ensure the insertion site remains visible.



8. **Documentation**
   - Complete CVAD Management Record with date/time of needle insertion
   - Document difficulties in patient notes and include in clinical handover

De-Needling an Infusaport
1. Flush the Port: • Prepare equipment and flushing solutions using aseptic technique as per Peripheral & Central Intravenous Therapy Protocol • Cease infusion if in progress, clamp extension set and disconnect IV administration set using non touch technique. • Scrub the needle-free bung with 2% CHG/70% alcohol swab and allow to dry • Using pulsatile, positive pressure technique, flush port with 10-20mL 0.9% sodium chloride • Lock the line with heparinised-saline as per prescription. • Clamp line/extension.
2. Remove or loosen the dressing. 3. Clean the site with 2% CHG/70% alcohol swab • if hands contaminated, repeat hand hygiene and don clean gloves
4. Stabilise the port by placing the first finger and thumb of the non-dominant hand firmly on either side of the port. 5. Disengage the needle safety guard as per manufacturer instruction and with dominant hand, remove the needle in a straight upward direction. Refer to manufacturer instructions for specific safety device removal technique.[46, 47]
6. Dispose of needle into sharps waste container immediately as per Sharps Management policy 7. Apply pressure with sterile gauze until haemostasis achieved. 8. Inspect the site and cleanse with chlorhexidine/alcohol swab and allow to dry before applying an occlusive dressing. 9. Leave dressing in place for 24 hours and monitor closely for bleeding at site for at least 4 hours. 10. Report to medical officer for review if infection is suspected.
11. Document removal of needle on CVAD Management Record (MR852) and in the patients' notes.

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APPENDIX 11: Alteplase Administration Procedure

Key points

- CVAD occlusion is largely preventable through proper maintenance and flushing procedures. Thrombus occlusions if left untreated can contribute to CLABSI.
- Early identification and treatment can prevent early removal of the CVAD or Midline and avoid potential delay in the patient's treatment.

Alteplase Dose/volume

- Refer also to Alteplase Monograph for further information.
- Supplied frozen from pharmacy in 10mL syringe at a concentration of 2mg/2mL
- Maximum dose: 2mg per dose, maximum two doses in 24 hours
- The optimum volume to administer is 110% of the known intraluminal volume to ensure the catheter tip is in contact with alteplase.
    - If the known intraluminal volume exceeds 2mL, the dose can be diluted with 0.9% sodium chloride.
    - If the exact intraluminal volume is not known use the following dose and volumes as a guide:

Childs weight	Maximum Dose [48]	Volume
< 15kg	1mg	1mL
15-30kg	1.5mg	1.5mL
>30kg	2mg	2ml

Equipment

Prescription chart

Alteplase syringe

Blue tray – decontaminated with detergent wipe or 70% alcohol

10mL sterile syringe

10mL 0.9% sodium chloride

± heparinised-saline (of appropriate strength in 10mL syringe)

2% chlorhexidine gluconate (CHG)/70% isopropyl alcohol swabs

Disposable gloves

White medication label/s

Procedure: Administering Alteplase
1. Explain procedure to patient/carer. 2. Adhere to the 6 rights of medication administration. 3. Remove alteplase from fridge and allow to thaw for 15 minutes. 4. Wash hands and prepare equipment using aseptic technique.

- if the *known* intraluminal volume is greater than recommended above, the alteplase dose can be diluted with 0.9% sodium chloride to 110% of the lumen volume.

5. Vigorously scrub the hub with 2% CHG/70% alcohol swab for 20 seconds and allow to dry.
6. Confirm occlusion by attaching 10mL saline syringe and attempting withdrawal. If blood flashback obtained, flush with 5-10mL saline, clamp line and resume use.
7. If **partial occlusion** confirmed: *Ability to flush but sluggish or no blood return.*
    - Attach alteplase syringe to catheter hub/needle-free device.
    - Slowly instill into catheter – **do not use force**
    - Clamp line and remove syringe
    - Repeat cleansing of needle-free device.

8. **Complete Occlusion**: *Inability to infuse or withdraw blood.*

    Use negative pressure technique: [31, 39,49]
    - Attach empty 10mL luer lock syringe to needle-free device
    - Unclamp line and pull back on plunger to 3-5mL mark.
    - Clamp line and remove syringe
    - Attach alteplase syringe and unclamp line.
    - Allow alteplase to be drawn into the line.
    - Remove syringe and clamp line.
    - Repeat cleansing of needle-free device.

9. Label treated lumen/s with date & time of instillation and 'Alteplase in situ – 'DO NOT USE.' on a white medication label)
10. Leave for 60-120 minutes (optimum time is 120 minutes) [50,19]

11. **At the end of dwell time:**
    - Scrub the hub, attach 10mL syringe and attempt to withdraw alteplase.
    - If blood aspirate obtained, withdraw at least 3-5mL and discard (to ensure complete removal of blood clot and alteplase).
    - Flush with 10-20mL 0.9% sodium chloride
    - Change needle-free bung using aseptic technique.
    - Resume CVAD use or lock line with Heparinised-saline.

12. **If patency not restored:**
    - Leave for a further 60-120minutes or overnight
    - A second dose may be considered after consultation with medical team
    - Document interventions and outcomes in patient notes and CVAD Management record MR852
    - Consider other causes of catheter occlusion
    - Refer to surgical team/anaesthetic team if unable to restore patency

APPENDIX 12: Removing a PICC or Non-Tunnelled CVC

Key points

- Only to be performed by clinical staff who have received appropriate training. Removal can then be undertaken when deemed competent in the procedure or under direct supervision of an experienced, skilled clinician.
- There is a risk of air embolus during the removal procedure. Ensure the catheter is removed during breath hold or expiration only.
- Document removal on the CVAD Insertion and Removal Record.

Equipment

Dressing pack

PPE: Apron/ gloves; goggles (if risk of blood splash)

Cleansing swabs or solution: 2% chlorhexidine in 70% isopropyl alcohol

Sterile occlusive dressing: (eg. Tegaderm®)

± stitch cutter (if catheter secured with sutures)

± sterile scissors (if catheter tip required)

± specimen container

Procedure
1. Explain procedure to patient and family; 2. Implement comfort and distraction measures. 3. Position the patient supine or semi-supine 4. For patient with a PICC ensure arm is outstretched and below the level of the heart.
5. Clamp the catheter (and administration sets if present). 6. Wash hands and prepare equipment using aseptic technique 7. Don PPE 8. Loosen edges of dressing ± sutureless securement device with alcohol swabs and remove (do not use scissors on CVAD dressings) o If sutures present lift away from the catheter with forceps and cut the suture away from the catheter. 9. Cleanse the skin with 2% CHG/ 70% alcohol swabs and allow to dry.
10. If catheter tip required for culture, wash hands and don sterile gloves and/or use sterile forceps to remove the catheter.

11. Ask patient to perform Valsalva's manoeuvre if cooperative or ask patient to hold their breath during removal:
    - If child is crying/unable to follow instruction remove the catheter on expiration
12. Hold sterile gauze over the insertion site and using gentle even pressure, slowly withdraw catheter
13. If resistance is felt, pause, ask patient to turn head and try again.
    - If resistance is still encountered contact senior medical or nursing staff.
    - **Do not use force**

14. Once catheter removed apply continual pressure over the site until haemostasis is achieved.
15. Apply occlusive dressing and leave in place for 24 hours.
16. Observe the site for bleeding for a minimum of 4 hours.
17. Check the catheter integrity following removal to ensure no remnants are left behind (refer to catheter length on insertion record)

If catheter tip is required for culture:

18. Catheter tip (last 2-3 centimetres) is only sent for microbiological culture if clinically indicated i.e. unexplained fever, significant erythema or exudate at the insertion site.
    - Once catheter removed from patient, ensure the tip does not become contaminated e.g. by hands, clothing, bedding
    - Using sterile scissors cut the last 2-3cm of the catheter and place directly into the specimen container.
    - Label specimen with patient details and send with pathology request form to Microbiology

19. Document Removal on the CVAD Insertion and Removal Record MR852.01 and in the patient notes.

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