

HAEMODIALYSIS AND PLASMA EXCHANGE: MANAGING CATHETER ACCESS - CHW

PROCEDURE [®]

DOCUMENT SUMMARY/KEY POINTS

- Many children undergoing haemodialysis or plasma exchange have double-lumen haemodialysis access catheters inserted into the internal jugular veins, subclavian veins or femoral veins.
- Only accredited nursing staff can access cuffed or uncuffed haemodialysis catheters.
- Double-lumen haemodialysis catheters may be cuffed or uncuffed.
- Cuffed lines are inserted by surgeons in the operating theatre and are used for long term access.
- Uncuffed lines are inserted by anaesthetists or intensive care specialists and are used for short term access (maximum 3 weeks).
- Prophylactic antibiotics should be given at the time of insertion of both cuffed and uncuffed haemodialysis catheters
- When no longer needed cuffed catheters must be removed in the operating theatres by a surgeon while uncuffed catheters can be removed in the ward by nursing staff.
- Heparin locking of cuffed and uncuffed haemodialysis catheters requires high concentrations of heparin than other central venous access devices. This procedure outlines the procedures involved in:
 - Accessing catheters to undertake haemodialysis or plasma exchange
 - Caring for the exit sites of haemodialysis catheters
 - Collecting blood for investigations including blood cultures from haemodialysis catheters including heparin lock to maintain patency of haemodialysis catheter
 - Removal of uncuffed haemodialysis catheters
- The procedures described should only be undertaken by accredited nursing staff

This document reflects what is currently regarded as safe practice. However, as in any clinical situation, there may be factors which cannot be covered by a single set of guidelines. This document does not replace the need for the application of clinical judgement to each individual presentation.

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| Approved by: | SCHN Policy, Procedure and Guideline Committee | |
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| Team Leader: | Fellow | Area/Dept: Nephrology |

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| <h2>CHANGE SUMMARY</h2> |
| <ul style="list-style-type: none"> • Due for mandatory review. No major changes in practice. Restructured the document to highlight the information relevant to medical officers. |

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| <h2>READ ACKNOWLEDGEMENT</h2> |
| <ul style="list-style-type: none"> • Nursing and medical staff caring for children with haemodialysis catheters at CHW. |

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Introduction

Double-lumen haemodialysis catheters are used in children, who are in acute renal failure, children in chronic renal failure without useable permanent vascular access and in peritoneal dialysis patients and transplant recipients in need of urgent or temporary dialysis. These can also be used for children who require plasma exchange.^{1, 2}

Double-lumen haemodialysis catheters **MUST NOT BE ACCESSED** for any purpose(s) other than for haemodialysis or plasma exchange unless authorised by the Renal Nurse Practitioner or the renal consultant on call.

Double-lumen haemodialysis catheters may be **cuffed** or **uncuffed**. It is considered the risk of infection is reduced if cuffed catheters are used.

1 Using Double Lumen Haemodialysis Catheters

Important:

Double lumen haemodialysis catheters are dedicated dialysis catheters and **must not** be used for any other purpose except when authorised by the Renal Care Team. Successful haemodialysis depends on well- functioning vascular access capable of providing blood flows up to 300mL/minute.

Double lumen cuffed or uncuffed haemodialysis catheters **must only** be accessed by senior nurses *accredited* for the procedure by the Renal Care Team.

Check the manufacturer's recommendation regarding antiseptic solution to clean the haemodialysis catheter. Certain catheters will crack if the wrong antiseptic is used.

1.1 Cuffed haemodialysis catheters

Cuffed haemodialysis catheters are inserted surgically in the operating theatres and are used where a child is likely to undergo a prolonged period of haemodialysis and/or plasma exchange and has no other haemodialysis access. Children requiring long-term haemodialysis will have an arteriovenous fistula established. However this cannot be done in small children (under 20 kg) so they will need long-term haemodialysis via a double-lumen cuffed catheter. The Renal Nurse in charge in the Renal Treatment Centre should be contacted to provide the required cuffed haemodialysis catheter.

Examples of cuffed haemodialysis catheters: Bard soft cell dialysis catheter, Medcomp hemocath and Medcomp split cath.

1.2 Uncuffed haemodialysis catheters

Uncuffed double-lumen haemodialysis catheters may be inserted by anaesthetists or intensive care specialists for temporary dialysis where there is an urgent need to commence haemodialysis and/or plasma exchange. Uncuffed haemodialysis catheters are used for a maximum of three (3) weeks if placed in the jugular or subclavian veins except in exceptional circumstances. Femoral catheters in bed bound children should not be used for longer than 3-7 days due to the risk of thrombosis and infection.¹

Examples of uncuffed haemodialysis catheters: Vascath®, GamCath®

1.3 Insertion of haemodialysis catheters

- The jugular veins are the preferred site of insertion, with right internal jugular the preferred site⁸.
- The use of the subclavian vein is not recommended⁴ as it is associated with a greater risk of later venous stenosis. If a surgical arteriovenous fistula is subsequently constructed in the arm on the side of subclavian stenosis there may not be adequate blood flow for effective dialysis.
- Femoral haemodialysis catheters limit mobility, and are associated with a higher risk of infection.
- The use of real-time ultrasound guidance is strongly recommended for the placement of haemodialysis catheters and results in improved rates of successful catheter placement, and reduced rates of both haematoma formation and inadvertent arterial puncture.

- Prophylactic antibiotics are administered immediately preoperatively when a haemodialysis catheter is inserted:
 - Cefazolin 30mg/kg (maximum dose 2gm).
 - Gentamicin 2.5mg/kg (maximum dose 40mg).

- Optimal blood flow is achieved when the haemodialysis catheter tip is at the level of the caval atrial junction or beyond.
- Haemodialysis catheter position should be radiological confirmed as per the [SCHN CVAD Practice Guideline](#) (2013-9037)
- A record of insertion should also be documented in the patient record.

1.4 Catheter locking

Heparin Locking

The heparin dose required to lock each lumen of the haemodialysis catheter will depend on the child's size and coagulation.

- The volume of each lumen is written on the haemodialysis catheter. Usually the volume is about 1.5mL per lumen.
- The volume used to lock each lumen should be 0.1mL greater than the volume stated on the haemodialysis catheter lumen to ensure complete filling of lumen.
- In most cases, the heparin strength used to lock each catheter lumen should be **5000 units per 5mL (i.e. 1000 units per mL)**.
- For children ≥ 35 kg, the maximum dose per lumen should be 2500 U of heparin per lumen (heparin strength 5000U/mL). This would only be required if there is persistent clotting of the catheter lumens.
- For children <15 kg, not more than 500 U of heparin should be inserted into each lumen (saline will then be added to the heparin lock to ensure filling of the lumen).
- The catheter lumens should be covered and a label must be applied over the gauze, indicating the volume and strength of the heparin lock contained in each lumen.

Alteplase: Recombinant Tissue type Plasminogen Activator

- Use of alteplase has been shown to reduce haemodialysis catheter malfunction and catheter related blood stream infections²⁰.
- It is used weekly to lock haemodialysis catheters. The solution concentration is 1mg/mL and the volume used to lock each volume is 0.1mL greater than the volume in the catheter.

1.5 Care of haemodialysis catheter site

- Haemodialysis catheter-related infection is regarded as one of the most common post-insertion complications. Therefore, catheter exit site care has been considered as one of the most significant factors in prevention of micro-organism invasion from the exit site⁵.
- All haemodialysis catheters are covered by a sterile transparent dressing. The exit site is to be “enveloped” between two Tegaderm dressings which permits continuous inspection of the site⁶. The dressing must be sealed at all times.
- The haemodialysis catheter exit site dressing must be changed weekly^{1, 8, 9, 14} or as required if the dressing appears soiled, moist, pooling with blood/ discharges or blood clots and/or non-occlusive/ lifting^{1, 8, 9}.
- If signs of inflammation or infection are noticed, an exit site swab from the haemodialysis catheter must be taken and sent for bacterial culture^{1, 6, 11, 12}.
- Baths are permitted but care should be taken to keep the catheter and exit site as dry as possible. Sponge baths are recommended for infants and young children. Showers and swimming are contra-indicated.

1.5 Removal of double lumen haemodialysis catheters

- *Cuffed* haemodialysis catheters must be removed surgically.
- *Uncuffed* haemodialysis catheters may be removed in the ward by nursing staff.
- Haemodialysis catheters are large bore and bleeding from the site can be very significant. The patient's coagulation profile should be checked before the haemodialysis catheter is removed.
- If there has been a recent heparin-associated haemodialysis cycle, a period of 4 hours should be allowed prior to removal of the catheter.
- Catheters should not be removed until 24 hours after a cycle plasma exchange due to increased bleeding risk due to low fibrinogen.
- Please see section 2.12 regarding the procedure for removal of uncuffed haemodialysis catheters.

1.6 Possible complications of double lumen haemodialysis catheters and their management

Erosion of catheter cuff through the skin

- If the haemodialysis catheter cuff is extruded through the skin it is considered an infection risk and the haemodialysis catheter will need to be replaced.

Occlusion

- This is indicated by poor flushing and aspiration of the haemodialysis catheter. During haemodialysis, partially blocked catheters present with high venous pressures (> 150mmHg) and inability to achieve > 75% prescribed blood flow.
- Early malfunction is typically caused by malposition and the catheter may need reposition or replacement.
- Late malfunction is typically caused by thrombus or fibrin sleeve. Thrombus may respond to therapy with Alteplase.

Infection

- Infections involving the haemodialysis catheters can be located at the exit site, along the tunnel in cuffed catheters or within the catheter itself.
- Exit site infections present with a combination of erythema, tenderness and discharge within two cm of the exit site. Swabs of the exit site are taken and sent for culture. Exit site infections with erythema alone can be treated with oral antibiotics however those with erythema, tenderness and discharge can be treated with IV antibiotics with daily review of the site to assess progress.
- Tunnel infections present with erythema, swelling and tenderness along the subcutaneous tract of a cuffed catheter. Tunnel infections are usually an indication for replacement of the haemodialysis catheter. However if access sites are limited, a trial of response IV antibiotics may be considered.
- Catheter related blood stream infections (CRBSI) present with clinical signs of infection with positive culture from the haemodialysis catheter or peripheral blood culture. Typically the haemodialysis catheter will need removal, with replacement after at least 48 hours of appropriate antibiotic therapy.

Empiric IV antibiotics for treatment of patients with haemodialysis catheter with suspected CRBSI:

- Cefazolin 30 mg/kg/dose Q24H (max 2g/dose)
- Gentamicin 2.5mg/kg/dose STAT (Redose when trough < 1mg/L: usually 48hrly)

If systemically unwell consider adding **stat dose of vancomycin 15mg/kg/dose** after HD. For further guidance on dosing of vancomycin please see [Antimicrobial Dosing in Renal Impairment – CHW Practice Guideline](#).

- Haemodialysis catheters can become colonised with organisms without signs of sepsis. Catheter rewiring and replacement can be considered with colonisation.

Air embolism

- Air embolism is caused by entry of air into the vascular system. It is seen rarely in haemodialysis patients due to the presence of air detectors in haemodialysis machines but air may also leak into the patient during disconnection of caps and blood lines.
- Symptoms are dependent on patients position during the event. When seated air migrates directly to the central nervous system and the patient may experience loss of consciousness and seizures. When lying, air passes directly to the heart and lungs, with patients experiencing shortness of breath, cough and chest tightness.
- Air embolism is a medical emergency. Venous lines need to be clamped and blood pumped stopped if the patient is on dialysis. Patients should be positioned on the left side in a supine position with head and chest tilted downwards.

Accidental removal/displacement

- Both cuffed and uncuffed haemodialysis catheters can be accidentally removed or displaced.
- In the event of accidental removal, pressure should be applied to the catheter insertion site for 15 mins. Note for tunnelled lines this is generally in the internal jugular not the skin site.
- CXR should be sought to recheck catheter position.

Arrhythmia

- Incorrect placement of the haemodialysis catheter too far down in the right atrium can result in arrhythmia.
- If a patient undergoing haemodialysis is found to have an arrhythmia, haemodialysis catheter position should be checked with a CXR.

2 Haemodialysis Catheter Procedures

2.1 Accessing Haemodialysis Catheters

This procedure describes the provision of care by a renal or paediatric nurse, who has completed the appropriate training in accessing a haemodialysis vascular catheter and achieved accreditation to undertake this procedure.

Do not commence the procedure if the following occur:

- If infection is suspected (with the presence of the following signs and symptoms: fever, inflamed or red exit site, discharge and pain), notify medical team.
- The haemodialysis catheter is damaged.
- The haemodialysis catheter tip position has not been documented by the inserting medical officer in the child's medical record.

Do not proceed or persist with procedure if the following occur:

- If unable to aspirate heparin lock, **DO NOT FLUSH LUMEN** – notify Renal Nursing staff or medical team.
- If problems persist, i.e. unable to achieve required blood flow or venous pressure greater than blood flow rate, then return blood, disconnect child and notify medical team.

Expected outcomes

To connect children with renal failure to a haemodialysis machine via an adequately placed vascular haemodialysis catheter, in a manner that minimises contamination and maintains the integrity of the vascular catheter.

Risks and precautions

Child

| Risk | Precaution |
|-------------|----------------------------------|
| Infection | Maintaining aseptic technique |
| Air embolus | Maintaining prescribed procedure |

Staff

| Risk | Precaution |
|---------------|---|
| Sharps injury | Correct handling and disposal of sharps |
| Splash injury | Correct handling and disposal of fluids |

Equipment required

- Basic dressing pack.
- Gauze squares (sterile) as needed.
- 10mL or 20mL syringes x 2 (children under 20kg have each lumen flushed with 10mL saline; children over 20kg have 15mL saline flush pre and post dialysis).
- 3mL syringes x 2.
- Drawing up needle x 1.
- Normal saline ampoules 10mL x 2 -4.
- Blue protective sheet.
- Sterile gloves.
- Impervious gown or plastic apron, goggles or full face shield.
- Appropriate antiseptic solution: alcoholic chlorhexidine or povidine iodine.
- Adhesive paper tape.
- 1x20mL syringe for heparin infusion.
- 1 x non-injectable cap.
- Heparin 5000 units/5mL 1-2 vials as required.

Child preparation

- Inform child and parent/care giver of procedure.
- Position child for easiest access of haemodialysis catheter.
- Ensure adequate lighting is available.
- Contact play therapist for procedural support if necessary.

2.2 Procedure to access haemodialysis catheter

- Clean work surface with neutral detergent (example is Oasis Pro 12 Neutral Cleaner™).
- Perform one-minute hand wash.
- Open sterile equipment prior to touching the haemodialysis catheter.
- Open the ampoules of normal saline and heparin, place the ampoules beside the sterile field to ensure easy access.
- Open sterile gloves and don personal protective equipment – disposable plastic apron and protective eye wear.
- Expose haemodialysis catheter ends and place blue protective sheet under both limbs of the catheter.
- Wrap antiseptic soaked gauze around haemodialysis catheter limbs prior to 3 minute hand wash (allows time for effective disinfection).
- Disinfect hands with antiseptic hand rub.
- Turn off blood pump; clamp the arterial, venous and normal saline infusion lines.
- Place the dialysis blood lines to be connected to haemodialysis catheter in an accessible position.
- Perform 3 minutes hand wash.
- Don sterile gloves using full sterile technique.
- Draw up 10mL – 15mL Normal Saline in a 10mL or 20mL syringe.
- Prepare heparin infusion in 20mL syringe according to CHW Nurse administered Heparin for Haemodialysis and Plasma Exchange Procedure and apply a non-injectable cap and hand to assistant who applies a medication additive label.
- Place sterile dressing towel under the haemodialysis catheter limbs.
- Use sterile gauze to handle all aspects of the haemodialysis catheter and dialysis blood lines.
- Using forceps remove antiseptic soaked gauze from the haemodialysis catheter. Clean the catheter hub with fresh antiseptic soaked gauze. Scrub the catheter hub for one minute.
- Check that the clamps on both haemodialysis catheter limbs are closed.
- Hold arterial (red) limb of the haemodialysis catheter with a piece of sterile gauze.
- With additional sterile gauze, remove and discard the luer lock cannula cap of the arterial (red) limb and then connect to a 3mL empty syringe.
- Using a piece of sterile gauze open the clamp on the arterial (red) limb and withdraw the heparin lock and then re-clamp the arterial (red) limb.
- Disconnect the 3mL syringe and discard onto the side of the sterile field.
- Connect the first syringe containing normal saline, open the clamp, aspirate and then flush the lumen repeatedly to ascertain patency.
- Clamp the lumen and leave the syringe attached to the arterial (red) lumen.
- Repeat the accessing procedure as mentioned above for the venous (blue) lumen.
- Clamp the lumen and leave the syringe attached to the venous (blue) lumen.

2.3 Connecting haemodialysis catheter to Dialysis Blood Lines and the Machine ^{5,6}

- Use sterile gauze to separate the arterial and the venous blood lines.
- Connect the arterial blood line to the arterial (red) lumen of the haemodialysis catheter.
- Disconnect the recirculation connector and connect the venous blood line to the venous (blue) lumen of the haemodialysis catheter.
- Unclamp the arterial (red) and venous (blue) limbs of the haemodialysis catheters and the arterial and the venous dialysis blood lines.
- Start dialysis machine's blood pump at half the desired blood flow rate.
- Establish the child's individual target blood flow rate, ensuring acceptable venous and arterial pressure.
- Secure the dialysis blood lines to the child with tape.
- Commence dialysis as prescribed.
- Dispose of the used equipment appropriately as per NSW Health Infection Control Policy and CHW Waste management policy.
- Remove gloves and wash hands.

Documentation

Nursing care provided should be documented in the child's:

- Progress notes.
- Observations chart including inpatient fluid balance charts and medication charts if relevant.

2.4 Disconnecting haemodialysis catheter from Dialysis Blood Line and the Machine

Returning the blood at the end of therapy

When dialysis is completed, return the blood to the child as follows:

- Ensure that you have enough normal saline to run the blood back (at least 300mL for adult dialysis blood lines; 200mL for paediatric dialysis blood lines; 100mL for infant dialysis blood lines).
- Stop the dialysis machine blood pump. Open the saline and run the blood back into the arterial (red) lumen. This should only take a small amount of saline. When the blood lines appear light pink – clear in colour, clamp the line at the haemodialysis catheter and the pre-pump clamp.
- Turn on the blood flow at approximately half of the standard dialysis flow rate. Run the pump with saline until the blood lines and dialyser appear light pink to clear in appearance.
- Clamp the return blood line (blue clamp) and the venous (blue) lumen of the haemodialysis catheter.

2.5 Disconnecting double lumen haemodialysis catheter from the extracorporeal circuit

Equipment

- Basic dressing pack.
- Gauze squares (sterile) as needed.
- 10mL or 20mL syringes x 2 (children under 20kg have each lumen flushed with 1ml/kg (max 10mL) saline; children over 20kg have 15mL saline flush pre and post dialysis).
- 3mL syringes x 2.
- Drawing up needle x 1.
- Normal saline ampoules 10mL x 2 -4.
- Blue protective sheet.
- Sterile gloves.
- Impervious gown or plastic apron, goggles or full face shield.
- 10% povidone-iodine antiseptic solution.
- Adhesive paper tape.
- Peroxide solution.
- 2 x non-injectable caps.
- Heparin 5000 units/5mL 1-2 vials as required.

Procedure

- Clean work surface with neutral detergent (example is Oasis Pro 12 Neutral Cleaner™)
- Perform one-minute hand wash.
- Open sterile equipment prior to touching the haemodialysis catheter.
- Open the ampoules of normal saline and heparin, place the ampoules beside the sterile field to ensure easy access.
- Open sterile gloves and don personal protective equipment – disposable plastic apron and protective eye wear.
- Place a blue protective sheet under the haemodialysis catheter.
- Wrap anti-septic soaked gauze around both limbs of the haemodialysis catheter prior to 3 minute hand wash (allows time for effective disinfection).
- Perform 3 minutes hand wash.
- Don sterile gloves.
- Draw up appropriate volume of Normal Saline in a 10mL or 20mL syringe x 2.
- Place sterile dressing towel under the haemodialysis catheter limbs.

- Use sterile gauze to handle all aspects of the haemodialysis catheter and blood lines.
- Remove antiseptic soaked gauze from the haemodialysis catheter and scrub the catheter again with antiseptic soaked gauze.
- Check that the clamps on both the arterial (red) and venous (blue) limbs of the haemodialysis catheter are closed.
- Hold arterial (red) limb of the haemodialysis catheter with a piece of sterile gauze.
- With additional sterile gauze, disconnect the blood tubing from the arterial limb of the haemodialysis catheter and then attach the syringe containing the saline flush to the arterial (red) lumen.
- Unclamp the arterial (red) lumen and flush the saline through the lumen at a moderate pace to prevent red blood cells from sticking to the haemodialysis arterial (red) catheter lumen and forming clots.
- Clamp the arterial (red) lumen and remove the syringe.
- Draw up appropriate volume of heparin 5000 units per ml in 3 ml syringes x 2
- Attach the 3mL heparin lock syringe to the arterial (red) lumen.
- Flush the heparin into the arterial lumen at a moderate to rapid pace and clamp under positive pressure to avoid heparin leaking out of the holes at the side of the haemodialysis catheter lumen.
- Remove the 3mL syringe and place a non-injectable cap on the haemodialysis catheter lumen.
- Repeat for the venous (blue) lumen.

Wrap the both haemodialysis catheter limbs in gauze and label indicating that the haemodialysis catheter is heparin locked.

2.6 Haemodialysis Catheter Exit Site Care

Description of practice

This practice describes the care the nurse provides for the exit site and/or dressing of a child's double lumen haemodialysis catheter.

Haemodialysis catheter exit site dressing should be attended once per week and as necessary^{7, 8, 16, 20}.

The haemodialysis catheter exit site dressing must be performed by a nurse accredited by the Renal Care team.^{1, 6, 7, 9, 10}

Principles

- The haemodialysis catheter should not be allowed to become wet in the shower or bath.
- An aseptic non touch technique must be adhered to when performing the haemodialysis catheter exit site dressing^{1, 9, 12, 20}.
- Standard precautions must be applied¹¹: Non-sterile goggles or face shield, impervious gown or disposable plastic apron and sterile gloves.
- The haemodialysis catheter exit site dressing must be changed weekly^{1, 8, 9, 14, 20} or as required if the dressing appears soiled, moist, pooling with blood/ discharges or blood clots and/or non-occlusive/ lifting^{1, 8, 9, 20}.
- If the child is suffering from a coagulopathy, the dressing requirement should be reviewed by the Renal Nurse Practitioner before the procedure.
- If signs of inflammation or infection are noticed, an exit site swab from the haemodialysis catheter must be taken and sent for bacterial culture and sensitivity test^{1, 6, 11, 12}.
- Haemodialysis catheter-related infection is regarded as one of the most common post-insertion complications. Therefore, catheter exit site care has been considered as one of the most significant factors in prevention of micro-organism invasion from the exit site⁵. All haemodialysis catheters are covered by a sterile transparent dressing, which permits continuous inspection of the site^{6, 8, 9}.

Expected outcomes

- The child's haemodialysis catheter exit site will be kept clean and dry and hence the chance of infection will be minimized.
- The haemodialysis catheter will be supported and secured safely and appropriately.
- The child's comfort is maintained.
- Any adverse events are identified and action taken promptly.

Risks and precautions

Child

| Risk | Precaution |
|------------------------------------|--|
| Infection | Maintain aseptic technique |
| Haemodialysis catheter dislodgment | Follow prescribed procedure and ensure haemodialysis catheter is well secured at all time with minimum of two sutures in short term catheters. |
| Air embolus | Maintaining prescribed procedure |

Staff

| Risk | Precaution |
|---------------|---|
| Sharps injury | Correct handling and disposal of sharps |
| Splash injury | Correct handling and disposal of fluids |

Practice

Equipment

- Dressing trolley.
- Disinfectant solution (as per catheter manufacturers recommendations).
- Sterile gauze squares x 2 packets.
- Sterile dressing pack x 1.
- Non-sterile gloves x 1 pair.
- Sterile gloves x 1 pair.
- Blue protective sheet x 1.
- Transparent adhesive dressing dressings x 2 (for example "Tegaderm™").
- 10% povidone-iodine antiseptic solution, unless contraindicated ^{1, 8, 9, 10}.
- Normal Saline.
- Hydrogen peroxide 3% if required to soften crusting at the exit site.
- Antiseptic impregnated circular dressing (for example "Biopatch™").
- Goggles or face shield.
- Disposable plastic apron.
- Adhesive removal agent if necessary (for example "Kendall Preppies™").
- Culture swab x 1 (if a wound swab on the catheter exit site is required).
- Disposable plastic bag or a rubbish bin.

Procedure

- Explain the procedure to the child and carer.
- Consult play therapist regarding procedural support if necessary.

Note: Many children find this procedure distressing. If this is the case the dressing should be performed out of the main dialysis area in the procedure room.

- Ensure adequate lighting is available.
- Position the child. Ensure the bed or the dialysis chair is at the right height for your back.
- Simple hand-wash and don protective equipment as listed above.
- Clean the working surface of the trolley with neutral detergent (example is Oasis Pro 12 Neutral Cleaner™).
- Perform a one-minute hand wash.
- Open dressing pack onto clean work surface.
- Pour 10% w/v povidone-iodine into the tray. (Use alternate disinfectant or Normal Saline if child sensitive to Povidone-Iodine).
- Open the transparent adhesive dressing and antiseptic impregnated circular dressing onto the tray.
- Place a blue underpad under the haemodialysis vascular catheter area.
- Apply antiseptic hand rub to hands.
- Remove the existing dressing and dispose as per CHW Waste management policy.
- Check the haemodialysis catheter exit site for redness, inflammation or drainage.
- If the above situation occurs, it may reflect possible infection, then swab the site, send for bacterial culture and sensitivity tests, and notify the nurse practitioner or medical officer.
- If there is some old adhesive left on the child's skin, an adhesive remover should be used to remove the adhesive and clean the skin.
- Wash hands again with antiseptic hand wash for 3 minutes, dry hands thoroughly and don sterile gloves.
- If there is old blood or crusting around the haemodialysis catheter exit site, clean it away with saline or peroxide soaked cotton balls.
- Clean the exit site with povidone-iodine soaked gauzes in a circular motion and allow it to dry for at least 3 minutes (if child is allergic to povidone-iodine, use Normal saline).
- Ensure that the skin is thoroughly dry prior to placing the antiseptic impregnated circular dressing at the exit site.
- Apply a transparent adhesive "sandwich" dressing as follows:
 - Pick up one transparent adhesive dressing. Peel the backing off half way. Fold it in half.
 - Lift the haemodialysis catheter up (do not touch the exit site).

- Place the folded transparent adhesive dressing underneath the haemodialysis catheter. The side of the transparent adhesive dressing that has had the backing peeled off should stick to the skin.
 - Peel the rest of the paper backing off the transparent adhesive dressing, and place the haemodialysis catheter down so that it rests on top of the transparent adhesive dressing.
 - Peel the backing completely off the second transparent adhesive dressing.
 - Place the second transparent adhesive dressing over the first and on the skin above the catheter exit site. There will be a single layer of transparent adhesive dressing on the skin and a double layer enveloping the haemodialysis catheter.
- Discard equipment appropriately.
 - Wash hands with antiseptic hand wash and dry hands thoroughly.
 - Document the procedure in child's clinical notes.
 - Povidine iodine ointment should not be used at the catheter exit site as it may damage the catheter.

2.7 Blood or Blood Culture Collection

Principles of practice

Double lumen haemodialysis catheters should **only** be accessed by nurses accredited by the Renal Care team.

Double lumen haemodialysis catheters should not be accessed for any other procedure except haemodialysis or plasma exchange. This includes blood collection, administration of IV fluids or medications or for CVP monitoring.

Under exceptional circumstances and when authorised by the renal consultant or senior renal nurse, the haemodialysis catheter may be accessed if blood cultures from the catheter are required or urgent biochemistry is required when peripheral venipuncture has been unsuccessful.

With the exception of renal care team, senior and junior medical staff and nurses not accredited for the procedure may not access the line or give permission for the line to be accessed.

Procedure

Equipment

- Basic dressing pack.
- Gauze squares (sterile) x 3 packets or more as needed.
- 10mL syringes x 2.
- 20mL syringes x 1 (2 if collecting blood cultures).
- 3mL syringes x 2 (4 if collecting blood cultures).
- Drawing up needle x 1 (2 if collecting blood cultures).
- Normal saline ampoules 10mL x 1-2 (2-3 if collecting blood cultures).
- Heparin 5000 units/5mL x 1 vial.
- 3 way tap x 1.
- 1 x non-injectable cap (2 if collecting blood cultures).
- Appropriate antiseptic solution (povidene iodine or chlorhexadine).
- Blood tubes or blood culture bottles.
- Blue protective sheet.
- Sterile gloves.
- Disposable plastic apron, goggles or full face shield.

2.8 Preparing the haemodialysis catheter

- Decide which haemodialysis catheter lumen to use (arterial [red] or venous [blue]) and note the volume of the lumen (indicated by the manufacturer on the catheter lumen).
- If collecting blood cultures, blood should be taken from both lumens and the bottles labelled arterial (red) or venous (blue) accordingly. The volume of both lumens must be noted.
- Clean work surface with neutral detergent (example is Oasis Pro 12 Neutral Cleaner™).
- One minute hand wash.
- Open dressing pack; peel open and drop the remaining sterile equipment onto the sterile field.
- Pour antiseptic solution into one compartment of the dressing tray.
- Open the ampoules of normal saline and heparin, place the ampoules beside the sterile field to ensure easy access.
- Don personal protective equipment – gloves, disposable plastic apron and protective eye wear.
- Expose catheter ends and place blue protective sheet under the vascular catheter lumens.
- Disinfect hands with antiseptic hand-rub.
- Saturate a gauze square with 10% povidone-iodine antiseptic solution; wrap the soaked gauze around the catheter lumen prior to 3 minute hand wash (allows time for effective disinfection).
- 3 minute hand wash.
- Don sterile gloves.

2.9 Blood Collection for biochemistry or other urgent specimen

Note: use sterile gauze to handle all aspects of the catheter

- Draw up 10mL – 20mL normal saline into the 20mL syringe.
Guide: use 1mL/kg (max 10 mL) for children under 20kg; 15mL 21kg – 35kg; 20mL for children over 35kg.
- Prepare heparin lock syringe (the volume of the lumen plus 0.1mL).
- Prepare blood collecting equipment.
- Place a 5mL syringe on one port of the 3 way tap and a 10mL syringe on the other port. Close the 3 way tap to the 5mL syringe.
- Collect the blood sample.
- Hold the haemodialysis catheter lumen up with a sterile forceps and place a sterile dressing towel under it.

- Remove antiseptic soaked gauze from the catheter lumen and then scrub catheter hub for 1-2 mins with antiseptic soaked gauze.
- Check that the clamps on both haemodialysis catheter lumens are closed.
- Hold the selected haemodialysis catheter lumen with a piece of sterile gauze.
- With additional sterile gauze, remove and discard the luer lock cap from the catheter lumen and then connect to a 3mL empty syringe.
- Using a piece of sterile gauze open the catheter clamp and withdraw the heparin lock and then re-clamp the lumen.
- Disconnect the 3mL syringe and discard onto the side of the sterile field.
- Connect the 3 way tap with the 10mL and 5mL syringes attached.
- Using gauze open the catheter lumen clamp; withdraw 10mL blood (less for infants); close the tap to the 10mL syringe and open it to the 5mL syringe; withdraw the correct amount of blood into the 5mL syringe; open the 3 way tap to the 10mL syringe and close to the 5mL syringe; return the 10mL blood.
- Close the 3 way tap to the catheter lumen.
- Clamp the catheter lumen.
- Remove the 3 way tap and blood sample and place it in a safe place or hand it to an assistant to place in the blood tubes.

2.10 Heparin lock of the haemodialysis catheter lumens

- Place the 20mL syringe containing the saline flush onto the lumen.
- Unclamp the lumen and flush the saline through the lumen at a moderate pace to prevent red blood cells from sticking to the catheter lumen and forming clots.
- Clamp the lumen and remove the 20mL syringe.
- Place the 3mL heparin lock syringe on the lumen.
- Flush the heparin into the lumen at a moderate to rapid pace and clamp under positive pressure to avoid heparin leaking out of the holes at the side of the catheter lumen.
- Remove the 3mL syringe and place a non-injectable cap on the catheter lumen.
- Wrap the haemodialysis catheter lumens in gauze and label indicating that the catheter is heparin locked.
- Place the blood in the blood tubes if not already done.
- Dispose of used equipment and protective wear appropriately.
- Wash Hands.

2.11 Blood Culture Collection from both lumens

Note: use sterile gauze to handle all aspects of the catheter.

Accessing arterial (red) lumen

- Hold the haemodialysis catheter lumens up with a sterile forceps and place a sterile dressing towel under it.
- Remove the antiseptic soaked gauze from one of the catheter lumens and clean the entire lumen with antiseptic.
- Check that the clamps on both catheter lumens are closed.
- Hold the arterial (red) lumen with a piece of sterile gauze.
- With additional sterile gauze, remove and discard the luer lock cap from the catheter and then connect to a 3mL empty syringe.
- Using a piece of sterile gauze open the catheter clamp and withdraw 3mL into the syringe and then re-clamp the lumen. (The sample will contain both the heparin lock and blood).
- Disconnect the 3mL syringe; place a sterile needle onto it; place it on the side of the sterile field.
- If possible, ask an assistant to place the blood into the blood culture bottles and label arterial (red) lumen immediately to avoid specimen collection error.

Heparin lock arterial (red) lumen

- Place the 20mL syringe containing the saline flush onto the lumen.
- Unclamp the lumen and flush the saline through the lumen at a moderate pace to prevent red blood cells from sticking to the catheter lumen and forming clots.
- Clamp the lumen and remove the 20mL syringe.
- Place the 3mL heparin lock syringe on the lumen.
- Flush the heparin into the lumen at a moderate to rapid pace and clamp under positive pressure to avoid heparin leaking out of the holes at the side of the catheter lumen.
- Remove the 3mL syringe and place a non-injectable cap on the catheter lumen.

Accessing venous (blue) lumen

Collect the blood culture sample from venous (blue) lumen by repeating procedure above ([Accessing arterial \(red\) lumen](#)).

Heparin lock of venous (blue) lumen

Heparin lock the venous (blue) lumen by repeating procedure above ([Heparin lock arterial \(red\) lumen](#)).

Completing the procedure

- Wrap the haemodialysis catheter lumens in gauze and label each lumen to indicate that the catheter is heparin locked.
- Place the blood in the blood culture bottles if not already done.
- Dispose of used equipment and protective wear appropriately.
- Wash Hands.

2.12 Removal of Uncuffed Haemodialysis Catheter

Description of practice

- This practice describes the nurses' role in the removal of an uncuffed haemodialysis access catheter.
- Uncuffed subclavian or jugular catheters should be used for maximum of three (3) weeks except in exceptional circumstances.
- Uncuffed femoral catheters are used for only 3 to 7 days in bed bound children.¹

Staff

This procedure must be undertaken by nurses accredited by the Renal Nurse Practitioner or Renal CNS to undertake this procedure.

Contra-indications

- Child who is anti-coagulated.
- Child with bleeding disorder or active bleeding.
- Child with a platelet count less than $150 \times 10^9/L$
- Less than four hours since haemodialysis session using heparin
- Less than 24 hours post plasma exchange

Policy statement

- The removal of a haemodialysis vascular catheter must be ordered by the renal team in the child's notes, or the attending renal consultant must be consulted before removal and the information documented in the child's medical records.
- This policy only applies to uncuffed haemodialysis catheters used for haemodialysis or plasma exchange.
- Removal of uncuffed haemodialysis catheters must be performed aseptically ².
- To minimise or prevent the risk of bleeding, the removal of uncuffed haemodialysis catheter must be done at least four (4) hours after cessation of heparin or alternatively, on a non-dialysis day^{5, 6, 7}. Haemodialysis catheters should not be removed less than 24 hours post plasma exchange.

Young children may find this procedure frightening, therefore the procedure should be performed away from the main dialysis room and the play therapist should be consulted for procedural support

- The child must be placed in a bed, preferably in supine position^{2, 6, 7}.
- If the child is old enough to understand, to prevent the risk of air embolism, Valsalva manoeuvre (deep breathing in and out) must be performed by the child when removing uncuffed haemodialysis catheter, under the instruction of a registered nurse ^{5, 6, 7, 8}.
- If septicaemia is suspected as a result of the uncuffed haemodialysis catheter, the catheter tip must be sent to Microbiology for culture and sensitivity and a blood culture sample taken peripherally.

- Once removed, firm pressure must be applied for at least 15 minutes on the exit site. A waterproof sterile dressing must be applied on the exit site, once the bleeding has stopped and the child should remain in bed for at least one hour^{2, 6, 7}.
- A Medical Officer must be contacted if continuous bleeding and haematoma are present^{2, 7, 8}.
- Standard precautions must be applied throughout the procedure and personal protective equipment must be worn, i.e. sterile/non-sterile gloves, goggles or face shield, disposable plastic apron.
- Accurate documentation must be attended.

Expected outcomes

- Registered Nurses accredited by the Renal Care team to undertake this procedure will remove an uncuffed haemodialysis catheter safely and competently.
- Any possible complications will be prevented or minimised.

Risks and precautions

Child

| Risk | Precaution |
|---------------------|--|
| Excessive bleeding | Review child for contra-indications |
| Air embolism | Ensure child in Trendelenburg position (<i>supine position head is low and body and legs are on an inclined plane</i>) |
| Haematoma formation | Ensure adequate pressure is applied to puncture site |
| Infection | Utilise aseptic technique |

Staff

| Risk | Precaution |
|---------------|---|
| Sharps injury | Correct handling and disposal of sharps |
| Splash injury | Correct handling and disposal of fluids |

Practice

Equipment

- 1x sterile dressing pack.
- Sterile gauze as needed.
- 1x sterile adhesive dressing.
- 1x sterile stitch cutter.
- Antiseptic solution.
- Sterile gloves.
- Blue under pad.

- Pair of non-sterile gloves (for removing old dressing).
- Clean work surface with neutral detergent (example is Oasis Pro 12 Neutral Cleaner™).
- Personal Protective Equipment (PPE) – plastic apron, goggles or full-face mask shield.
- Sterile specimen container for catheter tip.

Procedure

- Explain the procedure to the child and parents/caregivers.
- Depending on the child's age/ developmental level, encourage him/her to practice Valsalva manoeuvre (deep breathing in & out).
- Take the child into the procedure room and position them on the bed in a supine position.
- Don PPE (plastic apron and goggle/full face mask shield).
- Clean dressing trolley with neutral detergent (example is Oasis Pro 12 Neutral Cleaner).
- Perform one-minute hand- wash
- Open the dressing pack onto the surface of the dressing trolley.
- Pour antiseptic solution into the dressing pack.
- Place a blue under-pad under the child's vascular catheter.
- With non-sterile gloves, remove old dressing from the catheter exit site and discard.
- Perform three minute hand wash and put on sterile gloves.
- Using the sterile forceps, soak at least 3 gauzes in antiseptic solution.
- Using the forceps, gently lift the catheter and place a sterile paper towel underneath.
- Discard forceps.
- Using another pair of forceps, clean the exit site with antiseptic soaked gauze.
- Allow the antiseptic to dry (2-3 minutes).
- Remove the stitches using the stitch cutter.
- Once done, place a folded sterile gauze over the exit site in readiness for uncuffed haemodialysis catheter removal.
- Ask assistant to place child in Trendelenburg position. For haemodialysis catheters in jugular or subclavian veins ask the child to turn their head opposite the exit site.
- Instruct the child to take a deep breath and hold it.
- Using another gauze square, remove the uncuffed haemodialysis catheter in one steady pull. DO NOT discard the catheter. Place it on the dressing tray.
- Once the catheter is out, instruct child to breath normally.
- Apply pressure to the exit site for at least 15 minutes until the bleeding has stopped.
- Apply a sterile dressing over the exit site.
- With sterile blade, cut the tip of the catheter and place in sterile specimen jar and send to Microbiology for culture and sensitivity.
- Discard sharps and other waste appropriately.
- Document procedure in the child's medical record.
- Advise the child and family that the child should not undertake any exercise or boisterous play for the rest of the day.
- Reassess the puncture site after five minutes for any further bleeding.
- The child needs to remain in bed under observation for one hour post removal in case of adverse events.

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