

The management of the Haemodialysis Central Venous Catheter





The management of the Haemodialysis Central Venous Catheter

Department of Nephrology, Dialysis and Transplantation



The Management of the Haemodialysis Central Venous Catheter

Document Number: 5	Reason for Change: Guideline amended (Section 3.5.3)
Original Date of Approval: August 2004	Originally Approved By: Renal committee
Recent Date of Approval: 23 rd Nov 2010 17 April 2012 (Amended copy) Section amended: 3.5.3	Approved By: Renal guideline committee  
Date Effective From Nov 2010	Superseded Documents 5 b
Review Date: Nov 2012	

Oct 2010 Page No ...1. Guideline NO 5

The management of the Haemodialysis Central Venous Catheter

Department of Nephrology, Dialysis and Transplantation



The Management of the Haemodialysis Central Venous Catheter

Document Number: 5	Reason for Change: Guideline amended (Section 3.5.3)
Original Date of Approval: August 2004	Originally Approved By: Renal committee
Recent Date of Approval: 23 rd Nov 2010 17 April 2012 (Amended copy) Section amended: 3.5.3	Approved By: Renal guideline committee
Date Effective From Nov 2010	Superseded Documents 5 b
Review Date: Nov 2012	

CONTENTS

1. SECTION 1
 - 1.1. Rationale
 - 1.2. Review history
 - 1.3. Scope
 - 1.4. Principles
2. SECTION 2
 - 2.1. Objectives
 - 2.2. Definitions
 - 2.3. Hand hygiene
3. SECTION 3
 - 3.1. Insertion sites
 - 3.2. Acute access
 - 3.2.1: Temporary catheter placement
 - 3.2.2: Post insertion
 - 3.2.3: Temporary catheter removal
 - 3.3. Permanent access
 - 3.3.1: Permanent catheter placement
 - 3.3.2: post insertion
 - 3.3.3: Removal of permanent catheters
 - 3.3.4: post removal of permanent catheter
 - 3.4. Management of the central venous catheter
 - 3.4.1: Dressing the new exit site
 - 3.4.2: After 1-3 days
 - 3.4.3: Bathing, showering & swimming
 - 3.4.4: Removal of sutures
 - 3.4.5: Flushing the CVC when not in use
 - 3.4.6: Taking bloods
 - 3.4.7: Catheter damage
 - 3.4.8: Administering TPN/Antibiotics on the ward
 - 3.4.9: Accessing the CVC
 - 3.5. Complications

The management of the Haemodialysis Central Venous Catheter

- 3.5.1: Exit site infection
- 3.5.2: Tunnel infection
- 3.5.3: Systemic infection
- 3.5.4: Antibiotic locks
- 3.5.5: Cuff protrusion
- 3.5.6: Thrombosis
- 3.5.7: Occlusion
- 3.5.8: Air embolism

4. Distribution

5. Filing

6. Review

7. Appendix

Guideline for the management of tunnelled line infection in hemodialysis patients

SECTION 1

INTRODUCTION –

1.1: Rationale: To provide guidelines & assist the multidisciplinary team in safely managing the Central Venous Catheter (CVC) of a renal patient. Multidisciplinary care will be directed towards patient education, maximising the life of the CVC and providing psychological and emotional support for the patient.

1.2: Review History

Date	Review No.	Change	Ref. Section
Sept 2010	3	Updated Guideline	Not Applicable

1.3: Scope: This guideline applies to all staff working within the department of dialysis & transplantation within Beaumont Hospital.

Responsibilities of the multidisciplinary team:

- Members of the multidisciplinary team involved in Central Venous Catheter Care must be aware of best practice guidelines in place and acknowledge complications that can occur if guidelines are not acted upon.
- Members of the multidisciplinary team must acknowledge any limitations of competence and refuse in such cases to accept delegated functions.
- CVC should only be accessed by staff that are competent to do so.
- They must seek support and training from the relevant personnel prior to accepting such duties.
- All staff within the Department of Nephrology have an obligation to ensure patient safety at all times, each member is responsible and accountable for their own practice and must ensure their skills is up to date.
- Be aware that permanent catheter placements are performed in Radiology Department, Room 12.
- Be aware that all temporary CVC's are inserted at ward level by the renal registrar and assisted by a nephrology nurse. St. Peters Ward treatment room has been specifically designed for insertion of venous catheters so where possible all temporary catheter insertions within the unit should be performed

The management of the Haemodialysis Central Venous Catheter

there.

- CVC should not be used until confirmation of correct placement and authorisation has been given by the radiology/nephrology team and is documented in the medical notes.
- Hand hygiene is the single most important procedure in the prevention of intravascular catheter associated or related infections. Aseptic technique (gloves, gown and drapes) must be used at the insertion of, accessing and disconnecting CVC.
- Use aseptic technique and clean ports using 2% chlorhexidine solution and allow to dry prior to accessing or disconnecting CVC.
- Adhere to infection control guidelines when utilising the CVC.

Responsibility of the renal nurse:

- Liaise with the medical team to determine time and place of Catheter placement.
- Prepare the patient for CVC line insertion or removal.
- Give the patient a CVC information leaflet and discuss any questions/anxieties.
- Maximise patient comfort and safety.
- Maximise the life of the CVC.
- Observe and record complications arising from all aspects of CVC management.
- Temporary, non-cuffed, non-tunnelled catheters can be removed by renal trained nursing staff.
- The nurse must be familiar with the procedure and confident about performing it. Bearing in mind the Scope of Nursing Practice (2000), no nurse should undertake a task/responsibility if they do not feel competent or confident to do so.
- Be deemed competent in the management of the CVC.
- Observe and document the CVC site daily for inpatients and on dialysis days for haemodialysis patients in the CVC record sheet.
- All CVC lines should be dated with day of dressing due.
- Assist medical team at ward level with insertion of CVC e.g. setting up sterile

The management of the Haemodialysis Central Venous Catheter

trolley, maintaining patient safety throughout.

Responsibility of the renal medical team:

- Liaise with Room 12 in radiology in arranging permanent CVC line placement.
- Obtain consent for the permanent CVC, clearly outlining associated complication as in section 7.5.
- Organise a Chest Xray post CVC insertion when performed at ward level by the renal registrar.
- Obtain consent for haemodialysis prior to haemodialysis treatment.
- Permanent, cuffed and tunnelled catheters are removed by medical personnel only.
- Maximal sterile barrier precautions (e.g., cap, mask, visor, sterile gown, sterile gloves, and large sterile drape) during the insertion of CVC's must be utilised to substantially reduce the risk of bacteremia.

Complete the CVC insertion form when CVC lines are inserted in St Peters ward.

1.4: Principles: The Department of Nephrology, Dialysis and Transplantation has a responsibility to ensure Hospital Guidelines are developed where required/appropriate and implemented effectively.

- It is intended as a guide towards best practice for all members of the multidisciplinary team involved in the care of the renal patient with a central venous catheter.

SECTION 2

2.1: The objectives of this guideline are:

- To highlight the responsibilities and accountability of all members of the multidisciplinary team involved in the management of the central venous catheter.
- To ensure patient safety.

The management of the Haemodialysis Central Venous Catheter

- To provide guidance to determine the requirements of audit
- To minimise infection associated with central venous catheters

2.2: Definitions:

- A CVC is one which is placed in a central vein such as the internal jugular or subclavian vein, in order to facilitate access to the blood for haemodialysis or plasma purposes. The tip of the catheter should dwell at the junction of the superior vena cava and the right atrium.
- The catheter will be dual lumen, having two extension tubes. One extension tube is for the removal of blood from the body (red-arterial). The second extension tube is to facilitate the return of the blood to the body as it is treated (blue-venous).

2.3: Hand Hygiene:

- Hand Hygiene is the single most important procedure in the prevention of catheter associated or related infections.
- Hand hygiene must be performed prior to accessing CVC, performing patients dressing, Before and after each episode of patient care, After touching environment and prior to touching patient.

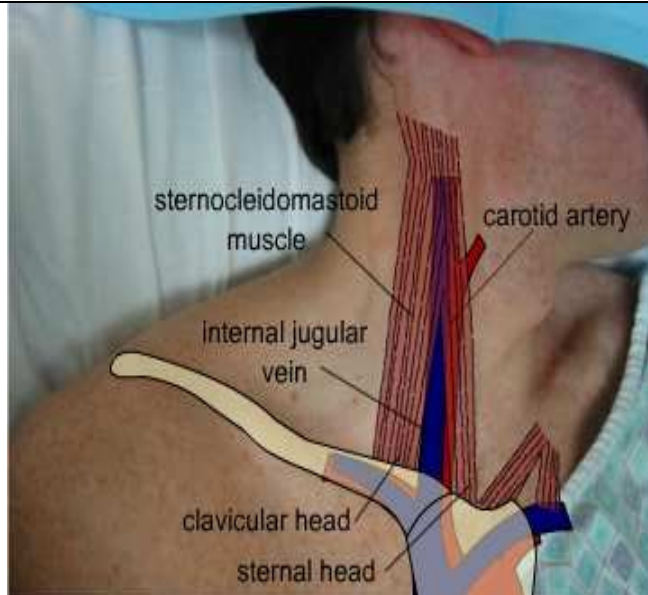
SECTION 3

THE PROCEDURE –

3.1: Insertion sites:

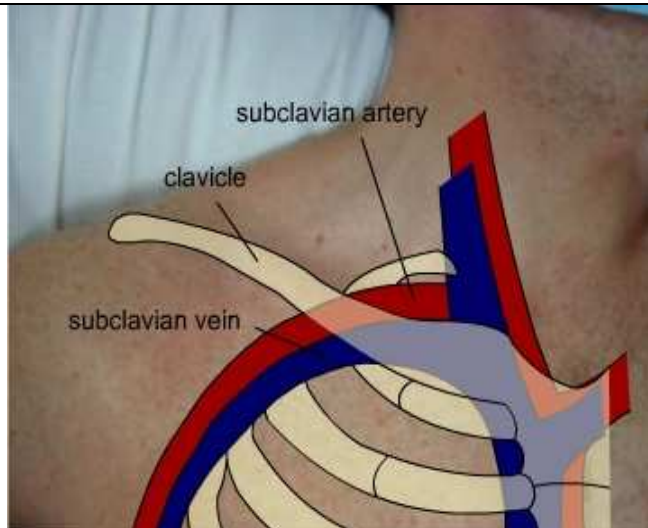
Internal Jugular Catheter

- Have the patient lift his/her head from the bed to define the sternomastoid muscle.
- Catheterisation will be performed at the apex of a triangle formed between the two heads of the sternomastoid muscle.
- The apex should be approximately three finger breadths above the clavicle.
- The carotid artery should be palpated medial to the point of catheter insertion.



Subclavian Vein Catheter

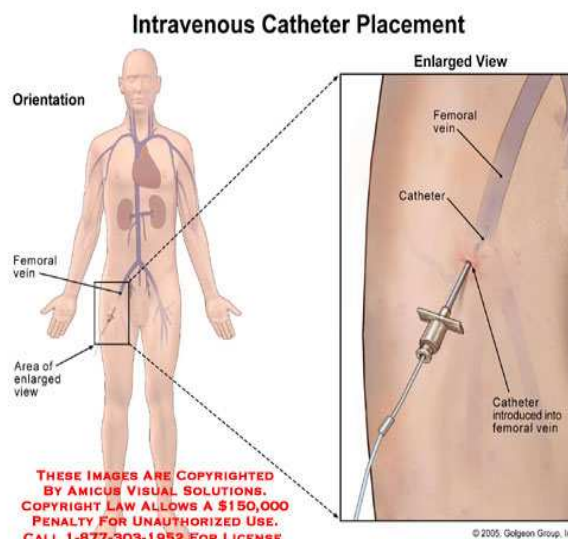
- The position of the subclavian vein is posterior to the clavicle, superior to the first rib and anterior to the subclavian artery.
- The patient should be in a modified trendelenberg position, with the upper chest exposed and the head slightly turned to the side opposite that of the insertion area.



The management of the Haemodialysis Central Venous Catheter

Femoral Vein Catheter

- The patient should be completely on his/her back.
- Both femoral arteries should be palpated for site selection and consequence assessment.
- The knee on the same side of the insertion site should be flexed and the thigh abducted.
- The femoral vein is then posterior/medial to the artery.



Note: For permanent catheter insertion the site of choice is the internal jugular but the subclavian and femoral veins are also used depending on the needs of the patient.

3.2 Acute Access:

3.2.1: Temporary catheter placement:

- Inform the dialysis nursing staff as early as possible that the patient will require haemodialysis.
- Ensure that the patient has received the patient information leaflet 'Insertion of a femoral dialysis line'.
- In general, the right or left femoral vein should be used. If these are not suitable / possible, the next best choice is the right internal jugular vein.
- Ensure recent blood tests are performed prior to procedure, including U+E, CBC, Coag & T+S.
- Prepare the sterile trolley for the procedure (See appendix)
- Chloraprep solution to be used to cleanse the insertion site, allow to air dry.
- The nurse will assist the Renal Registrar throughout the procedure.
- **Ultrasound guidance** should be used to direct insertion of the catheter and to locate the vein and minimise insertion-related complications. The Ultrasound

The management of the Haemodialysis Central Venous Catheter

Machine is located on St. Peters ward or in room 12.

- Ensure the patient is in the correct position for the procedure. The patient should be completely on his/her back.

(Refer to "Insertion Sites")

- Reassure the patient throughout the procedure.
- Check peripheral pulses during and post procedure. (Femoral access only). To observe for trauma caused during insertion of Catheter
- Observe for signs of bleeding i.e. restlessness, hypertension, pain, decreased pulses.
- Place batch number label of catheter in patient medical notes.
- Medical team to fill in CVC insertion form and document procedure in patients medical notes.

3.2.2: Post Insertion:

- Record patient's vital signs as per hospital policy.
- ¼ hourly for 1 hour
- ½ hourly for 2 hours
- 1 hourly for 4 hours
- 4 hourly for 4 hours
- 4 hourly for 24 hours
- Inform medical staff of any abnormalities.
- Observe exit site for any signs of bleeding.
- Apply pressure to exit site if bleeding occurs and inform medical staff.
- Reassure patient if complication does occur.
- Observe for verbal and non-verbal signs of pain at exit site and administer analgesia as prescribed.
- The patient should maintain bed rest for approximately 2 hours post-insertion.
- Document the type and location of catheter in nursing care plan and on the central venous catheter record sheet.
- A Chest Xray is only required if temporary access is internal jugular or subclavian

The management of the Haemodialysis Central Venous Catheter

3.2.3: Temporary catheter removal:

- Review temporary line after 5 days, line to be changed as per the nephrologist instructions.
- Temporary line can be removed by nursing or medical staff.
- Inform patient of intended procedure and obtain verbal consent for removal.
- Set up sterile trolley in preparation for removal of Catheter (See appendix).
- Patient must be placed in the Supine/ Trendelenberg position
- Clean exit site prior to removal with chloraprep and allow to dry for 60 seconds.
- Remove sutures from anchor of Central Venous Catheter.
- Grip the Catheter firmly, apply traction and at the same time ask the patient to take a deep breath.
- Send the tip of the Catheter in a sterile jar to microbiology labelled for culture and sensitivity.
- Apply sterile dressing which should remain in situ for at least 24 hours.
- The head of bed/chair may then be elevated gradually.
- Record the patient's vital signs and observe the wound dressing.
- Patient should remain in the unit for at least 2 hours after removal of Catheter.
- Document procedure in the patient's medical notes.

3.3: Permanent Access:

3.3.1: Permanent catheter placement:

- The procedure should be explained to the patient and their family, ensure the patient has received the patient information leaflet on 'CVC insertion'.
- Ensure informed consent is obtained by medical staff and signed by the patient.
- Ensure recent blood tests are performed prior to procedure, including U+E, CBC, Coag & T+S.
- Fast the patient from 12 midnight.

The management of the Haemodialysis Central Venous Catheter

- Administer all regular medications on the morning of procedure, except anticoagulants and hypoglycaemics. Insulin dependent patients will require a GKI infusion as per hospital policy to commence at 6am on the morning of the procedure.
- Ensure patient has a shower using Hedrix surgical scrub and pays particular attention to cannulation sites i.e. Upper chest or groin area.
- Provide the patient with a hospital gown.
- Record baseline vital signs.
- Complete the pre-operative checklist.
- Patient should be educated on the care and management of their central venous catheter. The patient education leaflet should be provided to the patient prior to procedure.
- Medical team to Fill in CVC insertion form and document procedure in patients medical notes

3.3.2: Post insertion:

- Record patient's vital signs as per hospital policy.
- ¼ hourly for 1 hour
- ½ hourly for 2 hours
- 1 hourly for 2 hours
- 4 hourly for 4 hours
- Inform medical staff of any abnormalities.
- Observe exit site for any signs of bleeding.
- Apply pressure to exit site if bleeding occurs and inform medical staff.
- Reassure patient if complication does occur.
- Observe for verbal and non-verbal signs of pain at exit site and administer analgesia as prescribed.
- The patient should maintain bed rest for approximately 2 hours post-insertion.
- Document the type and location of catheter in nursing care plan and on the central venous catheter record sheet.
- Ensure the radiologist has documented the position of the line and that it is ready for use in the patient's medical notes. This is sufficient documentation to commence haemodialysis (as per renal guideline meetings 2010). A post-

The management of the Haemodialysis Central Venous Catheter

insertion chest x-ray is not required as the line is inserted in the x-ray department.

- The patient should be provided with an emergency pack on discharge containing blue clamps, gauze dressings and spare dressings.

3.3.3: Removal of permanent Catheters:

Indications for catheter removal:

- Positive blood cultures indicating catheter sepsis.
- Positive wound swab from the insertion site.
- Generalised septicaemia.
- A leaking or damaged catheter (which cannot be repaired).
- Blockage.
- Termination of therapy, CVC has not been used in 3 months.
- Working AVF, Remove CVC 2-4 weeks once cannulation has been successfully implemented.
- Successful kidney transplant so catheter no longer needed.

Permanent, cuffed and tunnelled catheters are removed by medical personnel **ONLY** due to the risk of catheter breaking and subsequently resulting in a catheter embolism. The patient is placed in the supine or Trendelenberg position and full aseptic technique is employed. Usually the cuff of the catheter has to be exposed and freed from granulation tissue to facilitate removal.

Note 1: Ideally the patient will have been off Clopidogrel (Plavix) or aspirin for 7-10 days before removal of the permanent catheter but this may not be feasible if urgent removal is required (e.g. sepsis).

Note 2: Ideally the patient will have INR <1.8 and APTT <50 and platelets >80 before removal of the permanent catheter but this may not be feasible if urgent removal is required (e.g. sepsis).

Set Up Procedure for the Removal of Permanent Catheters

The management of the Haemodialysis Central Venous Catheter

- The nurse sets up a sterile trolley in preparation for the catheter removal and assists the medical staff throughout the procedure.
- A dressing trolley is disinfected and the top shelf draped with a double sterile dressing drape.
- The following equipment is opened onto the sterile top shelf:
 - 1 dressing pack
 - 1 sterile minor surgery drape
 - 1 sterile gown
 - 1 pair sterile gloves
 - 2 packets sterile gauze swabs
 - 1 X5ml syringe (for local anaesthetic)
 - 2 blue needles (to draw up & inject local anaesthetic)
 - 1 orange needle (to inject local anaesthetic)
 - 3/0 prolene suture with curved needles
 - 1 scalpel
 - 1 Mepore 9 X 10cm dressings
 - 2 dressing drapes
 - The following equipment is placed unopened on the bottom shelf:
 - 2% Chlorhexidine
 - 1 specimen jar (for tip of catheter)
 - Local anaesthetic- Lignocaine 2% X 2 vials
 - Suture set.
 - Large sharps bin
 - Alginate bag

Procedure for removal of permanent CVC:

- Confirm that the line is to be removed.
- Check patients' coagulation.
- Explain and discuss the procedure with the patient & instruct patient on Valsalva manoeuvre. (If Valsalva contraindicated have patient exhale)

The management of the Haemodialysis Central Venous Catheter

- Place patient in the Trendelenberg position, i.e. head slightly lower than feet (10-30 degrees). If this cannot be tolerated place patient in supine position.
- Decontaminate hands with bactericidal soap and water.
- Place all equipment required for the procedure on the bottom shelf of a decontaminated (wash with precept) dressing trolley.
- Take the trolley to the patient's bedside. Open the sterile packs, tipping their contents gently onto the centre of the sterile field. Pour antiseptic into gallipots or an indented plastic tray.
- Using gloved (non sterile) hands or forceps, remove the old dressing and discard into the yellow health care risk waste bag. Ensure the clamp is closed on the catheter.
- Decontaminate hands with bactericidal soap or alcohol hand rub.
- Don sterile gloves at this stage.
- If the site is red or discharging, take a swab for bacteriological investigation.
- Clean the insertion site thoroughly with Chlorhexidine 0.5% in 70% alcohol and allow to dry for 60 seconds prior to removal of catheter.
- Cut and remove any skin sutures securing the catheter.
- Cover the insertion site with a thick pad of sterile absorbent swabs.
- Ask the patient to
 - a) Perform the Valsalva manoeuvre
- Or
 - b) Hold their breathe.
- Hold the catheter with one hand near the point of insertion and pull firmly and gently. As the catheter begins to move, press firmly down on the site with the swabs. Maintain pressure on the swabs for about 5min after the catheter has been removed (until haemostasis occurs).
- Place the removed catheter onto the sterile field making sure not to contaminate the tip. Ensure catheter is intact.
- When bleeding has stopped (approximately 5min) cover site with occlusive dressing and remove after 24 hours.
- Routine culturing of catheter tip is practice within Beaumont hospital renal unit. Carefully cut off the tip (approximately 5cm) of the catheter using sterile scissors and place it in a sterile container for microbiological investigation

The management of the Haemodialysis Central Venous Catheter

- Dispose of any equipment used appropriately into sharps /health care risk waste /non health care risk waste.
- Reposition the patient & record vital signs.
- Document the following
 1. Reason for removal
 2. Date and time of CVC removal
 3. If Catheter tip was sent for C&S
 4. Condition of site
 5. Status of patient throughout the procedure

3.3.4: Post removal of permanent catheter:

- Record vital signs.
- ¼ hourly for 1 hour
- ½ hourly for 2 hours
- 1 hourly for 2 hours
- Observe exit site regularly.
- The patient should remain on bed rest for 2 hours post-removal of catheter.
- Sutures to be removed approximately 7-10 days post-removal of CVC.

3.4: Management of the central venous catheter

Dressing the exit site.

- *All CVC exit sites should be dressing with a transparent dressing. Exceptions are made for patients that have some oozing at the site or sensitivity to the dressing.*
- *Transparent dressings are to be changed once a week, mepore dressings are to be changed on alternate days.*

- *A CVC record sheet must be maintained for each patient with a CVC:*
 - *Inpatients: Daily inspection on all inpatients with a transparent dressing and on alternative days for patients with a mephore dressing that are **holding/not on dialysis**.*
 - *Haemodialysis outpatients: visual inspection to be completed on each dialysis treatment session.*
- *All dressings should be done at the beginning or during the first hour of Haemodialysis treatment*
- *Clean the exit site with 2% chlorhexidine/Clinell cleaning wipes with 2% chlorhexidine in alcohol and allow to air dry for 60 -90 seconds.*

3.4.1: Dressing the new exit site:

- The exit site should be left undisturbed for 3 days.
- The dressing should be changed immediately if there is any exudate or blood observed on the outside of the dressing. As a wet surface provides a liquid pathway for bacteria to travel.
- When bleeding is excessive at the exit site, the dressing should be changed and replaced with a more absorbent dressing, such as Kaltostat and secured with a pressure dressing. Pressure should be applied to the site.
- If bleeding is excessive consider resuturing the exit site.
- The ideal dressing immediately post insertion is a dry dressing, gauge covered and sealed with a transparent dressing.

The management of the Haemodialysis Central Venous Catheter

3.4.2: After 1-3 days:

- Transparent dressing should be applied and changed every 7 days.
- Dry dressing (Mepore) should be applied if there is any oozing or discharge at the exit site. Dressing should then be changed every 2 days or on each dialysis day.

Venepuncture site:

- Apply a dry dressing/transparent dressing until the sutures are removed / dissolved and area has healed.

3.4.3: Bathing, showering & swimming:

- Patient should be informed that exit site should not be submerged in water.
- If transparent dressing is intact patient can shower.
- If patient has dry dressing or no dressing, they can shower after 21 days as follows:
 - Remove dry dressing immediately after showering.
 - Dry exit site after shower using sterile gauze and non – touch technique.
 - Clean exit site as usual & apply new dressing.
- Swimming is not advised.

3.4.4: Removal of sutures:

- Depends on the type of CVC in situ.
- **Temporary non tunnelled catheter.**
 - Must be secured by sutures at all times, as long as the catheter is in situ.
- **Permanent Tunnelled catheter**
 - Permanent femoral and transhepatic CVC catheters must be secured with sutures as long as the line is in situ.
 - Permanent Jugular & Subclavian Catheters

The management of the Haemodialysis Central Venous Catheter

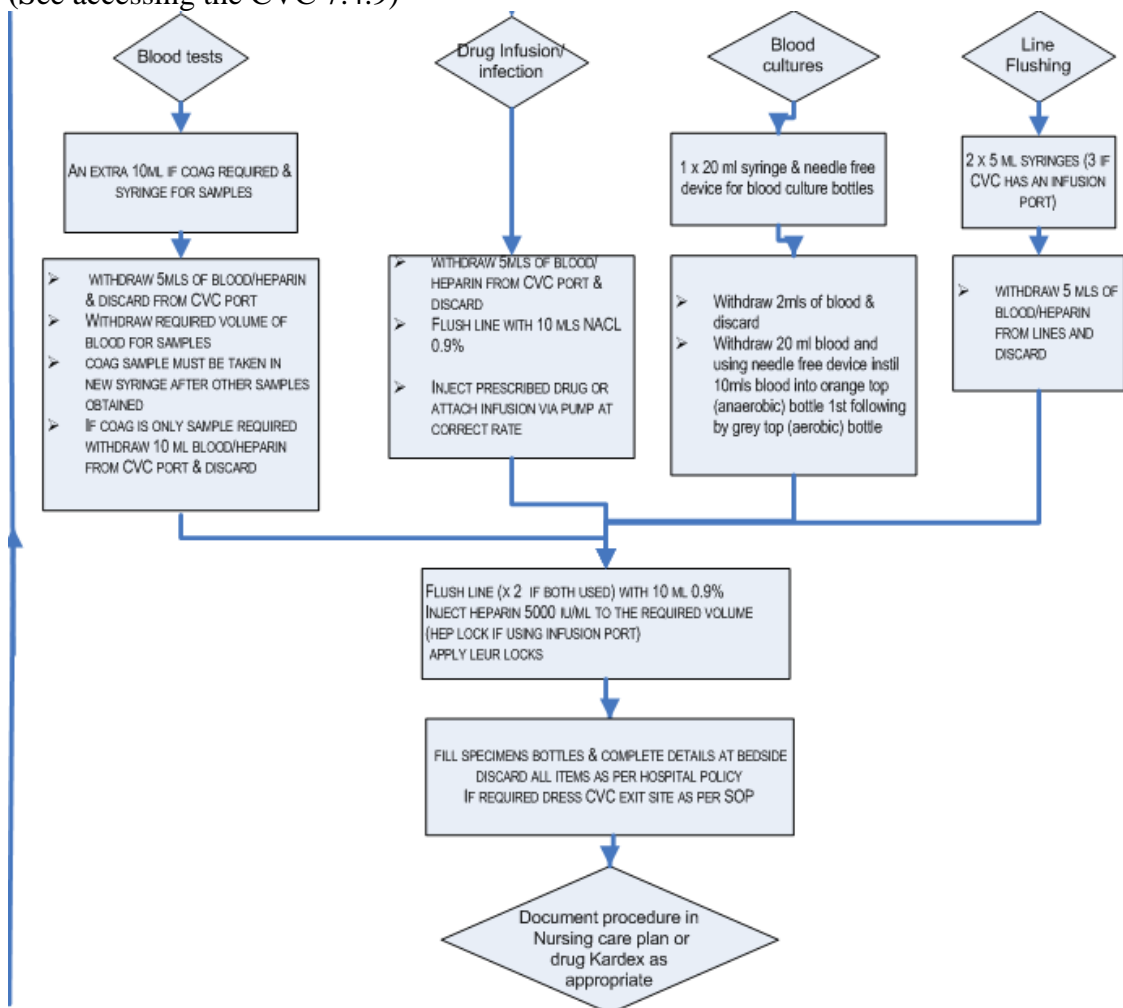
- Venepuncture site: Sutures should be removed in 7-10 days.
- Exit site: remove at 21 days.
- For Ashsplit Catheters removed exit site sutures in 6 weeks.

3.4.5: Flushing the CVC when not in use:

- CVC should be flushed once a week.
- Aspirate heparin in the line prior to flushing.
- Flush each lumen with 10mls of 0.9% sodium chloride.
- Instil required heparin (Or Taurolock) to lock the line. (Use heparin 5000iu/ml)

3.4.6: Taking Bloods

(See accessing the CVC 7.4.9)



The management of the Haemodialysis Central Venous Catheter

3.4.7: Catheter Damage:

- Avoid using sharp instruments near the catheter.
- The position of the clamps on the catheter should be changed on each dialysis session to avoid damage to one particular area.
- The patient should receive clear instructions on keeping the CVC safe and instructions on what to do in the event of CVC damage at home.

Instructions on what to do if there is damage to the CVC.

- Immediately clamp the catheter above the split on the CVC just below the skin exit site. Cover area with alcohol swab, sterile gauze and tape.
- Catheters that cannot be repaired using a repair kit must be changed over guidewire.
- Central venous catheters changed over guide wire require a CXR post to determine the correct position of the CVC.
- The patient should receive clear instructions on keeping the CVC safe and instructions on what to do in the event of CVC damage at home

3.4.8: Administering TPN/Antibiotics on the ward

Haemodialysis Catheters should not be used for any purpose other than dialysis, except in life threatening emergencies. (CDC report, 2002)

The person who accesses the CVC in such conditions must insure that the heparin is withdrawn prior to use and that the CVC is flushed and heparinised after use under strict aseptic conditions

The management of the Haemodialysis Central Venous Catheter

3.4.9: Accessing the CVC:

Accessing the CVC for haemodialysis

- Decontaminate hands (Wash hands or use alcohol gel)
- Decontaminate trolley
- Prepare trolley for accessing the CVC; On pack **or** dressing pack, 10mls syringes x 2, 5ml syringes x 2, 2ml syringe x 1, bare cannula, 2% chlorhexidine, NACL x 2, (additional syringes if blood samples are required.)
- Decontaminate hands and apply sterile gloves.
- Draw up NACL flush in 10ml syringe x 2.
- Rub sterile gauze soaked with chlorhexidine/Clinell wipes around catheter hubs and place catheter on a sterile drape.
- Ensure CVC is clamped before removing bungs.
- Treat each lumen separately.
- **If the patient has Normal Bungs:** Remove the bung from the arterial lumen, and clean the outer part of the catheter hub with soaked chlorhexidine gauge/Clinell wipe, allow to air dry for 60 -90 seconds.
- Insert a 5 ml syringe and remove 3mls of blood from the lumen and discard in the sharps bin.
- Flush lumen with 10mls of NACL, aspirate blood to check patency of lumen.
- Repeat last three steps for the venous lumen.
- **If the patient has Tego Bungs:** Leave the bung attached to the arterial lumen, and clean the outer part of the bung with soaked chlorhexidine gauge/Clinell wipe, allow to air dry for 60 -90 seconds.
- Insert a 5 ml syringe and remove 3mls of blood from the lumen and discard in the sharps bin.
- Flush lumen with 10mls of NACL, aspirate blood to check patency of lumen.
- Repeat last three steps for the venous lumen.
- **Insert loading dose of heparin into lumen being used as venous port.**
- Using sterile gauge disconnect the arterial line from the priming bag of saline and attach to the lumen being used as the arterial port. Discard gauze.
- Using sterile gauge disconnect the venous line from the priming bag of saline and attach to the lumen being used as the venous port. Discard gauze
- Open the clamps and start the blood pump to commence dialysis.

The management of the Haemodialysis Central Venous Catheter

- Secure blood lines to patient's clothes and wrap CVC connectors with sterile gauze & tape.
- Discard all items as per hospital policy.

Disconnecting the CVC from haemodialysis

- Decontaminate hands (Wash hands or use alcohol gel)
- Decontaminate trolley
- Prepare trolley for disconnecting the CVC: **Off pack or** dressing pack, 2mls syringes x 2, 10mls syringes x 2, bare cannula, 2% chlorhexidine, NACL x 2, heparin 5000 iu/ml **or Sodium Citrate lock**, access cannula. (Additional syringes if blood samples are required.)
- Check heparin vial with 2nd nurse.
- Decontaminate hands and apply sterile gloves.
- Draw up NACL flush in 10ml syringe x 2, **heparin lock or Sodium citrate lock (As per length of each lumen)**
- Rub sterile gauze soaked with chlorhexidine/Clinell wipes around catheter hubs/Tego Bungs and place catheter on a sterile drape.
- Stop blood pump using sterile gauze.
- Clamp arterial lines (HD line and CVC line)
- Gloves are no longer sterile.
- Disconnect arterial HD line from CVC line and attach 10mls of NACL to CVC line using a non touch technique, flush CVC line.
- Attach arterial HD line to the Y connector, open clamps and start blood pump with sterile gauze and commence wash back procedure.
- Stop blood pump using sterile gauze and clamp venous clamps.
- Disconnect venous HD line from the CVC line and attach. a 10ml syringe of NACL using a non touch technique, flush CVC port.
- Remove gloves and decontaminate hands.
- Apply sterile gloves.
- Treat each lumen separately.
- **If the patient has Normal Bungs:** Leaving the syringe attached to the arterial lumen, clean the outer part of the catheter hub with soaked chlorhexidine gauze/Clinell wipes, allow to air dry for 60 -90 seconds.

The management of the Haemodialysis Central Venous Catheter

- Instil required amount of heparin **or Inject Sodium citrate lock slowly** into the lumen and apply sterile bungs.
- Repeat last two steps for the venous lumen.
- **If the patient has Tego Bungs:** On the arterial lumen, clean the outer part of the bung with soaked chlorhexidine gauze/Clinell wipes, allow to air dry for 60 -90 seconds.
- Instil required amount of heparin **or sodium citrate lock slowly** into the lumen.
- Repeat last two steps for the venous lumen.
- Cover CVC connectors with sterile gauze and tape.

3.5: Complications

3.5.1: Exit site Infection

Signs & symptoms:

- Redness at exit site,
- Pain,
- Swelling
- Crusting at exit site

Treatment:

- Check patient's temperature, vital signs, and ascertain their general condition to rule out systemic infection.
- Send swab for culture and sensitivity from patient's exit site.
- Empiric therapy with an appropriate antibiotic should be commenced after blood cultures are taken and involvement of the tunnel/port pocket ruled out (if a tunneled CVC is present).
- CVC removal is recommended if antibiotic treatment fails. Exchange of the CVC over a guidewire in the presence of an exit site infection is not recommended. If blood cultures are positive, then treatment for CRBSI is indicated.
- Temporary catheters are not cuffed and do not have a subcutaneous tunnel. In this case if there is an exit site infection the catheter should be removed.

3.5.2: Tunnel Infection

Signs & Symptoms:

- Catheter tunnel superior to the cuff is inflamed,
- Patient may experience pain and have drainage from the exit site which is culture positive.

Treatment:

- Successful therapy of tunnel infections without CVC removal is very unlikely.
- In the absence of bacteraemia 7-10 days of antibiotics may suffice. If associated with bacteraemia, the patient should be considered to have complicated CRBSI.
- Bacteraemia with tunnel tract involvement should prompt catheter removal.
- Patient to be admitted onto the ward.

3.5.3: Systemic Infection

Signs & Symptoms:

- Pyrexia
- Generalised aches and pains
- Fatigue
- Hypotension
- Shivering
- Tachycardia
- Elevated WCC
- Elevated CRP

Management of tunnelled line infection in hemodialysis patients

Empiric management of pyrexia in haemodialysis patient

- 1. Take two sets of blood cultures** using aseptic technique, either through the CVC and peripherally or through different lumens of the CVC, if peripheral blood cultures cannot be taken).
 - Peripheral blood cultures should be obtained from vessels not intended for future use in creating a dialysis fistula.

The management of the Haemodialysis Central Venous Catheter

- When a peripheral blood culture cannot be obtained, blood cultures should be drawn during haemodialysis from bloodlines connected to the CVC.

2. Send:

- Urine (if patient passing urine) for culture and susceptibility
- Exit site swab for culture & susceptibility if there is evidence of local infection
- CVC tip for culture & susceptibility if line is being removed
- FBC
- CRP

3. Check:

- For clinical evidence of tunnel infection: if so remove catheter and send tip for culture
- For history or possible history of Vancomycin-resistant enterococci (VRE)
- Was the patient recently an in-patient with CVC-related infection? If so check the organism implicated

4. Give:

- **Empiric Vancomycin (unless history of VRE) via the CVC immediately and after taking blood cultures as above**
 - i. Check protocol – dose as per weight
 - ii. Give at the **end of the dialysis session**
- **Gentamicin** If the patient is haemodynamically unstable / immunosuppressed / clinical suspicion of gram negative infection

5. Contact:

- Consultant microbiologist and/or consultant nephrologist if concerned

6. Follow-up:

- Positive blood culture results will be telephoned to the clinical team.
- Please ensure that exit site swab results, CVC tip culture results and any other culture results are followed up to ensure that the empiric

The management of the Haemodialysis Central Venous Catheter

antimicrobial therapy is appropriate and to rationalise from broad to narrow spectrum agents if feasible.

- Patients from whom *S. aureus*, *Candida* spp. and *Enterococcus* spp. are recovered from blood require repeat blood cultures to document sterility of blood and to facilitate decision making regarding appropriate duration of therapy
- Therapeutic drug monitoring is required during therapy for patients on Vancomycin or Gentamicin.

1. When do I need to remove the CVC (see figure below)?

Discuss with the consultant nephrologist and microbiologist first

- **CRBSI due to *S. aureus*, *Pseudomonas* or *Candida* spp.**
 - Insert temporary (non-tunnelled catheter) inserted into another anatomical site.
 - A long-term haemodialysis catheter can be placed once repeat blood cultures are negative.
 - Guidewire exchange is recommended only if no alternative sites are available for CVC insertion.

2. When can I retain the CVC (see figure below)?

- **CRBSI due to other pathogens (e.g., Gram negative bacilli other than *Pseudomonas* spp., coagulase-negative staphylococci, and *Corynebacterium* spp.)**
 - Started intravenous antibiotics without immediate catheter removal (provided patient clinically stable).
 - **If symptoms persist or there is evidence of a metastatic infection, the catheter should be removed.**
 - Surveillance blood cultures should be obtained one week after completing an antibiotic course for CRBSI, if the catheter has been retained. If the blood cultures are positive, the catheter should be removed and a new, long-term dialysis catheter should be placed after a repeat blood cultures are negative

3. When can I stop empiric antibiotic therapy?

- Empiric antibiotic therapy can be discontinued in patients with suspected CRBSI, if **both sets of blood cultures are negative and no other source of infection is identified.**
- If peripheral blood culture cannot be obtained and there is no clinical evidence for an alternate source of infection (i.e., the only evidence for CRBSI is positive blood cultures taken through the catheter):
Continue antibiotics as for confirmed CRBSI

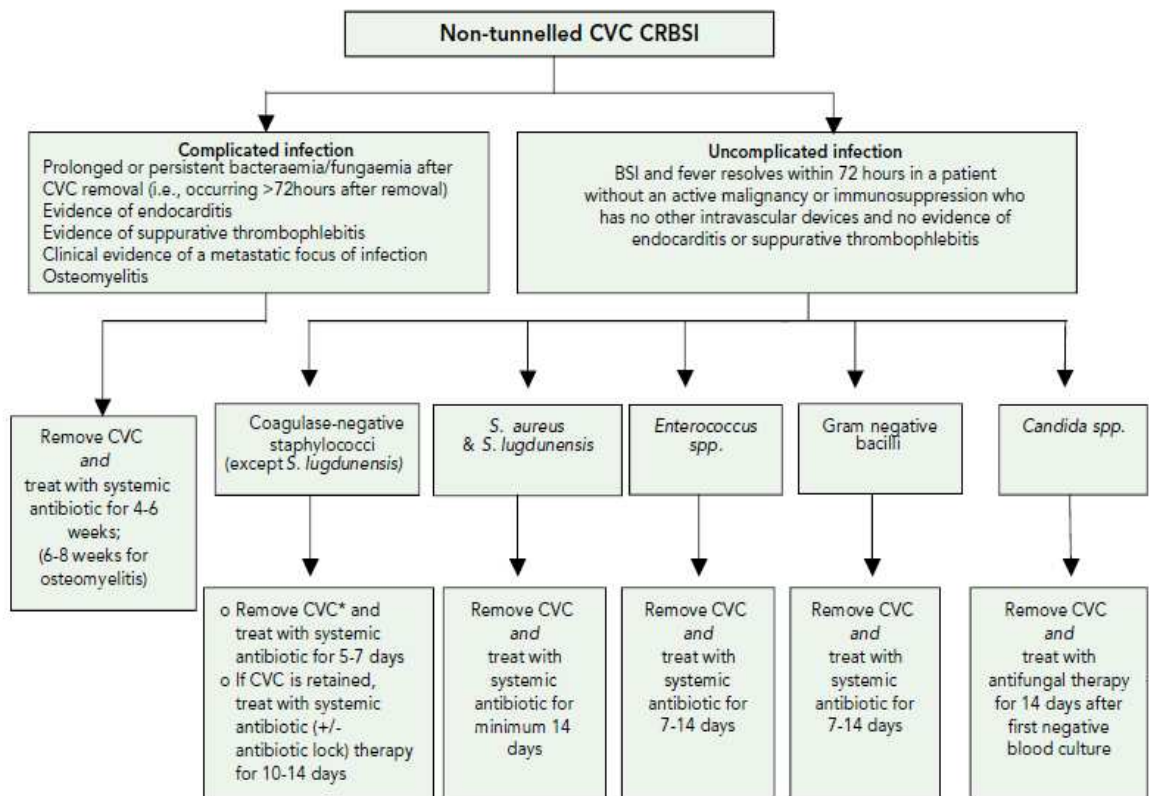
4. When should I order a TOE?

CRBSI in association with

- prosthetic heart valve,
- pacemaker,
- implantable defibrillator,
- persistent bacteraemia or fungaemia or persistent fever >72 h after start of appropriate treatment and catheter removal
- any case of *S. aureus* CRBSI where duration of therapy less than 4 weeks is considered

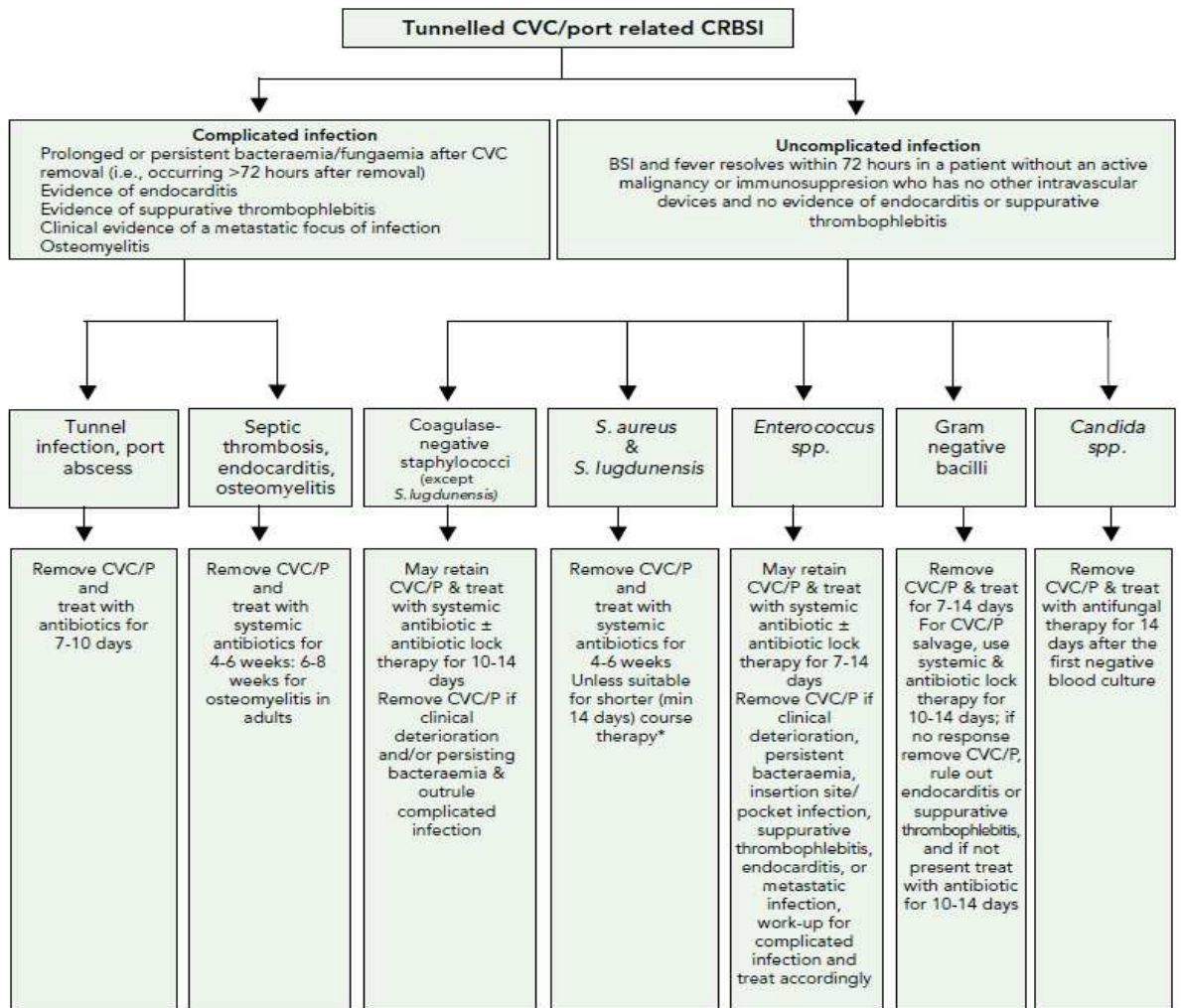
Unless dictated otherwise by clinical condition, TOE should be performed at the earliest 5–7 days after onset of bloodstream infection, i.e. bacteraemia or fungaemia, to avoid false negative results. In case of negative results, a repeat examination should be considered when endocarditis is suspected

The management of the Haemodialysis Central Venous Catheter



*Infections may resolve in patients without intravascular/orthopaedic prosthesis/devices with CVC removal alone (and no antibiotic therapy). Blood cultures should be repeated after CVC withdrawal to confirm the absence of bacteraemia.

The management of the Haemodialysis Central Venous Catheter



* Patients can be considered for a shorter duration of antimicrobial therapy (i.e., a minimum of 14 days therapy) if the infected tunnelled CVC / port is removed and

- Fever and bacteraemia resolve within 72 hours of initiating appropriate antimicrobial therapy.
- The patient has no prosthetic intravascular device (e.g., pacemaker, recently placed vascular graft).
- There is no evidence of endocarditis or suppurative thrombophlebitis on TOE and ultrasound, respectively.
- There is no evidence of metastatic infection on physical exam and sign/symptom-directed diagnostic tests.
- The patient is not diabetic, not immunosuppressed (i.e., not receiving systemic steroids, neutropaenia, or other immunosuppressive drugs such as those used for transplantation).

The management of the Haemodialysis Central Venous Catheter

3.5.4: Antibiotic locks

- Consider the use of antibiotic lock solution (Taurolock) for patient who is at high risk for Catheter related bloodstream infection (CRBSI.) It can be instilled into catheter lumen at the end of the dialysis session.
- High risk patient for CRBSI include
 - Diabetic patients
 - Patient with previous blood stream infection
 - Patient with nasal carriage of staphylococcus
 - Peripheral atherosclerosis

3.5.5: Cuff protrusion

Possible cause:

- Tissues within tunnel have failed to adhere to the cuff & the catheter has migrated out.

Treatment:

- Tape catheter firmly to skin at exit site.
- Do not commence on dialysis.
- Contact the nephrology team to review patient.
- Prepare patient for CXR and possible line change.

3.5.6: Thrombosis

Signs and symptoms:

- Diminished blood flow.
- Increased venous pressure.
- Increased negative arterial pressure.
- Swelling of upper arm, neck, shoulder, face.
- Pain radiating down to the arm from where the catheter is placed.
- Neck vein distension.

Possible causes:

- Due to thromboplastic substances and platelets collecting at the site of venepuncture.

The management of the Haemodialysis Central Venous Catheter

- Fibrin sheath formation at the distal end of line.
- Clotted blood in the device.
- Mechanical kinking or leakage.
- Anatomical obstruction.

Treatment:

- Try to aspirate residual heparin
- Administer a bolus dose of Actilyse (TPA) as prescribed and as per actilyse guideline. If not successful to restore adequate blood flow an infusion is recommended.(see guidelines of TPA)
- Radiographic evaluation and treat accordingly.
- Commence the patient on anticoagulation and monitor INR (Warfarin) if the patient has recurrent access problems.
- If all above measure fail removal of line is recommended.

3.5.7: Occlusion

Signs and symptoms:

- Persistent withdrawal occlusion.
- High venous pressure.
- Increased negative arterial pressure,
- Diminished blood flow.

Possible causes:

- Clotted blood in the device.
- Fibrin sheath formation at the distal end of line.
- Tip of line may be situated at the wall of vein.
- Precipitation of incompatible drugs.
- Malposition of devise.
- External pressure on devise eg enlarged axillary nodes, pressure of pacemaker.
- Mechanical kinking, leakage.

The management of the Haemodialysis Central Venous Catheter

- Anatomical obstruction.

Treatment:

- Try to aspirate residual heparin.
- Flush the CVC with 20mls of Normal Saline in each lumen.
- Ask the patient to take a deep breath and encourage the patient to change position.
- If the above measures are not successful administer TPA as prescribed. (See Guidelines of TPA administration).
- Radiographic evaluation and further treatment based on findings like repositioning, catheter exchange over guide wire.
- If unable to restore the patency with all above measures, removal of catheter is recommended.

3.5.8: Air embolism

Signs and symptoms:

1. Depends on the position of the patient at the time of air entering to the blood stream and amount of air entered.
2. If patient is sitting up air will enter the cerebral venous system resulting in confusion, distorted vision diplopia, blindness, and coma.
3. If the patient is lying down, air will enter the lungs causing chest pain, dyspnoea, coughing, cyanosis and cardiac arrest.
4. A churning sound may be heard on cardiac auscultation

Possible causes:

- Catheter left unclamped when cap is removed.
- Connectors in the tubing's or vascular access are not well secured.
- Improper administration of IV solutions or blood transfusion during Dialysis.
- Using air vented IV bottles.
- Use of defective or disarmed air detector in dialysis machine.
- Over riding air detector alarm.
- At the time of insertion or removal of catheter.

The management of the Haemodialysis Central Venous Catheter

- Improper priming.
- Faulty device

Treatment:

- Stop blood pump immediately and clamp lines if patient is on haemodialysis.
- Contact nephrology team immediately.
- Try to aspirate air from line.
- Place the patient in the tendelenberg position on their left side.
- Administer 100% oxygen.
- Monitor patient's vital signs.

SECTION 4

DEVELOPMENT AND CONSULTATION PROCESS – Consisting of:

CONSULTANT SUMMARY	
Date PPPG issued for consultation	14 th Sept 2010
Number of versions produced for consultation	eight drafts
Committees/meetings where PPPG was formally discussed	Dates: 10 th Jan 2010, 16 th Feb. 2010, 12 th April 2010, 11 th May 2010, 14 th sep 2010

Where Received	Summary of Feedback	Actions/Response

SECTION 5

REFERENCE DOCUMENTS – Consisting of:

A list of works that the author has used as a source of information, evidence or inspiration



Appendix 1

Guidelines for Management of tunneled line infection in hemodialysis patients

Take two sets of blood cultures either through the CVC and peripherally or through different lumens of the CVC (If peripheral blood cultures cannot be taken)
 ➤ Peripheral blood cultures should be obtained from vessels not intended for future use in creating a dialysis fistula.

