# CLINICAL PRACTICE GUIDELINE

## Central Venous Catheter

This document should be read in conjunction with the [Disclaimer](#).

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Aims

- To provide central venous access when peripheral access is difficult.
- To allow haemodynamic monitoring by monitoring central venous pressure, and enable central gas measurements.
- To enable rapid infusion of fluids/medications.
- To deliver nutritional support.
- To provide access for haemodialysis, plasmapheresis, temporary cardiac pacing or chemotherapy.
- To provide access for vasoactive, inotropic or hypertonic agents that should not be administered peripherally.

Insertion

Key Points

1. CVC insertion is performed aseptically. At KEMH the procedure is performed in theatre.
2. A midwifery / nurse escort is required where clinically indicated and the midwife / nurse will be required to remain with the patient until a comprehensive clinical handover has been given to the theatre staff.
3. Hair removal is not recommended unless it interferes with dressing adhesion.
4. Written consent must be obtained and documented on the MR295 Generic Consent Form prior to insertion of a CVC.
5. The internal and external catheter length must be documented at the time of insertion by the medical practitioner responsible for the procedure.
6. Two dimensional ultrasound guidance provides a clear benefit compared to the ‘placement by the landmark method’ for decreasing risk factors associated with CVC insertion.
7. Central vascular access devices should have the correct catheter tip location determined radiographically post insertion. This should be documented on the MR 732 ‘CVC & PICC line care plan’ prior to initiation of prescribed therapy.

Contraindications

These include:

- an uncooperative patient
- uncorrected bleeding diathesis
- skin infection over the puncture site
- thrombosis
- a pneumothorax or haemothorax on the contralateral side
- presence of only one functioning lung
Complications of CVC Insertion

Complications following CVC insertion may include:

- malposition of the catheter
- haematoma
- catheter embolism / air embolism
- arterial puncture
- thrombosis / haemorrhage / sepsis
- pneumothorax / haemothorax
- cardiac tamponade / cardiac arrhythmias

Preparation Prior to the Procedure

1. Check patient consent is documented and in the medical records.
2. Apply one application of 2% nasal Mupirocin pre operatively the night prior to insertion, or if this is not possible as early as practicable on the day of the procedure. 4% chlorhexidine body wash should be used on the day of the procedure.
3. Ensure the patient is dressed in appropriate clothing for theatre.
4. Ensure that there are no contraindications to insertion. Arrange medical review if found.
5. Escort the patient to theatre. The midwife / nurse will be required to remain with the patient until a comprehensive clinical handover has been given to the theatre staff.

Post Procedure

1. Check documentation to ensure verification of correct placement of the catheter tip. Confirmation is documented on the MR 732 ‘CVC & PICC Line Care Plan’. **CVC therapy should not be used until correct placement is confirmed.**
2. Confirm that the date and site of insertion is documented on the MR 732 ‘CVC & PICC line care plan’.
3. Prior to leaving the recovery room assess the CVC site – e.g. ensure the dressing is intact and stabilised, note the presence of any exudate, and observe for signs of incorrect placement or complications.
4. Ensure ongoing instructions for catheter management is available e.g. prescribed flushes or infusions.
Monitoring / Dressing

Key Points

1. The catheter site shall be inspected regularly, at least daily and prior to any access, for signs of infection, phlebitis, catheter migration or damage, suture integrity and exudate.\(^1\)\(^3\) The condition of the site shall be documented in the notes following each inspection.

2. Site appearance should not be used as the only indicator of infection. Local inflammation is uncommon with CVC related infection caused by coagulase-negative staphylococci as this pathogen incites little local or systemic inflammation.

3. In the event that a patient shows evidence of sepsis, discuss with the medical officer and consider removing the CVC and replacing it with a peripheral IV cannula. The CVC tip should be sent for culture.

4. A sterile, transparent dressing is preferred, that allows visual monitoring of the insertion site, and allows palpation through the intact dressing.\(^2\)

5. Attend:
   - Hand hygiene before and after any manipulation of vascular access devices or catheter sites\(^2,4\)
   - An aseptic technique\(^2,4\)
   - Standard precautions. See Infection Control Manual

6. CVC dressings are:
   - An aseptic technique.
   - Changed 24 hours following insertion to remove any accumulated exudate.\(^5\)
   - Changed immediately if the integrity of the dressing is compromised.\(^2, 6\)
   - Changed every seven days for transparent dressings\(^1, 7, 8\) (+ the positive pressure valve) or gauze dressings every one\(^5\) to two\(^2, 3\) days, or sooner if they are not intact or there is moisture under the dressing.\(^2, 5, 6, 9\)

7. The dressing change shall be documented in the woman’s medical record\(^5\) and on the Central Venous Catheter Nursing / Midwifery Care Plan (MR732).

Equipment

- 2x Sterile glove packs\(^6\)
- Sterile dressing pack
- Sterile transparent semi permeable dressing\(^6\) e.g. Opsite™ or Tegaderm™
- 10mL Sterile 0.9% sodium chloride
- Chlorhexidine 2% with 70% alcohol solution
- Antimicrobial e.g. Biopatch\(^\circledR\).
Procedure

1. Explain the procedure to the woman and obtain verbal consent. 
2. Prepare the equipment on a cleaned trolley. NB: It may be appropriate to change the administration set at this time.
3. Position the woman to achieve adequate access and comfort.
4. Attend hand hygiene by washing hands with antimicrobial soap or using alcohol hand-gel.
5. Put on gloves.
6. Before removing the dressing, anchor the catheter below the insertion site with an adhesive dressing (Fixomul™).
7. Using aseptic non-touch technique or sterile gloves, carefully remove and dispose of the dressing. Advise the patient to remain still during the dressing change to avoid accidental dislodgement of the catheter. Discard dirty gloves, perform hand hygiene and put on second pair of sterile gloves.
8. Remove any exudate with sterile 0.9% sodium chloride.
9. Clean the catheter insertion/dressing site working from the insertion site outwards in a circular motion using gauze / impregnated swab soaked with the chlorhexidine and alcohol solution. This should be repeated a total of 3 times using a new swab for each application.
10. Allow the catheter insertion site to air dry. Allow to air dry; do not blot or wipe.
11. Assess the site for phlebitis, tenderness, catheter migration or kinking.
   ➢ Do not advance catheters that have migrated. Notify the anaesthetist immediately.
12. If the CVC is secured with sutures, check them for integrity and condition.
13. If appropriate, clamp lumens and change the administration set and bungs at this time.
14. Apply a Biopatch® antimicrobial dressing around the insertion site (blue side up).
15. Apply the sterile transparent dressing (IV 3000 Opsite) from the top, smoothing down over insertion site and catheter.
16. Position the administration set to avoid traction of the catheter, connection or clothing.
17. Discard equipment appropriately.
18. Remove PPE. Perform hand hygiene
19. Document the date and time of the dressing change:
   • on the dressing,
   • in the woman’s medical record (including site condition and length of catheter),
   • on the nursing care plan or midwifery observation chart, and
   • on the “CVC & PICC Line Care Plan (MR732)".
Flushing

Key Points

- Observe hand hygiene before and after any manipulation of vascular access devices or catheter sites. See Infection Control Manual Policy 2.4, Hand Hygiene
- Always use an aseptic technique.
- Observe standard precautions. See infection Control Manual, Policy 2.1, Standard Precautions
- No smaller than a 10mL syringe should be used when aspirating / accessing a CVC, to reduce the risk of catheter damage or rupture.
  - Sodium Chloride 0.9% shall be used for flushing.
- Flushing is to be performed before, between and following the administration of intravenous medications, incompatible IV fluids, blood products and blood sampling.
- If not being regularly used, flush the CVC every 24 hours with 10mL of 0.9% sodium chloride. A catheter must have a positive pressure bung attached if it is to be flushed at intervals greater than 8 hourly.
- When flushing use a rapid pulsing action to create turbulence, ensuring complete clearance of the catheter.
- The catheter should NOT be clamped if positive pressure valves e.g. Posiflow valves are in use as this action negates the positive pressure exerted by the valve in order to minimise reflux into the catheter and prevent the catheter from blocking.

Equipment

- 10 mL syringe(s)
- Sodium chloride 0.9%
- 2% Chlorhexidine /Isoprophy1 Alcohol BP 70% impregnated swab
- Sterile Gloves
- Drawing up needle(s)

Technique

1. Inform the woman and obtain verbal consent.
2. Prepare the equipment
3. Draw up the required volume of flush
4. Check solution with a second nurse/midwife before administration.
5. Do not clamp the CVC if a positive pressure valve/bung is in use.
6. Clean the needless access port with a chlorhexidine 2% and Isoprophy1 Alcohol BP 70% impregnated swab and allow to air dry
7. Inspect the catheter for signs of kinking, catheter migration or damage prior to flushing. If problems are suspected, do not flush until these factors have been remedied.

8. Aspirate blood to check the patency of the line.

9. Attach the syringe and administer the flush solution. Difficulty in flushing the CVC shall be reported to the anaesthetist or acute pain CNC.

10. Flush before, between and after medications and / or as prescribed on MR810.

11. When utilising the device for intermittent therapy via an infusion pump, the line must be flushed promptly with a 50mL 0.9% Sodium Chloride bag. Then flush the device with 10mL of 0.9% sodium chloride in a 10mL syringe on disconnection of the infusion set to reduce the risk of line blockage.

12. When utilising the device for the transfusion of blood products, the line must be flushed following disconnection of the infusion set with 20mL of 0.9% sodium chloride (in 2 x 10mL syringes).

13. Positive pressure valves should be in place where any device is not receiving continuous IV therapy.

14. Document administration of medication on the MR810

15. Discard the equipment appropriately.

Difficulty in Aspiration or Flushing – Refer to the Algorithm below
Blood return is absent

Ask patient to cough, deep breathe, change position, stand up or lie with foot of the bed tipped up.

Ascertain possible cause of persistent withdrawal occlusion.

Is blood return obtained?

YES

Use central venous catheter as usual

NO

Flush central venous catheter with Sodium chloride 0.9% in 10mL syringe using a brisk push/pause technique.

Is blood return obtained?

YES

Use central venous catheter as usual

NO

SEEK MEDICAL ADVICE

Management may include the following:

- Verify the catheter tip location by chest X Ray.

- Administer 250mL Sodium chloride 0.9% challenge via an infusion pump over 15 minutes to test patency. CAUTION should not be used for patients with a high sodium level or on fluid restrictions.

- Consider the use of Urokinase 5000 international units in 2mL and leave for 60 minutes.

Is the patient to receive highly irritant/vesicant drugs?

YES

Proceed as long as there are no other complications or pain

NO
Changing the Tubing

Key Points
1. In patients **not** receiving blood, blood products or lipid fat emulsion the administration sets, secondary sets and add-on devices **continuously used** should be changed no more frequently than at 96 hour intervals, but should be changed at least every 7 days.\(^\text{10}\)
2. Replace **intermittent** administrations sets within 24 hours\(^\text{11, 12}\) or earlier if required according to KEMH blood transfusion guidelines.
3. Discard and do not reuse intravenous administration sets when they are disconnected e.g. for inter or intra – hospital transfers, medical imaging or procedures in other departments.
4. At KEMH administration sets used for blood transfusion or products are replaced **eight** hourly or earlier if flow is compromised. See Haematology Transfusion Medicine Protocol 9.1 Administration of blood components – standard administration checks and filters.
5. Lipid containing fluids require administration sets to be changed within 24 hours of initiating infusion e.g. Total Parenteral Nutrition (TPN).\(^\text{11}\)
6. Add on devices including extension sets, three way taps and needleless access ports should be of Luerlok design and be replaced when the administration set is changed.\(^\text{12}\)
7. Positive Pressure Valves should be changed every 7 days\(^\text{4}\) or more frequently if contaminated or leaking.\(^\text{5}\)
8. Administration sets should not be intermittently disconnected (including for patient showering/ toileting).\(^\text{1}\)
9. Care must be taken not to contaminate central line and their administration sets during access.
10. Ensure that the CVC is clamped prior to changing. At all other times the clamps should remain open to reduce the risk of catheter occlusion and infection.
11. Observe:
   - Hand hygiene measures. See Infection Control Manual, Policy 2.2, Hand Hygiene
   - An aseptic technique
12. A line used on a peripheral cannula must never be connected to a central line.

Equipment
- Dressing pack
- Optional sterile drape and artery forceps – required for multiple line changes
- Add-on devices e.g. extension tubing / 3 way taps / connections
- Single use Chlorhexidine 2% with 70% Isopropyl Alcohol swabs
- Prescription e.g. TPN order on MR741 Parental Nutrition Order, or other prescribed fluids on the MR740 Intravenous Fluid Sheet.
• Appropriate administration sets

Procedure

• Explain the procedure and obtain verbal consent.
• Prepare the equipment.
• Position the patient for adequate access to the CVC and for comfort.

Technique

• Visualise the insertion site of the catheter and perform a Peripheral Intravenous Visualisation Assessment Score (PIVAS) score as per Clinical Guideline PIVC: monitoring
• Using an aseptic technique open the dressing pack, assemble the administration set/add on devices, and connections.
• Prime the line ensuring sterility.
• Close the roller clamp and hang fluid from the infusion stand.
• Remove any tapes or dressings to access the CVC connection and close the roller clamp on the line to be changed.
• Place the sterile drape appropriately, and then clean the catheter hub thoroughly with the single use Chlorhexidine and alcohol wipe. Allow to dry. Close the sliding clamp(s) on the CVC.
• Disconnect the administration set, and reconnect the primed replacement set.
• Open the clamp(s) to the patient and the line, ensure the flow and set the rate of the infusion.
• Tape the administration set in a secure and comfortable manner.

Post Procedure

• Label the administration set with the date and time of the next due change.
• Document in the medical notes

• Discard the equipment appropriately.

Blood Sampling

Key Points
1. Ideally blood samples should be taken from peripheral veins; however a CVC or PICC is often inserted because a patient has poor peripheral access, making blood sampling from a CVC or PICC necessary.¹
2. The pathology form must clearly state whether the sample id from a CVC or PICC.
3. Always use an aseptic technique when accessing the CVC / PICC
4. To help minimise the risk of catheter occlusion the recommended method is to aspirate samples with a syringe and transfer into the appropriate vials using the pink vacutainer. Vigorous pulsative saline flushes immediately post sampling is essential to reduce occlusion risk.

5. Continuous infusions may be paused for blood sampling from alternative lumens, where appropriate, but must not be disconnected to obtain blood samples. Use an alternative route.

6. All specimen tubes require 3 points of identification. Label after collection.
   - Specimens must be labelled by the collector at the bedside.
   - Clearly label each specimen with the patient’s full name, URMN, date of birth and date of collection, and collector’s signature. Use the patient’s hospital label when possible.
   - Blood culture bottles also require information about the sampling site (i.e. peripheral, CVC or PICC).
   - Specimens without the patient’s full name and date of birth will be rejected by the laboratory.

**Equipment**

All preparations must be undertaken on a clean work surface (in the treatment / clean utility room or using a clean trolley).

- 2 x kidney dishes
- Non sterile gloves
- 2 x 10mL syringes for post sampling flushing
- 2 x 10mL ampoules 0.9% Normal saline for injection
- Chlorhexidine 2% / 70% alcohol swab
- 1 x 10mL or 20mL syringe (syringe size is determined by the sample requirement)
- 1 x 10mL syringe (for 5-10mL blood discard. **Do not discard the blood if collecting blood cultures; this is to be included in the sample**).
- Pink vacutainer tube and luer lock adaptor or blue vacutainer.

**Procedure**

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<th>Collecting the Sample: Preparation</th>
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<tr>
<td>1. Confirm the patient’s identity and explain the procedure.</td>
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<tr>
<td>2. Perform hand hygiene.</td>
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<tr>
<td>3. Clean the kidney dish / trolley with pre-diluted detergent or water and a detergent wipe.</td>
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<tr>
<td>4. Gather the equipment and check the expiry dates.</td>
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<tr>
<td>5. Turn off any infusions one minute prior to sampling if possible.¹</td>
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<td>6. Where possible, use the distal lumen (which has the largest bore) to obtain the sample.¹²</td>
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<tr>
<td>7. Perform hand hygiene and apply non sterile gloves.</td>
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8. Scrub the positive pressure valve (PPV) using friction for 15-20 seconds with the chlorhexidine and alcohol swab. Allow to air dry for 30 seconds before accessing.
9. Attach a 10mL syringe to the PPV and aspirate 5-10mL of blood. Discard the syringe and blood. NB: If taking blood cultures do not discard the collected blood, include in the sample.

**Blood Sampling**: To maintain a closed system and reduce the risk off infection and contamination do not remove the PPV during blood sampling

**Using the Syringe transfer to Vacutainer**
1. Attach the sample syringe to the PPV and aspirate the required amount of blood volume.
2. Place the syringe in the clean kidney dish.
3. Immediately following blood sampling, flush with 20mL of 0.9% sodium chloride for injection using 2 x 10mL syringes ,using a rapid, pulsating push/ pause positive pressure technique until the line is clear to prevent the risk of occlusion and infections.1-4
4. Attach a pink Vacutainer tube to the syringe.
5. Insert the appropriate blood tubes in the correct order of draw as required.

**Post-Procedure**
1. Dispose of the sharps and waste appropriately
2. Remove gloves and perform hand hygiene
3. If used, clean the trolley with pre diluted detergent and water of a detergent wipe.
4. Perform hand hygiene.
5. Label and sign the samples, complete the request form and send to Pathology.

**Removal**

**Key Points**
1. Indications for catheter removal are:
   - therapy requiring central venous access is completed13, 14
   - unresolved catheter related complications of infection, occlusion or thrombosis13, 14
   - faulty device13, 14
   - at the direction of the medical staff
2. When venous thrombosis is suspected the CVC should not be removed until tests confirm the size and location of the thrombosis.15
3. Prevention of infection principles should be employed during removal of a CVC including:
   - hand hygiene – see Infection Control Manual Policy 2.2 Hand Hygiene
   - standard precautions – see Infection Control Manual Policy 2.1 Standard Precautions
4. The CVC should be removed utilising safety measures to prevent complications such as air embolism, haemorrhage, catheter fracture or dislodgement of thrombosis.\(^\text{13}\)

5. Nursing and midwifery staff can remove non-tunnelled CVC’s if they have been deemed competent and are fully aware of potential risks\(^\text{16}\); otherwise they should be supervised by trained personnel until they can safely perform the procedure.

6. All tunnelled CVC should be removed by a medical practitioner competent in the procedure.

7. A patient’s clotting status should be assessed prior to CVC removal to decrease risk for bleeding or haematoma formation.\(^\text{13}\)

8. If infection or phlebitis is suspected the catheter tip should be sent for culture and blood cultures collected.\(^\text{16, 17}\)

**Equipment**

- Dressing Pack
- Stitch cutter
- Personal Protective Equipment
- Single use Chlorhexidine 2% with 70% alcohol swab
- Sterile gauze
- Sterile Transparent Semipermeable Membrane (TSM) dressing
- Sterile scissors and specimen jar with label (if tip is required)

**Procedure**

**Preparation**

- Confirm the patient’s clotting status is normal.
- Confirm the patient’s identity.
- Explain the procedure and obtain verbal consent.
- Prepare the equipment.
- Visually assess the wound.

**Technique**

- Position the patient in the Trendelenburg or supine position.
- Close the catheter and roller clamp(s) to the administration sets as required.
- Perform hand hygiene and don non sterile personal protective equipment (PPE).
- Remove the dressing and any tape in situ.
- Remove gloves and perform hand hygiene.
- Assess the wound and perform a wound swab for culture if the wound appears infected.\(^\text{13}\)
- Perform hand hygiene and don gloves.
- Clean the exit site with a single use Chlorhexidine 2% and 70% alcohol wipe and allow to air dry.
- Remove any sutures taking particular care not to cut through the catheter.
- Holding a sterile swab over the insertion site grasp the catheter and smoothly remove the CVC while the patient: performs the Valsalva manoeuvre or is exhaling (when unable to perform the Valsalva manoeuvre)
- If the catheter is difficult to remove, STOP and contact the medical officer for review.
- Apply gentle digital pressure to the exit site for 5 minutes until haemostasis is achieved.\textsuperscript{15,18}
- Apply a transparent air occlusive sterile dressing.\textsuperscript{16}
- The access site should be assessed every 24 hours until the site is epithelised.\textsuperscript{13}
- The site should be inspected as per Clinical Guideline IV Cannula:monitoring
- Inspect the integrity of the line to ensure the tip is present, the complete line has been removed and no breakage has occurred.\textsuperscript{13}
- The removed line should be measured and its length documented and checked against the length documented on insertion.
- Discuss signs of complications that may occur from CVC removal and advise the patient to report abnormalities immediately.

**Collection of a catheter tip**
- Cut a 3-5cm\textsuperscript{19} catheter tip off with sterile scissors and place in a labelled specimen jar as required.

**Post procedure**
- Position the patient in a supine position for a minimum of 30 minutes.\textsuperscript{13}
- Document the condition of the CVC and wound site in the:
  - MR250 Progress Notes
  - Gynaecology Nursing Care Plan
  - MR285 Midwifery Observation Chart
- Document the date and time of removal on the MR732 CVC & PICC Line Care Plan.
Blood Sampling From

**Key Points**

7. Ideally blood samples should be taken from peripheral veins; however a CVC or PICC is often inserted because a patient has poor peripheral access, making blood sampling from a CVC or PICC necessary.¹

8. The pathology form must clearly state whether the sample id from a CVC or PICC.

9. Always use ANTT when accessing the CVC / PICC

10. To help minimise the risk of catheter occlusion the recommended method is to aspirate samples with a syringe and transfer into the appropriate vials using the pink vacutainer. Vigorous pulsative saline flushes immediately post sampling is essential to reduce occlusion risk.

11. Continuous infusions may be paused for blood sampling from alternative lumens, where appropriate, but must not be disconnected to obtain blood samples. Use an alternative route

12. All specimen tubes require 3 points of identification. Label after collection.
   - Specimens must be labelled by the collector at the bedside.
   - Clearly label each specimen with the patient's full name, URMN, date of birth and date of collection, and collector's signature. Use the patient's hospital label when possible.
   - Blood culture bottles also require information about the sampling site (i.e. peripheral, CVC or PICC).
   - Specimens without the patient's full name and date of birth will be rejected by the laboratory.

**Equipment**

All preparations must be undertaken on a clean work surface (in the treatment / clean utility room or using a clean trolley).

- 2 x kidney dishes
- Non sterile gloves
- 2 x 10mL syringes for post sampling flushing
- 2 x 10mL ampoules 0.9% Normal saline for injection
- Chlorhexidine 2% / 70% alcohol swab
- 1 x 10mL or 20mL syringe (syringe size is determined by the sample requirement)
- 1 x 10mL syringe (for 5-10mL blood discard. Do not discard the blood if collecting blood cultures; this is to be included in the sample).
- Pink vacutainer tube and luer lock adaptor or blue vacutainer.
### Procedure

#### Collecting the Sample: Preparation

1. Confirm the patient’s identity and explain the procedure.
2. Perform hand hygiene.
3. Clean the kidney dish / trolley with pre-diluted detergent or water and a detergent wipe.
4. Gather the equipment and check the expiry dates.
5. Turn off any infusions one minute prior to sampling if possible.\(^1\)
6. Where possible, use the distal lumen (which has the largest bore) to obtain the sample.\(^1,2\)
7. Perform hand hygiene and apply non sterile gloves.
8. Scrub the positive pressure valve (PPV) using friction for 15-20 seconds with the chlorhexidine and alcohol swab. Allow to air dry for 30 seconds before accessing.
9. Attach a 10mL syringe to the PPV and aspirate 5-10mL of blood. Discard the syringe and blood. NB: If taking blood cultures do not discard the collected blood, include in the sample.

#### Blood Sampling: To maintain a closed system and reduce the risk of infection and contamination do not remove the ppv during blood sampling

**Using the Syringe transfer to Vacutainer**

1. Attach the sample syringe to the PPV and aspirate the required amount of blood volume.
2. Place the syringe in the clean kidney dish.
3. Immediately following blood sampling, flush with 20mL of 0.9% sodium chloride for injection using 2 x 10mL syringes ,using a rapid, pulsating push/ pause positive pressure technique until the line is clear to prevent the risk of occlusion and infections.\(^1,4\)
4. Attach a pink Vacutainer tube to the syringe.
5. Insert the appropriate blood tubes in the correct order of draw as required.

#### Post-Procedure

1. Dispose of the sharps and waste appropriately
2. Remove gloves and perform hand hygiene
3. If used, clean the trolley with pre diluted detergent and water of a detergent wipe.
4. Perform hand hygiene.
5. Label and sign the samples, complete the request form and send to Pathology.
References

21. Green J. Care and management of patients with skin-tunneled catheters. Nursing
Central Venous Catheter

**Standard.** 2008; 22(42):41-8.


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