

CENTRAL VENOUS LINE MANAGEMENT IN NEONATES - GCNC

PRACTICE GUIDELINE[®]

DOCUMENT SUMMARY/KEY POINTS

- This document provides a guideline for clinicians in the Grace Centre for Newborn Care on inserting and managing central venous catheters.

Key performance indicators

- Aseptic non-touch technique (ANTT) (using non-sterile gloves) must be used for the clinical management of all centrally placed catheters.
- An aseptic technique must be used when opening a central line system (internal lumen exposed) eg changing the administration set.
- Once a central catheter is connected to an IV system it becomes a closed system.
- All intermittent medications and medication infusions are connected to the closed system using a Split septum Luer activated valve (valve).
- When administering medications the valve is swabbed with 2% Chlorhexidine and 70% Alcohol before connecting the tubing or syringe and prior to disconnection of the tubing or syringe.
- All infusions are given via an infusion pump with pressures set and recorded.
- Total fluid requirement (TFR) and fluid rates are checked at commencement of each shift with the oncoming RN.
- All IV fluids with additives have a reconstitution sticker attached that has been correctly labelled with the relevant details and two signatures.
- All narcotic medications have the volume at commencement and end of the infusion recorded and signed for by two RNs on the IV chart.
- Central line catheter type, size and tip location are recorded in the infant's medical record by the clinician inserting the catheter, this includes surgeons, registrars and specialists.

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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CHANGE SUMMARY

- Removal of Peripheral Line component from policy

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Central venous line catheters

A Central Venous Line (CVL) is a Silastic catheter which can be single or multi lumen. The catheter is passed through a large vein so the tip lies in the thoracic portion of the vena cava near the junction with the right atrium. The most commonly used veins are the umbilical, internal jugular, subclavian or femoral¹.

CVLs are of advantage as fluids can be administered via these lines regardless of osmolality, pH, or other chemical properties of the solution or medication^{2, 3}. It provides secure access for the administration of Total Parenteral Nutrition (TPN). Larger bore lines can be used for exchange and blood transfusions, blood sampling, and central venous pressure monitoring. Placement of a CVL can reduce the number of skin punctures associated with peripheral cannulae⁴.

Types of central venous catheters used in neonates

Peripherally inserted central lines (PICC) (Per-Q-Cath). These are very fine Silastic lines which are placed via a peripheral vein and then threaded into the superior or inferior vena cava at the junction with the right atrium. Occasionally the line tip may not reach the superior or inferior vena cava due to difficulty in placement — these 'long lines' are still managed as central lines. The procedure is performed on the ward by a neonatal fellow, registrar or consultant. PICC lines are indicated for short or long term peripheral access to the central venous system.

Umbilical venous catheters (UVC) are inserted in the umbilical vein. These lines are inserted on the ward by the neonatal fellow, registrar or consultant. These may be single or multiple lumens. Each lumen is managed as a separate catheter.

Percutaneous central lines inserted over a guide wire (also known as non-tunnelled) are inserted after puncture of a large vein such as the femoral or internal jugular vein. Catheters inserted into the jugular vein have a high infection rate⁵. These lines are often inserted by an anaesthetist or anaesthetic fellow either in theatre or on the ward. These may be single or multiple lumen catheters.

Surgically inserted tunnelled central lines (Broviac®, Hickman®, Cook®, and Arrow®) require insertion under general anaesthesia by a surgeon. The Catheter is placed via one of the large central veins into the superior vena cava above the right atrium. The proximal end of the catheter is tunnelled subcutaneously to the desired exit site. The catheter cuff is inserted under the skin at the insertion site to help secure the catheter. These may be single or multiple lumen catheters. Each lumen is managed as a separate catheter.

Management of central venous catheters

Terminology

Aseptic Non-touch technique (ANTT)

ANTT includes hand washing with 2% chlorhexidine gluconate hand wash *prior* to setting up for the procedure and *prior* to the application of non-sterile gloves.

Clinical hand wash

The washing of hands to reduce bacterial count by using an antiseptic hand wash for 30-60 seconds.

Antiseptic solutions and uses

- Chlorhexidine 2% in Alcohol 70% swabs are used for cleansing non skin areas such as intravenous cannulas and needless devices.
- Aqueous Chlorhexidine Irrigation Solution 0.1% — for use in skin cleansing.

Open intravenous system

When the administration set or bag is disconnected exposing the internal lumen to atmosphere.

Closed intravenous system

Once the administration sets have been connected the use of a needless device ensures that all subsequent administration of drugs occur through the device.

Split septum Luer activated valve

A Luer locking valve that allows the connection of syringes and extension tubing by maintaining a closed system for administering fluids through central catheters. They reduce the risk of contamination and are needle-free.

Bolus drug

A slow intravenous push over 3-5 minutes.

Intermittent drug

A short infusion of 15 – 60 minutes.

Clinical management of central lines

Rupture of the line or damage to blood vessels and viscus may occur if excessive pressure is exerted on the line during placement and during infusions. It is recommended that medications and flush solutions be administered with a syringe volume greater or equal to 10mL in size ^{6,7,8,9}.

- Requests for surgically placed central catheters are made by the neonatologists and double lumen catheters are preferred.
- UVCs and PICCs are inserted in the NICU using a sterile technique and with use of hats, masks, gown and sterile gloves¹

- A two-minute hand wash and the use of sterile gloves is required prior to inserting all central catheters in the unit.
- When changing the administration sets an aseptic non-touch technique including at 30-60 second hand-wash with 2% chlorhexidine gluconate in 70% alcohol is used as the internal lumen of the set is exposed. Alternatively, using an alcohol-based hand-rub for 10-30 seconds (until hands are dry) will achieve proper hand antisepsis, as long as hands are not visibly soiled or contaminated with organic materials¹⁰. Non-sterile gloves are worn as part of the technique, but they do not eliminate the need for hand washing¹⁰.
- 'Three way' taps/ stopcocks are not used. Instead a 'piggyback' or closed system is used with a valve attached for intermittent infusions and drug administration¹¹.
- To minimise the risk of infection and clot formation, central lines should not be routinely accessed for blood sampling¹. If possible a venipuncture or capillary sample should be obtained. If blood is to be sampled from surgically placed central catheters an order must be obtained from the neonatologist on call and the blood sampled only when the administration sets are changed. A surgeon may document in the patient's records that a specific line is not to be used for blood sampling.
- Surgically placed central catheters require an Operation Record which clearly states the name of the surgeon performing the procedure, date of insertion, type and size of device inserted, and the vessel used. The type of catheter, entry site and site of the tip of the catheter should also be documented in the infant's medical record in the electronic medical records by the registrar or nurse on return to the ward.
- All centrally located catheters are at risk of phlebitis and contamination and subsequent infection, particularly when parenteral nutrition is in use. In order to reduce some of the possible risks to the patient, in-line filters are used for all central lines^{11, 12}. Administration sets for Vamin need only be changed every Monday, Wednesday, and Friday¹³. Lipid infusions are changed every 24 hours.
- Ensure that central line catheter position is correct by verifying position on x-ray prior to fluid commencement and subsequently every shift using MagicWeb.
- Ensure the catheter is taped for security (see below) and that the insertion site can be viewed easily.
- PICC lines are never clamped as the small lumen may become blocked. During the change of administration set the fluid should be under positive pressure by having the infusion pump turned on¹⁴.
- Blood or blood products should not be infused through a PICC due to the small lumen. The catheters may rupture if subjected to high pressure¹⁴.
- Blood can be administered through larger central venous catheters however platelet administration should be avoided because of increased risk of clotting and thrombus formation in the line.

Recommendations for multi-lumen designation ¹⁵

The lumens in a multiple lumen catheter run the length of the catheter with exit points at different stages.

- Proximal: blood sampling if required, medications, blood administration.
- Medial: Total Parenteral Nutrition, medications if TPN use is not anticipated.
- Distal: blood administration, high volume fluids, medications including inotrope and Prostin and CVP monitoring if required.
- Use a 'Split septum Luer activated valve' on all extensions where drugs or fluids are changed every 24 hours or more frequently.

Catheter types and priming volumes

Brand	Type	Size	Lumen/s	Lumen size		Priming volume
Premicath	PICC	1 Fr	single	28g		0.1mL
Epicutaneo-Cava	PICC	2 Fr 15cm 30cm 50cm	single	24g		0.1mL 0.12mL 0.16mL
Bard - Broviac	Surgically placed - tunnelled	2.7Fr 71cm	single	0.5mm		0.15mL
Bard - Broviac	Surgically placed - tunnelled	4.2Fr 71cm	single	0.7mm		0.3mL
Bard - Hickman	Surgically placed - tunnelled	7Fr 65cm	double	Red	1mm	0.8mL
				White	0.8mm	0.5mL
Proact (Vygon)	Umbilical catheters	5Fr 40cm	double	19g each lumen		0.30ml
Arrow	UVC/femoral	4Fr	double	Distal	22g	0.25mL
				Proximal	22g	0.31mL
Arrow	UVC/femoral	5.5Fr 30cm	triple	Distal	20g	0.38mL
				Medial	22g	0.35mL
				Proximal	22g	0.39mL
Arrow	UVC/femoral	5.5Fr 13cm	triple	Distal	20g	0.30mL
				Medial	22g	0.31mL
				Proximal	22g	0.34mL

CODAN Triple Connectors – light safe					
	Length	Prime volume	Filter	Injection port	Use
Long arm (Red)	24cm	0.4mL	0.2 micron	Split septum Luer activated valve	Drugs
Middle arm (Blue)	21 cm	0.3mL	0.2 micron	none	Vamin
Short arm (White)	12 cm	0.2mL	none	Split septum Luer activated valve	Lipids

Site care

All sites must be checked hourly and documented in the electronic medical record under 'vitals'. Each shift, documentation of the site is recorded in the electronic medical record under 'assessment'. Documentation includes:

- Bleeding (swelling, ooze early after insertion).
- Infection (heat, redness, swelling, pain), usually 3-7 days after insertion.
- Dislodgement (exposed cuffs, increased length of catheter exposed). The lines should be dressed and looped, secured with tape and transparent film dressing.
- Compare the infant's left and right limbs and chest sides, observing for vein asymmetry and chest wall asymmetry, discoloration or oedema.

Staging severity of IV infiltration¹⁶

Clinical symptoms		Actions
Stage I	Painful IV site No erythema No swelling	For all stages Stop the infusion Establish alternate IV site Determine infusate Elevate extremity Continue assessment of site and surrounding tissue / pain
Stage II	Painful IV site Slight swelling (> 1cm in any direction) No blanching Good pulse below infiltration site Brisk capillary refill below infiltration site	
Stage III	Painful IV site Marked swelling (> 2 cm in any direction) Blanching Skin cool to touch Good pulse below infiltration site Brisk capillary refill below infiltration site	As above Notify neonatologist
Stage IV	Painful IV site Very marked swelling (> 3 cm in any direction) Blanching Skin cool to touch Decreased or absent pulse* Capillary refill > 4 seconds* Skin breakdown or necrosis* * the presence of any one of these signs constitutes a stage IV infiltration	As above Notify neonatologist Plastic's Team consulted

Caveats to guidelines

- If the dressing becomes moist or starts to lift, check the insertion site for leaking around the cannula and replace the dressing if necessary.
- All 'tissued' peripheral cannulas are removed by the nursing staff after checking with NCC or CNS or doctor.
- Necrotic areas or severely swollen and blanched areas resulting from infiltration should be reported immediately to the medical staff and an IMMS form completed.
- 'T' pieces are flushed with normal saline. If continuous IV fluids are not in progress the cannula patency is maintained with normal saline flushes of 0.5 mL on insertion and then every six hours¹.

Checking and documentation procedures for all intravenous fluids

- All intravenous fluid bags must be labelled with the time and date of commencement with the signatures of two RNs.
- At the commencement of each shift or when there is a new bag/syringe or rate change two registered nurses must double check and compare with the fluid orders and record:
 - The infusion rate on the pump.
 - The contents of the fluids in each bag and syringe.
- When narcotic infusions are checked, two registered nurses must double check and record:
 - The volume of fluid left in the new syringe after set up and purging is recorded on the IV fluid order chart.
 - The volume of fluid left in the old syringe at the completion of the infusion is recorded on the previous day's IV fluid order sheet.
 - Any preset bolus limit and the purging of bolus medication to the infant.
- The date and time of infusion changes, additives prescribed, and two registered nurses signatures must be documented:
 - On the infusion orders which are updated every 24 hours.
 - On a reconstitution sticker which is placed on the fluid bag or syringe.
- Pump pressures for each line are set at the commencement of each infusion and are observed and recorded each hour.

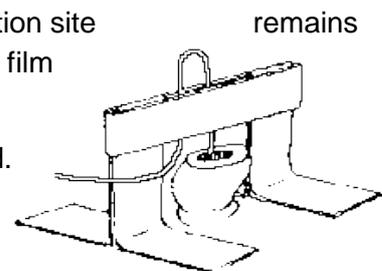
Technique

- Two registered nurses check the fluid orders including drug doses according to the drug manual.
- Before commencing the infusion, two registered nurses check the infusate, the reconstitution and drawn-up drug dose.

- Unless there are changes in dosage or type of additives in the maintenance fluids the giving set only requires changing every 48 hours. A piece of tape with a record of date of IV set change is placed on the burette to aid this process. T-connectors are left in-situ and are not changed daily with routine IV tubing changes.
- If there are multiple infusion lines, label each line to identify what fluid/medication is being infused.

Umbilical venous catheters

- The catheter is sutured to the umbilical stump not the skin. The preferred suture material is 3/0 silk.
- Umbilical ties are removed as soon as bleeding has stopped reducing the risk of skin necrosis.
- Hourly observation of the stump and recording of findings is performed for the duration of the umbilical catheter. The stump is assessed for bleeding.
- Security of the dressing and the catheter, as the stump sloughs and begins to separate the sutures may not secure the catheter effectively.
- A 'goal-post' taping method (see below) is used so the insertion site remains visible and the stump is allowed to dry, though a transparent film dressing is a suitable alternative.
- Position the infant to enable the insertion site to be observed. Infants with umbilical lines should never be nursed prone.



Procedure for fluid and administration set changes

- All central line fluid and administration sets are changed on night shift prior to midnight.
- All central line administration sets including extension tubing with filters, Luer activated valves and infusion bags are changed on Monday, Wednesday, and Friday nights regardless of when the fluids were commenced. In-line filters are used for all central catheters unless clinically contraindicated when it is documented in the infant's medical record.
- Lipid infusions and tubing are changed every 24 hours (this line does not have a filter).
- All drug infusions, including administration sets are changed every 24 hours, unless contraindicated by the drug manufacturer.
- Replace administration sets used to administer blood products after infusion has ceased.
- It is preferable for blood and blood products to be infused via a dedicated line as Dextrose infusions can cause haemolysis and should not be mixed with blood products.
- If there are multiple infusion lines each line requires a label to identify the fluid/medication being infused. Caution needs to be taken with drug incompatibilities.

- If multiple infusions are being given through a single lumen then consideration needs to be given before flushing the line following administration of drugs.
- When flushing a central line a syringe of no smaller volume than 10mL should be used.

Technique

- The procedure should be carried out in an environment with minimal traffic flow of personnel this may require asking individuals to wait while the procedure is being attended.
- Prepare a clean surface for the procedure by thoroughly cleaning the trolley or locker top with an alcohol solution or impregnated wipe.
- All lines should be set up, connected and disconnected using an aseptic non-touch technique with a 30-60 second hand wash. When the hand wash is completed hands are dried using a clean hand towel followed by the wearing of non-sterile gloves. These techniques will reduce the incidence of line infection¹³.
- It is essential to have a second RN who also attends a clinical hand wash to double check the fluids and the prescribed and set rate on the infusion pump.
- A sterile field is provided on a previously sterilised surface with the use of a sterile plastic drape. The equipment required is assembled onto this field.
- When changing the bag only, wipe the access point of the old line, between the bag and administration set needle, with a 2% Chlorhexidine and 70% Alcohol swab using a vigorous action to create friction at the site. Allow the site to dry before disconnection. The administration set is held with a sterile gauze swab with one hand while the bag is held and disconnected with the other hand. The assistant will aid disconnection and dispose of the old bag and assist with the insertion of the new bag onto the administration set.
- When changing the administration set prime the lines with the new fluid.
- Place a drape under the line to be accessed to provide a clean field.
- Swab the access point with a 2% Chlorhexidine in Alcohol 70% swab. Use a vigorous action when cleaning the site as it is the friction that removes potential contamination.
- Allow the solution to dry before accessing the line.
- Cuffed Silastic catheters are clamped prior to disconnection this should be done over the guard on the line with a non-crushing clamp or on the piggy back line.
- Percutaneous fine bore PICC lines require a continuous fluid infusion of a minimum of **one mL per hour**²³ and **the catheter is never clamped**. During line changes ensure the new fluid is at a positive pressure by having the pump turned on and the line primed with fluid.
- Disconnect the line and connect the new primed set making sure the internal lumen remains uncontaminated and there is no air in the hub.

Administration of drugs via CVL (intermittent infusion and bolus)

- A peripheral line is preferred for administration of bolus drugs where pharmacologically indicated. Continuous infusions may pose less infection risk than frequent intermittent access.
- Plan administration of drugs so as to reduce the number of infusions at any one time into the line.
- Bolus and intermittent drug infusions are given after a written order by a medical officer on the medication chart. Intermittent infusions are given after a written order on the fluid chart.
- If the central line is to be used for the administration of drugs, a split septum Luer activated valve is used. If this method is used then a 30-60 second clinical hand wash is required and a 'no touch' technique is performed as described previously.
- Prior to administering drugs the drug compatibilities should be checked.

Technique

- Hands that are visibly soiled require washing with soap and water for 60 seconds, otherwise 0.5% chlorhexidine gluconate in 70% alcohol hand-rub maybe used when administering medications via a needless device.
- Use non-sterile gloves.
- Swab the valve (Split septum Luer activated valve) with 2% chlorhexidine in 70% alcohol swab with friction and allow to dry.
- Connect the medication syringe or infusion set directly into the valve.
- After the medication has been infused clear the line with an appropriate volume of normal saline using a 10 mL syringe. If administering more than one medication, ensure that the line is flushed with saline between instillation of each medication.
- Swab the injection port with 2% chlorhexidine in 70% alcohol swab following the completion of the medication when the syringe or tubing is disconnected, this is to ensure all remnants of medication are removed and the connection is clean.
- If the line is being cleared with the use of a flush infusion (as in the case post discontinuation of inotrope use) it is important to ensure that the flush is administered at the same rate as the drug had been administered for a period of time sufficient to clear the line.

Maintaining patency of lumen

Maintaining patency of central catheters requires careful consideration of the specific situation which includes size of catheter or lumen, frequency of intermittent infusions or drugs and use of the catheter or lumen. When a catheter or lumen is no longer used for continuous infusions it can be capped and 'locked' in preparation for intermittent or future use¹⁵.

- Heparin is added to TPN administered via central venous catheters to reduce thrombus formation and to prolong patency¹⁴.
- PICC lines and small lumen central catheters are **neither capped nor have a heparin-lock**. Patency is maintained with an infusion set with a minimum combined volume of 1 mL per hour¹⁵

When administering bolus drugs or intermittent drug infusions the line is initially flushed with normal saline (refer to priming chart) using a pulsating action. A pulsating motion (push-pause-push) is used following the administration of medications, collection of blood samples, or prior to connecting IV infusion, drug infusions or bolus drugs. This motion creates turbulence in the catheter lumen assisting with the removal of fibrin sheaths and drug precipitation.

Heparin lock (hep-lock) refers to the instillation of heparin into the central catheter when the lumens are not being used for more than 24 hours. 'Lock' refers to creating a positive pressure lock in the central catheter which prevents the backflow of blood into the catheter. Heparin is used to reduce the risk of thrombosis formation and maintain patency.

heparinised saline 10units/mL, 0.5–1mL per lumen (depending on the priming volume).

- To insert the lock, one mL of heparinised saline (10units/mL) is instilled after first flushing the lumen with 1mL of normal saline using a pulsating action (push-pause-push).
- For catheters and lumen which are accessed at least every 8 hours for intermittent drug infusions then normal saline flushes (technique as described above) can be used to maintain patency⁷.
- A positive pressure lock is created within the lumen by maintaining a pressure on the syringe plunger whilst clamping the lumen of the central catheter.
- Once hep-locked, the clamp on the central catheter remains closed to maintain the positive pressure in the lumen.
- Each lumen requires a hep-lock be attended at least every seven days.
- When removing the hep-lock it is recommended that the lumen contents are aspirated and discarded and not flushed into the patient. Note: aspirating small lumen (less than 1mm or 22g) catheters is not possible.
- Heparin locks are charted on the patient's PRN medication chart and a label placed on the relevant lumen.
- Intermittent flushes are charted on the standard medication chart every 6-8 hours depending on the frequency of the intermittent infusions/drugs.
- Risks for occlusion include; infusing incompatible substances, inadequate flushing between administering incompatible substances, failure to instil positive pressure to prevent reflux of blood and fungal colonization of the catheter¹⁷.

Central line dressings

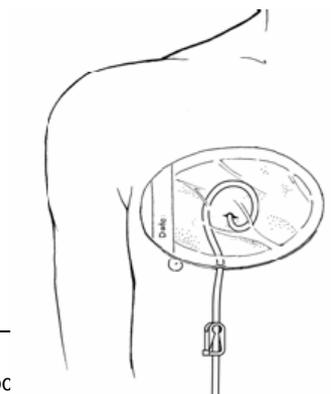
Infant safety

- All procedures must be performed by or under the supervision of an experienced nurse.
- Two staff members are required for the procedure.
- Initial central line dressings are not applied until correct line placement is determined by x-ray
- Thereafter, semi-permeable dressings should only be changed as necessary because of the risk of bacterial contamination and accidental dislodgement of the catheter¹⁸. The dressing should be replaced if it becomes loose, visibly wet or soiled, the catheter becomes twisted or kinked or if there is bleeding or inflammation.
- It is recommended not to use scissors or sharp objects near the catheter when changing central line dressings.
- Dressings should be carried out following a 60 second minimum clinical hand wash and 'no touch' technique using sterile gloves.
- If a dressing is lifting or the loop has gone and the line needs re-dressing immediately.

Broviac catheters

Technique

- The initial dressing occurs in the operating theatre. A sterile, transparent film dressing is used to cover the catheter exit site. Semi-permeable dressings should not be changed in the first week, if possible, to avoid the risk of inadvertent displacement of the CVL, unless authorised by the Surgeon.
- When securing the catheter try to angle the catheter away from the chest and avoid taping over the chest in infants with a cardiac defect as they will require cardiac echocardiography.
- The cleaning procedure is the same for all external tunnelled central venous catheters regardless of what type of dressing is used, or whether a dressing is used or not.
- Clean the exit site dressing site and then down the central line from the exit site with Aqueous Chlorhexidine Solution 0.1%. Do not return to the catheter exit site with the same swab.
- Coil the external portion of the central line and secure the loop with three Steri-strips wrapped around the line and crossed in a butterfly style.
- Leucoplast is placed to cover the edges of the transparent film dressing to ensure an adequate seal.



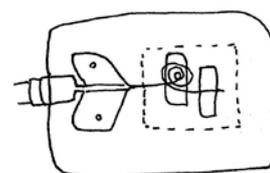
- Write the date the dressing was changed on the Leucoplast and record the procedure in the infant's notes.

PICC lines

Peripherally inserted central catheters are not sutured in place therefore it is most important that the dressing remains well secured to avoid line dislodgement. The dressing is left undisturbed and checked each hour and should only be changed if the dressing has become loosened or soiled.

Technique

- Appropriate solution is applied to remove the leucoplast tape from old dressing (olive oil).
- The assistant puts on one sterile glove.
- The dressing is removed, ensuring that tension is not placed on the line, the assistant puts a 'gloved' finger on the catheter entry site to avoid accidental removal of the line.
- After the dressing is removed, a minimum one minute clinical hand wash is performed, and sterile gloves are worn.
- The area is swabbed with Aqueous Chlorhexidine Solution 0.1%. Starting at exit site and using circular motion covering the entire dressing area, including the line.
- The catheter and connection are repositioned as shown in the diagram, changing the hub if possible, to prevent pressure areas.
- The catheter is coiled at the exit site and secured by taping it flat against the skin with Steri-strips.
- A piece of clear sterile plastic the size of a postage stamp size is cut to size using a stitch-cutter and placed over the coiled catheter. (This can be obtained from a butterfly needle package). The plastic is placed over the insertion site and line to prevent the transparent dressing adhering to the line and thus reduce the risk of accidental dislodgement if the site needs further redressing.
- The entire area, including connections and hub, is covered with a sterile transparent film dressing, ensuring that the area is air tight.
- Ensure there is an adequate seal on the edges of the non-occlusive dressing to avoid lifting.
- A date of change is written on a small piece of tape which is then placed on the site.
- The procedure is documented in the infant's notes.



Line Repair

This procedure is done by two persons one person must be experienced in the assembly of the PICC technique. If you are in doubt or have not done the procedure then check with the neonatologist.

If leakage occurs due to ruptured catheter at the connection

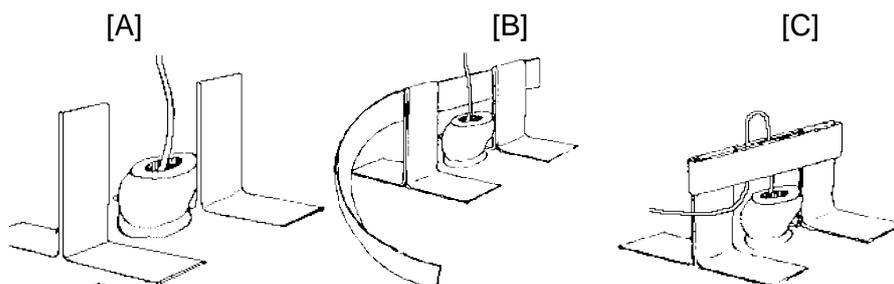
- Wash hands.
- Remove dressing as steps 1 through to 4.
- Use sterile gloves.
- Using stitch cutter, cut catheter close to the rupture.
- Discard ruptured section of the line.
- Using a 26g butterfly needle, thread the needle protector over the catheter.
- Prime the butterfly needle and tubing and attach to infusion line.
- With bevel of needle uppermost, carefully thread the catheter onto the needle. Try to advance it at least half the length of the needle.
- Keep the IV Infusion running during this manoeuvre, this makes it easy to identify if you have punctured the line.
- Ensure there is no further leaking, if satisfactory carefully thread cover back onto needle.
- Replace the dressing as described above.
- Document repair in the patient's records.

Umbilical venous catheters

Umbilical lines as secured by means of a goal post style or Tegaderm™ dressing. Apply the dressing once there has been x-ray confirmation of line placement, and prior to commencement of infusions.

Goal post technique

- Place *comfeel* strips lengthwise on the infant's abdomen, one each side of the umbilicus
- Apply leucoplast goal posts lengthwise on top of the *comfeel* [A]. The size of the goal posts should be relevant to the infant's size.
- Apply a strip of leucoplast horizontally as a crossbar to the goal posts [B]. The UVC is looped and attached securely inside this crossbar [C].



Central line blood sampling (except PICC lines)

Patient /carer safety

- Blood *must not* be aspirated from a PICC line because of its small lumen size and potential for blockage and damage to the line¹⁴.
- Blood should only be aspirated from central lines once permission is obtained from the neonatologist on service. For some lines the surgeon may indicate that blood sampling is not to be done – this order is documented in the patient's record. The blood should be collected with line change to reduce the number of times the line is broken into.
- Blood is collected under aseptic conditions.
- Any blood removed or reinserted should be carried out slowly to prevent hemolysis of the specimen and collapse of the catheter/vein.
- It is recommended that an assistant help with the procedure.
- Blood should only be aspirated from the line with a syringe 10 mL or greater volume.
- It is ideal that a lumen of the central line be dedicated solely for blood collection.
- Blood collection should not be obtained from lines where an inotrope is infusing.

Family considerations

If family members are present explain procedure to them.

Swaddle and contain the infant, ideally with help of another nurse or parent.

Technique

- Aseptic non-touch technique and protective eye wear are used.
- If there is not a dedicated line for blood sampling stop and clamp infusion(s) where appropriate, for at least one minute prior to drawing the blood.
- If there is lipid running through the line the lipid must be turned off for at least one hour prior to sampling from that line.
- A 30-60 clinical hand wash is performed and sterile gloves worn for the procedure.
- To maintain asepsis it is preferable to have an assistant.
- Place syringes to be used for blood collection on to the sterile field along with syringe which has been primed with flushing solution. If the CVL lumen does not have fluid infusing a sterile bung will be required.
- When disconnecting and connecting to the CVL lumen the line can either be kinked off between fingers or clamped with the in line clamping system. Ensure no air bubbles enter the line.
- If a multiple lumen catheter is used both lumens will require clamping.
- If the catheter or lumen has had an infusion running through it the line is disconnected onto the sterile field and the lumen is aspirated to the priming volume of the lumen.

- The syringe is set aside and a new syringe attached for sampling. Once the sample has been taken the blood from the clearance syringe is discarded unless clinically indicated and ordered by a medical officer. If there is a rationale to return this blood the blood should be reinserted slowly to the infant.
- Once the sample has been collected the line is flushed using a 10 mL syringe and recapped or reconnected to the infusion line. Ensure all clamps are off to allow the infusion to continue.

Removal of central venous catheters

- The majority of surgical CVLs are removed electively under general anaesthesia in the operating theatre. Sometimes, a surgeon may remove a tunnelled CVL in the NICU if the infant is stable and has a normal coagulation profile. The surgeon uses local anaesthesia and an aseptic technique for the procedure.
- Peripherally inserted CVL lines can be removed on the ward by registered nurses who have been deemed competent by the educators.
- Umbilical Venous Catheters can be removed on the ward by CNS or NCC or medical officer.
- At the time of removal of the CVL, the tip of the line should be visually inspected to ensure that removal has been complete and documented in the electronic medical record. Unless infection is suspected the line tip is not sent to pathology for culture.

Technique for removal of tunnelled central venous catheters in the neonatal unit

This is an aseptic technique carried out by a surgeon. The procedure can be performed in the ward treatment room. The nurse responsible for the care of the infant must be available to obtain equipment needed and to assist with the procedure.

Equipment

- Sucrose
- Minor procedure tray
- Sterile plastic drape
- Basic pack
- Chlorhexidine Irrigation Solution 0.1%
- Sterile gown and gloves

Technique

- The nurse prepares the sterile field and with the assistance of the doctor opens the equipment on this field
- The infant is placed on the open care system with a radiant warmer turned on and positioned supine and with the bed level.
- Sucrose is given as ordered and a pacifier used if appropriate.
- If required a dose of oral morphine maybe used and is ordered on the medication chart.

- After washing hands the dressing is loosened ready for removal by the doctor.
- The line is checked to ensure it is clamped.
- After the doctor has performed a clinical hand wash and applied gown and gloves the nurse removes the dressing with the doctor supervising.
- The doctor swabs the exit site with the Chlorhexidine Irrigation solution.
- Lignocaine 1%, 0.5—1mL should be infiltrated at the skin entry site of the catheter.
- The doctor removes the line during the infant's expiratory phase of breathing.
- Pressure is applied to the site to achieve haemostasis.
- The site is covered with an occlusive dressing to ensure adequate sealing of the site. This dressing should be left on for 24–72 hours in case of air embolism.

Post procedure care

- The procedure is documented in the notes by both the nurse and doctor involved.
- The dressing should be observed for bleeding for a minimum of 4hours.
- Vital signs should be taken and recorded for a minimum of 4 hours post procedure.

Technique for removal of peripherally inserted central line catheters

- Wash hands
- Remove tape and dressing
- Apply clean non sterile gloves
- Grasp the catheter at the insertion site with dominate hand pull it forward. Using the non dominant hand hold catheter end at the insertion site before reclasp the catheter with dominant hand and continuing removal in small increments keeping the catheter parallel to the vein.
- As much as possible removal of the catheter should be a slow intermittent traction without placing excessive pressure on the insertion site.
- If resistance is met, do not continue. Apply a dressing and notify a medical officer.
- After removal apply pressure at the insertion site to achieve haemostasis.
- Examine the catheter tip and length to ascertain complete removal of catheter.
- Document procedure and findings in the infant's notes (electronic medical record)

Technique for removal of umbilical venous catheters

This procedure can be carried out by medical officer, clinical coordinator or clinical nurse specialist. If a UAC is to remain in-situ then ideally a medical officer will remove the UVC in case of accidental dislodgement of the UAC.

- Universal precautions should be observed

- Give the infant sucrose
- Wash hands
- Turn off infusion and clamp catheter.
- Loosen gate dressing
- Apply gloves
- Cut stiches between the UVC and the knot of the suture.
- Withdraw catheter slowly till completely removed.
- Remove dressing with catheter and dispose of appropriately
- If necessary use sterile gauze to apply pressure above the stump site to achieve haemostasis.

Post procedure care

- Observe the site for bleeding for a minimum of 4 hours

Central venous pressure monitoring

Please refer to the clinical practice guideline on hemodynamic monitoring.

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