Central Venous Access Device (CVAD) insertion, management and maintenance in the NICU

Guideline Responsibilities and Authorisation

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Guideline Review History

Version	Updated by	Date Updated	Summary of Changes
3	Arun Nair	Oct 2016	None
4	Anja Hale	Nov 2021	Name Change. Insertion of CVAD, Taping and Dressing of CVAD. Documentation of CVAD management.
5	Anja Hale	Mar 2022	Content updated.
6	Anja Hale	Nov 2023	Competency required for inserter, catheter selection, and loss of dressing and/or skin integrity including response.

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Central Venous Access Device (CVAD) insertion, management and maintenance in the NICU

1. Overview

1.1 Purpose

To provide instructions on the insertion, management, and maintenance of CVADs in NICU to provide prolonged intravenous nutrition (IVN) or drug therapy for neonates. This guideline covers central venous access device mainly peripherally inserted central catheter (PICC) but does not include umbilical venous catheterisation (UVC).

1.2 Staff group

Health New Zealand | Te Whatu Ora Waikato staff working in NICU.

1.3 Patient / client group

Neonates and Infants in NICU.

1.4 Definitions

Aseptic non-touch technique (ANTT)	Aseptic Non-Touch Technique (ANTT) is a technique that maintains asepsis and is non-touch in nature. The key parts of any procedure are identified and protected – this includes staff performing effective hand hygiene, instituting a non-touch technique when handling, and wearing the appropriate standard precautions. For the purpose of this procedure the word “STERILE” will continue to be used to describe access to the CVAD.
Bundle of care	Care bundles are groupings of best practice interventions, which individually improve care but when applied together, result in a significantly greater improvement.
CHG	Chlorhexidine gluconate
CNS	Clinical Nurse Specialist
CVAD	Central Venous Access Device
g	Grams
G	Gauge
IV	Intravenous
Medical Staff	In NICU they include Neonatal Nurse Practitioner, Clinical Nurse Specialist, Registrar and Paediatricians.
NP	Nurse Practitioner
Reg96	Specialised Neonatal intravenous nutrition used for preterm or term infants unable to tolerate enteral feeds for a prolonged period
IVN	Intravenous Nutrition

PICC	Peripherally Inserted Central Catheter
SMO	Senior Medical Officer

1.5 Indications for Use

- Prolonged intravenous nutrition
- Long-term IV drug therapy
- Administration of hyperosmolar IV fluids i.e., glucose solution >12.5%, inotropes
- Limited IV access

1.6 Contraindications

- Infection – systemic or cutaneous near the proposed point of insertion
  - Occasionally a CVAD may need to be placed to assure antibiotic therapy for systemic infection.
- Anatomical irregularities in the infant's extremities or chest that could interfere with placement of the catheter.

1.7 Special considerations

- Thrombocytopenia or coagulopathy – may require blood product correction prior to insertion.
- Decreased venous return - oedema that presents due to decreased venous return may be hard to distinguish from oedema resulting from catheter complications. Choose another limb if possible.

2. Clinical Management

2.1 Competency required

- All medical staff which includes NPs, CNSs, Paediatricians and Registrars / Advanced Trainees experienced in CVAD insertion or under direct supervision from a trained professional.
- All new staff will follow an accreditation process with NPs or SMOs / Advanced Trainees. They must perform at least two successful supervised procedures prior to performing the procedure independently.

CVAD insertion, line changes and dressings are high risk procedures and due care must be taken to avoid contamination of the area, by following general aseptic principles all the time. It is strongly recommended that the staff involved are not interrupted. All other staff and members of the public should keep away from the area during the procedure.

2.2 Equipment

- Trolley
- Gown pack x 1 per proceduralist
- Masks and caps x 2
- Sterile gloves x 2
- Vygon - manufacturer supplied PICC line insertion kit
  - CVAD catheter – Select the size appropriate to the infant's weight, vein size and anticipated fluids/medications to be infused.
  - For all CVADs used in NICU, a 0.6ml/hr infusate is adequate to keep lumen open but usual practice is to run fluids at least 1ml/hr
- Vygon Nutriline Catheter 24G (2F) 30cm
- Vygon – Nutriline Twinflo double lumen Catheter 24G (2F) 30cm.
  - Consists of two 1F lumens, with or without introducer.
- Vygon Premicath polyurethane 28G (1F) single lumen 20cm (Premi cath)
  - Preferred CVAD for most infants weighing < 1500g.
  - If used for any other indications, please discuss with specialist on service or on call first.
  - Maximum flow rate 10ml/hr
- Microsite or Microflash for Nutriline catheters
- BD Insyte 20 GA 30mm (pink cannula) or BD Insyte 24 GA 19mm (yellow cannula) for Premicath
- 3 way tap x 1, please add a luer plug (bionector/bung) when 3 way tap is connected
- Sodium chloride 0.9%
- For infants </= 1000 g and/or < 26 weeks use chlorhexidine gluconate 0.1% aqueous solution
- For infants > 1000 g use BD ChloraPrep™ (Chlorhexidine gluconate 2% with isopropyl alcohol 70%) applicator swab
- Omnipaque for CVAD
- Transparent film dressing for CVAD
- Sterile Steri strips
- Duoderm
- Prepacked plastic drapes (76 X 106 cm) by Defries industries pvt ltd.
- MICROTEK™ intraoperative probe cover featuring isosilk™ (when using cold light)

2.3 Guideline

1. Discuss the procedure with parents including indication for CVAD, the risks and benefits. Gain parental consent.
2. Identify the proceduralists (accredited to perform procedure on an infant), assistant and a designated staff member to complete the CVAD insertion checklist (Appendix C).
3. Check resuscitation equipment like T-piece resuscitator and suction.
4. Select the vein to be used and measure the required length of catheter to be inserted from point of entry to desired tip placement.
   - CVAD inserted via the leg, measure from the insertion site to Xiphisternum.
   - CVAD inserted via the arm, measure from the planned insertion site along the arm to the shoulder joint (acromion point), then to the sternal notch. This is the approximate location of SVC.
5. To reduce contamination of sterile field by through traffic, restrict access to nursery with door “STOP” signs and screens prior to commencing procedure.
6. Choosing a catheter

	Indication	Preferred catheter
1	Weight < 1000 g and /or Gestational age < 26 weeks	Premicath
2	Gestational age 26-30 weeks (up to 1500 g)	Premicath > Nutriline
3	Gestational age >30 weeks and/or > 1500 g	
3a	Needs only IVN and not on inotropes or long-term antibiotics (>7 days)	Nutriline (single lumen) > Premicath
3b	IVN and Inotropes use or IVN and on long term antibiotics	Nutrline Twinflow (double lumen) > Nutriline > Premicath
4	CVAD only for long term antibiotics	
	< 1500 g and/or < 28 weeks > 1500 g	Premicath Nutriline > Premicath

7. Consider methods of pain relief
   - Swaddling of infant
   - Oral sucrose 25% - Sucrose Oral Liquid for Analgesia in Neonates and Infants (Ref. 2905)
   - Intravenous opioid - Fentanyl for neonates (Ref. 2916)
   - Intranasal midazolam - Midazolam for neonates (Ref. 2939)
8. Both, clinician inserting CVAD and assistant, apply hair covering and mask
9. Clean trolley with appropriate surface wipes and allow it to dry.

10. Preparation of critical sterile field and laying out the equipment:
    - Assistant to perform hand hygiene using soap solution as per hospital hand hygiene recommendations.
    - Inserter to perform surgical hand wash using chlorhexidine 4% antiseptic soap solution for 2 minutes as per hospital hand hygiene recommendations.
    - Dry hands with sterile towel provided.
    - Don sterile gown and gloves (double glove).
    - Ask assistant to open the CVAD dressing pack and carefully lay down the contents.
    - Add rest of the equipment without disturbing the sterile field.
11. Prepare the catheter by attaching a 10 ml syringe with sodium chloride 0.9% to catheter and flush to displace the air from the lumen and assess the integrity of the catheter prior to insertion. Flush through all lumens.
12. Position the infant:
    - For insertion of CVAD in upper limb: abduct the arm with the infant's head turned toward the intended arm for insertion. Chin to shoulder will reduce the likelihood of the catheter entering the jugular vein.
    - For insertion of CVAD in lower limb: you may need to manipulate at the hip to get past the venous femoral confluence.
13. Prepare the insertion site and surrounding skin with Chlorhexidine swab appropriate for the weight and gestation of the infant as mentioned in the equipment. Begin at insertion site and swab in a circular motion or pat in ELBW infants. Clean the whole limb ensuring the entire limb is painted by antiseptic solution taking care that palm and finger or toe web spaces are cleaned also. If required, assistant may be asked to perform the surgical hand hygiene and don sterile gloves to assist with limb preparation. Allow at least 2 minutes to dry.
14. Use the sterile plastic drapes provided in the PICC line pack or use a prepacked sterile plastic drape (size 76 X 106 cm) to cover the infant and the surrounding incubator. Remove first pair of gloves.
15. Place sterile drapes underneath and above the insertion site providing as large a sterile field as can be safely done, whilst ensuring the ability for adequate observation of infant.
16. Apply a sterile tourniquet 2-3 cm above insertion site if required.
17. Use the cold light to improve the visualisation of the vein if required. Use a sterile ultrasound probe cover to keep the field sterile. Refer to Appendix A.
18. Use slight tension to the skin to stabilise the vein and then insert the introducer needle or splitting cannula, bevel upwards at an angle of 20° to the skin until securely within the vein.

Continued on next page

19. When blood flow is seen in the cannula chamber (or needle chamber in case of microsite) gently, advance a few millimetres further to ensure that the entire needle bevel is within the vein. Follow the manufacturer's instructions as per the needle used (24G cannula or microflash or microsite). Remove the tourniquet.
20. Whilst stabilising the introducer needle to maintain its position in the vein use non toothed forceps to advance the catheter in short increments (0.5-1cm) until the desired length is inserted.
21. If resistance is encountered, flushing with flush solution may help the catheter advance past obstructions and valves in veins or gentle massage of the involved area may help.
22. Aspirate for a blood return which indicates vascular placement.
23. If using an introducer needle completely withdraw from insertion site, keeping the needle parallel with the skin to avoid cutting the catheter. Remove the split away needle.
    - If using a Microsite or Microflash, withdraw from insertion site, split and remove cannula.
    - If using a Premicath and 24 G angiocath, cut cannula hub (with the scissor) following insertion into vein and prior to threading catheter. Once catheter is inserted, slide reminder of cannula back up line to T-piece connection and secure with Steristrip.
    - One may choose to leave the entire cannula and not to cut it at all.
    - Ensure the cannula is resting well on the Duoderm to avoid pressure injury.
24. A lack of blood return or inability to flush may indicate malposition. Withdraw the catheter slightly and aspirate. Use 10 ml syringe to flush all the CVADs. Avoid using smaller syringes as they increase the risk of CVAD breakdown. Continue this manoeuvre until a blood return is present, then attempt to reinsert the catheter **(PerformStep 23 prior to any manipulation of line)**.
25. Apply pressure to the puncture site until bleeding stops. Secure at skin with Steristrip just beyond insertion site. Consider application of one drop of tissue adhesive/glue (cyanoacrylate) at catheter entry site after bleeding has stopped to achieve haemostasis and avoid catheter migration. If ongoing bleeding consider application of a Surgicel hemostat dressing on the insertion site. Compress the Surgicel dressing for three minutes. The hemostat stimulates the production of thrombin and fibrinogen, which facilitates coagulation of the blood.
26. If 24G cannula with hub intact is used (for Premicath), the hub of the cannula **MUST be cleaned of blood**. (By aspiration with a blunt needle attached to syringe containing sterile sodium chloride 0.9% and sterile gauze.)

Continued on next page

27. Verify the position of the catheter by a non-contrast x-ray. Omnipaque (0.5 ml in 10 ml syringe) *only if lower limb catheter is in the lumbosacral region (L1-S5) for catheter confirmation.*
    - The preferred tip locations are the superior vena cava (between T2- T5, ideal T4-T5) for arm placement, or the inferior vena cava outside of the heart shadow and between T9 –T12 for lower limb placement.
    - If the catheter tip is beyond the desired location, it must be withdrawn. Position should be confirmed by re x-raying. Catheters that are not in far enough can only be advanced if the insertion site has remained sterile.
    - Catheters inserted through the lower limb, in particular the left side, may enter the lumbar vein. Any lower limb catheter in the lumbosacral region (L1 to S5) needs a confirmation with contrast (Omnipaque). The radiographic image is obtained whilst the Omnipaque (0.5ml in 10ml syringe) is being administered. Flush only the amount required for priming the catheter i.e. 0.1-0.2 ml). Also, use a lead shield covered by sterile linen to protect yourself. A lateral view may provide additional information. Aspirate the remaining Omnipaque contrast from CVAD and discard it after the x-ray. Flush the catheter with sodium chloride 0.9%
28. The decision to use a catheter that is not centrally placed must be made following careful consideration of the necessity of vascular access versus the higher risk of catheter complications. For upper limb catheters, it is advisable to pull them out from the subclavian vein into the axillary vein for early identification of extravasation and the prevention of pleural effusion.
29. Any non-central position of CVAD lines must be followed up closely.
    - Document clearly on the handover sheet about the malposition of the CVAD line and handover to the next team.
    - Review and note the CVAD position on all subsequent X-rays.
    - Lower limb CVAD lines migrate less as compared to upper limb CVAD lines. Preferentially consider lower limb CVAD lines over upper limb CVAD lines.
    - Anticipate extravasation/complications and keep a high index of suspicion. Remove if risks outweigh benefits.
    - If a pleural effusion secondary to catheter extravasation is suspected Triglyceride and glucose levels of pleural fluids paired with serum levels need to be done to confirm the diagnosis.
30. Secure the catheter as mentioned below in 2.5.

2.4 Potential complications

- Mechanical problems such as occlusion, leaking and dislodgement
- Catheter related blood stream infection (High risk)
- Catheter migration
- Extravasation
- Myocardial perforation, effusion, or tamponade

2.4.1 Prevention and management of complications is outlined in the following table

(See Appendix D for troubleshooting flowchart)

Problem	Prevention	Detection	Management
Occlusion	Use positive pressure flushing techniques Flush line following drug administration Always run continuous infusion of ≥0.6mL/hr through CVAD line Do not sample blood via CVAD line Correct any obvious signs of mechanical obstruction Do not transfuse blood products (RBC)	Change in capacity to infuse solutions Monitor for kinked CVAD or infusion lines	Check catheter and line are not clamped Attempt to reposition patient Inspect catheter for knots, bends migration Attempt to clear CVAD (pulsatile flush) Troubleshoot with senior RN/ NP/Registrar
Sepsis	Hand hygiene Minimise line access Observe for signs of inflammation or discharge from insertion site (CLIP score) Ensure dressing is intact and free of exudate Remove CVAD when no longer required Disconnecting intermittent infusions from CVAD when finished running	Respiratory deterioration Increasing or new apnoea/bradycardia events Lethargy, poor feeding, hyperglycaemia, temperature instability Altered white blood cell count	Remove line if possible Obtain specimens for culture (urine, blood) Commence IV antibiotics Evaluate chest x-ray
Phlebitis	Observe insertion site or the venous track for warmth, oedema and vein induration	Erythema and/or oedema at entry site or along the course of the CVAD	Elevate limb Check chemical properties of infusion. If chemical irritation likely, consider either further dilution or removal of the line in case of phlebitis extending along the course of the CVAD. For phlebitis restricted to the entry site: If no improvement after 24hours or phlebitis advances consider removal of line

Thrombosis	Check tip location on x-ray Detect inflammation and phlebitis early Secure catheter to prevent migration	Facial, neck and chest wall oedema or venous distension Respiratory deterioration Resistance to flushing	Treat thrombus with heparin or antithrombotic agent Consider removal of line
Catheter migration inwards / closer to the heart	Maintain security of dressing Verify tip position whenever a chest x-ray is taken for another clinical reason	Atrial or ventricular arrhythmias depending on migration location	Obtain x-ray and verify tip position Consider leaving in current position or pulling line back Check with x-ray following adjustment Consider removal of line
Catheter dislodgement (movement outwards/away from central vein)	Maintain security of CVAD with intact dressing Ensure no tension on CVAD or dressing	Tension on catheter Loosening of dressing following tension on line Security of dressing compromised	Obtain x-ray to check tip position Consider risks and benefits of leaving catheter in position Keep high index of suspicion for extravasation Consider removal of line
Catheter Breakage	Maintain security of CVAD with intact dressing Provide families with information on how to move their baby safely	Evidence of blood or fluid leaking from the line Visualisation of a broken or snapped CVAD	Clamp the line Check the patient for signs of air embolism Notify Medical staff Determine if line can be repaired Implement strategies to prevent reoccurrence
Air Embolism	Use needleless access device between end of CVAD and all extension sets Clamp or briefly occlude lines during disconnection Use pumps for all infusions and ensure connections are secure Do not use alcohol to clean CVAD catheter as this may weaken the material and increase risk of line fracture	Check tubing for disconnection or air in line or extension sets Check for line fracture	Signs of air embolism can include sudden onset cyanosis, shock and cardiac arrest Place infant in left lateral head down position and seek medical assistance Administer 100% oxygen to decrease air embolism

2.5 Securing of CVAD

(See Appendix B)

1. Secure external length of catheter with a slight curve as it exits the skin to minimise the risk of tension causing outwards migration. Apply skin closure strips (Steristrips) 0.5-1 cm from insertion site to allow visualisation of puncture wound.
2. Loosely coil the remaining length of catheter and secure with another Steristrip preventing kinks or bends.
3. Cut a rectangular piece of hydrocolloid skin barrier (Duoderm) and place under catheter hub to prevent skin breakdown.
4. Secure with Steristrips. Position the extension set to exit the dressing in the furthest position from the insertion site.
5. Cover the site with transparent semipermeable membrane dressing allowing for ongoing site inspection. Stretching dressings during application can cause adhesion failure. Ensure the dressing does not circumference the limb.
6. Wherever possible please use the Grip-Lok™ adhesive securement device (comes with Nutriline Twin Flow catheters) to secure the catheter. Grip-Lok can be only used for Nutriline CVADs and **not** Premicath.

2.6 Documentation

Document the procedure in the clinical record and complete the CVAD insertion checklist (Appendix C) including:

- Indication
- brand, type, size, number of lumens and lot number (utilise sticker from CVAD packaging)
- vein of insertion
- number of attempts at cannulation
- any complications encountered
- length of catheter at insertion point
- radiographic location of catheter tip and any manipulation of catheter
- procedural medications given and infant's tolerance of procedure
- name of clinician performing procedure

It is the medical team's responsibility to check the CVAD dressing daily during morning hours (0800-1600). It is nursing team's responsibility to remind the medical team to perform the check.

2.7 Dressing Change of CVAD

A dressing change is required in the following situations:

- Dressing integrity is compromised
- Moisture, drainage, or blood is present
- Signs of infection are present (This is on rare occasion only as ideally CVAD should be removed when CLABSI is suspected rather than a dressing change.)

2.7.1 Dressing integrity

Severity score	Description	Management	Response time
1 Mild	The edges of the dressing are lifted which is away from the insertion site and does not pose any immediate threat to the integrity of the dressing. 	Transparent dressing may need to be trimmed and reinforced by additional transparent dressing along the border. Avoid any other materials like SteriStrips or brown tape.	6 hours
2 Moderate	The dressing is lifting but underlying CVAD is not exposed (except the exit point). But it may expose the CVAD and CVAD may lose its integrity if not addressed immediately.  Or Dressing is soiled or has a collection of significant amount of fluid or blood underneath the dressing which puts it at risk of loss of integrity.	This requires urgent redressing of the CVAD. RN to escalate to SMO if not attended by NP/Reg within 1 hour. Medical team (NP/Reg/SMO) to put Tegaderm on the exposed edge immediately to avoid the exposure to CVAD prior to redressing it.	1 hour

3 Severe	The CVAD is exposed (except at the exit site) due to dressing lift off. This puts infants at high risk of CLABSI. 	CVAD must be removed. If this is the only secure access in a critically ill baby then it must be discussed with SMO and must be documented in the notes if CVAD is not removed.	1 hour

2.7.2 Skin integrity

Severity	Description	Management
1 Mild	Erythema alone without skin breakdown	Close monitoring of the skin for breakdown.
2 Moderate	Erythema with minor skin breakdown involving some areas of the skin	Use the adhesive remover wipes where possible. Avoid dressing on the broken area and expose it to air where permissible.
3 Severe	Extensive skin breakdown with ooze due to loss of superficial dermis along with epidermis (skin stripping).	Requires a mepital dressing as done for burns patients.

Changing the dressing is a two-person procedure to minimise the risk of contamination.

Every time the CVAD site is accessed for dressing change or adjustment of line, it must be done aseptically. *Do not access the CVAD through the port holes for this purpose, open the incubator side or raise lid fully.*

- Prepare infant and environment as per insertion steps
- Remove and discard the transparent dressing by loosening the furthest edge from the insertion site and gently stretching and peeling the dressing back past the insertion site whilst stabilising the line to prevent inadvertent withdrawal of line. Remove Steristrips carefully, check the length of CVAD at the time of insertion.
- Clean the area beneath the dressing and the length of the catheter with Chlorhexidine gluconate 2% skin swabs. Alcohol based preparations must **not** be used as alcohol may interfere with catheter integrity.
- Place transparent dressing ensuring full coverage of insertion site, Duoderm and securing strips.
- Document in clinical notes the appearance of the site, the current marking in cm at the insertion point (noting any migration), infant's tolerance of the procedure and any problems encountered.

2.8 CVAD Line Change for Nurses

- If the line is accidentally broken into, leaks or used for emergency drugs without the prescribed asepsis precautions mentioned above, consider removal of the catheter, or if not possible to remove, replace the infusion set as soon as possible within the next 24 hours.
- For infusion set change, clean the hub and the smart site extensions and using single use swabs with CHG 2% in alcohol 70% generously, taking care that the solution does not drip on to the skin of the baby. Allow to dry before touching again.
- Use sterile drapes and non-touch technique for preparation, priming and connection of infusion set as described in the nursing protocol manual.
- Change the infusion set delivering lipid or medication infusions (except insulin) every 24 hours.
- For IVN (Reg 96) or clear fluids (saline, insulin, or glucose), the infusion set needs changing only after 72 hours.
- Lipid Solution should be changed every 24 hours.
- IVN solution should be changed every 72 hours. Electrolytes may be added to a burette using sterile technique PRN during 72 hour hang time of clear IVN fluids.
- If the catheter needs to be kept for antibiotics or for any other purpose, use saline or glucose infusion at a minimum rate of 1 ml/hour through the CVAD Line.
- Do not try and withdraw blood from CVAD and do not stop infusion during antibiotic administration.
- Change the infusion set every 72 hours. (Do not use IVN or Lipids solutions for this purpose).

3. Audit

3.1 Indicators

- CVAD infection rate (local database)
- 100% completion rate of Insertion Checklist and Record
- CVAD removed when infant's condition no longer necessitates its use or if complications require its removal.
- Extravasation rate
- Tissue injury rate from pressure areas

3.2 Tools

- Central Vascular Access Device Insertion Checklist and Record
- Documentation on level 3 observation chart.

4. Evidence base

4.1 Associated Documents

- Central Venous Lines Umbilical Venous Line Management in NICU (Ref. 4936)
- Fentanyl for neonates (Ref. 2916)
- Midazolam for neonates (Ref. 2939)
- Morphine for neonates (Ref. 2940)
- Sucrose Oral Liquid for Analgesia in Neonates and Infants (Ref. 2905)

4.2 References

- Antiseptic Skin Preparation- First line use of CHG2%/ Alcohol 70% for all age group. Clinical guideline: Great Ormond Street Hospital for children UK.
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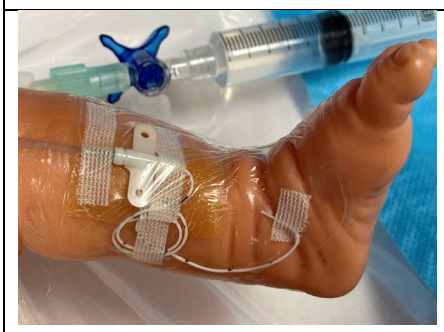
- Percutaneous CV Catheterisation. Chapter 31. Atlas of Procedures in neonatology III Ed Lippincott Williams & Wilkins 2002
- Peripherally Inserted Central Catheters: Guideline for Practice, 3rd edition. National Association of Neonatal Nurses.
- Role of radiopaque agent and surveillance radiographs for peripherally inserted central catheters in newborn infants. Paediatric Radiology. 2023. (53) 2235-2244. Y Stekhova, V Kodur, G Low, J Baird, K Lowe et al.
- Strategies to prevent Central line- Associated blood stream infections in acute care hospitals. SHEA/IDSA Practice recommendation. Infection Control and Hospital Epidemiology 2008 Vol. 29, Supplement 1

Appendix A - Preparation of cold-light for use in sterile field

	Use MICROTEK™ intraoperative probe cover featuring isosilk™ to cover the cold-light source to aid the insertion of CVAD. Please ask assistant to open the pack. It comes with an ultrasound gel which can be handed over to assistant in an aseptic manner. Please open the probe cover as shown in the picture to allow the placement of cold-light.
	Ask assistant to insert the LED end of the cold-light to be inserted first followed by the battery end.
	Trim the length of the probe cover enough to accommodate the cold-light.

Appendix B - Tegaderm Transparent dressing

	Secure external length of catheter with a slight curve as it exits the skin to minimise the risk of tension causing outwards migration. Apply skin closure strips (Steristrips) 0.5-1 cm from insertion site to allow visualisation of insertion site. Cut a rectangular piece of hydrocolloid skin barrier (Duoderm) and place under catheter hub to prevent skin breakdown. Secure with Steristrips
	Loosely coil the remaining length of catheter and secure with another Steristrip preventing kinks or bends Position the extension set to exit the dressing in the furthest position from the insertion site
	Cover the site with transparent semipermeable membrane dressing allowing for ongoing site inspection. Stretching dressings during application can cause adhesion failure. Ensure the dressing does not circumference the limb.

Appendix C - CVAD checklist and record

Patient Name	
date of Birth	
NHI	
(or sticker)	

Central Vascular Access Device Insertion Checklist & Record

Must be completed for ALL central line / Long line insertions on all patients (ONE per line)			
Insertion Details			
Date Line inserted _ _/_ _/_ _ _ _		**Time inserted** _ _:_ _	
Location of Procedure		**Insertion Site** **Right** ☐ **Left** ☐	
☐ NICU Waikato		☐ Saphenous	☐ Jugular (int/ext)
☐ Theatre		☐ Cephalic	☐ Femoral
☐ other _____		☐ Basilic	☐
		☐ UAC	☐ UVC
Catheter Details			
Type ☐ umbilical line		No of Lumens	☐ single
☐ Nutriline			☐ double
☐ Premicath			
☐ Epicutaneo Cath			
Internal Length measured		**Product Label**	
CVAD at skin _ _._ cm			
UAC at stump _ _._ cm			
UVC at stump _ _._ cm			
Position check and documented in patient's clinical record			
Placement confirmed by X-Ray Yes ☐ No ☐		Line Ready for use? Yes ☐ No ☐	
Location of tip on X-Ray:		Signature _____	

Insertion Bundle (to be completed by observer & signed by proceduralist & observer			
		Yes	No
1. Environment prepared			
2. Performed Hand Hygiene using chlorhexidine 4% wash for 2 minutes			
3. Skin preparation: chlorhexidine 2% (>1000g) ☐ Chlorhexidine 0.1% (<1000g) ☐			
4. Maximum barrier precautions			
	Hat		
	Mask		
	Sterile gown		
	sterile gloves		
5. Large sterile drape that covers entire patient			
6. Sterile procedure maintained during procedure and when applying dressing			

Proceduralist Name		**Proceduralist Signature**	
Designation			
Observer Name		**Observer Signature**	
Designation			

If there is a breach of sterile technique at ANY time, catheter placement should STOP IMMEDIATELY and the practice must be corrected before recommencing.

Patient Name	
date of Birth	
NHI	
(or sticker)	

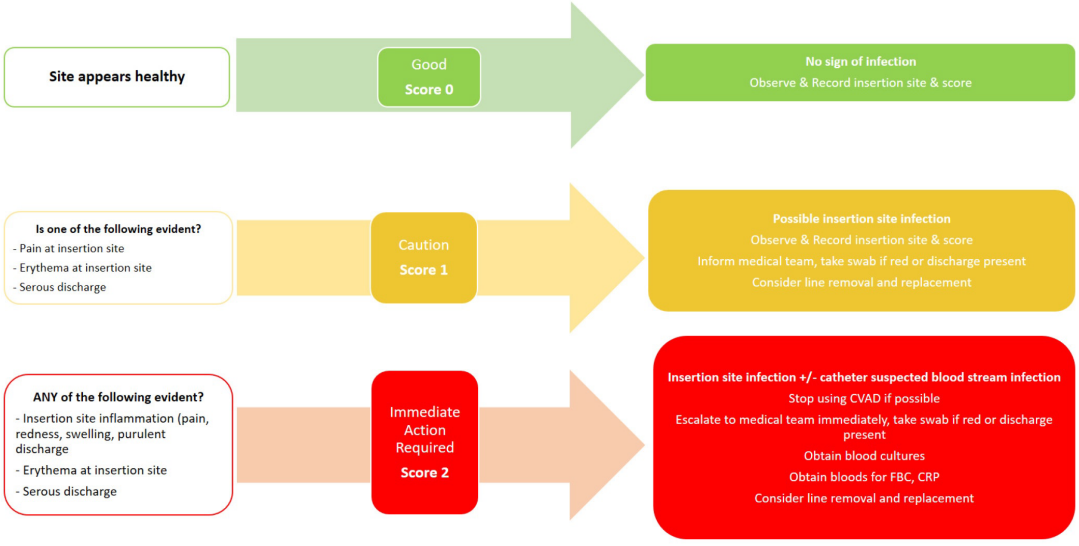
Central Vascular Access Device Insertion Checklist & Record

This form is to be completed by Medical Team as a daily record of CVAD management

Date Line inserted _ _/_ _/_ _ _ _	**Time inserted** _ _:_ _

Date	Time	CVAD still required? Y/N	Purpose **PN** (Parenteral nutrition) **Abx** (antibiotics) **FL** (fluids) **M** (medication)	Dressing Integrity **Mild** (Only edges lifted, address within 6 hours) **Mod** (Dressing compromised but CVAD not exposed, Immediate redressing) **Severe** (CVAD exposed, remove CVAD)	Site observed / CLIPS Score	Date dressing changed	Signature

CLIPS (Central Line Infection Prevention Score)



Date Line Removed _ _/_ _/_ _ _ _	**Reason for Removal**

Patient Name	
date of Birth	
NHI	
(or sticker)	

Central Vascular Access Device Insertion Checklist & Record

This form is to be completed by Medical Team as a daily record of CVAD management.

Date Line inserted _ _/_ _/_ _ _ _	**Time inserted** _ _:_ _

Date	Time	CVAD still required? Y/N	Purpose PN (Parenteral nutrition) Abx (antibiotics) FL (fluids) M (medication)	Dressing Integrity Score **Mild** (Only edges lifted, address within 6 hours **Mod** (Dressing compromised but CVAD not exposed, redress immediately) **Severe** (CVAD exposed, remove CVAD)	Site observed / CLIPS Score	Date dressing changed	Signature

Date Line Removed _ _/_ _/_ _ _ _	**Reason for Removal**

Patient Name	
date of Birth	
NHI	
(or sticker)	

Central Vascular Access Device Insertion Checklist & Record

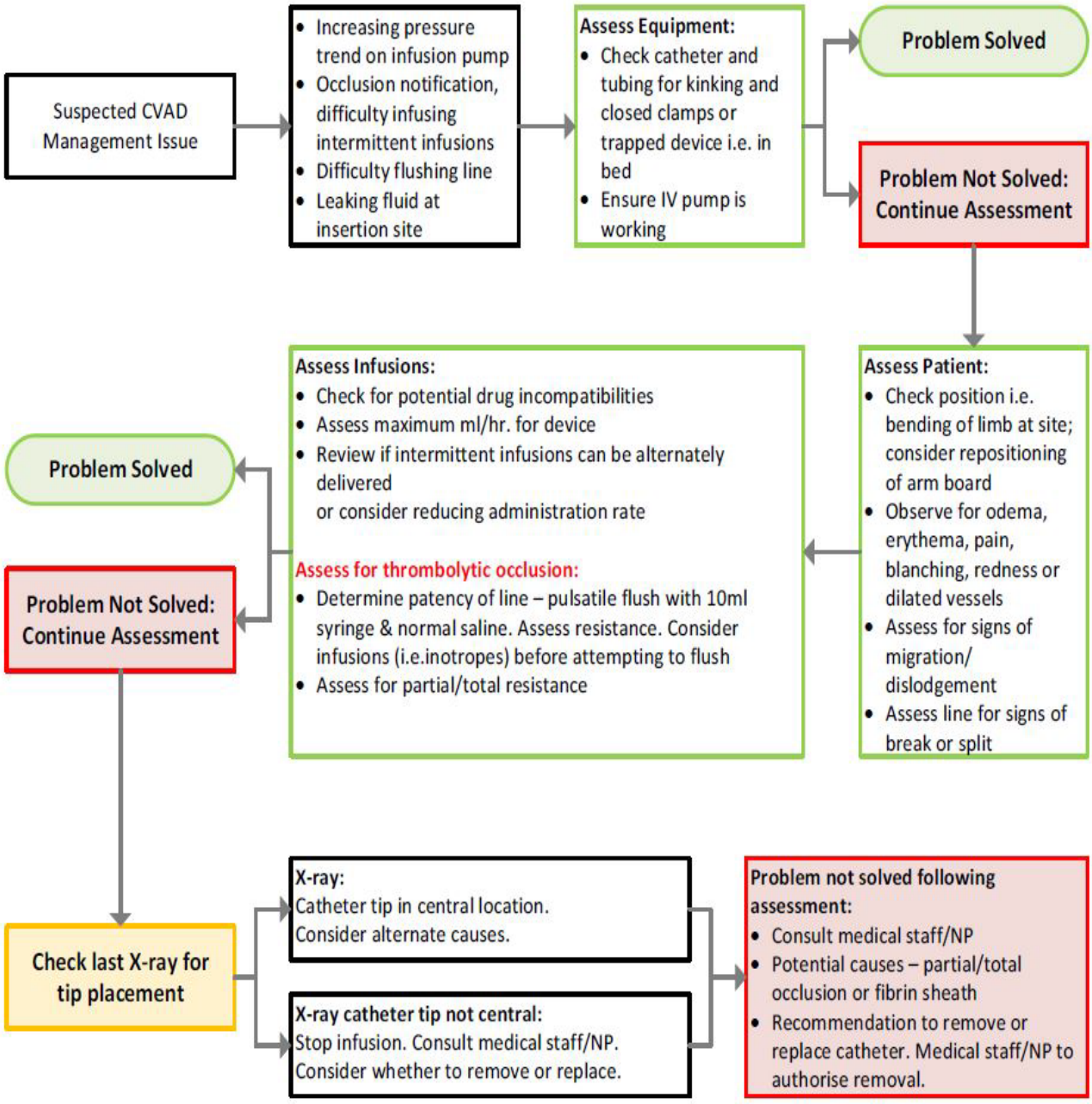
This form is to be completed by Medical Team as a daily record of CVAD management.

Date Line inserted _ _/_ _/_ _ _ _	**Time inserted** _ _:_ _

Date	Time	CVAD still required? Y/N	Purpose PN (Parenteral nutrition) Abx (antibiotics) FL (fluids) M (medication)	Dressing integrity	Site observed / CLIPS Score	Date dressing changed	Signature

Date Line Removed _ _/_ _/_ _ _ _	**Reason for Removal**

Appendix D - Troubleshooting flowchart



Troubleshooting Flowchart Modified from Earhart (2013)