

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

Protocol Responsibilities and Authorisation

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Target Audience	NNPs, CNSs, Registrars, SMOs & Nurses
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Protocol Review History

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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.
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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 Central Venous Access Devices (CVADs) in the Neonatal Intensive Care Unit (NICU) when used to provide prolonged total parenteral nutrition (TPN) or drug therapy for neonates.

1.2 Scope

Te Whatu Ora Waikato staff working in Neonatal Intensive Care Unit (NICU): Consultants, Registrars, Neonatal Nurse Practitioners (NNP) & Neonatal Nurse Specialists (NNS).

1.3 Patient / client group

Neonates and Infants in NICU.

1.4 Definitions

Aseptic non-touch technique (ANTT)	<p>Aseptic Non-Touch Technique (ANTT) is a technique that maintains asepsis and is non-touch in nature.</p> <p>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.</p> <p>For the purpose of this guideline the word “STERILE” will continue to be used to describe access to the CVAD.</p>
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
IV	Intravenous
Medical Staff	In NICU they include Neonatal Nurse Practitioner, Clinical Nurse Specialist, Registrar and Paediatricians.
NNP	Neonatal Nurse Practitioner
IVN	Intravenous nutrition used for preterm or term infants unable to tolerate enteral feeds for a prolonged period.
SMO	Senior Medical Officer

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1.5 Indications for Use

- Prolonged intravenous nutrition
- Long-term IV drug therapy
- Administration of hyperosmolar IV fluids i.e., dextrose 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 NNPs, CNSs, Paediatricians and Registrars experienced in CVAD insertion or under direct supervision from a trained professional.

CAVD 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
- Masks and caps x 2
- Sterile gloves x 2
- Sterile drape
- Neonatal I.A. line tray (sterile pack), or manufacturer supplied kit

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- CVAD inserted via the arm, measure from insertion site to the **sternal notch**
3. To reduce contamination of sterile field by through traffic, restrict access to nursery with door “STOP” signs and screens prior to commencing procedure
4. Consider methods of pain relief including
 - Swaddling of infant
 - Sucrose gel 66% if >1000g ([Sucrose Oral Liquid for Analgesia in Neonates and Infants](#) drug guideline)
 - Intravenous opioid ([Fentanyl for neonates](#) and [Midazolam for neonates](#) drug guidelines)
 - Intranasal midazolam ([Midazolam for neonates](#) drug guideline)
5. Both clinician inserting CVAD and assistant apply hair covering and mask
6. Clean trolley with antiseptic wipes or Hyposal
7. Perform hand hygiene with soap and water or alcohol-based hand rub
8. Open equipment and prepare a sterile field
9. Perform hand wash using 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).
10. Prepare the catheter by attaching a 10 ml syringe with 0.9% sodium chloride to catheter using a 3 way tap and flush to displace the air from the lumen and assess the integrity of the catheter prior to insertion. Flush through all lumens.
11. Position the infant
 - For arm insertion 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 leg insertion you may need to manipulate at the hip to get past the venous femoral confluence
12. Prepare the insertion site and surrounding skin with Chlorhexidine gluconate 2% skin swabs. If <1000g use sterile water. Begin at insertion site and swab in a circular motion for 30 seconds then allow at least 2 minutes to dry. Remove first pair of gloves.
13. 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.
14. Apply a sterile tourniquet 2-3 cm above insertion site if required.
15. 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.

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24. Secure the catheter as per 2.5

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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

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Prevention and management of complications is outlined in the following table
(See Appendix C for troubleshooting flowchart)

Problem	Prevention	Detection	Management
Occlusion	<p>Use positive pressure flushing techniques</p> <p>Flush line following drug administration</p> <p>Always run continuous infusion of $\geq 1\text{mL/hr}$ through PICC line</p> <p>Do not sample blood via PICC line</p> <p>Correct any obvious signs of mechanical obstruction</p>	<p>Change in capacity to infuse solutions</p> <p>Monitor for kinked CVAD or infusion lines</p>	<p>Check catheter is not clamped</p> <p>Attempt to reposition patient</p> <p>Inspect catheter for knots, bends migration</p> <p>Attempt to clear CVAD (pulsatile flush)</p> <p>Troubleshoot with senior RN/ NNP/Registrar</p>
Sepsis	<p>Hand hygiene</p> <p>Minimise line access</p> <p>Observe for signs of inflammation or discharge from insertion site (CLIP score)</p> <p>Ensure dressing is intact and free of exudate</p> <p>Remove CVAD when no longer required</p>	<p>Respiratory deterioration</p> <p>Increasing or new apnoea/bradycardia events</p> <p>Lethargy, poor feeding, hyperglycaemia, temperature instability</p> <p>Altered white blood cell count</p>	<p>Remove line if possible</p> <p>Obtain specimens for culture (urine, blood)</p> <p>Commence IV antibiotics</p> <p>Evaluate chest x-ray</p>
Phlebitis	<p>Observe insertion site for warmth, oedema and vein induration</p>	<p>Erythema and/or oedema at entry site</p>	<p>Elevate limb</p> <p>Check chemical properties of infusion. If chemical irritation likely, consider either slower administration or further dilution</p> <p>If no improvement after 24hours or phlebitis advances consider removal of line</p>
Thrombosis	<p>Check tip location on x-ray</p> <p>Detect inflammation and phlebitis early</p> <p>Secure catheter to prevent migration</p>	<p>Facial, neck and chest wall oedema or venous distension</p> <p>Respiratory deterioration</p> <p>Resistance to flushing</p>	<p>Treat thrombus with heparin or antithrombotic agent</p> <p>Consider removal of line</p>

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Catheter migration	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	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 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

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6. Aseptic non-touch technique – RBP. Clinical Practice Manual, Starship Children's Health, ADHB
7. Peripherally Inserted Central Catheters: Guideline for Practice, 3rd edition. National Association of Neonatal Nurses.
8. NQIP Infection Prevention and Control. Guideline for New Zealand Hospitals. Preventing ventral venous catheter-related bloodstream infections. December 2009.
9. Intravascular Devices Policy. Downloaded November 2021
10. northdevonhealth.nhs.uk/wp-content/uploads/2020/03/intravascular-Devices-Policy-v4.0.pdf
11. Central Venous Access Device (CVAD) Management in Neonates in the ICU environment. Practice guideline. The Sydney Children's Hospitals Network. Published 24/03/21

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Appendix A – Securing a Longline Central Vascular Access Device

Securing a Longline Central Vascular Access Device



Step 1: Secure near insertion site



Step 2: Loop and secure the catheter



Step 3: Cut a small rectangle of duoderm



EPI cath

Step 4: Position hub on duoderm and secure with steristrips. Line must exit distally




Nutriline



Step 5: Cover hub and line with tegaderm ensuring all tapes and insertion site covered. Not circumferential

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Appendix B – Central Vascular Access Device Insertion Checklist & Record.



Waikato District Health Board

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 <input type="checkbox"/> Left <input type="checkbox"/>		
<input type="checkbox"/> NICU Waikato		<input type="checkbox"/> Saphenous	<input type="checkbox"/> Jugular (int/ext)	
<input type="checkbox"/> Theatre		<input type="checkbox"/> Cephalic	<input type="checkbox"/> Femoral	
<input type="checkbox"/> other _____		<input type="checkbox"/> Basilic	<input type="checkbox"/>	
		<input type="checkbox"/> UAC	<input type="checkbox"/> UVC	
Catheter Details				
Type <input type="checkbox"/> umbilical line	No of Lumens		<input type="checkbox"/> single	
<input type="checkbox"/> Nutriline			<input type="checkbox"/> double	
<input type="checkbox"/> Premicath				
<input type="checkbox"/> 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 <input type="checkbox"/> No <input type="checkbox"/>		Line Ready for use? Yes <input type="checkbox"/> No <input type="checkbox"/>		
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) <input type="checkbox"/> sterile water (<1000g) <input type="checkbox"/>				
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.

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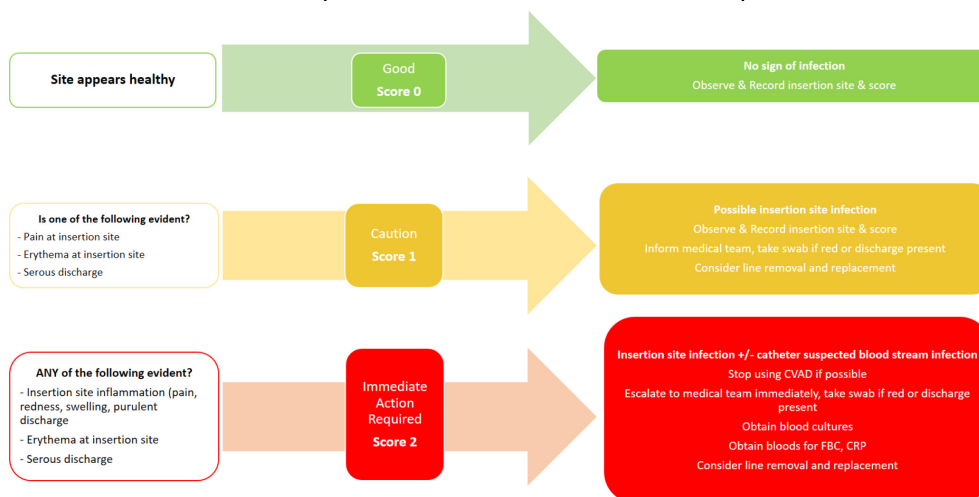
Patient Name	
date of Birth	
NHI	
(or sticker)	

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 ____:____[illegible]

CLIPS (Central Line Infection Prevention Score)



Date Line Removed _/_/_/

Reason for Removal

Patient Name	
date of Birth	
NHI	
(or sticker)	

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

Date Line inserted	/ /	Time inserted	:
--------------------	-----	---------------	---

[illegible]

Date Line Removed	Reason for Removal
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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	:
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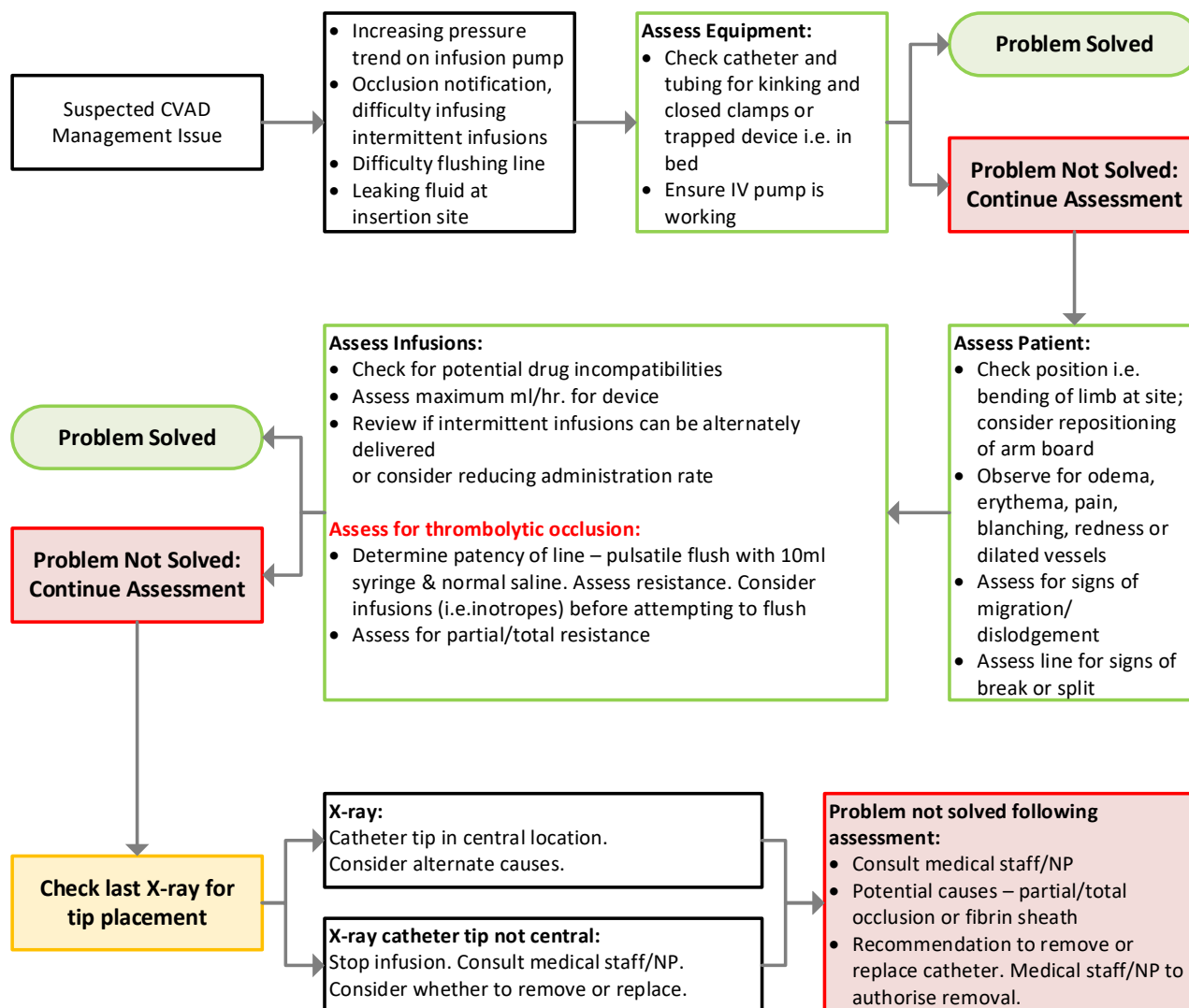
[illegible]

Date Line Removed	Reason for Removal
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Appendix C – Troubleshooting flowchart

The following flowchart is used to guide the assessment and management of central line occlusions.



Troubleshooting Flowchart Modified from Earhart (2013)