

BPG 01 - Central Venous Access Catheter Care Guideline

Statement of Best Practice

Patients with a central venous catheter (CVC) in situ will have care delivered safely, optimising their comfort and minimising adverse effects.

Introduction

A CVC is a wide-bore tube that is inserted into a major vein such as the internal jugular, subclavian or femoral vein. The device can have one to five lumens.

CVC insertion is indicated in patients who:

- Are critically ill and require additional monitoring to guide fluid administration
- Have poor peripheral access
- Require administration of drugs such as inotropes and vasopressors which should be given into a central rather than peripheral vein.
- Require the administration of long-term antibiotics and parenteral nutrition.

This guideline is divided into four sections

- Insertion
- Management (Daily care)
- Removal
- Education and training

Insertion

Prior to line insertion a full risk assessment will be required by the patients consultant to assess the patients individualised need for central venous access and benefits achieved to patient care, alongside the risks of the procedure and catheter remaining in situ.

- Communicate effectively to the patient by giving a full explanation of the procedure and providing reassurance, maintaining privacy and dignity at all times.
- Prepare the equipment needed for the procedure and assist medical staff (e.g. lines box / trolley) Ensure Aseptic Non-Touch Technique (ANTT) and infection control standards are adhered to at all times.
- The pressure bag prescribed 0.9% Sodium Chloride flush should be inflated to 300mm/Hg at all times to ensure patency of the of the catheter. The flush bag should be changed every 72 hours if the bag needs to be changed sooner the central monitoring set should be changed at the same time.
- In selecting an appropriate intravascular insertion site, assess the risks for infection against the risks of mechanical complications and patient comfort. Use the upper extremity for non-tunnelled catheter placement unless medically contraindicated.^{2,3}
- Position the patient appropriately according to site, patients bed should be in head down position to prevent air embolus

- Apply sterile, transparent, semi-permeable polyurethane dressing to cover the intravascular insertion site. (Consider the use of a chlorhexidine impregnated sponge dressing in adult patients with a central venous catheter as a strategy to reduce catheter related bloodstream infection.)³ Dressing to be dated.
- Identify a designated lumen of the catheter to administer lipid containing parenteral nutrition or other Lipid based solutions.³
- Check chest X-ray or line placement to verify position and exclude possible complications of insertion, ideally before use.
- Complete relevant documentation in accordance with Trust policy.

Management

- Calibration / re-zeroing should be performed at the start of each shift, a minimum of 8 hourly, or as required (positional change) placing the transducer height at mid-axillary point.
- Appropriate alarm limits should be set and clearly audible.
- Daily reassessment of line use and site assessment using appropriate documentation
- Transparent, semi-permeable polyurethane dressings should be changed every 7 days, or sooner, if they are no longer intact or if moisture collects under the dressing, using an Aseptic Non-Touch Technique (ANTT). (Use a sterile gauze dressing if a patient has profuse perspiration or if the insertion site is bleeding or leaking, and change when inspection of the insertion site is necessary or when the dressing becomes damp, loosened or soiled. Replace with a transparent semi-permeable dressing as soon as possible)³. Dressing to be dated.
- Use a single-use application of 2% chlorhexidine gluconate in 70% isopropyl alcohol (or povidone iodine in alcohol for patients with sensitivity to chlorhexidine) to clean the central catheter insertion site during dressing changes, and allow to air dry.³
- Administration sets in continuous use do not need to be replaced more frequently than every 96 h, unless device-specific recommendations from the manufacturer indicate otherwise, they become disconnected or the intravascular access device is replaced.³
- Administration sets for blood and blood components should be changed when the transfusion episode is complete or every 12 h (whichever is sooner).³
- Administration sets used for lipid-containing parenteral nutrition should be changed every 24 h.³
- Following infusion of or medication administration the lines should be aspirated and the flushed with 0.9% Normal Saline
- All Inotropes, vasopressors and potassium infusions should have a designated lumen for administration
- Complete relevant documentation in accordance with Trust policy

Removal

- Removal should be considered if there is a suspicion or evidence of infection. Appropriate samples taken for C&S according to Trust Trust policy.
- If lumens become occluded. Occluded lumens should be clearly labelled as blocked.
- If the line has been in situ for more than 7 days, line should be removed and replaced.
- If the line is no longer clinically indicated.

Procedure

- Communicate effectively to the patient by giving a full explanation of the procedure and providing reassurance, maintaining privacy and dignity at all times.
- Ensure ANTT and infection control standards are adhered to at all times.
- Correctly position the patient, the patient's bed should be placed head down.
- Patient if able to perform Valsalva manoeuvre if possible (The Valsalva manoeuvre is forced expiration of air against a closed glottis. This causes increased intra-thoracic pressure and decreases risk of air entering the subcutaneous exit tract. This can be achieved if the patient blows into a 20mL syringe with enough force to push the plunger back, or by the patient bearing down with catheter removal.)
If the patient is ventilated withdraw the catheter on the expiratory phase of the cycle.
- Apply pressure on removal and cover with a sterile air occlusive dressing.
- Complete relevant documentation in accordance with Trust policy

References

1. Critical Care National Network Nurse Leads (CC3N) National Competency Framework for Adult Critical Care Nurses. www.cc3n.org.uk
2. **Central Venous Pathway**, South Tees Hospitals
3. Loveday et al (2014) **epic3:National Evidence- Based Guidelines for Preventing Healthcare –Associated Infections in NHS Hospitals in England** Journal of Infection, 8651 s1-s70.
4. Mallet et al (2013) **Critical Care Manual of Clinical Procedures and Competence**. Wiley Blackwell

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CVC - Problem Solving

Problem	Cause	Prevention	Suggested Action
Arrhythmias	During CVC insertion the guide wire can enter the right atrium and cause arrhythmias	Use ECG monitoring during insertion so if arrhythmias occur the wire can be pulled back immediately	If arrhythmias are noted on the ECG on insertion of the guide wire immediately pull back the guide wire until the arrhythmia stops. Usually withdrawal of the guide wire will terminate the arrhythmia, but in some cases it may need to be treated by cardioversion or anti-arrhythmic medication.
Pneumothorax or Haemothorax	The needle used for locating the vein during CVC insertions can breach the pleura and cause a pneumothorax. If there is additional vascular injury this will cause a haemothorax	Ensure the use of ultrasound to guide the insertion of the CVC as this should minimise the risk of pneumothorax and haemothorax due to more accurate location of the vein to be cannulated.	A chest X-ray should be performed routinely following insertion.
Arterial Puncture	The artery is located adjacent to the vein in all sites used for the insertion of a CVC and so can be punctured accidentally instead of the vein.	Use of ultrasound to locate the vein to be used for CVC insertion	On identifying an arterial puncture, (blood will come back quicker, be pulsatile and bright red) the needle should be removed and pressure applied until the bleeding has stopped.
Nerve Injury	Nerves are found in close proximity to all the veins used in CVC insertion and so can be damaged during insertion of the needle to locate the vein.	Use of ultrasound to locate the vein to minimise the risk of damaging the nerve.	If awake patient may experience 'pins and needles' or numbness, in sedated patients may only become apparent at a later date. The area of altered sensation or weakness should be evaluated and documented and may require referral to a neurologist to evaluate further.
Air embolus	This is a risk during CVC insertion using the internal jugular vein and to a lesser extent the subclavian vein. If a patient is hypovolemic the venous pressure may be less than atmospheric pressure and so air can be sucked in via the needle or catheter.	The patient's bed should be placed head down so that the pressure in the vein to be cannulated is increased, hopefully to a level above atmospheric pressure. When the catheter is inserted it should be ensured that none of the lumens are left open to air.	The sign of a significant air embolism are cardiovascular collapse and cardiac arrest. If air embolism occurs, the patient's bed should be placed head down if not already done so and the patient tilted onto their right side. CPR should be commenced if cardiac output is lost.
Thrombosis of vein	The presence of a catheter in a vein for a prolonged period of time can lead to thrombosis of the vein.	Only have a CVC in situ for as long as clinically indicated	Remove CVC as soon as it is no longer required.

Adapted from Critical Care Manual of Procedures and Competence

Central Venous Catheter Care Pathway

Insertion

TRUST LOGO

Patient Sticker

Aim: To ensure patient safety is maintained and to ensure best procedural practice is attained with the intention of minimising the occurrence of catheter related blood stream infections.

When: Throughout all central venous placements, repositioning and maintenance.

By Whom: All Healthcare professionals responsible for the insertion, ongoing management and removal of CVC

Department	Procedure	Catheter Type	Insertion Site
Critical Care <input type="checkbox"/>	Elective <input type="checkbox"/>	Multi-lumen <input type="checkbox"/>	(please state)
Theatre <input type="checkbox"/>	Emergency <input type="checkbox"/>	Dialysis <input type="checkbox"/>	Tunnelled Line <input type="checkbox"/>
A & E <input type="checkbox"/>	Re-position <input type="checkbox"/>	PICC <input type="checkbox"/>	
Ward (state) <input type="checkbox"/>		Hickman <input type="checkbox"/>	
Radiology <input type="checkbox"/>		Other (state) <input type="checkbox"/>	
Before the procedure did the clinician :			YES NO (state reason below)
Wear a hat			<input type="checkbox"/> <input type="checkbox"/>
Use an Aseptic Non-Touch Technique (ANTT)			<input type="checkbox"/> <input type="checkbox"/>
Wear sterile gown and gloves			<input type="checkbox"/> <input type="checkbox"/>
Consider local anaesthetic			<input type="checkbox"/> <input type="checkbox"/>
During the procedure did the clinician :			YES NO (state reason below)
<ul style="list-style-type: none"> Skin preparation Chlorhexidine 2% with 70% Isopropyl Alcohol Leave to dry for minimum of 30 seconds 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Fully drape the patient in a sterile manner 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Use Ultrasound guidance with sterile sheath and lubricant 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Use appropriate CVC pack 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Maintain sterile field and effective aseptic technique 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Secure line with sutures 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Guide wire removal 			<input type="checkbox"/> <input type="checkbox"/>
After the procedure did the clinician :			YES NO (state reason below)
<ul style="list-style-type: none"> Appropriate clear view dressing with Chlorhexidine 2% with 70% Isopropyl Alcohol dressing applied 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Was sterility maintained during the application of the dressing? 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Was the dressing dated? 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Chest X-ray performed and correct position confirmed 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Check wave form of CVP trace on proximal lumen 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Aspirate and flush all lumen 			<input type="checkbox"/> <input type="checkbox"/>
<ul style="list-style-type: none"> Identify lumen for parenteral feeding 			<input type="checkbox"/> <input type="checkbox"/>
Please state comments and complications			
			Product Lot Number
Inserted By: Name Signature GMC/NMC		Assisted by: Name Signature GMC/NMC	

Central Venous Catheter Care Pathway

Management

Shift Assessments

- **Assess continued need for CVC – remove if needed**, after consultation with medical staff
- No routine replacement unless clinically indicated.
- Dressing intact – If not replace – aseptically / disinfect site with Chlorhexidine 2% with 70% Isopropyl Alcohol or routinely replace every 7 days
- Check all sutures are secure
- Check line for migration
- Transduce waveform on proximal lumen in critical care

Line Management

- Replace administration sets following the giving of blood or blood products
- Replace TPN and other lipid administration sets every 24hrs
- Replace all administration sets every 96 hrs
- Replacement multi-lumen connectors every 6 days please try and coincide these changes with administration set changes.
- All administration sets/lines and multi-lumen connectors to be dated and labelled with the drugs administered
- Transducer lines and NaCl 500ml to be changed every 72 hours and to be dated
- Transducer pressure bag set at 300mgHg and line patent
- Transducer to be zeroed once a shift.

All Catheter Manipulations

- Hand hygiene prior
- Clean apron and clear pair of non-sterile gloves
- Aseptic Non-Touch Technique (ANTT)
- Disinfect all ports and hubs with Chlorhexidine 2% with 70% Isopropyl Alcohol impregnated wipes and allow to air dry for 30 seconds.

Dressing Changes

Date	Reasons (Please state)	Signature	PIN/NMC

Central Venous Catheter Care Pathway

Visual Infusion Phlebitis Score VIPs

Observations, signs and symptoms	Score	Action
IV site appears healthy. No pain	0	No signs of phlebitis: OBSERVE CANNULA
One of the following is evident: <ul style="list-style-type: none"> • Slight pain near IV site • Slight redness near IV site 	1	Possible first signs of phlebitis: OBSERVE CANNULA
Two of the following are evident: <ul style="list-style-type: none"> • Pain at IV site • Erythema • Swelling 	2	Early stages of phlebitis LIASE WITH MEDICAL TEAM CONSIDER REPLACING/RESITING CANNULA
All of the following signs are evident: <ul style="list-style-type: none"> • Pain along path of the cannula • Erythema • Induration 	3	Medium stages of phlebitis: LIASE WITH MEDICAL TEAM RESITE CANNULA CONSIDER TREATMENT
All of the following signs are evident and extensive: <ul style="list-style-type: none"> • Pain along path of the cannula • Erythema • Induration • Palpable venous cord (if venous line) • Pus 	4	Advanced stage of phlebitis or the start of thrombophlebitis: LIASE WITH MEDICAL TEAM RESITE CANNULA INITIATE TREATMENT COMPLETE INCIDENT FORM
All of the following signs are evident and extensive: <ul style="list-style-type: none"> • All of the above plus • Pyrexia • Tissue damages 	5	Advanced stage of thrombophlebitis: LIASE WITH MEDICAL TEAM RESITE CANNULA INITIATE TREATMENT COMPLETE INCIDENT FORM

Each shift record the VIPs and initial chart to verify compliance with the care pathway.

VIP Score Chart

DOES THE PATIENT STIL NEED A CENTRAL LINE?

		Insertion Day	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Date								
Day	Score Initial	/	/	/	/	/	/	/
Night	Score Initial	/	/	/	/	/	/	/
Date		Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Date								
Day	Score Initial	/	/	/	/	/	/	/
Night	Score Initial	/	/	/	/	/	/	/
Date		Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
Date								
Day	Score Initial	/	/	/	/	/	/	/
Night	Score Initial	/	/	/	/	/	/	/

Central Venous Catheter Care Pathway

Removal

Line Removal				
Place of removal	Date	Requested Time removed	Actual time line removed	Number of days in situ:
Was the line removed within 2-4 hours of decision? Yes <input type="checkbox"/> No <input type="checkbox"/> If 'NO', why?		Line infected at any time? Yes <input type="checkbox"/> No <input type="checkbox"/> Details:		Reasons for removal:
Care management on removal				
Requirements	Yes	No	If answer 'NO' please give reason	
Hand Hygiene	<input type="checkbox"/>	<input type="checkbox"/>		
Patient laid flat	<input type="checkbox"/>	<input type="checkbox"/>		
Aseptic Non-Touch Technique	<input type="checkbox"/>	<input type="checkbox"/>		
Chlorhexidine 2% with 70% Isopropyl Alcohol	<input type="checkbox"/>	<input type="checkbox"/>		
Occlusive dressing	<input type="checkbox"/>	<input type="checkbox"/>		
Removal on expiration	<input type="checkbox"/>	<input type="checkbox"/>		
If line infection suspected:	Yes	No		
Site swab sent (if clinically indicated)	<input type="checkbox"/>	<input type="checkbox"/>		
Complications:				
Removed by – print name	Signature		GMC/NMC number	
New line sited	Yes		No	
Same site	Yes		No	

If catheter replaced - please commence a new Central Venous Catheter and Insertion Pathway

References:

Bion J. et al Matching Michigan, a 2-year stepped interventional programme to minimise central venous catheter blood stream infections in intensive care units in England. *BMJ Qual Saf* pub online Sept 20, 2012

Epic3 National Evidence Based Guidelines for preventing HAI's in NHS Hospitals England, *Journal of Hospital Infection* 2014