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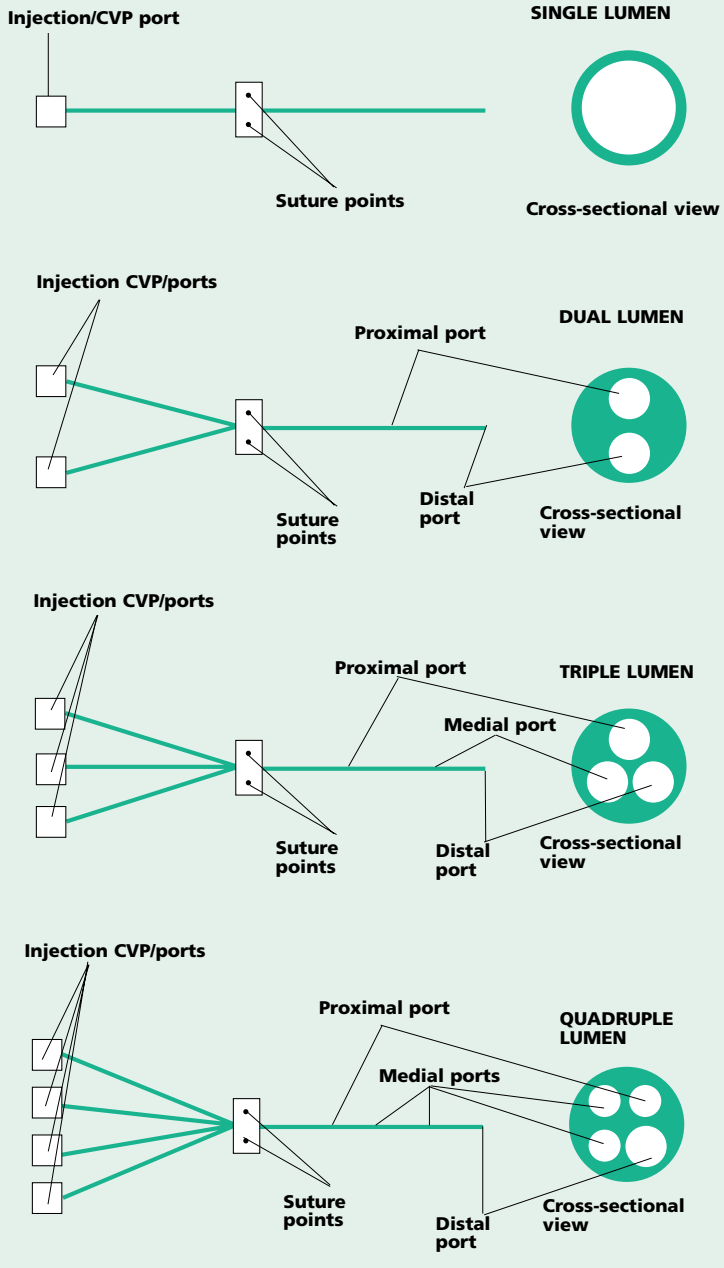
QUICK REFERENCE GUIDE 6

**A monthly series of quick reference guides to tear out and keep. Whether you are a student nurse, need to update your skills or are teaching others the guides will be a useful aid to your practice**

# Central venous lines

Central venous lines, commonplace in intensive therapy units, are being used more frequently with acutely ill patients on general medical and surgical wards. This guide covers the care associated with insertion and removal of central venous catheters and the risks associated with their use.

## Single and multilumen catheters




## 1. RATIONALE FOR USE

Central venous lines have several uses:

- Measurement of central venous pressure (CVP) (indicator of heart's effectiveness as a pump, circulating blood volume, patient's vascular tone, and patient's response to treatment)
- Diagnosis (eg. evidence of underlying cardiac pathology such as cardiac failure)
- Drug administration of preparations harmful to smaller lumen peripheral veins (eg. potassium chloride and dopamine) or in the absence of suitable peripheral access
- Fluid administration (eg. rapid infusion of a high volume of fluid in hypovolaemia)
- Insertion of a pacing wire.

Single and multi-lumen catheters are available. The type to be used should be decided prior to insertion depending on the range of uses anticipated (eg. multiple drug and fluid administration). Catheters have openings at different positions along their length:

- Proximal (nearest patient's external surface)
- Medial (in the middle)
- Distal (furthest away from patient's external surface).

This decreases the risk of drug and fluid incompatibilities which can be harmful to the patient.

Catheters also have clamping devices or 'on-off' switches, used when disconnecting lines to prevent air emboli formulation.

## 2. CENTRAL VENOUS LINE INSERTION

The aim is to place a catheter into the superior or inferior vena cava, just above the right atrium. The sites of choice are the:

- Subclavian vein
- Jugular vein.

These allow easiest access and impede patient mobility least. Other potential sites are the:

- Brachial vein
- Femoral vein
- Median basilic vein.

For these sites, catheters of varying lengths must be used to achieve the final position.

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Patient preparation is vital for what can be a relatively long and potentially frightening procedure. Explanations and reassurance must be given to the patient prior to and during the procedure.

These should continue subsequently, during catheter site care, measurement of CVP and drug or fluid administration.

Practical preparation involves lying the patient flat and raising the foot of the bed (to promote upper venous engorgement making it easier to puncture the vessel).

A strict aseptic technique is used for the procedure of insertion.

The catheter is fixed in place with sutures and the entry site covered with a clear dressing, to allow easy observation without increasing the risk of infection. The catheter's position is verified by X-ray – catheters have a radio-opaque strip for this purpose.

## 3. MEASURING CVP

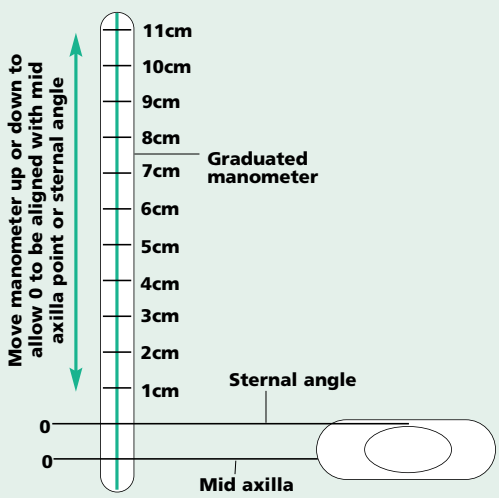
Several readings are necessary to provide an indication of the patient's response to treatment.

Measurements can be taken at two points
- At the sternal angle
- At the mid axilla point.

The site chosen should be marked on the patient's skin. The patient can be positioned in one of two ways, depending which is most comfortable:
- Lying flat
- At a 45 degree angle.

Whichever combination is chosen should be recorded so that all subsequent measurements are taken in the same position. This ensures consistency between measurements.

**Placement of manometer to measure central venous pressure**




Measurements are in centimetres of water using a graduated water manometer.

The procedure for measurement is:
- Zero the manometer (to remove extraneous pressures and equalise with atmospheric pressure)
- Fill manometer with solution (eg. normal saline) using a three-way tap
- Close off tap from solution bag
- Open tap to patient
- Observe the falling fluid level in the manometer
- Record the mean level (the fluid level will 'swing' between a high and a low level and the middle point is usually taken as the central venous system pressure).

Normal CVP range is:
0 to 5cm $H_20$ (sternal angle)
5 to 10cm $H_20$ (mid axilla point).

## 4. COMPLICATIONS

Problems from insertion include:
- Pnuemo- or haemopneumothorax caused by puncture of lung (via subclavian or jugular vein)
- Cardiac tamponade caused by puncture of heart
- Cardiac dysrhythmia from over-insertion of catheter tip into right atrium causing irritation
- Misplacement (during insertion or subsequent use) causing problems with fluid infusion or CVP measurement.

Problems occurring during use:
- Infection
- Air emboli can develop if any connection is loose
- Abnormal cardiac rhythms can result from rapid infusion of cold fluid
- Haemorrhage, especially in patients receiving, or who have received, thrombolytic therapy.

## 5. NURSING CARE

Acutely ill patients are more susceptible to infection. Strict aseptic technique is vital to prevent infection during:
- CVP measurement
- Connection of an infusion device
- Connection of a syringe for bolus drug dose administration.

Keeping central line handling to a minimum also helps reduce risk.

Nurses should monitor patients, catheters and infusions to ensure unrestricted flow of fluids. Regular flushing of the line may be prescribed.

Catheter removal is usually performed by the nurse. Explanation and reassurance are once again required, and the catheter is removed with the patient lying flat (if tolerated) and the foot of the bed elevated. Pressure is applied to the insertion site until bleeding has stopped.

The catheter tip is usually cut off using sterile scissors and sent for microbiological examination.

## Further reading

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