



Clinical Practice Procedures: Access/Intravenous – Central venous catheterisation (subclavian vein)

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Date	July, 2022
Purpose	To ensure a consistent procedural approach to intraosseous – Central venous catheterisation (subclavian vein)
Scope	Applies to Queensland Ambulance Service (QAS) clinical staff.
Health care setting	Pre-hospital assessment and treatment.
Population	Applies to all ages unless stated otherwise.
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Author	Clinical Quality & Patient Safety Unit, QAS
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Intravenous – Central venous catheterisation (subclavian vein)

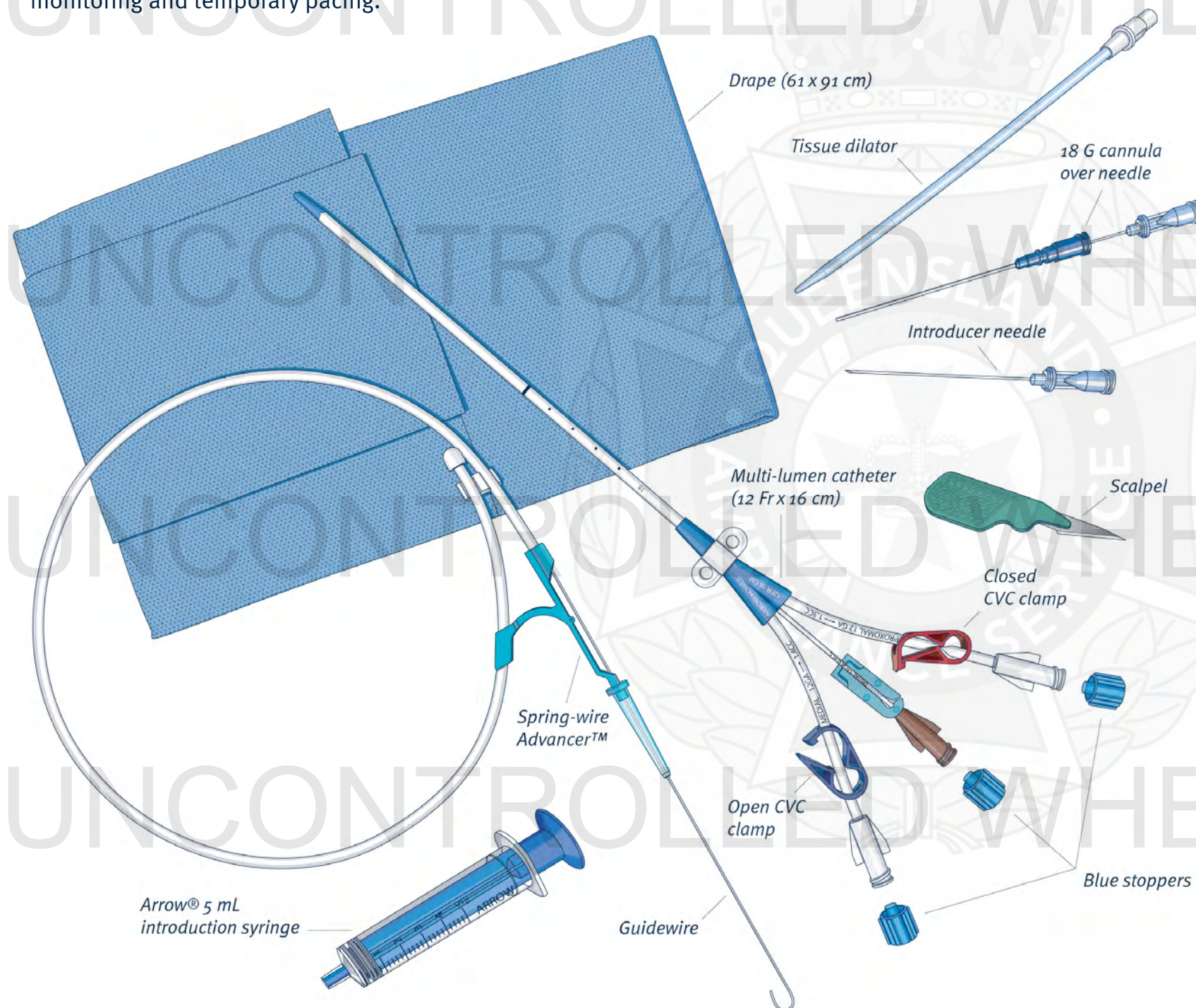
July, 2022

Central venous catheters (CVC) are multi-lumen devices inserted into a large central vein, that provide specific advantages over peripherally inserted venous catheters (PIVC). They can be used to establish vascular access where PIVC is difficult and allow the administration of medications that are contraindicated peripherally, such as prolonged use of inotropes and other vascular irritant drugs. In some cases, CVCs are also used for renal replacement therapy and as a conduit for invasive monitoring and temporary pacing.

In the pre-hospital environment, large bore CVCs have been successfully used for the rapid administration of blood and fluid products in critically unwell patients, where peripheral or intraosseous access is inadequate or has failed.^[1,2]

The subclavian vein is the recommended site for cannulation in this cohort of patients, due to its reliable anatomical landmarks (negating the need for ultrasound guided insertion) and maintained patency even in profound hypovolaemia.^[3]

The femoral vein may be chosen in certain patient groups, where subclavian access is difficult or contraindicated. The use of the femoral vein must be balanced against the chances of significant intra-abdominal injury that may involve the inferior vena cava, thus complicating attempts at fluid resuscitation.



Indications

- Requirement for large volume fluid resuscitation, where peripheral or intraosseous access is inadequate or has failed.

Contraindications

- Appropriate and patent peripheral or intraosseous access already sited
- Agitated or uncooperative patients
- Whenever possible, avoid sites of burns, infection or significant trauma

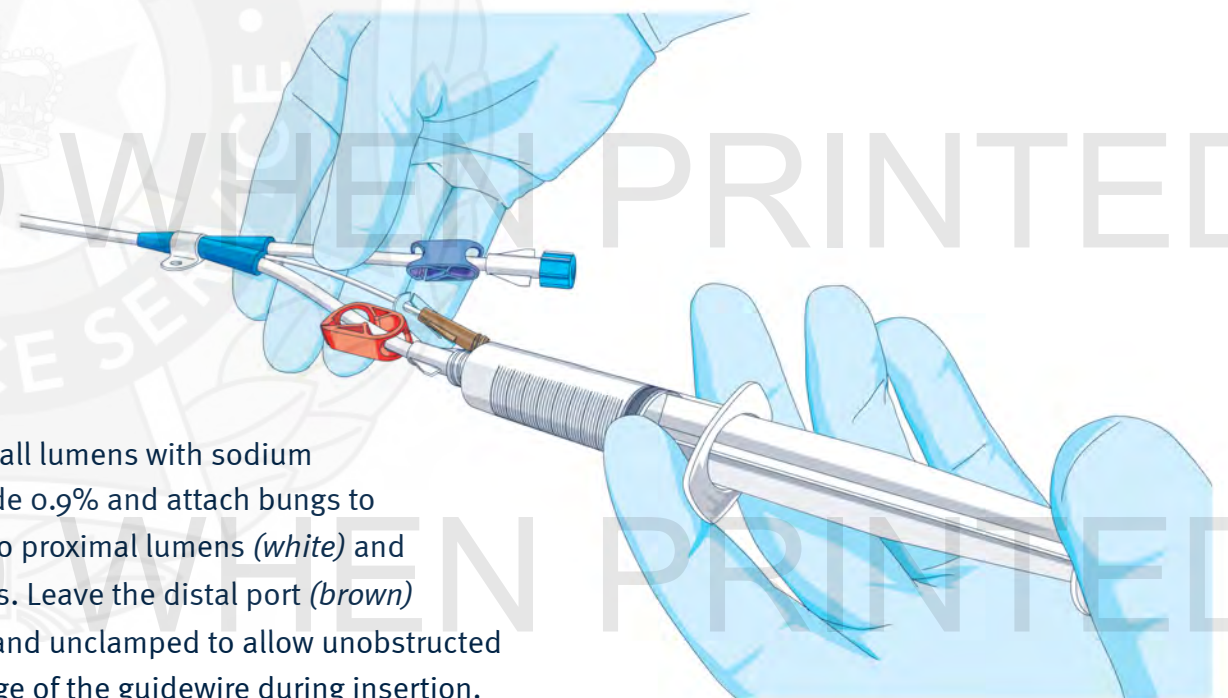
Complications

- Malposition
- Local or systemic infection
- Haemorrhage
- Arterial puncture or vessel damage
- Arterio-venous fistula
- Pneumothorax
- Arrhythmia
- Air embolus
- Thrombosis

PROCEDURE

1. Apply required infection control measures (refer to the *QAS Infection Control Framework*).
2. If possible, position the patient flat or head down to reduce the risk of air embolus.
3. Perform appropriate hand hygiene.
4. Open a sterile dressing pack onto a clean flat surface.
5. Open and place the following equipment on the dressing packs' sterile field:
 - a. 1 x 10 mL sodium chloride 0.9% (place this in an empty dressing pack container);
 - b. 1 x 10 mL syringe;
 - c. 3 x BD SmartSite™ Needle Free Valves (bungs);
 - d. 1 x 3 mL ChloraPrep™ (with tint) applicator (2% w/v chlorhexidine gluconate/ 70% w/v isopropyl alcohol); and
 - e. 1 x Tegaderm™ I.V. Advanced (10 cm x 12 cm) securement dressing.
6. Open the sterile ARROW® Large-Bore Multi-Lumen Central Venous Catheterisation Set and place it adjacent to the sterile field.
7. Perform appropriate hand hygiene and don sterile gloves (refer to *CPP: Other/Donning and doffing medical gloves*).

8. Prime all lumens with sodium chloride 0.9% and attach bungs to the two proximal lumens (*white*) and clamps. Leave the distal port (*brown*) open and unclamped to allow unobstructed passage of the guidewire during insertion.

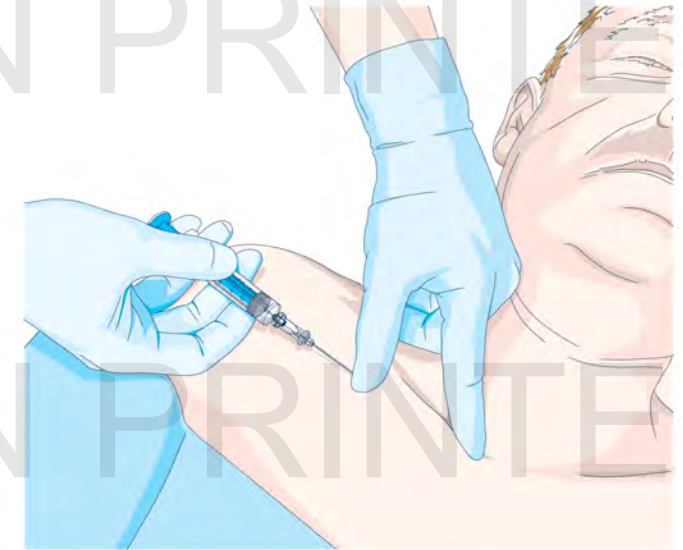


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9. Identify the landmarks for the point of insertion, approximately 1 cm infero-lateral to the transition between the middle and medial third of the clavicle.
10. Prepare the insertion site with a BD Chloraprep™ cutaneous solution applicator:
 - a. *Squeeze* – hold with the sponge facing downward, and gently squeeze the wings.
 - b. *Prime* – saturate the sponge by repeatedly pressing gently against the skin in the treatment area.
 - c. *Apply* – apply the solution in a thorough and systematic circular motion, cleaning outwards to a 20 cm diameter.
 - d. *Dry* – allow the solution to dry naturally.



11. Apply the sterile drape to the patient.
12. Attach the blue syringe to the introducer needle and insert it into the skin with the bevel facing upward. Once through the skin, maintain a very shallow angle (5–10 degrees) while using the non-dominant thumb to apply downward pressure to the skin over the needle, to gently guide it under the patient's clavicle.



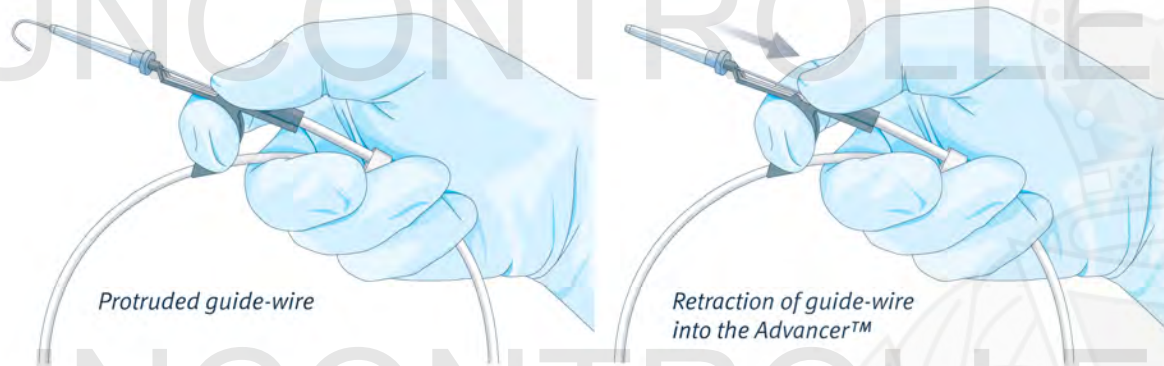
13. With a shallow angle, slowly advance the needle toward the sternal notch while drawing back on the syringe, until a flashback of blood is observed. If the first pass is unsuccessful, withdraw the needle without exiting the skin, and slightly redirect it in a more cephalad direction until flashback is achieved.



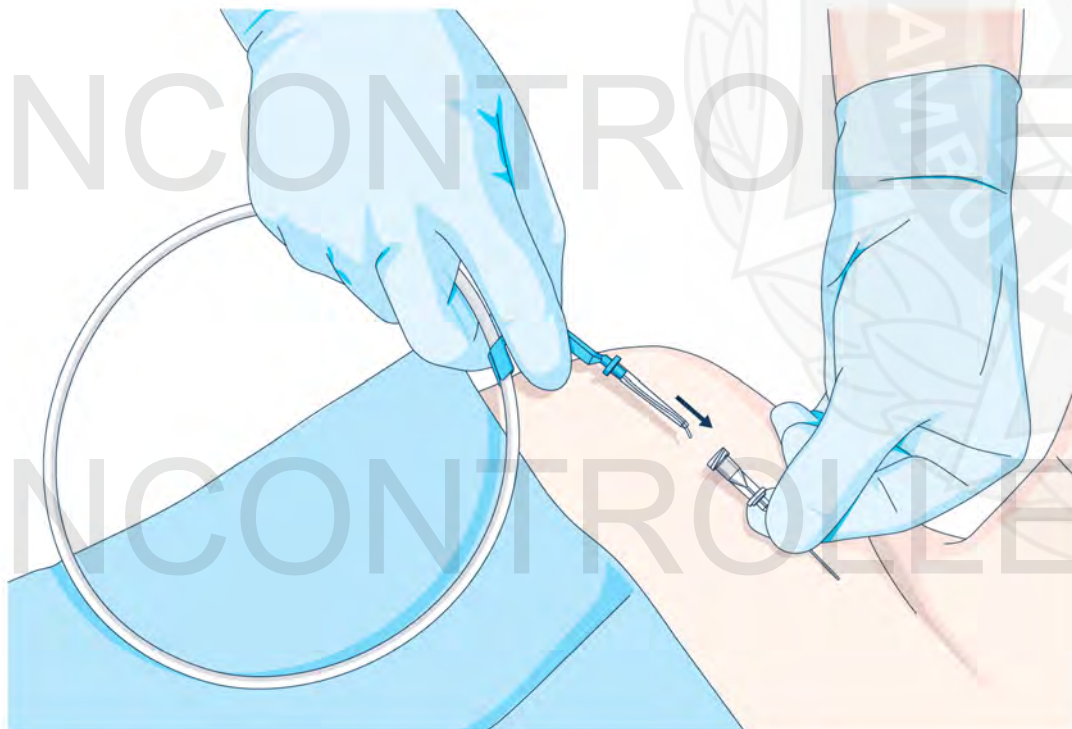
14. Using the non-dominant hand, support the needle in position while removing the syringe. A continuous trickle of blood confirms the needle is still positioned intra-vascularly. Occlude the end of the needle with a gloved finger to prevent an air embolism before guidewire insertion. If arterial puncture is suspected, remove the needle and apply firm pressure (5 minutes).

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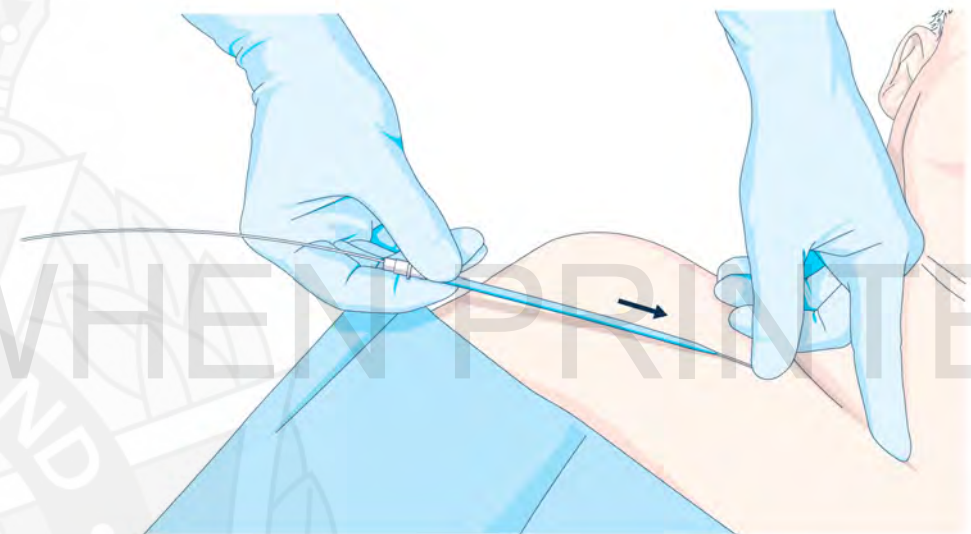
15. Confirm venous placement by observing the colour and plasticity of the blood, and ultrasound confirmation of wire placement.
16. Using your thumb, straighten the “J” by retracting the guide-wire into the Advancer™.



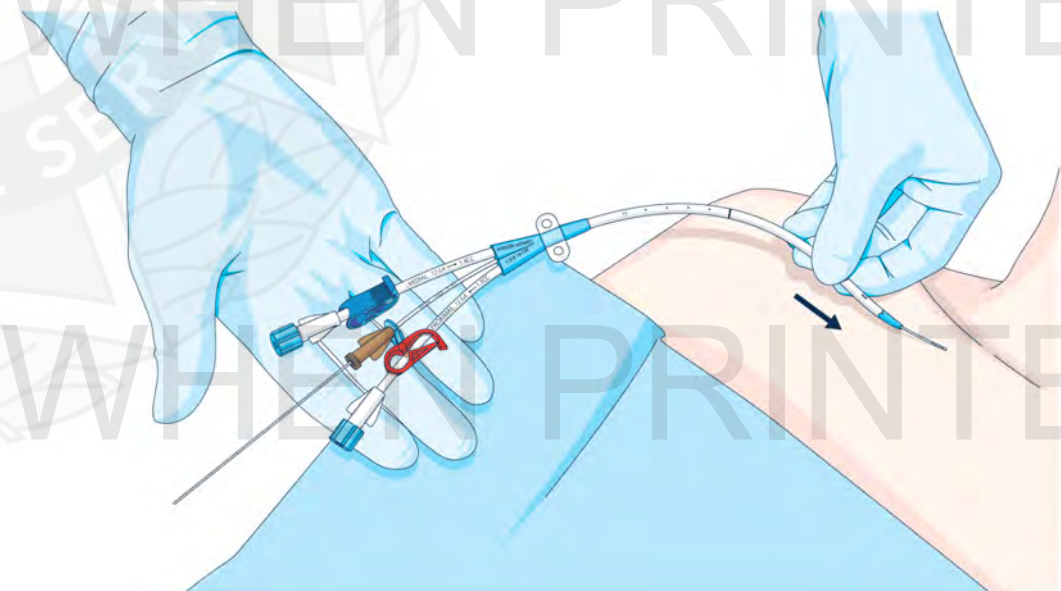
17. Insert the guide-wire through the needle and advance it until the double band (20 cm) marker is level with the proximal needle port. The presence of premature ventricular beats (PVCs) or other arrhythmia(s) suggests the wire is positioned in the right ventricle and should be withdrawn slightly until cessation of PVCs.



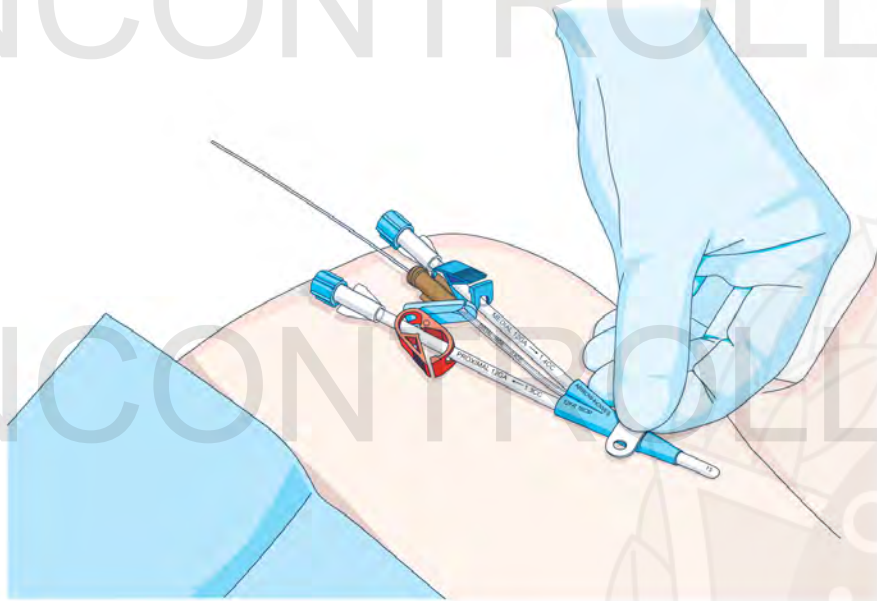
18. While supporting the wire, remove and safely discard the needle.
19. Using the supplied scalpel with the blade upright, make a small stab incision in the skin at the wire entrance, taking care not to transect the wire.
20. Feed the dilator over the wire and advance it through the skin to a depth that allows dilation of the subclavian vein.



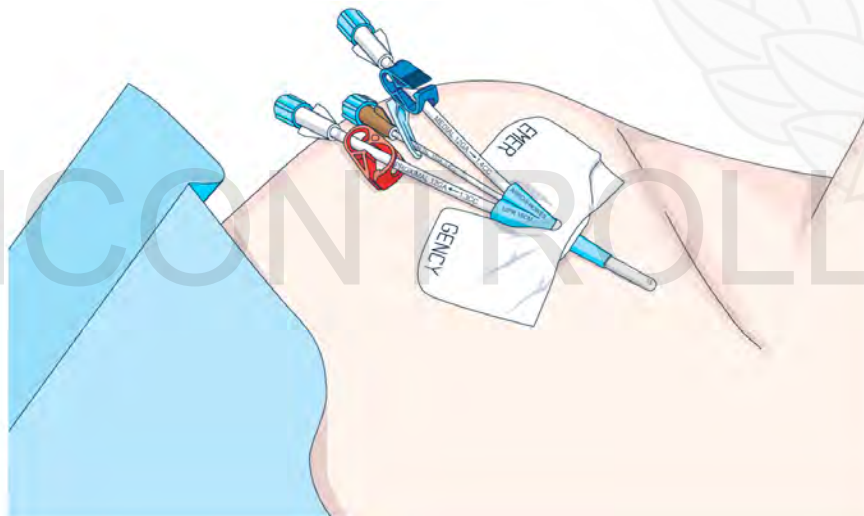
21. Remove the dilator and feed the CVC over the wire while ensuring the distal lumen port is unclamped, to allow the wire to exit.



22. Confirm the wire tip has protruded from the end of the CVC and support it with one hand before advancing the CVC further, to prevent inadvertent wire embolism.
23. Insert the CVC to an appropriate depth for the patient (suggested internal length in an average-sized adult is – Right: 14 cm / Left: 17 cm).^[4]



24. Remove the guide-wire (ensure completeness) and aspirate the lumen (*brown*) with a syringe until flashback of blood confirms correct position of the CVC. Flush the lumen with sodium chloride 0.9% and attach the remaining bung.
25. Secure the CVC to the skin with the Tegaderm™ dressing to prevent dislodgement by traction. Consider additional methods if necessary (e.g. sutures).



+ Additional information

- The potential for exposure to blood and body fluids during this procedure is **HIGH**. All precautions that serve to minimise risk to the clinician and patient must be applied.
- Eye protection must be worn by all clinicians.
- The pre-hospital insertion of a CVC is an infrequent procedure only used for patients with life-threatening illnesses. In these life-threatening situations, the requirement to confirm correct venous positioning of wire placement by ultrasound confirmation prior to dilation may be impractical.
- The right subclavian vein is the preferred site, although consideration should be made to insertion on the side with an ipsilateral decompressed chest injury, as this will negate the complication of a pneumothorax.
- Consider local anaesthetic infiltration before commencing the procedure in the awake patient, as clinically indicated (refer to *DTP: Lidocaine 1% (lignocaine 1%)*).
- Pulsatile or high-pressure blood flow from the needle after insertion may signal inadvertent puncture of the subclavian artery, and the needle should be removed immediately.
- In the intubated patient, if clinically appropriate, consider a short period of pausing ventilations during needle insertion, as this may reduce the risk of iatrogenic pneumothorax.^[5]