How to undertake venepuncture to obtain venous blood samples

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Rationale and key points
Venepuncture and obtaining accurate blood samples is an important procedure in healthcare, and can assist in the diagnosis, care and treatment of patients. This article outlines the procedure for undertaking venepuncture and obtaining venous blood samples. It emphasises the importance of undertaking a visual assessment of the patient’s skin and palpating the veins to identify a suitable site for venepuncture.

» The optimal sites for venepuncture are the veins in the antecubital fossa – the cephalic, basilic and median cubital veins. A suitable vein will be ‘bouncy’ to the touch, have no pulse and refill when depressed.

» Venepuncture can be undertaken using either a needle or a butterfly device with safety system, depending on which site is selected. The size of needle used will also depend on the venepuncture site.

» Before undertaking the procedure, it is essential to check the blood sample request form for the samples required and the healthcare organisation’s policy for the order of draw.

Reflective activity
‘How to’ articles can help update your practice and ensure it remains evidence-based. Apply this article to your practice. Reflect on and write a short account of:

1. How you think this article will change your practice when performing venepuncture and obtaining blood samples.

2. How you could use this resource to support your colleagues to perform venepuncture and obtain blood samples effectively.

Keywords
blood samples, palpation, phlebotomy, vein assessment, venepuncture, venous access

Preparation and equipment
» To undertake venepuncture and obtain blood samples, healthcare practitioners must have completed appropriate training and undertaken supervised practice and a final assessment to confirm competence. Aseptic non-touch technique should be used throughout the procedure.

» It is important that healthcare practitioners have knowledge of the anatomy of veins, arteries, tendons and nerves. The optimal sites for venepuncture are the veins in the antecubital fossa – the cephalic, basilic and median cubital veins (Dougherty and Lister 2015). In the forearm, the cephalic, basilic and accessory cephalic vein will provide sufficient blood samples. The metacarpal veins of the hands may also be used in older adults; however, these veins can be challenging to anchor because of reduced subcutaneous tissue and reduced skin turgor (elasticity of the skin) (Dougherty and Lister 2015). Figure 1 shows the main veins of the arm.

» The median cubital vein crosses over the brachial artery and radial nerve; therefore, if using this site for venepuncture, healthcare practitioners...
should take care not to puncture the artery or touch the nerve (Dougherty and Lister 2015). In addition, they should be aware that the needle should be inserted above or below the valves in the vein, which may be seen or palpated and feel like a ‘hard pea’. If the needle is inserted into a valve, there will be an initial splash of blood when the blood collection tube is inserted into the needle holder, but no further blood as the valve closes over the needle tip. If this occurs, it may be possible to gently advance or reposition the needle to clear the valve (Hoke 2015); if not, the blood collection tube will have to be removed, the tourniquet released, the needle removed and pressure applied to the site with gauze.

» When undertaking venepuncture, healthcare practitioners should use either a 21 gauge (g) or 22g needle or a 21g or 23g butterfly device with safety system, also known as a winged blood collection set, depending on which vein is selected. The 21g needle is the standard size, while a 22g needle enables access to fragile veins, which are often seen in older adults (Dougherty and Lister 2015). A butterfly device should be used for small veins and metacarpal veins; the 21g size is usually used to obtain blood samples, while the 23g size is appropriate for small, fragile veins (Hoke 2015).

» The healthcare practitioner should check the patient’s medical and vascular history before undertaking the procedure. They should ask the patient if there is any reason why an arm cannot be used for venepuncture, and if they have any allergies.

» The healthcare practitioner should confirm the patient’s identity verbally and by checking the patient identification wristband, and introduce themselves. They should explain the procedure to the patient, discuss any concerns or fears the person may have, and obtain their consent for the procedure. The healthcare practitioner should ensure the patient is in a comfortable position and relaxed, and use positive language about the procedure to reduce any anxiety (Mackereth and Tomlinson 2014).

» The healthcare practitioner should check the equipment seals are unbroken and within use-by dates. They should clean a venepuncture trolley, tray or surface with a detergent wipe or as per local policy, and arrange the equipment, including:

- Blood sample request form.
- Specimen bag.
- Gloves.
- Disposable apron.
- Alcohol gel.
- Tourniquet – as per local policy.
- 2% chlorhexidine gluconate in 70% isopropyl alcohol or 70% isopropyl alcohol – as per local policy.
- Needle holder.
- 21g or 22g needle or a 21g or 23g butterfly device with safety system.
- Blood collection tubes and spare tubes.
- Gauze swabs and dressing tape, or plasters.
- Sharps bin.
- Pen.
Procedure
Venepuncture using a needle
1. Wash your hands.
2. Put on a disposable apron. Cleanse your hands using alcohol gel and allow them to dry. Check your hands for skin breaks and ensure these are covered with a plaster.
3. Ask the patient to remove any items of clothing covering their arms, assisting them to do so if necessary.
4. Undertake an initial visual assessment of the patient’s skin and veins in both arms, observing for bruising, oedema and skin breaks.
5. Apply a tourniquet approximately 8cm above the venepuncture site – approximately three to four finger widths. Ensure the tourniquet is not too tight by checking that the patient has a radial pulse.
6. Assess and palpate the veins, in both arms if necessary. Locate a suitable vein by palpation with the tips of your fingers – do not use your thumb because it has a pulse. Try not to look at the vein when palpating because this will reduce your sense of touch (Dougherty and Lister 2015). A suitable vein will be bouncy to the touch, have no pulse and refill when depressed. A hard vein indicates the vein is thrombosed, and should not be used for venepuncture (Dougherty and Lister 2015).
7. Clean the venepuncture site using 2% chlorhexidine gluconate in 70% isopropyl alcohol or 70% isopropyl alcohol, as per local policy. Use a back and forth movement for 30 seconds, then allow to dry for 30 seconds.
8. Release the tourniquet.
9. Place the sharps bin on your dominant side, and ensure the blood collection tubes and gauze swab are within reach of your non-dominant hand.
10. Reapply the tourniquet and cleanse your hands using alcohol gel, allowing them to dry.
11. Put on gloves.
12. Hold the needle holder in your dominant hand, with your thumb on top of the holder and three fingers underneath. Ensure that the bevel of the needle is facing up, in line with your thumb, and remove the needle cover (Figure 2).
13. Anchor the vein by pulling down on the skin below the site with the thumb of your non-dominant hand, thus preventing movement of the vein.
14. Hold the needle at an angle of 15-30 degrees to the skin and insert the tip of the needle 2mm with conviction, stopping when you no longer feel resistance or if you feel a ‘pop’ (Figure 3).
15. Keep your dominant hand in the same position on the needle holder. Pick up a blood collection tube with your non-dominant hand, and place it label down into the needle holder.
16. Place your index and middle finger on the flanges of the needle holder and your thumb on top of the blood collection tube and push the tube into the needle holder (Figure 4). This ensures movement of the needle is minimised when inserting the blood collection tubes.
17. Release the tourniquet as the first blood collection tube begins to fill.
18. Remove the blood collection tube from the needle holder, and gently invert the tube several times. The number of times it should be inverted will depend on the type of tube.
19. Insert, fill and remove the required blood collection tubes, in accordance with the blood sample request form and order of draw. Once the required tubes have been filled, pick up a gauze swab with your non-dominant hand. Remove the needle from the vein and apply pressure to the site with the gauze swab until the bleeding has stopped.
20. Activate the needle safety device and dispose of the needle and needle holder in the sharps bin.
21. Where possible, ask the patient to hold the gauze in place and to keep their arm straight.
22. Label the blood collection tubes with a pen and place them in a specimen bag with the blood sample request form.
23. Check the venepuncture site has
stopped bleeding, then apply either a fresh gauze swab secured with dressing tape or a plaster.

**Venepuncture using a butterfly device with safety system**

1. Perform steps 1-11 of the procedure for venepuncture using a needle.
2. Pinch the wings of the butterfly device together with your thumb and index finger (Figure 5). Ensure the bevel of the needle is facing up.
3. Hold the needle at an angle of 10-30 degrees to the skin, depending on the venepuncture site.
4. Insert the tip of the needle into the vein 1-2mm with conviction, stopping when you no longer feel resistance or if you feel a pop. A flashback of blood will be seen in the tubing.
5. Lower the angle of the needle and advance approximately 1mm. The wings of the butterfly device will now lie flat against the skin (Figure 6).
6. Support the butterfly device gently with your dominant hand and insert the first blood collection tube into the needle holder, ensuring the tube is positioned below the venepuncture site (Figure 7).
7. Release the tourniquet as the first blood collection tube begins to fill. Remove the tube from the needle holder and gently invert the tube several times. Insert, fill and remove the required tubes, in accordance with the blood sample request form and order of draw.
8. Once the required blood collection tubes have been filled, pick up a gauze swab with your non-dominant hand. Remove the needle from the vein and apply pressure to the site with the gauze swab until the bleeding has stopped (Figure 8).
9. Undertake steps 20-23 of the procedure for venepuncture using a needle.

**Evidence base**

Venepuncture is ‘the puncture of a vein as part of a medical procedure, typically to withdraw a blood sample or for an intravenous injection’ (Oxford Dictionaries 2018). The process of obtaining a blood sample for analysis is known as
of erroneous blood results. For instance, the lymph fluid movement of a patient who has undergone a mastectomy will be suboptimal, which may affect blood results and increase the risk of infection (Warekois and Robinson 2015). Many local policies state that whether or not to take a blood sample from the side of the body affected by a mastectomy is a decision that should be made by a doctor. The presence of haematomas may indicate that a vein has been used for multiple blood draws and

Figure 6. Lower the angle of the needle and advance approximately 1mm

Figure 7. Support the butterfly device gently with your dominant hand and insert the first blood collection tube into the needle holder

Figure 8. Remove the needle from the vein and apply pressure to the site with the gauze swab

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that there is an increased risk of a sclerosed (hardened) vein (Warekois and Robinson 2015). Therefore, in these cases, healthcare practitioners should select another vein for venepuncture or seek advice from a doctor.

The healthcare practitioner should assess the need to wear gloves when palpating the veins. If the skin of the patient and the healthcare practitioner is intact, the author suggests that palpation of the veins can be undertaken without gloves. However, gloves should be worn for palpation if there is a risk of contact with bodily fluids.

Some local policies state that 2% chlorhexidine in 70% isopropyl alcohol should be used to clean the venepuncture site, while the World Health Organization (2010) guidelines on drawing blood samples (other than blood cultures, which involve specific guidelines) state that a 70% isopropyl alcohol swab for 30 seconds should be used. Sarmah et al (2016) found that alcohol does not cause sample haemolysis. It is important to allow the skin to dry after cleansing; if 70% isopropyl alcohol is not allowed to dry the risk of specimen haemolysis increases and maximum bacteriostatic action is not provided (Warekois and Robinson 2015).

The back-and-forth movement when cleaning the skin creates a friction which, together with allowing it to dry for 30 seconds, will optimise antisepsis of the skin. Holding the needle holder at the correct angle enables insertion and smooth venepuncture, reducing the risk of puncture of the posterior wall of the vein. Puncture of the posterior wall of the vein is one of the causes of haematoma, a leakage of blood from the vessel into the surrounding tissues (Brooks 2014). If a haematoma occurs, the healthcare practitioner should remove the tourniquet; take the tube off, remove the needle and apply pressure (Brooks 2014). The healthcare practitioner should not reapply the tourniquet above the haematoma because this will cause it to increase in size.

Anchoring the vein and minimising movement of the needle when inserting the blood collection tubes will prevent damage to the endothelium and posterior wall of the vein. Phlebitis is an inflammation of the endothelium indicated by redness and pain. Phlebitis is a complication of venepuncture caused by the needle rubbing the endothelium, resulting from movement of the needle within the vessel (Brooks 2014). To reduce the risk of phlebitis, the healthcare practitioner should ensure they use the appropriate size needle and minimise movement of the needle while collecting blood samples.

The manufacturers of blood collection tubes recommend an order of draw, to minimise the risk of additive contamination, which could affect the blood sample. For example, the coagulation tube (light blue top) is usually drawn before tubes with any type of anticoagulant or clot activator to ensure there is no interference with the coagulation results (Warekois and Robinson 2015). Blood cultures will always be drawn first. It is important the healthcare practitioner knows the order of draw used in their healthcare organisation. Placing the tube label down enables the healthcare practitioner to see the tube fill, while inverting the tubes ensures that the additives they contain are activated.

Gauze is used to apply pressure to the puncture site after the needle is removed to prevent haematoma. Asking the patient to keep their arm straight and apply pressure with a gauze swab will reduce the risk of haematoma. Using cotton wool balls to apply pressure on the venepuncture site is not advised because cotton fibres may become trapped in the clot, and when they are removed from the puncture site, this could tear the clot and restart bleeding (Warekois and Robinson 2015).

**Patient identification checks**

It is vital to check the patient’s identity to avoid errors in treatment and patient harm. To reduce patient identification errors, the National Patient Safety Agency* (2007) stated that the core patient identifiers required on patient identification wristbands are: last name, first name, date of birth, and NHS number. In Wales, the first line of the patient’s address is also required (Harris et al 2009). Blood collection tubes should not be pre-labelled.
and the healthcare practitioner should label these before moving away from the patient to reduce the risk of incorrect information being written on the tubes.

Some clinical areas use Positive Patient Identification technology, which enables electronic identification of the patient. For instance, in Oxford University Hospitals NHS Foundation Trust (2018), each patient wristband has a unique barcode, and when this is scanned by the healthcare practitioner it enables test request forms to be generated and printed at the bedside. This reduces the risk of patient identification errors and blood sample labelling errors.

References


