Vessel health and preservation 2: inserting a peripheral intravenous cannula

The concept of vessel health and preservation (VHP) was first introduced in the United States in an attempt to provide a systematic approach to vascular access device (VAD) selection, insertion and ongoing maintenance (Moureau et al, 2012). The UK VHP framework by Hallam et al (2016), provided an adapted approach to the US version; it was updated by the Infection Prevention Society et al in 2020. This updated framework has incorporated evaluation and research studies from the initial framework (Weston et al, 2017; Hallam et al, 2016) and further international evidence-based studies linked to vein assessment, device selection and duration, suitability of medicines, and evaluation/ongoing care and maintenance of the VAD. Key points to consider before and during the procedure to insert a peripheral intravenous catheter (PIVC) are outlined in Box 1.

Accountability
Health professionals must ensure they have had the relevant education and training, and are equipped with the necessary skills, knowledge and competence to undertake insertion of a PIVC. All registered nurses (RNs), including nursing associates, are accountable and may be required to explain their actions. Any delegation of a task or element of patient care to another health professional, patient, relative or carer also comes under the remit of the RN who remains accountable (Nursing and Midwifery Council, 2019).

Risk assessment
As discussed in part 1 of this series, the initial risk assessment before insertion of a PIVC should:
- Include whether there is a genuine need for intravenous (IV) access/therapy;
- Question whether a more suitable alternative is available (Hallam and Denton, 2020).

It is important that any VAD is clinically indicated. Risk assessment should also include a peripheral vein assessment to ensure the grade of the vein is compatible with the nature of the IV therapy prescribed, the setting where treatment will be delivered (outpatient, long-term or inpatient/acute care) and the length of time the PIVC is required (Fig 1).

Fig 2 highlights the descriptors for each grade of the vein: grade 1 indicates there are four or five suitable veins that are visible, compressible and ≥3mm in diameter (Van Loon et al, 2019), while grade 5 indicates that no suitable veins can be located with ultrasound. For each grade there is also a column to indicate insertion management. All grades indicate that the PIVC should be inserted by a trained, competent health professional but, as the grade increases, the quality of vein decreases and the insertion management indicates additional steps – for example, ultrasound-guided technology (USG) for grade 4 veins (Blanco, 2019; Franco-Sadud et al, 2019; Van Loon et al, 2019) and referral for alternative VAD for grade 5 veins.

Patients known to have difficult IV access (DIVA) should be referred to an IV specialist and have an individual pathway of care (Van Loon et al, 2019).

If USG (Fig 3) is used, the health professional performing the procedure should be

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**Box 1. Key points in maintaining vessel health**

- Is a VAD (specifically a PIVC) required for this patient at this time?
- Is there an alternative to IV therapy/access?
- Does the vessel health, nature and length of treatment indicate an alternative to a PIVC?
- Are there known difficulties with IV access for this patient? If yes, consult local policies/procedures
- Aseptic technique should be used for “any procedure that breaches the body’s natural defences” (Loveday et al, 2014)
- Hand decontamination is a fundamental component of any procedure involving an aseptic technique and should be performed at key moments – see My 5 Moments for Hand Hygiene (World Health Organization, 2009)
- The PIVC site should be cleaned with 2% chlorhexidine with 70% isopropyl alcohol (NICE, 2012; Loveday et al, 2014)
- Ultrasound-guided insertion of a PIVC should be used for veins graded 4 and only by health professionals trained in this procedure
- PIVCs should be secured with a sterile, semi-permeable, transparent dressing or a combination of a sterile, transparent, semi-permeable dressing and an integrated securement device (Marsh et al, 2018)
- All health professionals undertaking any procedure including ultrasound-guided PIVC insertion should be trained and competent in that procedure
- All registered nurses and nursing associates are accountable for any acts or omissions, and delegation of any procedure or element of patient care

IV = intravenous; PIVC = peripheral intravenous catheter; VAD = vascular access device.
trained and deemed competent in its use. Real-time USG is recommended as this can help reduce the total procedure time, needle insertion attempts and needle redirection (Franco-Sadud et al, 2019).

### Infection prevention

An aseptic technique should be used for any invasive procedure that poses a risk of infection, including insertion of a PIVC. Poor aseptic non-touch technique and non-adherence to infection prevention and control precautions during the procedure can lead to the transfer of transient organisms that may lead to a localised or systemic infection (National Institute for Health and Care Excellence, 2012). Inadequate skin decontamination before insertion of a peripheral cannula or other VAD may lead to infection from micro-organisms (for example, *Staphylococcus aureus*) that are already present on the skin, including the patient’s own (Loveday et al, 2014). Non-sterile gloves are required for this procedure as there is a risk of exposure to body fluid. Sterile gloves are only required if there is likely to be contact with a key part, such as the site for insertion of the cannula. In this instance, it is unlikely that sterile gloves will be required unless the vein needs to be repalpated following skin disinfection.

### Documentation

Documentation should follow local policy and a PIVC insertion and maintenance bundle may be used in some areas; however, there is some uncertainty as to whether such bundles are effective at reducing PIVC complications and bloodstream infections (Ray-Barruel et al, 2019). As a minimum, documentation should include:
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**Fig 5. Veins of the forearm and hand**

- Cephalic vein
- Basilic vein
- Median cubital vein
- Accessory cephalic vein
- Dorsal venous network
- Dorsal metacarpal veins
- Digital dorsal veins

- Date and time of the procedure;
- Number of attempts to insert a PIVC;
- Dressing(s) used and the name;
- Signature and designation of the health professional undertaking the dressing.

The type and gauge of the PIVC may also be included. If the procedure was undertaken by a trainee under supervision, the name, signature and designation of the trainer is also required.

**Procedure for insertion of a PIVC**

**Equipment**

- Sharps container.
- Chlorhexidine gluconate in 70% isopropyl alcohol swab to clean the skin;
- Non-sterile gloves;
- Cannula;
- Cannula dressing;
- Isopropyl alcohol swab.

**Procedure**

1. Introduce yourself to the patient and check their identity by asking them to state their name and date of birth. This should be checked against their notes and wristband; their hospital number should also be cross-checked.

2. Explain the procedure and rationale for PIVC insertion to the patient and gain their informed consent. It is important to check their history of PIVC insertion; this should include data on difficult PIVC, whether USG cannulation was used, and history of infection or other complications such as extravasation and infiltration. The patient’s medical notes may include this information.

3. Decontaminate hands with an alcohol-based hand rub (ABHR), or liquid soap and water if hands are physically soiled/dirty or if there is potential to spread organisms that are alcohol resistant – for example, *C. difficile* and other organisms that may cause diarrhoeal illnesses such as norovirus. ABHRs used must conform to British Standards (NICE, 2012).

4. Prepare the environment for the procedure. If this is the patient’s own home, a wipeable procedure tray dedicated for an aseptic procedure should be available. In acute healthcare settings a clean dressing trolley or clean procedure tray should be used. The surface should be cleaned with detergent, or a detergent wipe, to reduce the number of viable pathogenic organisms (Loveday et al, 2014).

5. Collect the required equipment, checking the expiry date and that the packaging is intact. Open the sterile pack onto a sterile field; a special sterile PIVC insertion pack may be available. PIVC choice should be based on where the catheter will be inserted and the smallest gauge should be selected – usually 20-24g (Gorski et al, 2016). The catheter size and areas of insertion should also be guided by the type of therapy required. Certain medications may not be suitable via a PIVC, and Medusa – the injectable medicines guide website (medusa.wales.nhs.uk) – should be consulted.

6. Perform hand hygiene using an ABHR, or liquid soap and water if an ABHR is unavailable.

7. Check the patient’s veins and palpate before cleaning the site. Fig 5 illustrates the main veins of the forearm and hands. Areas of flexion, such as the elbow, should be avoided, and the device used should be no larger than a third of the diameter of the vein – anything greater can reduce blood flow and cause a thrombus (Sharp et al, 2016). There is also evidence that the veins on the back of hands can be associated with PIVC failure (Marsh et al, 2018).

8. If there are no palpable visible veins, refer to the VHP framework and local guidelines. Local policy should determine how many attempts should be made before escalation. If a patient has had problems with cannulation in the past, refer them for an individual pathway of care (Van Loon et al, 2019).

9. Clean the site with chlorhexidine gluconate in 70% isopropyl alcohol (NICE, 2012) and leave to dry.

10. Perform hand hygiene using an ABHR. Avoid touching any key/critical parts/sites (Fig 6) during the procedure including:
- The patient’s skin/vein entry point, where the PIVC is to be inserted;
- The catheter that enters the vein;
- Underneath the injection port cap.

11. Put on a clean disposable plastic apron and non-sterile gloves. Avoid touching any key/critical parts/sites (Fig 6) during the procedure including:
- The patient’s skin/vein entry point, where the PIVC is to be inserted;
- The catheter that enters the vein;
- Underneath the injection port cap.

If any key parts are touched, the procedure should be stopped and restarted from the beginning, using an aseptic non-touch technique.
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12. Insert the PIVC according to local policy. It is important the vein is not repalpated once the area has been cleaned and left to dry.

13. If USG insertion is required, the equipment must be clean and a sterile cover applied to the probe.

14. Once the PIVC has been inserted, flush it with sterile 0.9% sodium chloride to confirm vein placement and patency (Hill, 2019). The liquid should enter the vein easily, without causing the patient pain, and there should be no signs of infiltration.

15. Apply a dressing suitable for a PIVC and the insertion area; the surrounding skin should be visible. A sterile semi-permeable transparent dressing (Loveday et al, 2014) should be used or a combination of a sterile, transparent, semi-permeable dressing and an integrated securement device (ISD, Fig 7). ISDs can help prevent micro-movement and dislodgement of the PIVC and subsequent failure (Marsh et al, 2018).

16. Remove your gloves and apron, and dispose of these before decontaminating your hands.

17. Perform hand hygiene using an ABHR.

18. Dispose of waste into the correct waste stream as per local policy and procedures.

19. Clean the trolley/tray with detergent or a detergent wipe and store as per local policy and procedures.

20. Perform hand hygiene.

21. Update the patient’s records according to local policy.

References


Professional responsibilities

This procedure should be undertaken only after approved training, supervised practice and competency assessment, and carried out in accordance with local policies and protocols.