Nursing Practice
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Venous cannulas

Use of peripheral venous catheters is common but infection can occur, and prove fatal, if care is not taken to monitor the site and reduce the risk of complications.

Care of peripheral venous cannula sites

In this article...

- Why peripheral venous catheters are used
- Complications associated with peripheral venous catheters
- Minimising the risk of complications

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Abstract

Peripheral venous catheters are commonly used in hospitals to deliver intravenous therapy. They are associated with a range of complications that can be damaging to patients’ health and increase healthcare costs. In order to minimise the risk of these complications, thorough patient assessment and careful catheter management are essential.

It has been estimated that as many as one in three hospital patients have a peripheral venous catheter (PVC) in situ at any given time (Reilly et al, 2007). These small hollow catheters are advanced over a needle into a peripheral vein via the skin, and are used predominately for the delivery of intravenous (IV) therapy. However, PVCs are not without complications. Infection and phlebitis are of primary concern (Royal College of Nursing, 2010), so registered nurses must ensure their knowledge and skills related to the management of PVCs are up to date and evidence based (Nursing and Midwifery Council, 2008) in order to reduce the complications associated with these devices.

This article discusses some of the complications associated with PVCs, focusing specifically on phlebitis and infection, and how they might be prevented through careful observation and meticulous care of the site.

Indications and sites
Peripheral venous cannulation is indicated for short-term use in many clinical situations. These mainly include administration of:
- IV fluids;
- Drugs;
- Blood and blood products;
- Dyes and contrast media.

Common sites of insertion are the cephalic or basilic veins of the lower arm; or the dorsal venous arch located on the back of the hand (Lavery, 2007) (Fig 1). The superficial veins of the lower limbs may also be cannulated, but these tend to be avoided as they are associated with a higher risk of infection and embolism (RCN, 2010).

Several factors must be considered when selecting a site for peripheral venous cannulation. The risk of infection or phlebitis can be minimised by considering the following:
- The general condition of the veins;
- Avoidance of points of flexion;
- The type of drug to be administered (determined by the osmolality or pH);
- Speed of drug delivery;
- Duration of intended therapy;
- The size of the cannula versus the size of the vein.

Complications
Several complications are associated with having a PVC in situ and the administration of IV therapy (Box 1). The most serious are discussed below.

Phlebitis
Phlebitis is the inflammation of a vein, or more specifically its inner lining, the tunica intima (RCN, 2010). Clinical signs of

5 key points
1. Peripheral venous catheters are commonly used in hospitals to deliver intravenous therapy
2. PVCs are associated with several complications, some of which can have serious consequences
3. Careful observation and monitoring are crucial to identifying complications at an early stage
4. Scrupulous hygiene and site management will minimise the risks of healthcare-associated infections
5. PVCs should be removed as soon as they become clinically unnecessary

Keywords: Peripheral venous cannula/Intravenous therapy/HCAIs

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Phlebitis are localised redness, heat and swelling, which can track further along the length of the vein, eventually leading to induration and a “palpable venous cord” (Jackson, 1998). The patient may complain of pain, either continuously or during infusion of drugs through the cannula. Phlebitis is precipitated by mechanical, chemical or infective causes (Higgins and Parry, 2011).

**Mechanical phlebitis**
This is caused by the cannula rubbing and irritating the tunica intima; the risk of this complication may be reduced by using the smallest gauge cannula capable of delivering the prescribed drug (Joanna Briggs Institute, 2008).

**Chemical phlebitis**
This occurs as a consequence of irritation to the tunica intima caused by properties of the drug being infused. Strongly alkaline, acidic or hypertonic drugs can cause significant irritation if injected into a small vein with an insufficient blood flow (JBI, 2008). Drugs for IV administration should always be reconstituted and delivered according to the manufacturer’s recommendations, and informed by local policy.

**Infective phlebitis**
This occurs as a consequence of microorganisms entering the vein through the puncture site. These can originate from the patient’s own resident skin flora or from cross-contamination of microorganisms onto the PVC site and injection ports. Infective phlebitis can be a consequence of poor hygiene practices of healthcare providers (Health Protection Scotland, 2012).

**Catheter-related bloodstream infections**
Catheter-related bloodstream infections are caused by similar means as infective phlebitis but microorganisms – including Staphylococcus epidermidis, Staphylococcus aureus, candida species and enterococci – can also be introduced within contaminated infusion fluid (Pratt et al., 2007). Once introduced into the PVC tubing they combine to form a biofilm; this is a collection of microorganisms that grows on both living and inert substances in the presence of moisture. If fragments of biofilm become dislodged and enter the systemic circulation, they can precipitate a bloodstream infection; this can cause bacteraemia or sepsis, which can have potentially fatal consequences (HPS, 2012).

The complications associated with PVCs and IV therapy can have a devastating effect on patients’ health and quality of life, and increase the costs of healthcare through prolonged hospital stays and treatment (Duchtler et al., 2012).

**Patient care**
Observation and monitoring of the PVC site and localised tissue are essential to ensure any significant changes are identified and responded to appropriately, to reduce the risk of complications. If two or more signs indicative of phlebitis are present (Jackson, 1998), or if the PVC is not functioning, it should be removed immediately; it should only be resited if the clinical need for a PVC remains (HPS, 2012).

**Phlebitis scales**, such as the Visual Infusion Phlebitis Scale (Jackson, 1998; Fig 2), can assist nurses in assessing and managing PVC sites (RCN, 2010).

The clinical necessity for a PVC should be under constant review. Clinical requirement should be considered at least daily and the PVC should be removed as soon as it is deemed unnecessary. It has been suggested that clinical indication alone should drive the removal of PVCs (Webster et al., 2010). However, national guidelines state that removal should be considered if the PVC has been in situ for longer than 72 hours (HPS, 2012) or 72-96 hours (Department of Health, 2011), as the risk of complications increases with time (Dougherty and Lister, 2008). PVCs inserted in emergency situations should be removed within 24 hours (RCN, 2010).

The RCN (2010) and HPS (2012) recommend that PVC sites are checked at least on a daily basis. It is also recommended that the site is assessed during injection of drugs, when IV fluid bags are changed or when drip flow rates are checked (RCN, 2010). To facilitate this, the PVC should be dressed with a transparent dressing to allow the site to be seen. The dressing should be sterile and semi-permeable; non-sterile tape should never be used. Correct application of an adhesive dressing will keep the PVC secure and minimise the risk of mechanical phlebitis; if the dressing becomes damp or loose it must be changed.

PVC-site care must always be performed using an aseptic non-touch technique (Rowley, 2001) to prevent cross-infection (Pratt et al., 2007). Dressings must not be secured with a bandage as this causes them to retain moisture and makes it impossible to see the insertion site (Dougherty and Lister, 2008).

Handwashing has been indicated to be the single most important step in breaking the chain of infection. The World Health Organization (2009) indicates that hands should be decontaminated before clean and aseptic procedures, and handwashing.
is a key recommendation in national care bundles that aim to reduce the risk of healthcare-acquired infections associated with PVCs (HPS, 2012; DH, 2011).

The high-impact PVC care bundle used in England and Wales (DH, 2011) advocates that PVC access ports, particularly needleless connections, are cleansed with 2% chlorhexidine gluconate in 70% isopropyl alcohol before devices are administered. These recommendations stem from national ep2c guidelines for preventing HCAIs in central venous catheters (Praet et al, 2007).

More recently it has been argued, based on further microbiological research studies and similar recommendations within American national guidelines (O’Grady et al, 2011), that the type of cleansing solution might be less important than the physical action of cleaning the port (HPS, 2012). The Scottish PVC care-quality improvement tool, therefore recommends scrubbing the port with an antiseptic solution containing 70% isopropyl alcohol for 15 seconds or more (HPS, 2012). However, HPS (2012) acknowledges that there are limitations in the quality of research used to inform the choice of antiseptic solution for PVCs, so further studies are necessary to improve the evidence base underpinning these recommendations.

Nurses should ensure their clinical practice adheres to local hospital policies in relation to this issue. Regardless of the cleansing solution selected, the DH (2011) and HPS (2012) agree that the PVC port must be allowed to dry before the device is used.

### Documentation

The date, time and reason for removal of the PVC should be documented within the patient’s notes with the corresponding grade on the phlebitis scale (RCN, 2010). The widespread acknowledgement that PVCs are associated with HCAIs has prompted many hospitals to adopt quality assessment and monitoring tools in an attempt to reduce these infections. Documentation plays an important role in the audit process, facilitates the generation of measurable real-time data (HPS, 2012; DH, 2011), and has been found to improve staff compliance with care bundles. This should help to improve the quality of care for patients with a PVC in situ (Boyd et al, 2011; Easterlow et al, 2010).

### Conclusion

The complications associated with PVCs can have potentially damaging or even fatal consequences for patients. Infection and phlebitis are avoidable if simple hygiene and safety principles are adhered to for each patient at every point of contact. Nurses can significantly influence the quality of care provided by adopting the principles associated with the safe management and care of patients who have these devices in situ (HPS, 2012; DH, 2011). NT

References


Department of Health (2011) High Impact Intervention No 2: Peripheral Intravenous Cannula Care Bundle. tinyurl.com/DH-HIA2-cannula


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