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## Peripheral intravenous cannulation: Reducing pain and local complications

Nikki Welyczko

### Pose de cathéters intraveineux périphériques : réduire la douleur et les complications locales

Nikki Welyczko

#### Abstract

*Caring for patients with peripheral intravenous cannulas/catheters (PIVCs) is an important part of the nurse's role and insertion of PIVCs has traditionally been a post-registration nursing skill. With the introduction of the Nursing and Midwifery Council Standards for Proficiency for Registered Nurses in 2018, insertion of PIVCs is to be incorporated in pre-registration nursing programmes for all four fields of nursing practice. Although IV cannulation is a commonly performed clinical procedure, it is associated with significant risks and complications, which can cause pain for patients. This article outlines the factors that can cause pain for adult patients requiring a PIVC and recommends that the use of local anaesthetics be more widely considered when inserting a cannula. The identification, prevention and clinical management of commonly occurring painful local complications that can arise post-PIVC insertion are also discussed.*

**Key words:** peripheral intravenous cannulation; pain; haematoma; nerve injury; phlebitis; infiltration; extravasation

#### Résumé

*La prise en charge des patients ayant une canule ou un cathéter intraveineux périphérique (CIP) est un aspect important du rôle du personnel infirmier, et la pose d'un CIP a toujours été une compétence acquise après l'examen d'autorisation infirmière. Depuis l'entrée en vigueur des normes de compétence en matière de soins infirmiers (Standards for Proficiency for Registered Nurses) établies par le Nursing and Midwifery Council en 2018, la pose*

*de CIP doit être incluse dans les programmes de soins infirmiers précédant l'examen d'autorisation infirmière, et ce, dans les quatre domaines de la pratique infirmière. Bien que la pose de canule ou de cathéter intraveineux soit une intervention clinique courante, elle est associée à des risques et complications d'importance pouvant entraîner de la douleur chez le patient. Cet article présente les facteurs pouvant causer de la douleur chez les patients adultes ayant besoin d'un CIP et recommande que soit envisagé plus souvent le recours à des anesthésiques locaux lors de la pose d'un CIP. La détection, la prévention et la prise en charge clinique des complications locales douloureuses pouvant fréquemment survenir après la pose d'un CIP sont également abordées.*

**P**eripheral intravenous cannula/catheter (PIVC) insertion is the most common invasive procedure performed across a range of healthcare settings (Jackson et al, 2013), with up to 70% of inpatients requiring a PIVC during hospitalisation (RayBarruel et al., 2018). PIVCs are essential for a plethora of clinical reasons, including the administration of fluids, medications such as antibiotics, chemotherapy and blood products (McGowan, 2014), or contrast agents, which are required for imaging (Piredda et al., 2017). Despite multiple international and national guidelines—and such widespread use—PIVC-associated complication rates persist at an unacceptably high rate. Reasons for PIVC failure include accidental removal or dislodgement, pain, phlebitis, occlusion, infiltration and infection (Ray-Barruel et al., 2018), which can result in future vascular compromise, treatment delays, extended hospital stay, and local and systemic infections (Johann et al., 2016).

Over half of all patients requiring IV cannulation report experiencing pain and anxiety (Page & Taylor, 2010), with pain the most commonly cited side-effect of having a cannula in situ (Bond et al., 2016). Because the procedure is so routinely carried out, it is arguable that not enough consideration is given to the associated pain and anxiety experienced by adult patients. Inadequate pain relief is not only unpleasant, but may also cause anxiety about further treatment and deter patients from seeking medical care in future (Bond et al., 2016). Decreasing the pain associated with IV cannulation would increase patient satisfaction, reduce the negative physiological effects of pain (Sessle, 2011) and lessen patient anxiety. Pre-existing anxiety or phobia associated with PIVC may be reduced through use of effective communication skills, and through diversion, distraction and relaxation techniques (Dougherty, 2008). Adults' previous experiences with PIVC should also be taken into consideration, and measures applied that previously relieved pain and anxiety (Dougherty, 2011).

IV therapy has been a well-established part of most registered nurses' professional practice (Royal College of Nursing [RCN], 2016) for many years. The number of patients requiring therapy by this route has grown exponentially (Gabriel, 2010), and increasing numbers of patients are receiving IV medications and infusions in community settings and in their own homes, reflecting the changing approach to care delivery. Such initiatives reduce the pressure on secondary care services and allow patients greater choice and flexibility. Nurse-led cannulation has been linked to a number of benefits, including a reduction in healthcare-associated infections (HCAIs) (Loveday et al., 2014), a decrease in patient waiting times and an increase in patient satisfaction (Johann et al., 2016).

### Scope of professional practice

Although peripheral IV cannulation has been part of the scope of professional practice for registered nurses and appropriately trained support workers, such as healthcare assistants and assistant practitioners, for a significant period of time, its inclusion in the pre-registration nursing curricula as an essential skill is new. Annexe B of the Nursing and Midwifery Council's (NMC) (2018a) *Future Nurse: Standards of Proficiency for Registered Nurses* requires students from all fields of practice to take greater responsibility than was previously the case in relation to IV medication administration, IV devices and peripheral IV cannulation.

Box 1 identifies the standards of proficiency specific to these areas, which must be achieved during pre-registration nursing programmes.

#### Box 1. Specific standards of proficiency for nurses

##### Annexe B: Nursing procedures

- 2.2 Undertake venepuncture and cannulation and blood sampling
- 2.4 Manage and monitor blood component transfusions
- 2.5 Manage and interpret ... infusion pumps
- 5.7 Manage artificial nutrition and hydration using oral, enteral and parenteral routes
- 5.8 Manage the administration of IV fluids
- 5.9 Manage fluid and nutritional infusion pumps and devices
- 9.9 Safely assess and manage invasive medical devices and lines
- 11.7 Administer injections using ... intravenous routes and manage injection equipment

Source: Nursing and Midwifery Council, 2018a

It is important to note that IV cannulation and administration are not without risk (National Institute for Health and Care Excellence (NICE), 2017). The complications associated with PIVCs have the potential to endanger a patient's life, so it is imperative that registered nurses and nursing students are knowledgeable and competent in all aspects of IV cannulation (Osti et al., 2019). All training, education and assessment of clinical competence should be aligned with contemporary clinical standards (RCN, 2016). The process of venous access device selection and management should be based on the latest available recommendations, guidelines and evidence for the safe and effective treatment of patients requiring vascular access.

Nurses' awareness and ability to recognise risk factors and successfully mitigate against them has the potential to improve the quality of patient care and reduce complications, pain, length of hospital stay and healthcare costs (Milutinović et al., 2015). The results from an international investigation (Alexandrou et al., 2018) found differences in the management and outcomes of patients with PIVCs. The authors reviewed 40,620 PIVCs from 51 countries and found that many of those left in situ were not being used, had inappropriate dressings or were inserted in suboptimal sites. Despite national and international best practice guidelines, the research identified that a significant

number of patients had cannulas in situ that were failing and were at risk of complications, including infection. This suggests discrepancies between recommended management guidelines for PIVCs and current clinical practice.

Any health professionals inserting PIVCs 'must ensure that they have the appropriate skills and knowledge to optimise care for patients' (Gabriel, 2010). Nursing students and NMC registrants must be assessed as competent in the procedure; they must also demonstrate competence in all aspects of IV therapy and act in accordance with *The Code* (NMC, 2018b) to maintain the knowledge and skills required for safe, effective practice. Teaching and assessment of PIVC insertion and care should include both theoretical and practical elements and cover legal and professional issues, fluid balance, pharmacology, drug administration, local and systemic complications, infection control issues, use of infusion pumps and devices, and risk management (RCN, 2016).

### Pain on insertion

Pain has been identified as the primary outcome of PIVC insertion, irrespective of the size of cannula used (van Loon et al., 2018). Although topical anaesthetic creams containing lidocaine and prilocaine and gels containing tetracaine are frequently used in pediatric cannulation, this is not standard practice with adults. It is estimated that 14–38% of adults have a fear of needles (McMurtry et al., 2016), with higher prevalence among younger age groups and women (McLenon & Rogers, 2019). The presence of needle phobia can make the procedure more distressing for patients. Lidén et al. (2012) and McMurtry et al. (2016) have suggested that health professionals may underestimate the extent of people's needle anxiety, indicating the need for better patient assessment.

### Topical anaesthetic agents

The need for topical anaesthetic agents prior to undertaking the procedure should be considered on a case-by-case basis, and the cream, gel or spray must be prescribed and used in accordance with the manufacturer's instructions, especially with individuals who have had previous bad experience or suffer from needle phobia, both of which may induce 'anticipatory' feelings of increased distress and anxiety before PIVC insertion is carried out (Valdovinos et al., 2009; McGowan, 2014). Rüscher et al. (2017), who undertook a randomised controlled study of the efficacy of

local anaesthetics for peripheral IV cannulation, concluded that local anaesthesia can be recommended before PIVC insertion only if a large cannula is used (e.g., 16 G or 14 G). The same authors also suggest that vapocoolant spray may be at least as useful as lidocaine injection; it prevents pain to a similar extent and is associated with a lower rate of unsuccessful puncture. Additionally, a systematic Cochrane review by Griffith et al (2016) that looked at the findings of nine studies indicated that the use of vapocoolant spray reduces insertion pain.

Vapocoolant sprays are topical anesthetics with a rapid effect. They produce immediate skin anaesthesia by rapid evaporation of the volatile liquid (i.e., ethyl chloride, fluorohydrocarbon) from the skin surface. Evaporation causes a drop in temperature of the skin and results in rapid, temporary interruption of pain sensation (Dalvandi et al., 2017). Vapocoolant sprays are more cost-effective and have a faster onset compared with topical analgesics (Dalvandi et al., 2017), such as lidocaine/prilocaine cream, which takes at least 1 hour to take effect, and tetracaine, which takes 30 minutes to take effect (Tremlett and Bajwa, 2009). This time scale may provide an argument for the use of vapocoolants, especially in emergency situations. Despite these apparent advantages, it should be noted that vapocoolants are vasoconstrictive, causing the vessel to shrink. This can lead to multiple attempts to achieve successful device placement, particularly in small vessels. In addition, there is only a short window of opportunity for insertion because the effect of the spray wears off after about 10 seconds. Health professionals, therefore, need to be confident in their vein selection and their ability to cannulate rapidly and successfully.

Bond et al. (2016) undertook a systematic review and network meta-analysis and concluded that local anaesthetic prior to cannulation should become normal practice and be an indicator of high-quality care. Such practice would not only benefit patients with needle phobia, but also all adult patients requiring insertion of a PIVC.

### Pain is dependent on site

Many factors govern the choice of insertion site for peripheral IV cannulation and it is important to assess patients individually. Veins that are generally considered best for peripheral cannulation are found in the forearm (cephalic and basilic veins) or the hands (metacarpal veins) (O'Grady et al., 2011; McGowan, 2014).



A prospective randomised study carried out by Goudra et al. (2014) investigated the effect of site selection on the pain of cannulation. Fifty-five consecutive adults, scheduled to undergo elective surgery, were randomly allocated to be cannulated in their antecubital fossa (ACF) ( $n=28$ ) or on the dorsum of the hand (DOH) ( $n=27$ ). Five patients were excluded due to multiple attempts. Pain scores on cannulation related to each site were recorded and compared. The study found that the ACF site was significantly less painful than the DOH site when using a 20 G cannula. Van Loon et al (2018) found that pain experienced during intravenous cannulation depends more on the cannulation site and patient characteristics than on the inserted size of PIVC. The differences between the pain experienced at different sites are unclear. However, it has been suggested that cannulation on the DOH is more painful compared with the ACF due to the tougher skin and greater density of nociceptors on this site (Goudra et al., 2014). The findings of Cicolini et al. (2014) steer towards recommending the use, whenever possible, of ACF veins for peripheral intravenous cannulation due to the reduced risk of phlebitis. However, considerations such as an increased chance of bending the catheter and occlusion of infusions may preclude the ACF from being used routinely in clinical practice.

### **Pain related to unsuccessful or multiple attempts**

Pain relating to unsuccessful or multiple PIVC attempts is an issue for patients, and may adversely affect their overall hospital experience (Helm et al., 2019). About 11% of adults have difficult venous access and are often exposed to repeated failed cannulation attempts, resulting in treatment delays (Smith, 2018). PIVC insertion is associated with a high overall failure rate of 35% to 50%, even when the health professional performing the task is highly skilled (Helm et al., 2019). Siting a PIVC at first attempt has been found to be an important factor in preserving vessel health because the risk of PIVC failure increases for each subsequent insertion (Wallis et al., 2014). It is recommended that first attempts for PIVC should be at the most distal veins possible (RCN, 2016), with following attempts proximal to prevent the potential for infiltration at previous sites (McGowan, 2014).

In their study, Cooke et al (2018) found that 40% of adults and 64% of children reported experiencing first-insertion attempt failure for their most recent PIVC. Nadler et al. (2015) advised that a maximum of two attempts should be made due to a deteriorating success rate noted with subsequent efforts. Ultrasound-guided vascular cannulation

has been shown to improve the procedure success rate of IV cannulation and reduce its associated complications (Blanco, 2016), but it is not routinely used for PIVC placement.

### **Pain relating to the size of the cannula**

NICE (2017) recommends that before the insertion of a cannula the health professional undertaking the procedure needs to make a clinical decision in relation to the site and choice of vein, in order to reduce the risk of cannula failure and associated complications. It is recommended that health professionals should use the smallest gauge cannula capable of meeting clinical need (Thomas, 2015; Bodenham et al., 2016) to maximise the optimum haemodilution effect, leading to a reduction of mechanical and chemical phlebitis and, consequently, helping to reduce pain and discomfort (RCN, 2016). For example, 20 G cannulas are considered to be small and are suitable for the majority of patients who require IV fluids; 18 G PIVCs are average sized and suitable for IV fluids and smaller-volume blood transfusions. Comparatively, in their study, van Loon et al (2018) reported that inserting a smaller size PIVC did not result in a lower pain sensation. Moreover, they concluded that the key element in order to prevent pain upon inserting a PIVC was the avoidance of unsuccessful attempts.

### **Pain-associated local complications following insertion**

Complications are common on insertion and during PIVC therapy (Rickard et al., 2012), and they can be local or systemic. Systemic complications fall outside the remit of this article. The next section outlines some of the principal local potential causes of pain in peripheral intravenous therapy and discusses how these can be avoided and managed.

### **Haematoma**

A haematoma is the leakage of blood into the tissues, indicated by rapid swelling that occurs during the insertion procedure or after removal (Perucca, 2010; McCall and Tankersley, 2020). Swelling, tenderness and discolouration at the site are the classic signs of a PIVC-related haematoma (Kaur et al., 2011).

It can be caused by a variety of issues, including (Ford, 2019):

- Poor insertion technique
- Inappropriate vein selection
- Inadequate pressure applied on removal
- Incorrect use of the tourniquet
- Using a cannula size that is too large for the chosen vein.

Perhaps, unsurprisingly, Coventry et al. (2019) found an association between the absence of oedema, bruising and haematoma with successful PIVC insertion. Patients who are receiving anticoagulants and antiplatelet agents are at increased risk of haematoma development (Kornbau et al., 2015).

## Management

If a haematoma occurs during PIVC insertion, the first action is to remove the cannula and apply localised pressure until the bleeding stops (Garza & Becan-McBride, 2013; McCall & Tankersley, 2020). Care should be taken when applying extended pressure during cannulation of older patients, because this can lead to further tissue injury (Miliani et al., 2017). Elevate the extremity, if appropriate, reassure the patient and explain the reason for the bruise. Apply a pressure dressing, if required, and an ice pack, if bruising is extensive (Moini, 2013).

## Nerve injury

The median and ulnar nerves are in close proximity to the basilic vein in the proximal area of the arm, which means that PIVC insertion can lead to nerve injuries (Sandhu & Sidhu, 2004). These can be due to (Kaur et al., 2011):

- The PIVC causing direct injury to a nerve
- Tissue infiltration affecting a nerve
- A haematoma that may irritate a nerve.

Patients will experience localised numbness and tingling and loss of sensation to sharp touch. Three types of nerve injury can occur from an IV cannulation:

- Neurapraxia (minor injury with complete recovery)
- Axonotmesis
- Neurotmesis (severe injury).

Nerve injury is rare and is usually self-limiting; however, surgery may be required if an injury is severe.

## Management

The avoidance of nerve injury requires good cannulation technique and comprehensive knowledge of the relevant anatomy (Kim et al., 2017), particularly of sites associated with the greatest risk. The same authors recommend shallow insertion of the PIVC at a 5-15° angle relative to the skin, using the non-dominant arm. However, for some patients, such as those with chronic kidney disease (CKD), the non-dominant arm may be saved in case a fistula or graft is subsequently needed. In the event of touching a nerve during PIVC insertion, the tourniquet should be released and the needle

removed immediately (Garza & Becan-McBride, 2013). The patient needs to be reassured, and it should be explained that the pain may last for a few hours and sometimes for a few days, and that the area may feel numb. If the pain or numbness continues to worsen, medical advice should be sought.

## Phlebitis

Phlebitis is the inflammation of a vein, which is the most common complication associated with the use of PIVCs; it affects between 27% and 70% of all patients receiving IV therapy (Sengupta, 2019). The clinical features of phlebitis associated with PIVCs are shown in *Box 2*.

### Box 2. The clinical features of phlebitis associated with peripheral intravenous cannulas

- Erythema, warmth and oedema at the site
- Pain or burning at the insertion site or along the vein
- Vein appears red and hard
- Increase in baseline temperature by one degree

Source: Urbanetto et al., 2016

Phlebitis leads to increased discomfort for patients, longer hospital stays and higher healthcare costs (Wallis et al., 2014). Various factors can influence the development of phlebitis, such as:

- Inadequate technique when inserting the cannula
- Underlying health conditions
- The characteristics of the vein, catheter size (do Rego Furtado, 2011)
- Prolonged use (Alexandrou et al., 2018)
- Infection control factors, such as the hand hygiene of the health professional
- The health professional's skill in administering medication through the PIVC (Rickard et al., 2012).

In their prospective, observational study, Mandal and Raghu (2019) found that the incidence of phlebitis was higher in patients who had an 18 G catheter (37.97%) compared with patients who had a 20 G catheter (23.94%). Incidence of phlebitis was also found to be higher in PIVCs inserted in emergency situations (34%) compared with non-emergency situations. There was a higher incidence of phlebitis in patients who were given intravenous drugs (37.93%) and blood products (53.33%).

There are three types of phlebitis associated with PIVC use: mechanical, chemical, and infectious or bacterial (Kaur et al., 2011; RCN, 2016; Sengupta, 2019).

## Mechanical phlebitis

Mechanical phlebitis occurs when a PIVC moves inside the vein, causing friction and inflammation, or when the cannula size is too wide for the vein. Movement can arise as a result of physical trauma (RCN, 2016) or if the cannula is not effectively secured (Kaur et al., 2011).

## Chemical phlebitis

Chemical phlebitis is caused by the intima of the vein becoming inflamed by irritant or vesicant solutions infused through the cannula, for example antibiotics, blood products and glucose-containing fluids (Kaur et al., 2011). Factors such as pH and osmolality can significantly affect the incidence of chemical phlebitis and it may be further exacerbated when a small vein has been used for cannulation (Sengupta, 2019). To achieve optimum haemodilution effect, appropriate dilution of solutes is required. In addition, it is vital to undertake appropriate patient assessment to determine each individual's vascular access device requirement and subsequent vein suitability.

## Infectious or bacterial phlebitis

Infectious or bacterial phlebitis is caused when bacteria are introduced into the PIVC. This can arise due to a number of factors, such as contamination of the IV tip on insertion (Kaur et al., 2011) and ineffective cleaning of the skin or poor hand hygiene of health professionals. Bacterial phlebitis can create serious complications due to the potential for developing systemic sepsis (Sengupta, 2019). Intravenous catheter-related bloodstream infections have become a leading cause of healthcare-associated bloodstream infections (HCA-BSIs) (Health Protection Surveillance Centre, 2014). Health professionals must ensure that they employ effective handwashing, and aseptic non-touch technique (ANTT) must be adhered to throughout the insertion, ongoing maintenance and removal procedures (Rowley et al., 2010). The skin and PIVC ports should be cleaned using 2% chlorhexidine and 70% alcohol solution (Loveday et al., 2014; Bodenham et al., 2016), allowing time for them to air dry for at least 30 seconds (Ford, 2019). In the absence of actual or suspected infection, routine changes of PIVC at 72–96 hours are not advocated (Bodenham et al., 2016). The PIVC must be re-sited only if clinically indicated, not routinely (Loveday et al., 2014).

Dressings need to be changed if soiled or damaged, but, if still intact, changing the dressing may contribute to introducing

contamination (Bernatchez, 2014). Transparent film dressings allow visual inspection of an insertion site and can typically be changed less frequently than those secured with gauze and tape—they are therefore favoured in the epic3 evidence-based guidelines for preventing HCAs (Loveday et al., 2014). The use of occlusive dressings reduces the risk of external contamination of the cannula site (Gorski et al., 2018). ANTT should be used for dressing changes (RCN, 2016).

## Assessing phlebitis

The majority of healthcare institutions use a visual infusion phlebitis (VIP) score to help assess for phlebitis. It is recommended that the cannula site be monitored daily using a VIP scoring tool (Morrow-Barnes, 2015). Ray-Barruel et al (2014) identified 71 different phlebitis assessment scales, but concluded that none have been thoroughly validated for use in clinical practice. This lack of consensus on phlebitis measures may have contributed to discrepancies in reported data of phlebitis incidence, preventing meaningful comparison of phlebitis rates.

## Prevention and management

The primary prevention methods for phlebitis include using an appropriate size of vascular access device and ensuring appropriate fixation of the device. Appropriate device selection will depend on medication required, effective hand hygiene (Helm et al., 2019), rigorous ANTT, effective use of skin preparation, and the ongoing care and management of devices (Loveday et al., 2014; RCN, 2016). Using a visual infusion phlebitis (VIP) score to detect the early signs of phlebitis has been found to be successful in reducing the incidence of phlebitis (Tzolos and Salawu, 2014). The use of the ACF has been associated with lower rates of phlebitis (Wallis et al., 2014; Comparcini et al., 2017); however, it is recommended that it should be avoided because the symptoms of infiltration/extravasation are delayed in these areas (Helm et al., 2019).

If phlebitis does occur, it should be assessed and graded using a VIP score and the appropriate action taken. This may include observing the cannula in the early stages or re-siting in the mid-advanced stages of phlebitis. The treatment of superficial phlebitis can be managed by applying a warm compress to the area, elevating the affected extremity, and administering oral or topical anti-inflammatory medications (Higginson & Parry, 2011). If left untreated, superficial phlebitis has the potential to progress to deep venous thrombosis and pulmonary embolism.



## Tissue infiltration and extravasation

Infiltration and extravasation are both caused by the 'inadvertent administration of a solution into the surrounding tissue instead of the intended vascular pathway' (RCN, 2016:64). Infiltration is caused by a non-vesicant medication or solution and extravasation is caused by a vesicant medication or solution. Non-vesicants are IV solutions that generally do not cause ischaemia or necrosis, but can result in long-term injury as a result of local inflammatory reactions or compression of the surrounding tissues, resulting in compartment syndrome (RCN, 2016). Vesicant solutions are more dangerous, and leakage into the tissues can cause blistering and potential tissue necrosis (Gorski, 2018). Acidic or alkaline preparations and those with greater osmolarity than plasma may cause extravasation injuries. Cytotoxic drugs commonly cause extravasation injury (NICE, 2019).

## Causes

Tissue infiltration and extravasation are both caused by incorrect cannula placement and dislodgement due to inadequate stabilisation of the cannula (RCN, 2016). Some sites are more prone to extravasation, such as the dorsum of the foot, ankle, the ACF and areas in close proximity to joints where there is limited protection from underlying structures (Al-Benna et al., 2013). Patients who have fragile, mobile, thrombosed veins or veins that are difficult to cannulate are more susceptible to extravasation (AlBenna et al., 2013). Al-Benna et al. (2013) identified that extravasation is more likely to occur during the night and, as such, may go unnoticed.

## Clinical signs and symptoms

Typical signs and symptoms of infiltration include oedema, pain, discomfort or tightness around the site, as well as changes in the appearance and temperature of the site, such as swelling, blanching and coolness (Braga et al., 2018). The infusion may have reduced in flow or have stopped altogether.

## Prevention and management

Prevention of infiltration includes avoiding siting PIVC in the hand, ACF and upper arm, ensuring that the PIVC is appropriately secured, and that the site is monitored regularly (Helm et al., 2019). Clinical management of extravasation involves immediately stopping the infusion (NICE, 2019). The cannula should not be removed until

after an attempt has been made to aspirate the area (through the cannula), to remove as much of the drug as possible to prevent further damage and tissue necrosis (NICE, 2019). Medical attention should be sought. The area of extravasation should be marked with a pen or a photograph taken. The incident should be documented by completing an incident report form and making a full record in the patient's medical/nursing notes.

Prompt action is particularly important due to the vesicant nature of the medication being administered. The affected limb should be elevated above heart level (NICE, 2019). Pharmacy should be contacted for advice on possible available antidotes and for appropriate treatment as part of ongoing management of the site in relation to the particular drug. If treatment is delayed, surgical debridement, skin grafting and amputation can be the eventual result (Al-Benna et al., 2013). Prevention of extravasation involves careful PIVC placement, close monitoring of the infusion site, and the use of an appropriate dressing to secure the PIVC to prevent dislodgement (Al-Benna et al., 2013).

## Conclusion

The insertion and management of PIVCs are some of the most frequent aspects of care that nurses are engaged with. Reducing the pain from IV cannulation, both on insertion and during IV therapy, is essential to ensure patient comfort and satisfaction. However, maintaining patients' vascular access throughout treatment can be difficult due to a number of local complications that can occur, including haematoma, nerve damage, phlebitis, infiltration and extravasation. Early recognition of PIVC complications and prompt action to manage situations are essential for reducing risk and ensuring safe outcomes for patients. To reduce pain on insertion the use of local anaesthesia should be considered more widely in the case of adult patients.

The introduction of IV cannulation as a skill for pre-registration nursing students requires a high level of knowledge, skill and supervision. Education and training should be based on contemporary, evidence-based PIVC insertion and maintenance care. In addition, it is imperative that clinical areas adopt protocols to provide a clear process for venous access device selection and management based on the most current recommendations, guidelines and evidence available for the safe and effective treatment of patients requiring PIVC. **BJN**

## Key points

- Caring for patients with peripheral intravenous cannulas/catheters (PIVCs) is an important part of the nurse's role
- Following the introduction of the Nursing and Midwifery Council Standards for Proficiency for Registered Nurses in 2018, insertion of PIVCs is to be incorporated in pre-registration nursing programmes for all four nursing fields
- Pain is the most often cited side-effect of IV cannula insertion reported among adult patients
- Complications are common both on insertion of the access device and during PIVC therapy
- Nurses' awareness and ability to recognise risk factors and mitigate against them has the potential to reduce complications, improve the quality of care and patient satisfaction, and reduce pain, length of stay and costs

## CPD reflective questions

- What are the ways in which pain on insertion of a peripheral intravenous cannula (PIVC) can be reduced?
- Can you describe possible adverse incidents and local complications that may arise during or following PIVC insertion?
- Outline local complications that may arise during or following PIVC insertion. How can these be prevented and managed?

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