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# Peripheral intravenous therapy: key risks and implications for practice

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## Summary

Personnel, environment and procedures related to peripheral intravenous (IV) therapy are explained. Parenteral routes are suggested and, where peripheral IV therapy is required, recommendations are made to minimise risk of anaphylaxis and infection.

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## Keywords

**Drug therapy; Intravenous therapy**

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## Aim and intended learning outcomes

The aim of this article is to review the key risks of peripheral intravenous (IV) therapy. After reading this article you should be able to:

- Review risk analysis relating to peripheral IV therapy.
- Identify and analyse key risks associated with peripheral IV therapy.
- Discuss implications for clinical practice.
- Identify measures to reduce risks through scenarios and critical analysis.
- Consider the wider issues and risks relating to peripheral IV therapy and the nurse's role.

## Introduction

Risk management and examining ways to learn from adverse incidents have increased. This can be attributed in part to the Department of Health's (DH) publication *An Organisation with a Memory* (DH 2000) and, more recently, in England and Wales, to the National Patient Safety Agency (NPSA), which was established in 2001. The document *An Organisation with a Memory* acknowledges that adverse events occur in around 10 per cent of admissions and that service failures can have serious consequences for patients.

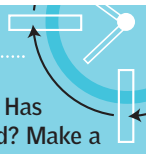
IV therapy presents a potential risk to patient safety, with associated risks varying from minor complications to death. The number of patients who require IV therapy is increasing, because more patients are acutely ill and also because of changes in prescribing patterns. To reduce risks associated with peripheral IV therapy, the risks need to be identified and managed.

The 'Swiss Cheese Model' of risk (Reason 2000) shows how, despite policies and procedures being in place, systems errors can still occur often with catastrophic results. Adverse incidents are typically caused by alignment of different factors; however, good practice can prevent errors becoming incidents (Amoore and Ingram 2002). It is important that different aspects of peripheral IV therapy are considered, taking into account policy and practice, to reduce errors in clinical practice. This article identifies these aspects and offers recommendations for practice, with the aim of reducing the associated risks.

Many environmental hazards relate to storage, ventilation, lighting, space and professional and safety aspects, such as preparation time and support. For example, a busy and cramped treatment area could lead to needlestick injury. To

ensure good practice, the Clinical Resource and Audit Group (CRAG 2003) recommends regular planned audits of personnel, environment and procedures where there is preparation of injections in near-patient areas. The CRAG headings are used to review these aspects.

## Time out 1



**Where do you currently prepare peripheral intravenous medicines? Has the area been evaluated or audited? Make a list of any potential risks that you can identify.**

## Personnel

NHS Lothian – University Hospitals Division (LUHD), through its Shared Governance Framework (LUHD 2002a), requires any registered nurse undertaking peripheral IV therapy to self-assess his or her competence every three months. This ensures the maintenance of skills and addresses any limitations related to professional accountability (Nursing and Midwifery Council (NMC) 2004a).

One of the risks associated with the peripheral IV route, as with other routes, is calculation of medicine doses. This requires educational support to enable staff competence (Hutton 1998, LUHD 2003a). NMC (2004b) guidance on the administration of medicines specifies that two staff members are required where there are complex calculations, and that both practitioners need to calculate independently. Upton (2001) states that two registered practitioners are required throughout the IV drug administration procedure to participate in calculating, checking the prescription, selecting, dispensing, preparing, and administering the medicine as well as recording the procedure. This minimises the risk of medicine calculation or practice error. However, some organisations may consider single nurse administration acceptable.

Research suggests that common errors in drug administration include poor handwriting of prescriptions, staff failing to follow policy and poor communication (Cooper 1995, Williams 1996, Upton 2001). However, an ethnographic study that specifically explored peripheral IV drug administration found that errors were most common during bolus administration and when making up medicines that required multiple-step preparation (Taxis and Barber 2003). Recommendations for practice:

- Support for staff is crucial; staff should be appropriately trained and knowledgeable of their practice area and medicines.
- Robust policies and procedures should be in place to help support and assess staff in clinical practice.
- Staff must complete an approved competency-based training programme relating to their field of practice and be familiar with associated medicines and policies (Royal College of Nursing (RCN) 2003).
- Up-to-date information should be readily available to support good practice (LUHD 2003b), as well as expert resources, for example, a 24-hour pharmacy helpline.

CRAG (2003) stipulates that staff who undertake peripheral IV medicine administration must be subject to regular re-assessment of competence. NHS Education for Scotland (NES 2004) is developing a framework for transferability of clinical skills. NES (2004) suggests that the process of transferring clinical skills is driven by personal development plans and is subject to an annual appraisal.

## Environment

The preparation of injections in clinical areas is associated with risks of contamination. CRAG (2003) recommends that staff undertake a risk assessment of the environment and the procedure. Staff should consider where medicines are prepared and query whether the following are in place:

- Adequate lighting so the prescription can be read easily.
- Adequate ventilation to reduce air contamination.
- Enough space to prepare the injection safely.
- A safe sharps' disposal system.
- Ability to work uninterrupted or free from distraction.

Staff should acknowledge and recognise the risk of medicine spillage, and protect themselves by ensuring safe reconstitution practice and medicine handling, and follow appropriate guidance on managing spillage (DH 2002). One aspect that staff need to consider is the high risk of aerosol spray during the reconstitution of powdered medicines. Many medicines, particularly antibiotics, are in powder form and therefore require reconstitution before use. However, if the aerosol is sprayed into the atmosphere staff members may be exposed to that drug, which can be absorbed through mucous membranes. The use of a practical workstation allows staff to practise

reconstitution and safe handling of medicines in a classroom setting.

Medicine manufacturers have a role to play in environmental aspects. CRAG (2003) recommends that standard doses or concentrations of commonly used injections should be identified. Research often cites labelling or packaging of products as a contributory factor to the occurrence of drug errors (Cooper 1995, Cousins and Upton 1996, Williams 1996, Upton 2001). Manufacturers can also play a part in increasing risk. For example, water and 0.9% sodium chloride come in identical volumes and containers. If staff are distracted or fail to follow policy, this could lead to a medicine error.

Any medicine prepared in a clinical area must be administered immediately (NMC 2004b). CRAG (2003) recommends that all injections are clearly identified at all stages of the process. Reconstitution of IV-related medicines requires asepsis, knowledge of compatibility, interactions, storage, stability and equipment. Training should include the opportunity to practise standard preparation skills. Recommendations for practice (RCN 2003):

- Audit the practice area where injections are prepared.
- Secure medicines safely and securely, as per unit or organisation policy.
- Ensure two registered staff are present and participate when undertaking peripheral IV therapy.
- Staff who undertake peripheral IV preparation should receive training in infection control, professional issues, hazards of medicines, anaphylaxis, calculations, incident reporting and the Yellow Card Scheme, as well as competency-based training in infusion devices.
- Wear appropriate protective clothing, such as aprons, gloves and eye shields. Aprons should be worn at all times, and gloves and eye shields depending on the medicine and the particular hazard. Refer to the manufacturer's guidelines and the *Control of Substances Hazardous to Health Regulations 2002* (DH 2002).

## Procedures

The purpose of setting standards is clear: to inform and educate staff about current best evidence and practice. Peripheral IV therapy theory should relate to local and/or national guidance or procedures. NES (2004) is focusing on educational and training standards in clinical skills, venepuncture, cannulation and peripheral IV therapy. Such standards ensure that staff are trained to an appropriate level, now and for future approved levels, and staff can transfer skills without the need to repeat training.

The *NMC Code of Professional Conduct* states that each registered nurse has a responsibility to deliver care based on current evidence, best practice and, when available, validated research (NMC 2004a). Policies and procedures should be documented and developed by experienced practitioners to reflect current issues in clinically effective care, and should be subject to annual review.

**Route** There are three peripheral IV routes: bolus injection, intermittent and continuous infusion, and each have inherent risks. The rationale for route choice is based on knowledge of the medicine and its therapeutic effect. The patient, circumstances and equipment need to be considered. Peripheral route choice requires competent practice and effective clinical judgement to reduce risk and ensure safe practice (NMC 2004a) (Table 1).

When considering the peripheral IV route, administration factors such as compliance, absorption and rate of medicine administration are also important.

**Compliance** The peripheral IV route ensures the prescribed medicine concentration is achieved rapidly. It overcomes any nil-by-mouth or fasting requirements, and may also overcome a patient's refusal to take oral medication.

**Absorption** One hundred per cent bioavailability is achieved as the medicine is administered directly into the circulation and avoids the need for absorption; problems with malabsorption or medicine inactivation by the gut are also avoided. The risk of pain is also avoided; some medicines can be painful to the tissues and therefore cannot be given by the subcutaneous or intramuscular route (Dougherty and Lamb 1999).

**Rate of medicine administration** Once injected, there is no recall. The risks of speedshock, anaphylaxis, extravasation, infiltration and fluid overload with large-volume rapid

**TABLE 1**

**Rationale for peripheral intravenous route**

| | |
|---|---|
| Bolus injection | ▸ Quick response needed<br>▸ High blood concentration required<br>▸ Patient is fluid overloaded<br>▸ Medicine is not chemically stable in a solution |
| Intermittent infusion | ▸ High blood concentration required<br>▸ Patient is fluid overloaded<br>▸ Medicine not chemically stable for continuous route, for example, benzylpenicillin<br>▸ Reduces risk of adverse reactions, for example, bolus antibiotics |
| Continuous infusion | ▸ Constant blood level required<br>▸ Constant effect required |

(LUHD 2003a)

infusions are factors to be considered, taking into account time, cost and increased risk of infection. Risks associated with the peripheral IV route are summarised in Table 2. Recommendations for practice:

- Patient assessment and full clinical history should be taken including medicine history and examination.
- Assessment of the cannula – query whether it is patent, inserted correctly and has not exceeded the recommended insertion time of 48-72 hours (LUHD 2002b).
- Ask if there is any evidence of phlebitis, infiltration or extravasation, for example, pain, swelling or redness.
- Administration of medicine by intermittent infusion and the continuous route require correct flow rate. Flow rate can be managed with an infusion device. These carry an additional risk of incorrect infusion rate, often due to device position, incorrect rate setting or device selection (Amoore and Adamson 2003). Staff must be competent in the use of devices and update their knowledge and skills through regular review and assessment of competence (Carlisle *et al* 1996, NMC 2004a).

## Time out 2

**A patient in your care is in his fourth post-operative day, and at the 0800 hours medicine round you notice that gentamicin 80mg is due by the peripheral intravenous route. The patient's condition is stable and he is tolerating a normal diet. Consider the action you would take. What is your rationale?**

**TABLE 2**

**Peripheral intravenous route risks**

| | |
|---|---|
| Bolus injection | ▸ Anaphylaxis/anaphylactoid reactions<br>▸ Speedshock<br>▸ Infiltration or extravasation<br>▸ Phlebitis |
| Intermittent infusion | ▸ Anaphylaxis/anaphylactoid reactions<br>▸ Infiltration or extravasation<br>▸ Phlebitis<br>▸ Fluid overload<br>▸ Medicine error – rate too fast or slow |
| Continuous infusion | ▸ As above<br>▸ Incorrect rate – overdose |

## Time out 3

**With reference to Time out 2, you may have approached the prescriber and requested that the medicine be changed to the oral route. Does your organisation have a peripheral intravenous therapy step-down policy to oral medications? Would this benefit safe and cost-effective practice?**

The benefits of the peripheral IV route outweigh the risks (CRAG 2003); however, this method requires registered medical and nursing staff to monitor the patient and the prescription regularly to ensure that the treatment continues to be the most appropriate and effective.

## Infection

Infections resulting from peripheral IV therapy can cover a wide spectrum of clinical symptoms, from minor irritation to increased morbidity and mortality. Thus, the patient can experience minor irritation at the site (local infection), bacteraemia (bacteria are present in the blood) or more serious septicaemia (systemic infection). Box 1 shows the signs of local and systemic infection.

Infection control should be an integral part of patient care. All nurses involved in peripheral IV therapy have a role to play in the prevention and containment of infection.

## Time out 4

**What is the current practice for infection control regarding peripheral intravenous therapy in your clinical area? In what ways do you think infection control could be improved?**

Infection can be divided into two groups: exogenous and endogenous. Exogenous infection occurs when micro-organisms originate outside the patient's body. This is usually due to cross-infection, for example, via the hands of healthcare professionals and equipment. Endogenous infection is due to organisms already present on or in the patient's body.

Exogenous and endogenous infection can be due to intrinsic and extrinsic contamination. Intrinsic contamination refers to infection that is present in the apparatus or medicine before use, whereas extrinsic is introduced during use. Table 3 shows intrinsic and extrinsic infection in relation to the different types of apparatus.

**Intrinsic and extrinsic infection** Once intrinsic or extrinsic infection has been identified, it is essential that strategies are developed to reduce risk. The risk of infection by the intrinsic route can be greatly

reduced by nurses' checking the packaging of all equipment for signs of contamination. Storing products in the correct environment and checking expiry dates also reduce the risk of infection. Checking that products are only for single use and are being used according to manufacturers' instructions is also essential.

Extrinsic infection can be reduced by good hand-washing and aseptic techniques, and by reviewing practice every time manipulation of the IV system is required. This includes changing the fluid and the infusion set and the use of three-way taps. Steps should be taken to minimise the number of manipulations and to ensure that good technique is used when doing so (Plumer and Weinstein 2001).

It is essential that nurses seek ways to reduce the risk of infection for patients, while taking precautions to protect themselves. The most common types of catheter-associated infections are shown in Table 4 (LUHD 2003a).

When diagnosing catheter-associated infections, microbiology results from the catheter and blood results should be considered in conjunction with the clinical presentation of the patient. Despite coagulase-negative staphylococci being the most common organism isolated from cultures, they do not cause bacteraemia as often as *Staphylococcus aureus*. Catheter-associated bacteraemia is associated with 22 per cent of patients with complications, such as endocarditis and osteomyelitis (LUHD 2003a).

Infection control is the concern and responsibility of all healthcare staff. The implications of not identifying and containing infection can be detrimental to patient care. Patients may experience physical discomfort which may lead them to seek financial compensation. In addition, there are the increased costs of treating infection with antibiotic therapy and longer hospital stay. Recommendations for practice:

- Consider whether a cannula is necessary. This is because some cannulae can be inserted 'routinely' and this practice should be challenged (Waitt *et al* 2004).
- Use a polyurethane cannula where possible, as this is the best method of reducing phlebitis rates (Gaukroger *et al* 1988).
- Ensure appropriate cleaning products are used on the skin before insertion of the cannula: chlorhexidine 2% has been shown to reduce the rate of infection (Maki *et al* 1991).
- Cover the cannula with a transparent, semi-permeable dressing. This allows the site to be viewed easily (Parker 1999).
- Change the cannula site every 48 hours. This has been shown to reduce infection rates at the cannula site (Gaukroger *et al* 1988, Panadero *et al* 2002).
- Use an aseptic technique for cannulation and all further manipulations of the IV system to reduce infection (Wilson 2001).

**BOX 1**

**Signs of local and systemic infection**

| Local | Systemic |
|---|---|
| Erythema, pus, warmth, induration, palpable venous cord, pain or venous thrombosis | Chills, fevers, malaise, headache, tachycardia, nausea, vomiting, hypotension leading to cyanosis, tachypnoea and hyperventilation leading to collapse, shock and death |

**TABLE 3**

**Intrinsic and extrinsic sources of infection**

| Intrinsic | Extrinsic |
|---|---|
| Cracks in glass containers | Attachment of administration apparatus |
| Punctures in plastic containers | Additives to infusion fluid |
| Infusion fluid | Injections into the closed intravenous (IV) system, including flushes and specimen collection |
| IV infusion set – damaged packaging | Contaminated air |
| Contaminated equipment, for example, drip stands, infusion devices | Stopcocks, three-way taps and other devices |
| | Insertion and manipulation of the device, due to contaminated hands, the patient's normal flora or contaminated skin disinfectants |
| | Bottle or bag changes |

**TABLE 4**

**Common types of catheter-associated infections**

| Organism | Per cent of catheter-associated infections |
|---|---|
| Coagulase-negative staphylococci | 30–40 |
| *Staphylococcus aureus* | 5–10 |
| *Enterococcus* species | 4–6 |
| *Pseudomonas aeruginosa* | 3–6 |
| *Candida* | 2–5 |
| *Enterobacter* species | 1–4 |
| Acinetobacter | 1–2 |
| Serratia | <1 |

(LUHD 2003a)

- Avoid lower extremities, joints and nerves when siting the cannula. Lower extremities are more difficult to view. Cannulating over joints is uncomfortable, reduces patient mobility and, if nerves are damaged, may cause patient harm.
- Try to reduce the number of attempts to cannulate, as increased puncture sites means increased entry sites for infection.
- Identify patients at risk and take additional precautions, including those who are older or younger, those who already have an infection, are immunosuppressed, have poor nutrition, have a loss of skin integrity, are on antibiotic therapy and patients having multiple invasive procedures (Dougherty 2002).
- Record and report any signs of infection (NMC 2004c).
- Educate staff in the portals for entry of infection so that steps can be taken to reduce risks.
- Clean infusion equipment before and after use. Check whether equipment is for single use only. Equipment such as drip stands and infusion equipment can be contaminated, therefore it needs to be cleaned regularly and between patients (Medical Devices Agency 1996).
- Good hand washing techniques and precautions to protect staff should always be employed. Contaminated hands of staff is a major source of infection. Gloves, aprons and, if necessary, masks and goggles should be worn if staff administering peripheral IV therapy are at risk (RCN 2003).

CRAG (2003) reported that no therapeutic intervention is risk-free, but that the benefits of the medicine outweigh the risks. One key risk related to peripheral IV therapy management is anaphylaxis (Henderson 1998, Drain and Volcheck 2001, LUHD 2004).

## Time out 5

Review current policy in your practice area regarding anaphylaxis management. Does it provide clear guidance on the nurse's role?

**Anaphylaxis** Anaphylaxis is a systemic immediate hypersensitivity reaction caused by an immunoglobulin(Ig)-E-mediated immunological release of mediators from mast cells and basophils. Anaphylaxis can have life-threatening consequences (Henderson 1998, Drain and Volcheck 2001, LUHD 2004).

Apart from medicines, other causative factors of anaphylaxis include food, stings and idiopathic causes. The International Liaison Committee on Resuscitation (ILCOR) (1997) noted the incidence of anaphylaxis at the time in the UK was around one in 2,300. However, due to unpredictability, actual numbers are not known (Henderson 1998). Drain and Volcheck (2001) noted that with the increasing use of medicines and antibacterials in the United States, medicine-induced anaphylaxis and anaphylactoid reactions have increased. CRAG (2003) estimated the scale of anaphylaxis in NHS Scotland of near-patient antibiotic preparation at around 650,000 injections and a further 350,000 prepared in pharmacy. Therefore, it could be estimated that 435 reported cases of anaphylaxis a year are due to antibacterial agents alone, based on the premise of one in 2,300 and a total population of 1,000,000. Drain and Volcheck (2001) studied other causative agents, including non-steroidal anti-inflammatory drugs, anaesthetics, muscle relaxants, latex and radio-contrast media. Anaphylaxis is often unpredictable and so health professionals need to focus on how they can decrease the risks (Box 2).

Drain and Volcheck (2001) noted that the greater the number of years since the last administration of the offending agent, the less chance there is of a recurrence. Using the parenteral route for medication administration increases the severity and frequency of a reaction, so choice of medicine and route need to be reviewed regularly. If the patient still requires a peripheral IV route, he or she needs to remain under medical supervision for 20-30 minutes after medicine administration (LUHD 2004).

## Time out 6

A patient is due 1.2g benzylpenicillin as an intravenous bolus at 12.00 and you give the medicine by the prescribed route. You are due to give the 5ml saline flush in 30 seconds, but are called to an urgent situation. What might be the outcome? What is the recommended rate for giving a saline flush? How would you manage the outcome?

Immediate actions following anaphylaxis depend on the severity of the reaction. These can range from a mild skin reaction to cardiovascular collapse. Recommendations for practice:

- Discontinue the suspected medicine.
- Administer oxygen, adrenaline (epinephrine) and IV fluids.
- Get help, activate the emergency help button

and telephone the universal cardiac arrest number 2222 for resuscitation (NPSA 2004).

- Start ABC (check airway, breathing and circulation).
- Start cardiopulmonary resuscitation if there is no pulse.
- Monitor oxygen saturation, vital signs and electrocardiogram.

If conscious, the patient with anaphylaxis will be anxious, so nurses need to provide reassurance and adequate information and communication. After a mild event, Drain and Volcheck (2001) specify that at least two hours' observation is needed and in severe cases at least 24 hours.

LUHD (2004) notes the need to ensure prompt and appropriate reporting and recording in the patient's case records (NMC 2004c), and consideration of the Yellow Card Scheme. The Yellow Card Scheme promotes the reporting of adverse medicine reactions, in this situation (anaphylaxis) type B; described as 'a novel response not expected from the known pharmacological actions of the medicine' (Committee on Safety of Medicines and Medicines Control Agency 2002). The patient will require advice on safety issues for the future. This might include the use of a Medic Alert, a bracelet identification system, or an adrenaline (epinephrine) kit.

**Speedshock** An associated hazard with peripheral IV therapy is speedshock, described by Dougherty and Lamb (1999) and Plumer and Weinstein (2001) as a systemic reaction that occurs when a substance that is foreign to the body is rapidly introduced. This occurs most commonly with rapid bolus injection, and is one reason why LUHD developed *The Preparation and Administration of Parenteral Medicines* policy (LUHD 2003b) to ensure safe and consistent practice. The document includes recommended rates of medicine administration and flush volume and rate: flush rate should be no faster than the medicine that has been administered. Plumer and Weinstein (2001) recommend the use of a medical device to regulate flow. Flushing guidance is often overlooked, but is an essential component of peripheral IV care. Recommendations for practice:

- RCN (2003) guidance provides brief recommendations, and a website on IV practice in the United States addressed the issue of flushing (Hadaway 2004). Both advocate pulsatile flush (alternating stop-start technique) as this creates turbulence inside the catheter lumen and flushes any adhering substances.
- The flush volume should be equal to at least twice the volume of the catheter, usually 5-10ml of 0.9% sodium chloride (RCN 2003).

## Time out 7

Identify which medications used in your clinical area could present the greatest risks to patients. Identify the steps you would take if a patient had phlebitis, infiltration or extravasation.

## Phlebitis, infiltration and extravasation

It is important to consider the route, speed and effects on the venous system and tissues when infusing substances intravenously. Pain at the insertion site can be due to phlebitis, infiltration or extravasation. To identify and manage these risks, it is essential to differentiate between the different terms that relate to different types of injury.

**Phlebitis** Phlebitis is an acute inflammation of a vein directly linked to the presence of any vascular access device (Jackson 1998). The first indication of potential problems is often when the patient reports pain. If treated early enough, the symptoms can resolve without further intervention. Reduction in phlebitis rates and reduction in the severity of injuries have been shown in anaesthetised patients where a dedicated cannula is used solely for post-operative purposes (Panadero *et al* 2002). Many clinical areas now consider it good practice to use a phlebitis scale (Table 5).

Phlebitis is the most common complication of IV infusion therapy, and studies demonstrate that 20-80 per cent of patients receiving peripheral IV therapy develop phlebitis (Panadero *et al* 2002). Phlebitis can be further classified into mechanical, chemical and infective phlebitis, depending on the cause of the problem. Mechanical is predominantly due to cannula problems which cause trauma to the intimal wall of the vessel. This could occur on insertion or be caused by displacement of the catheter following manipulation. Chemical phlebitis is a consequence of the compositions

**BOX 2**

**Strategies to reduce the risk of anaphylaxis**

- Ensure that a detailed patient history is taken and full physical examination performed.
- Consider the administration route and the rate of the medicine and/or fluid.
- Identify patients with known allergies who may have had or may have an anaphylactic reaction.
- Ensure good knowledge of the medicine, as some cross-react and are contraindicated if there is a known history of anaphylaxis.

and concentration of the infusate, in particular infusates with extremes of Ph or osmolality, resulting in damage to the endothelium of the vessel wall (Philpot and Griffiths 2003). Infective phlebitis occurs when the tip of the cannula is infected (usually confirmed when blood cultures show the same microbiology as the tip that is sent for culture).

Treatment for phlebitis is usually heat and analgesia (Philpot and Griffiths 2003); however, the use of transdermal anti-inflammatory gel is reported to be beneficial (Cokmez *et al* 2003). The gel works as a vasodilator, counteracting venoconstriction caused by the phlebitis. Anti-inflammatory agents can be beneficial in reducing inflammation at the cannula site.

**Infiltration** Infiltration refers to the inadvertent administration of a non-vesicant drug into the surrounding tissues (Dougherty and Lamb 1999, Plumer and Weinstein 2001). Nursing and medical staff tend to use the terms 'infiltration' and 'extravasation' interchangeably, however, classification is linked to the medication that has caused the problem. The clinical symptoms of infiltration are coolness, leakage at the site, swelling and tenderness. The Intravenous Nurses Society (2000) has devised an infiltration scale (Table 6).

**Extravasation** Extravasation is the leakage of IV drugs from the vein into the surrounding tissues (Jones and Stanley 1997). It tends to relate to the leakage of vesicant drugs, meaning the potential for injury is increased. Moreno de Vega *et al* (2002) report that the most destructive medications are those that contain vinca alkaloids. Many substances which are used regularly can also cause damage and should be used with caution. Examples include sodium bicarbonate, potassium chloride, 10% glucose and erythromycin (CP Pharmaceuticals Ltd 1999). Chemotherapy also presents a high risk to patients and only qualified staff should administer this therapy following training on administration, side effects and action for specific medications.

Local policies for treating extravasations vary, often according to the specialty, age group of the patient and the medications being used. Common treatments can vary from wound exposure, occlusive dressings, infiltration with hyaluronidase and saline, to plastic surgery. Local extravasation kits may also be available to ensure quick action where necessary. It is essential that nurses protect themselves by documenting each stage of an extravasation and the action taken. This is to ensure that, should litigation occur due

**TABLE 5**

**Phlebitis scale**

| | | |
|---|---|---|
| Intravenous (IV) site appears healthy | 0 | No signs of phlebitis – observe cannula |
| **ONE** of the following signs is evident:<br>▸ Slight pain near IV site<br>▸ Slight redness near IV site | 1 | Possibly first signs of phlebitis – observe cannula |
| **TWO** of the following signs are evident:<br>▸ Pain at IV site<br>▸ Erythema<br>▸ Swelling | 2 | Early stage of phlebitis – resite cannula |
| **ALL** of the following signs are evident:<br>▸ Pain along path of cannula<br>▸ Erythema<br>▸ Induration | 3 | Medium stage of phlebitis – resite cannula, consider treatment |
| **ALL** of the following signs are evident and extensive:<br>▸ Pain along path of cannula<br>▸ Erythema<br>▸ Induration<br>▸ Palpable venous cord | 4 | Advanced stage of phlebitis or the start of thrombophlebitis – resite cannula, consider treatment |
| **ALL** of the following signs are evident and extensive:<br>▸ Pain along path of cannula<br>▸ Erythema<br>▸ Induration<br>▸ Palpable venous cord<br>▸ Pyrexia | 5 | Advanced stage of thrombophlebitis – initiate treatment, resite cannula |

(Jackson 1998)

**TABLE 6**

**Infiltration scale**

| Grade | Clinical criteria |
|---|---|
| 0 | No symptoms |
| 1 | Skin blanched<br>Oedema 2.5cm in any direction<br>Cool to touch<br>With or without pain |
| 2 | Skin blanched<br>Oedema 2.5-15cm in any direction<br>Cool to touch<br>With or without pain |
| 3 | Skin blanched, translucent<br>Gross oedema 15cm in any direction<br>Cool to touch<br>Mild to moderate pain<br>Possible numbness |
| 4 | Skin blanched, translucent<br>Skin tight, leaking<br>Skin discoloured, bruised, swollen<br>Gross oedema 15cm in any direction<br>Deep pitting tissue oedema<br>Circulatory impairment<br>Moderate to severe pain<br>Infiltration of any amount of blood product, irritant or vesicant |

(Intravenous Nurses Society 2000)

to patient injury, the sequence of events is clear.

In the neonatal specialty, one of the at risk groups, the prevalence is reported to be 38 per 1,000 (Wilkins and Emmerson 2004). Patients who are at most risk of phlebitis, infiltration and extravasation are listed in Box 3.

Recommendations for practice:

- Avoid placing cannula in lower extremities.
- Use the smallest size cannula possible.

**BOX 3**

**Patients most at risk of phlebitis, infiltration and extravasation**

- Older people
- Neonates and very young children
- Confused patients, or patients with dementia
- Patients with a communication problem, for example, stroke or unconsciousness
- Patients with diabetes, cancer, peripheral vascular disease, Raynaud's phenomenon (causing arterial spasm, may compromise peripheral circulation and reduce venous flow), superior vena cava syndromes (elevated venous pressure may predispose the patient to leakage at the intravenous (IV) site), and patients with blood abnormalities or circulatory problems.
- Patients who have had repeated IV infusion and or injections (these may thrombose vessels and limit the number of accessible veins). This could also apply to patients with substance misuse problems.

(CP Pharmaceuticals Ltd 1999)

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- Infuse the medication carefully and as per instructions.
- Only specially trained personnel should administer specific groups of medication, for example, chemotherapy.
- Identify 'at risk' patients and promote frequent checks.
- Document checks and report all changes, even those that are minor.
- Ensure the cannula is secured correctly.
- Check local policy guidance on treating phlebitis, infiltration and extravasation injuries.

**Time out 8**

**Identify 'at risk' patient groups within your clinical area. Could they be managed better? Consider implementing a phlebitis or infiltration scale or updating an existing policy.**

## Conclusion

Ensuring standards are reviewed and adhered to is crucial for safe evidence-based practice relating to peripheral IV therapy, while also maintaining and meeting professional requirements (NMC 2004a). It is essential that staff are appropriately trained and are knowledgeable of the medicines in use in their practice. This is currently addressed as part of post-registration education and training. To allow skilled staff to transfer skills across specialties requires some standardisation of educational outcomes, which would have benefits for individuals and organisations (NES 2004). This has implications for undergraduate education and relates to the future role of nurse prescribing. Consideration should be given to medical staff and their role in prescribing, and whether shared education is of benefit to reduce any associated risks.

Manufacturers can reduce risks associated with peripheral IV therapy by using consistent, standardised and clear labelling. This article has identified and suggested strategies to reduce risks in peripheral IV practice. Adhering to these recommendations will result in safer patient care and practice **NS**

**Time out 9**

**Now that you have completed this article you might like to write a practice profile. Guidelines to help you are on page 68.**

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