Why you should read this article:
- To refresh your knowledge of the administration of intravenous (IV) fluids and medicines
- To enhance your ability to identify and resolve issues that may occur with the administration of IV fluids and medicines
- To contribute towards revalidation as part of your 35 hours of CPD (UK readers)
- To contribute towards your professional development and local registration renewal requirements (non-UK readers)

Administration of intravenous fluids and medicines in children and young people

Leah Rosengarten

Abstract
Managing intravenous (IV) access is a standard proficiency for UK nurses, enabling them to administer IV injections and IV infusions and to manage injection equipment and infusion pumps and devices. In this article the author describes various types of venous access devices that are commonly seen in practice and details the preparation, checking and administration of IV fluids and medicines, including some complications that may arise. The author also discusses the calculation of fluid requirements, types of IV fluids, displacement values and ongoing care of venous access devices.

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Keywords
clinical, clinical skills, fluid intake, hydration, intravenous infusion, intravenous therapy, medicines, medicines management, nursing care, nutrition, professional

Aims and intended learning outcomes
The aim of this article is to enhance nurses’ knowledge of the administration of intravenous (IV) fluids and medicines in children and young people. After reading this article and completing the time out activities you should be able to:
- Discuss various types of venous access devices, including their benefits and limitations.
- Understand how to demonstrate the patency of venous access devices and the steps to take if patency is not established.
- Describe the main steps involved in the preparation, checking and administration of IV fluids and medicines.
- Recognise how IV fluid requirements are calculated for children and young people.

Introduction
It is a standard of proficiency for nurses in the UK to be able to administer IV injections and IV fluids and to manage injection equipment and infusion pumps and devices. The blood is responsible for providing the body with nutrients, proteins and hormones and for the removal of waste products, therefore IV access is often required in clinical settings to enable administration of medicines, fluids or nutrients directly into the patient’s bloodstream. This allows for greater absorption of these products at a faster rate than alternative methods, such as oral administration, resulting in quicker and often more effective delivery to the body’s tissues and organs (Hill et al 2022).
Several types of device enable IV access, including the following:

» Peripheral cannula – a short-term solution to venous access in children and young people and the most commonly used type of venous access in hospital settings. The peripheral cannula is inserted into the body’s outer veins, such as in the forearm, hand or antecubital fossa (anterior surface of the elbow joint) (Shaw 2016).

» Peripherally inserted central catheter (PICC) line – a medium-term venous access device which is inserted into a peripheral vein – often in the forearm – before being ‘tunnelled’ into the superior vena cava, which is the largest vein in the body and leads directly into the heart (Children’s Cancer and Leukaemia Group 2023).

» Central venous catheter (CVC) – inserted into a large vein in the body, usually in the neck, while the end of the catheter typically sits in either the superior vena cava or cavoatrial junction of the heart. Medicines and fluids can then be injected into the CVC and arrive quickly at the heart before being pumped around the body (Royal Marsden NHS Foundation Trust 2016).

» Central venous port – a type of CVC that is fixed to the chest wall and accessed via a needle through the skin. The catheter leading from the reservoir in the port is then inserted into the superior vena cava (Rosengarten and Camara 2020).

Table 1 lists some types of venous access devices, including some advantages and disadvantages of each.

<table>
<thead>
<tr>
<th>Type of venous access</th>
<th>Location</th>
<th>Common uses</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral cannula</td>
<td>Any peripheral vein</td>
<td>Short-term treatment</td>
<td>Ease of insertion, Smaller chance of serious infection compared with central venous catheters (CVCs), Less chance of long-term scarring</td>
<td>Short lifespan, Increased risk of becoming dislodged compared with CVCs, Small size of catheter</td>
</tr>
<tr>
<td>Peripherally inserted central catheter (PICC)</td>
<td>Often inserted into large veins in the arm, Tunneled into the superior vena cava</td>
<td>Medium-length treatment</td>
<td>Reduced risk of infection, No needles required</td>
<td>Intricate insertion, Smaller veins limit size of catheter, Risk of becoming dislodged</td>
</tr>
<tr>
<td>Central venous catheters (CVCs)</td>
<td>Usually inserted into a large vein in the neck, Tunneled into the superior vena cava</td>
<td>Long-term treatment</td>
<td>Access to central blood supply, No needles required</td>
<td>Difficult insertion, Risk of infection</td>
</tr>
<tr>
<td>Central venous port</td>
<td>Fixed to the chest wall</td>
<td>Long-term treatment</td>
<td>Lower risk of infection</td>
<td>Requires needle to access</td>
</tr>
</tbody>
</table>

(Rosengarten and Camara 2020)

Key points

- Intravenous (IV) access is often required in clinical settings to enable administration of medicines, fluids or nutrients directly into the patient’s bloodstream.

- IV administration of medicines is beneficial because it bypasses the need for absorption of medicines by the gastric tract, has a fast onset of action and enables 100% of the medicine to reach the systemic circulation.

- It is essential that children’s nurses have optimal understanding of the evidence base for IV fluid and medicine administration so they can deliver safe and effective care.

TIME OUT 1

Consider the various types of venous access devices used in your practice area. What are the advantages and disadvantages of these devices? Reflect on any complications associated with the use of these devices you have observed.

Ensuring patency

Before administering medicines into a child or young person’s vein, it is essential that the nurse ensures the device is correctly located within the vein to prevent infiltration or extravasation injuries (Shaw 2016, Rosengarten and Camara 2020).

Infiltration occurs when fluids which do not normally cause inflammation or damage (non-vesicant), for example sodium chloride, leak into the body’s tissues either from the device itself, often due to phlebitis (inflammation of a vein at the site of IV access), or when the device has become dislodged. Extravasation is when fluids which will cause inflammation or damage (vesicant), for example chemotherapy medicines, are inserted outside the vein and into the body’s tissues (Tofani et al 2012). Symptoms of infiltration or extravasation include pain, swelling and redness. Although infiltration of non-vesicant fluids may not cause tissue damage directly, pain, swelling and redness can still occur due to the presence of fluids under the skin.

To establish that a venous access device is correctly located inside a vein, it is recommended that a ‘flashback’ is observed before the medicine is inserted (where blood flow is seen).
is seen in the syringe chamber when the clinician draws back the needle (Fidalgo et al 2012). However, due to the delicate nature of children or young people's veins, it is not always possible to obtain a flashback of blood. Therefore, flushing a small amount of 0.9% sodium chloride into the device, while observing for signs of pain, redness or swelling, is an alternative way of ascertaining whether the device is correctly positioned (Guidelines and Audit Implementation Network 2014, Shaw 2016). It is essential that no vesicant medicines are given unless a clear flashback of blood is obtained from a venous access device. Therefore, nurses should be aware of which medicines are classed as vesicants.

Figure 1 shows guidance on the management of infiltration or extravasation events. Table 2 demonstrates the steps that should be taken if the patency of a venous access device cannot be confirmed; it is important that the nurse always follows local guidelines.

Maintenance of venous access devices
When maintaining a venous access device, the nurse should use an aseptic technique and follow standard infection prevention and control precautions (Loveday et al 2014). Hand hygiene protocols should be adhered to and appropriate personal protective equipment worn as per local policy when maintaining a venous access device.

Box 1 describes the basic requirements of venous access device maintenance.

Visual infusion phlebitis scores
Infusion phlebitis is defined as inflammation of the vein at the site of venous access. While there are different versions of visual infusion phlebitis scoring tools, they share a common aim which is to enable the clinician to monitor IV access devices for signs of infusion phlebitis, such as redness, pain or swelling, infiltration, extravasation or infection. A visual infusion phlebitis scoring tool, such as that shown in Figure 2, enables the nurse to recognise these signs and respond to inflammation or infection. Guidelines may vary locally and depend on the type and use of venous access device, but these scores should be completed once per shift as a minimum (Loveday et al 2014).

TIME OUT 2
You may hear the terms ‘maintenance’ and ‘replacement’ fluids in your practice setting. Do you know what these terms mean? If you are unsure, research the terms and reflect on how you may apply your knowledge in practice.

Intravenous fluids
Febrile illness and diarrhoea (with or without vomiting) are the second and third most common medical conditions, after breathing difficulties, that cause children to present to emergency departments (Sands et al 2012). Therefore, it is common that a children’s nurse will care for children experiencing dehydration and who require IV fluids. Box 2 details the care required by children and young people receiving IV fluids.

Calculating fluid requirements
Due to the frequency with which children’s nurses are likely to administer IV fluids, it is useful to understand how routine maintenance fluids are calculated. The Holliday-Sagar formula to calculate routine maintenance fluids is detailed in Box 3. The routine fluid maintenance formula for full-term neonates is detailed in Box 4.

On occasion children and young people may experience extreme dehydration or blood loss leading to hypovolaemic shock. Hypovolaemic shock occurs when a loss of blood volume leads to insufficient perfusion of the body’s tissues and can be fatal if untreated. IV fluid resuscitation must be delivered to children and young people who show signs of hypovolaemic shock (NICE 2020). They may be given IV fluid resuscitation using 10mL/kg of glucose free crystalloids that contain sodium in the range of 131-154mmol/litre (usually 0.9% sodium chloride) over less than 10 minutes (NICE 2020).
**Titration of fluids**

Children and young people receiving IV fluids due to diarrhoea and/or vomiting may require what are known as replacement fluids. These are administered on top of the maintenance fluids the child or young person is receiving and which will replace those fluids excreted from the body. The nurse will be required to document all ongoing fluid losses, by weighing and measuring these fluids, before administering the same replacement volume in IV fluids. NICE (2020) recommends the use of 0.9% sodium chloride containing potassium to replace ongoing losses in neonates born at full term, children and young people.

In practice, it does not always follow that children and young people will simply hydrate exclusively with oral or IV fluids. As such, it will be necessary for the nurse to titrate the amount of IV maintenance fluids the patient should receive depending on the fluids they are drinking orally and/or receiving through medicines (some IV medicines are administered in large volumes of fluid so this must be taken into account when estimating the patient’s overall hydration).

It is also common practice to use IV fluids to flush the system before administration of medicines to check for patency and again afterwards to ensure that no medicines have been retained in the device; therefore, this flushing must be considered in fluid balance calculations. Prescriptions of IV fluids should consider all fluids a patient is receiving orally and intravenously to prevent them becoming overhydrated, which could lead to excess water in the body and cause a drop in sodium (salt) levels (hyponatraemia) (Branan et al 2020).

**Types of intravenous fluids**

There are three main types of IV fluids frequently used in practice – isotonic, hypertonic and hypotonic. An isotonic fluid (such as 0.9% sodium chloride) has the same solute and water concentration as blood and is the most commonly used fluid for hydration and medicine administration. Hypertonic fluids (such as 3% sodium chloride) have a higher concentration of dissolved solutes than blood. The infusion of these fluids causes the movement of water from cells into the vascular system (NICE 2020). Hypotonic fluids, such as 0.45% sodium chloride (Electronic Medicines Compendium 2023), have a lower concentration of dissolved solutes than blood, therefore an infusion of hypotonic fluids causes the body to move fluids from the blood to the intracellular space.

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**Table 2. Steps to take if patency of venous access device cannot be confirmed**

<table>
<thead>
<tr>
<th>Device</th>
<th>Steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral cannula</td>
<td>Remove cannula and insert new device</td>
</tr>
</tbody>
</table>
| Peripherally inserted central catheter, central venous catheter (CVC) and central venous port (CVP) | Ask patient to breathe deeply, lift arm or change position. If no blood ‘flashback’:  
  - Flush CVC with 0.9% sodium chloride in 10mL syringe using a ‘push-pause’ technique  
  - If still no blood flashback:  
    - If the patient has a CVP, change the needle.  
    - If still no blood flashback:  
      - Insert the medicine urokinase (dissolved in 0.9% sodium chloride to a concentration of 5,000 units/mL) and leave for 60 minutes. Following this, withdraw the urokinase and reassess the catheter. Repeat as necessary  
      - If still no blood flashback:  
        - Verify the location of the catheter tip by chest X-ray |

(Developed by Andrew Jackson, consultant nurse intravenous therapy and care, Rotherham General Hospitals NHS Trust 2020)

**Box 1. Basic requirements of venous access device maintenance**

- Use 2% chlorhexidine gluconate in 70% isopropyl alcohol to clean the access port or catheter hub before access. Wipe the hub for a minimum of 15 seconds and allow to dry before accessing the system.
- Observe and evaluate devices and the surrounding tissue, the condition of the device and the security of the connections or add-on devices at least every shift.
- Visual infusion phlebitis (inflammation of a vein at the site of intravenous access) scores should be documented on each shift as a minimum.
- Flush the access device at regular intervals, as per local guidelines.
- Use a sterile, transparent, semi-permeable polyurethane dressing to cover the insertion site.
- Change the dressing covering the insertion point of the access device every seven days or more.
- Flush the access device at regular intervals, as per local guidelines.

(Loveday et al 2014)

**Figure 2. Visual infusion phlebitis scoring tool**

VIP score should be evaluated during each shift and documented on the observation chart.

- **0**: No signs of phlebitis  
  - OBSERVE CANNULA
- **1**: Possible first signs of phlebitis  
  - OBSERVE CANNULA
- **2**: Early stage of phlebitis  
  - RESITE CANNULA  
  - CONSIDER TREATMENT
- **3**: Medium stage of phlebitis  
  - RESITE CANNULA  
  - CONSIDER TREATMENT
- **4**: Advanced stage of phlebitis or start of thrombophlebitis  
  - RESITE CANNULA  
  - CONSIDER TREATMENT
- **5**: Advanced stage of thrombophlebitis  
  - INITIATE TREATMENT  
  - RESITE CANNULA

(Developed by Andrew Jackson, consultant nurse intravenous therapy and care, Rotherham General Hospitals NHS Trust. Reproduced with permission from 3M and adapted)
**TIME OUT 3**

In your practice area, which conditions would require treatment with an isotonic fluid, which would require a hypotonic fluid and when might you administer a hypertonic fluid? You can find more information about these fluids on the Nurse Labs website (nurseslabs.com/iv-fluids/) and in the NICE (2016) quality standard on IV fluid therapy in children and young people in hospital (www.nice.org.uk/guidance/qst331/chapter-quality-statement-3-fluid-type-for-intravenous-iv-fluid-resuscitation). You should also consult your local policies.

**Intravenous medicines**

IV administration of medicines is beneficial because it bypasses the need for absorption of medicines by the gastric tract, has a fast onset of action and enables 100% of the medicine to reach the systemic circulation (Greener and Carr 2022). IV medicines may be administered via bolus (administered over a short period of time), intermittent infusion or continuous infusion. The NMC (2018) requires all nurses to be able to manage the administration of IV medicines. This can be broken down into three distinct stages: preparation, checking and administration.

**Preparation**

Before administering a prescribed medicine, it is essential that the nurse understands its common indications, contraindications and side effects (NMC 2018). This may require the nurse to access a pharmaceutical reference guide such as the British National Formulary for Children (Joint Formulary Committee 2022). It is also important that the nurse is familiar with the relevant information in the prescription, such as the patient’s demographic details and the accurate name and dose of the medicine to be administered (NICE 2023a).

**Dilution of medicines and frequency of administration**

Many IV medicines require dilution before administration. It is important to ensure that medicines are appropriately diluted with a compatible fluid to ensure the medicine remains stable and does not cause irritation on administration. Some medicines, such as antibiotics, are often in powder form which needs to be reconstituted into a liquid form for injection.

When reconstituting a medicine, the nurse should follow the advice on the packaging or in pharmaceutical referencing guides on, for example, the type of diluent required and the volume needed. In addition, the displacement values of a medicine may vary between medicines and brands. Advice given in medicine information will usually include the volume and type of liquid required for reconstitution, whether the solution should be shaken, rolled or left to dissolve and the maximum time after reconstitution that the medicine must be administered (NICE 2023b).

When calculating the required dose of an IV medicine, the nurse should follow the formula shown in Figure 3. Liquid medicines are usually presented in mg/mL form. For example, if paracetamol is presented as 10mg/mL, this means that every 1mL of solution contains 10mg of paracetamol. Following the formula shown in Figure 3, if 120mg of paracetamol is required, the nurse can calculate the volume required by taking the amount ‘they want’ (120mg), dividing by the amount ‘they’ve got’ (10mg) and multiplying by the dose in which the medicine is contained (1ml),

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**Box 2. Care required by children and young people receiving intravenous (IV) fluids**

- Children and young people who are receiving IV fluids require assessment and documentation of the following:
  - Daily body weight
  - Fluid input, output and balance over the preceding 24 hours
  - Special instructions for prescribing
  - Assessment of fluid status
  - Results of laboratory tests (including full blood count, urea, creatinine, plasma electrolyte concentrations and blood glucose)
  - Results of point-of-care assessments
  - Details of ongoing fluid losses
  - Calculations of fluid requirements for routine maintenance, replacement, redistribution and fluid resuscitation due to shock
  - Details of fluid and electrolyte prescription (in mL per hour), with appropriate signatures, dates and times
  - Type of fluid (urine, gastric or other) and volume of fluid input and output, recorded hourly including running totals
  - 12-hourly fluid balance subtotals and 24-hourly fluid balance totals

(Adapted from National Institute for Health and Care Excellence 2020).

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**Box 3. Holliday-Segar formula to calculate routine maintenance fluids**

- 100mL/kg/day for the first 10kg of weight
- 50mL/kg/day for the next 10kg
- 20mL/kg/day for the remaining weight over 20kg
(Adapted from Holliday and Segar 1957, National Institute for Health and Care Excellence 2020).

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**Box 4. Routine fluid maintenance formula for full-term neonates**

- From birth to day one: 50-60mL/Kg/day
- Day two: 70-80mL/kg/day
- Day three: 80-100mL/kg/day
- Day four: 100-120mL/kg/day
- Day five to day 28: 120-150mL/kg/day
(Adapted from National Institute for Health and Care Excellence 2020).
resulting in 12mL of the medicine required (Lingwood et al 2022).

It is vital that medicines are administered only at the frequency advised to prevent overdosing or under-dosing and to maintain the therapeutic index of the medicine. The therapeutic index is the range in which a medicine remains therapeutic for a child or young person; for some medicines there can be a narrow range of safety between an ineffective dose, an effective dose and a lethal dose (Hill et al 2022). The British National Formulary for Children advises on the frequency of IV administration for all medicines licensed for use in children and young people (Joint Formulary Committee 2022).

Displacement values

When powder medicines are reconstituted with a solvent, the resulting volume of the mixture can be greater than the amount of solvent added because the powder itself adds to the volume. The difference between the volume of the solvent added and the final volume is known as the displacement value. For example, if 10mL of water for an injection is added to 10mg of amoxicillin powder and the result is 10.5mL of fluid in the vial, then the displacement value of that medicine is 0.5mL.

Displacement values vary between medicines and brands, so it is essential to always check the displacement value of the medicine being reconstituted. The displacement value must be considered when calculating the amount of medicine to be administered to prevent a child or young person receiving an underdose. Regarding the above example, if the displacement value was not considered and the patient was administered only the 10mL of fluid that was inserted into the vial, this would result in an underdose (Greener and Carr 2022).

Checking

Although local policies may vary, in the UK checking an IV medicine usually requires two registered nurses with the requisite knowledge and competence (Royal College of Nursing 2020). These nurses should independently calculate the amount of medicine required and both should witness every aspect of the reconstitution and preparation of the medicine.

The ‘5 Rs’ of medicine management remind nurses that before administering a medicine, it is essential to check that (Edwards and Axe 2015):

- The medicine is to be administered to the Right patient...
- It is the Right medicine...
- To be given through the Right route...
- At the Right dose...
- And at the Right time.

Edwards and Axe (2015) advocate for five further Rs which are:
- The patient has the Right to refuse the medicine.
- The nurse has the Right knowledge and understanding of the medicine and the patient.
- The nurse has asked the Right questions if there is any doubt in the process.
- The medicine has had the Right response.
- The Right advice has been given to the patient and family members.

Administration

The manufacturer’s guidance on the amount of diluant required, the compatible fluids for dilution and flushing and the amount of time over which a medicine should be administered (boluses are usually administered over 3-5 minutes) should be followed for all medicines.

A giving set comprises the equipment used to deliver medicines by infusion, such as the tubing which carries the medicine from the infusion container or syringe into the access device. The nurse should prime the giving set with a compatible solution, taking care to prevent or remove air bubbles in the line.

Nurses should be trained to use all giving sets and electronic IV administration devices that they intend to use before they use them (NMC 2018). Most electronic IV administration devices administer medicines in mL per hour. Therefore, to calculate the speed at which a medicine is to be administered, the nurse will need to take the total volume in mL and divide this by the total time in hours over which the medicine is to be administered, which will give the rate in mL per hour (Figure 4). For example, if 50mL of voriconazole is to be given over two hours, then 50mL divided by two is 25mL per hour. Alternatively, if the solution is to be given in less than one hour, the nurse can...
Nurses should maintain strict asepsis. In general, the giving set should not be used for signs of adverse reaction or anaphylaxis. The nurse should document the administration of all IV medicines in line with local policies (NMC 2018).

During IV medicines administration, NICE (2023b) provides the following guiding principles:

» Nurses should maintain strict asepsis throughout the IV administration of medicines.
» Where possible, ready-made preparations of medicines (those preprepared in a pharmacy department) are preferable. Where medicines must be prepared on the ward or unit, the nurse should consider the following (NICE 2023b):
  » Medicines should be administered immediately or as soon as practicable after preparation.
  » A diluent solution should be chosen that is compatible with the medicine being administered.
  » ‘Gold standard’ practice is to use preprepared solutions of medicines and diluents, but where this is not possible, or where a different diluent is required, medicines can be added directly to an infusion container (the container that the solution is kept in before it is administered into the device) without being preprepared.
  » Only one medicine should be added to an infusion container, ensuring that the components (the medicine and the diluent) are compatible.
  » Medicines should not normally be added to blood products, mannitol (because of the risk of incompatibility with other medicines) or sodium bicarbonate (because the alkalinity of sodium bicarbonate can affect other medicines).
  » The nurse should thoroughly mix solutions by shaking and should check to ensure the absence of particulate matter before administration.
  » IV infusions should be examined intermittently during administration to check for cloudiness, crystallisation, change of colour or other signs of interaction or contamination.
  » In general, the giving set should not be used for more than 24 hours due to the risk of microbial contamination.
  » Infusion containers must be labelled with the patient’s name, the name and quantity of additives and the date and time of addition (and the expiry date or time).

It is important to continue to monitor the patient throughout IV medicine administration. The nurse should document the administration of all IV medicines in line with local policies (NMC 2018).

Frequency of line changes and filters
Guidance varies on the frequency of infusion line changes. For example, NICE (2023b) advises that a giving set should not be used for longer than 24 hours because of the risk of microbial contamination, whereas evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England (Loveday et al 2014) advise that giving sets do not require replacement more often than every 96 hours. It is advisable that nurses follow local guidance but note that device-specific recommendations from the manufacturer may differ. When an infusion line becomes disconnected, or when a vascular access device is replaced, the line should be replaced (Loveday et al 2014). Additionally, if there are signs of interaction or discolouration in the line it should be changed immediately.

Most IV giving sets already contain an inline filtration system to filter out small particulate matter from solutions. If additional bacteria filters, particulate-retentive filters, air-eliminating filters and blood or blood component filters are required, guidance for these should be included in local policies (Gorski 2017). However, it is important to note that some medicines will have additional filtration requirements listed in the medicine information. When using bacteria, particulate-retentive and air-eliminating membrane filters, these should be changed at the same time as the IV administration set.

Presence of air in intravenous lines
Nurses are often concerned about the risks posed by accidental injection of air into a venous access device, and while IV infusion pumps are designed to identify air bubbles, nurses should not rely on these exclusively. There is no definitive answer about what constitutes a safe level of air inside a venous access device as the size of the air bubble which constitutes a risk will be proportionate to the diameter of the vessel it occludes. Therefore, the smaller the child the smaller the air bubble that could cause harm. The ideal management of IV infusions would be to remove all air bubbles from the giving set (Rosengarten 2020).
**TIME OUT 5**

Read your local policy for the administration of IV fluids and medicines. What does the policy say about line-locking? What are some of the benefits and limitations of such device locks?

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**Line-locking**

Line-locking refers to when a solution (usually 0.9% sodium chloride but sometimes an anticoagulant or antibiotic) is inserted or ‘locked’ into a venous access device when it is not being used to prevent backflow of blood into the line that could develop into a blood clot. Local policy will dictate the use of heparin as an anticoagulant or use of an antibiotic line-lock for venous access devices.

Due to the risk of antimicrobial resistance, antibiotic line-lock solutions should not be used routinely to prevent catheter-related bloodstream infections (NICE 2017). However, antimicrobial barrier caps (small caps which cover the port of the venous access device to protect it and which are impregnated with an antimicrobial) are advocated for preventing haemodialysis catheter-related bloodstream infections due to the cost and risk associated with infection in these lines (NICE 2021).

**Conclusion**

As with all care provided to children and young people, it is essential that the nurse has up-to-date knowledge and understanding of the processes involved in IV fluid and medicine administration to maintain their professional competence. Through understanding the complexities of IV fluid and medicine administration, the nurse will be able to identify and resolve issues that occur and continue to improve standards of care.

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**References**


Intravenous fluids

TEST YOUR KNOWLEDGE BY COMPLETING THIS MULTIPLE-CHOICE QUIZ

1. Healthcare-associated bloodstream infections are associated with which type of equipment?
   a) Sphygmomanometers
   b) Vascular access devices
   c) Magnetic resonant imaging scanners
   d) Stethoscopes

2. Which of the following venous access devices is most commonly used in children and young people’s hospital care?
   a) Peripherally inserted central catheter
   b) Central venous catheter
   c) Peripheral cannula
   d) Central venous ports

3. The term ‘extravasation’ is defined as:
   a) Where fluids which will cause inflammation or damage are inserted outside the vein and into the body’s tissues
   b) Where fluids which will cause inflammation or damage are inserted directly into a vein
   c) Where fluids which will cause inflammation or damage are inserted into an artery
   d) Where the venous access device becomes separated from the patient’s vein

4. What steps should the nurse take when they cannot confirm the patency of a peripheral cannula?
   a) Administer the drug anyway
   b) Administer 250ml of sodium chloride
   c) Remove the cannula and insert a new device
   d) Continue to use the cannula until they see signs of swelling or inflammation

5. Infusion phlebitis occurs when:
   a) The infusion is too frequent
   b) Excessive bleeding is seen at a venous access site
   c) The patient forcibly removes a venous access device
   d) Inflammation of the vein develops at the site of venous access

6. The role of replacement fluids is to:
   a) Replace fluids excreted from the body
   b) Replace fluids that the patient has refused to drink
   c) Thin the blood
   d) Promote regular urination

7. Which of the following is a benefit of IV administration of medicines?
   a) Bypasses the need for absorption of medicines by the gastric tract
   b) Has a fast onset of action
   c) Enables 100% of the medicine administered to reach the systemic circulation
   d) All of the above

8. The ‘displacement value’ is described as:
   a) The difference between two brands of the same medicine
   b) The difference between the volume of fluid added to a powder medicine and the final volume
   c) The amount of fluid needed to reconstitute a medicine
   d) The cost of the medicine per dose to the NHS

9. Which of the following is not one of the 5 ‘R’s of medicine management?
   a) Right dose
   b) Right time
   c) Right brand
   d) Right route

10. What action should a nurse take on noticing discoloration in an infusion line?
    a) Change the line immediately
    b) Leave the line in place and record it in the patient’s notes
    c) Call for medical assistance
    d) Flush the line with sodium chloride

How to complete this assessment

This multiple-choice quiz will help you test your knowledge. It comprises ten multiple choice questions broadly linked to the previous article. There is one correct answer to each question.

You can read the article before answering the questions or attempt the questions first, then read the article and see if you answer them differently.

You may want to write a reflective account. Visit rcni.com/reflective-account

Go online to complete this multiple-choice quiz and you can save it to your RCNi portfolio to help meet your revalidation requirements. Go to rcni.com/cpd/test-your-knowledge

The answers to this quiz are: 1. b 2. c 3. a 4. c 5. d 6. a 7. d 8. b 9. c 10. a

This activity has taken me ___ minutes/hours to complete. Now that I have read this article and completed this assessment, I think my knowledge is:

Excellent ☐ Good ☐ Satisfactory ☐ Unsatisfactory ☐ Poor ☐

As a result of this I intend to: ________________________________

_____________________________________________________________________________________________________________

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