

INTRAVENOUS CANNULAS



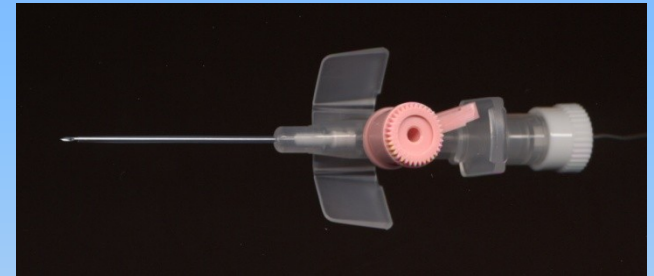
Aims & Objectives

This presentation aims to present students with an overview of cannulation, the knowledge and skills required to undertake the procedure safely and competently, how to recognise, prevent and manage associated complications.

Introduction

Peripheral cannulation provides access for the purpose of IV hydration or feeding and the administration of medications.

A **Cannula** is a flexible tube, usually **containing a needle** (stylet), which can be inserted into a body cavity, duct, or vessel in order to **drain fluid or administer a substance** such as medications.



A **Catheter** is a flexible tube that is inserted into a body cavity in order to **withdraw or introduce fluids**.



Peripheral cannulation is a common procedure with more than 24 million cannulae of all designs sold in the U.K.

Selection of a vein

Palpation of the vein should be performed before every cannulation to determine veins from arteries (**arteries pulsate and veins do not**), and also to **locate valves**.

Palpation is achieved by placing one or two fingers over the vein and pressing lightly; then releasing the pressure to assess the vein's elasticity and rebound filling.

The ideal vein is **bouncy, refills when depressed**, is **straight** and **free of valves**.

Must choose a suitable vein for the intended purpose; (**rate of flow, type of infusion, duration of therapy, avoid joints** since it will lead to **mechanical phlebitis** or **tissuing** of cannula. And also restricts the patient's movement.

Factors that may affect cannulation

- **Age of the patient** – small and very fragile veins in young and elderly
- **Nutritional status** – friable veins in those who are malnourished, deep difficult veins in obese patients
- **Medical history** – E.g. **Amputations, lymphoedema, cerebrovascular accident, mastectomy** (the arm on the side of the unaffected breast should be used), some **surgical procedures** or the presence of a **haemodialysis shunt**
- **Prescribed medications** such as **anticoagulants** or **long-term corticosteroids**, which make the veins more fragile and prone to bruising
- **The physical condition of the patient**, for example venous access is more difficult if the patient is **dehydrated**, in **shock** or **hypothermic**
- **Skill of the practitioner**

Improving venous access

- Use a **tourniquet** – apply **7-8 cm above the chosen site**, must be **tight enough to impede venous return but not affect atrial flow**
- **Opening and closing the fist** along with **gravity** both improve vasodilation
- **Gentle tapping** or **stroking** may improve vasodilation – but **can be painful**
- **Apply heat** – such as **warm pack**, or **soaking limb in a bowl of warm water**

Which vein?

For **prolonged courses of therapy**, it is recommended, although not always practical, to **start distally and cannulate at proximal points** since sites can be maintained for longer

Cephalic vein – takes a large gauge cannula and provides a natural splint, but is at a joint

Basilic vein – awkward for cannulation due to location, but is quite large

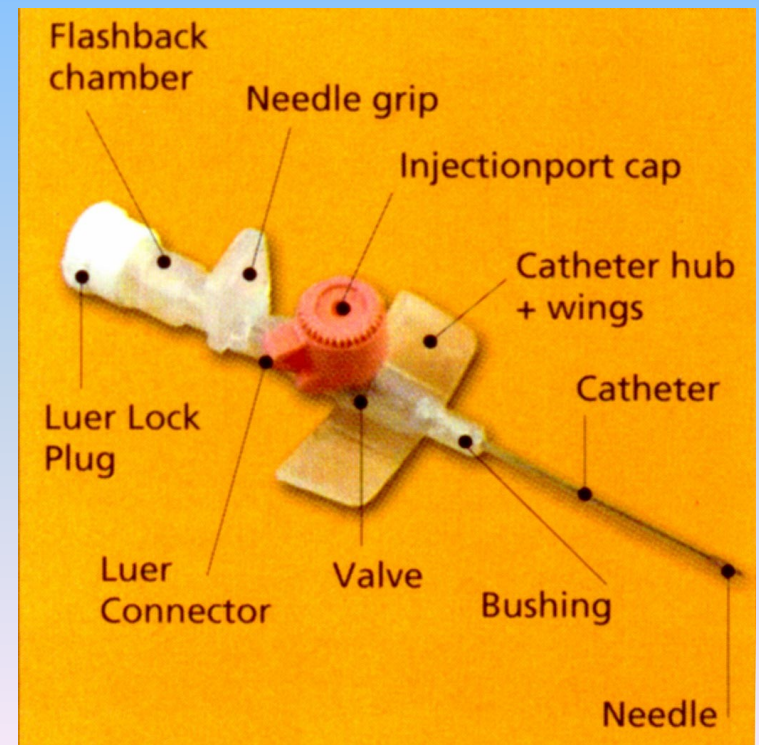
Dorsal venous network – easily accessible, visualised and palpated – contraindicated in older patients due to loss of turgor, so veins are not stable

Choosing a cannula

- Use “**over the needle**” type of cannula – where cannula is mounted on the needle – available in various **gauges (16–24g)**, **lengths (25-45mm)**, **compositions** and **designs**. Also different materials have **differing flow rates**.
- **Smallest gauge should be used** to minimise damage to the vessel intima and ensure adequate blood flow around the cannula (reduce risk of phlebitis).

- **Cannula comprises of different components**

Some have **wings** to help fix it to the skin, others have **ports** on top to enable the administration of medications without interfering with a continuous infusion. **Safety cannulae** are liable to reduce the risk of needlestick injury (have a safety button).



Preparation of the environment, the practitioner and the patient

- There should be adequate **lighting** and the room should be **warm** enough to encourage vasodilation
- **Practitioner should be in a comfortable position** (alter height of bed or chair)
- Wear **properly fitting gloves** to protect from contamination by blood spillage
- **Anxiety** in patient due to needle phobia or previous bad experience could present
- Provision of **clear and comprehensive information** should alleviate anxiety
- A **careful explanation** should be provided of the procedures and **patient consent** must be gained (**Verbal consent is usually acceptable**)
- **Patient should be in a comfortable position**. Placing arm on a **pillow** or **rolled towel** provides support and a firm, flat surface

Pain Relief

Non-pharmacological methods

- **Relaxation**
- **Distraction** – E.g. Coughing at time of insertion of needle

Pharmacological methods

- **Local anaesthetics** in the form of **cream** or **gel** or **intra-dermal injection** has been advocated to reduce pain, and anxiety in children and selected adults
- Local anaesthetic is also recommended **if the cannula is larger than 18g**, when a sensitive site is used or at the **patient's request**.

Skin preparation

- **It is important to clean the skin properly** – wash with soap and water to remove visible dirt (removes transient flora)
- **Use anti septic solution** - E.g. Chlorhexidine (2%) or alcohol (70%) for 30-60s
- **Allow skin to dry** – ensures disinfection and avoids stinging from needle
- **Do not touch or repalpate the skin** – avoids recontamination
- **Hair removal is not necessary** – but can be trimmed with scissors or clippers

The procedure

- **Stabilisation of the vein** – apply traction with non-dominant hand to the side of the insertion site or below it, using thumb and forefinger
- Stabilisation of vein should be maintained throughout the procedure until cannula is sited
- **Needle enters skin with bevel side up**, so **sharpest side penetrates skin first**
- **Angle needle enters** varies depending on type of device used and the depth of the vein in the subcutaneous tissue, from **10 to 45 degrees**
- **Once entry into the vein is achieved, angle is reduced** to prevent puncturing posterior wall of the vein
- When blood appears into chamber, it is known as “**flashback**”, indicating initial entry into the vein is successful
- Followed by a “**giving way**” sensation felt by the practitioner – overcoming of the resistance of the vessel wall

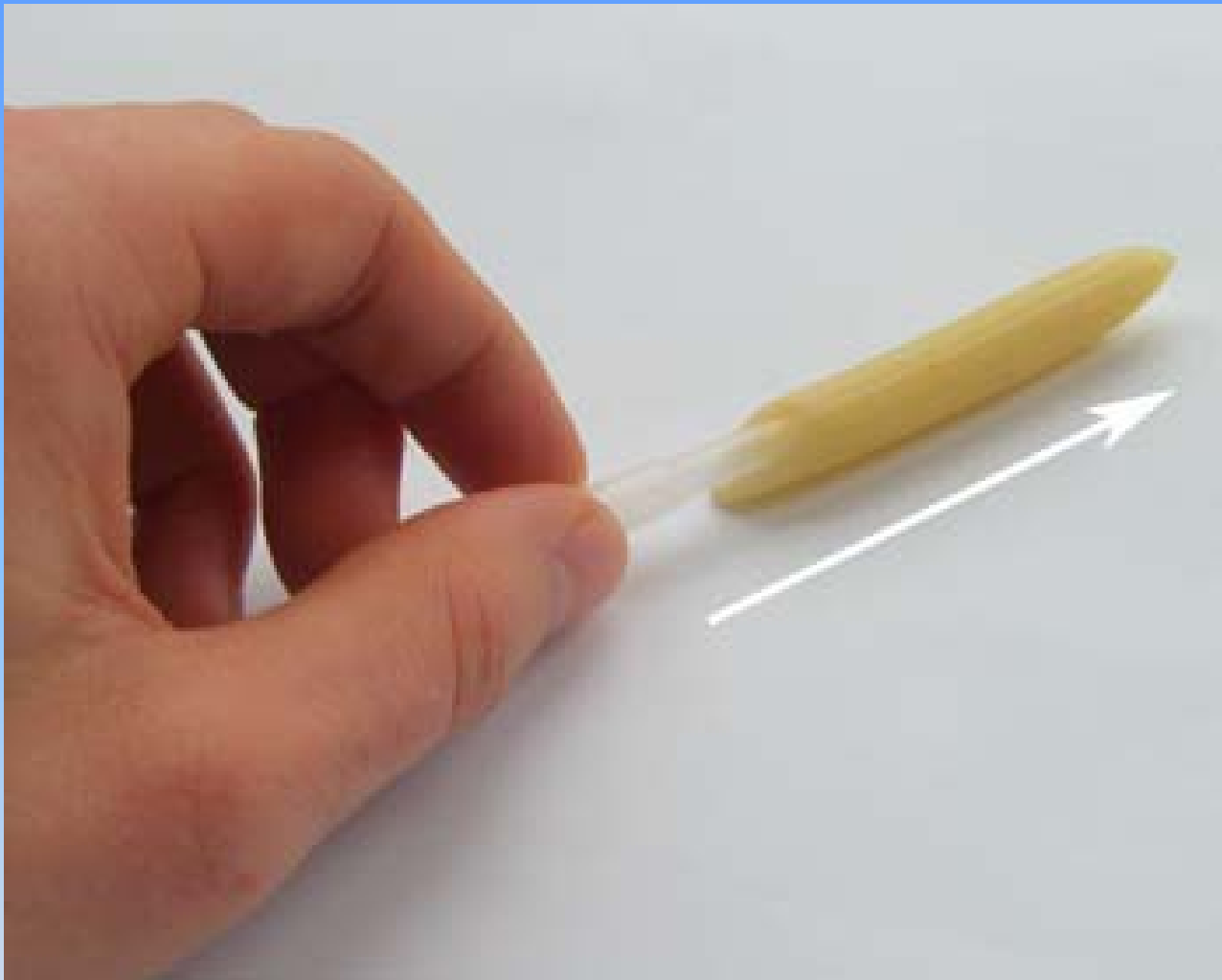
The procedure...continued

- Flashback may stop if posterior wall is pierced, or may slow if gauge of cannula is small or patient is hypotensive
- Cannula should be **advanced gently and smoothly into the vein**. The **one-handed technique** – the same hand that performs cannulation also withdraws the stylet and advances the cannula into the vein
- The **one-step technique** – where the practitioner can slide the cannula off the stylet in one movement once the cannula has entered the vein
- The **two-handed technique** – where the practitioner performs the cannulation with one hand but releases the skin traction to advance the cannula off the stylet, which **can result in puncturing of the posterior wall of the vein**
- If cannulation is unsuccessful the **stylet should never be reintroduced** as this could result in catheter fragmentation and embolism. The device should only be used once.
- Only **two attempts** should be made at cannulation before **passing the patient onto a more experienced practitioner**

Step – by – step



Step 1: Use a BD Venflon and a cooked piece of penne pasta. Using a BD Venflon is essential because the depth of its plastic casing means that the pasta sits nicely at an accessible height for cannulation (other brands often have deeper casings).



Step 2: Open the cannula, unfold its wings, and remove the plastic sheath that covers the needle. Insert the sheath through the pasta to stent it. The pasta simulates the skin, and the tapering end of the sheath creates a space to cannulate, simulating the vein



Step 3: Put the stented pasta into the cannula box ready for practice. In a real scenario remember to wear gloves, clean the overlying skin, and locate a sharps box before starting. Cannulation is easier if you first try to increase venous filling. It helps to use a tourniquet; to lower the arm below the level of the heart; to ask the patient to open and close their fist; and gently to tap above the vein



Step 4: Take a three point grip of the cannula, with your thumb on the white cap, index finger on the coloured cap, and middle finger on the wing. In a real scenario apply counter-traction to the overlying skin with your other hand to help anchor the vein during insertion



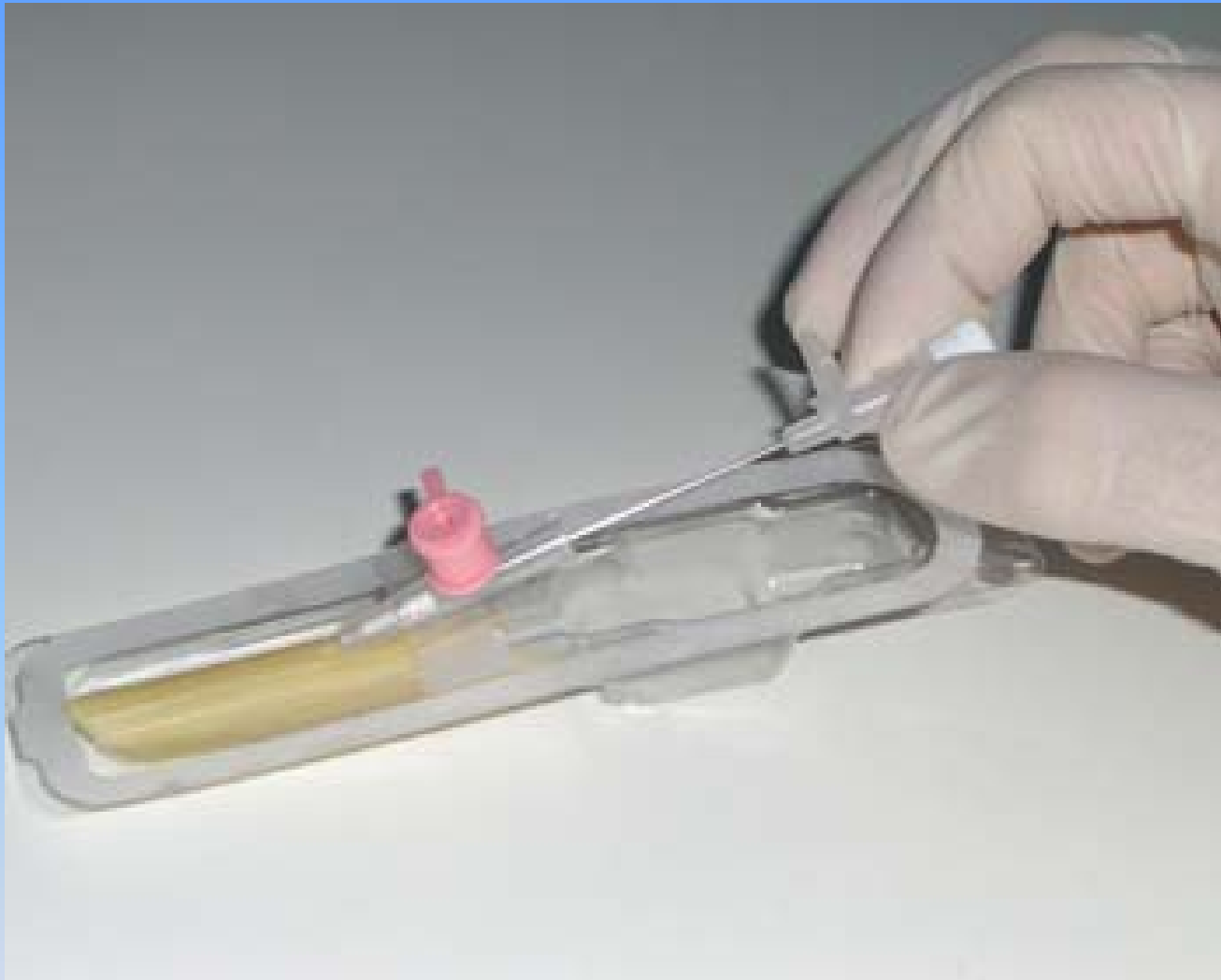
Step 5: Approach at a 30° angle to go through the skin (the outer layer of pasta) then reduce to a 15° angle to advance the needle inside the vein (the space between sheath and pasta) until you see the first flashback (in a real scenario). The flashback provides visual indication of venous entry. The first flashback occurs as you enter the vein, and the second occurs as the needle is withdrawn and blood moves to fill this space. There are three main explanations for failed needle insertions—missing the vein; perforating the posterior wall of the vein; and hitting a valve within the vein



Step 6: Now change your grip, so the thumb and middle finger are on the white cap to withdraw the needle about 5 mm to produce the second flashback. Importantly the index finger provides counter-traction on the wing



Step 7: With just the index finger remaining in place at the wing, advance the cannula along the vein. In a real scenario this is the time to release the tourniquet



Step 8: Fully withdraw the needle. Remove the white cap and use it to cap the cannula promptly. To prevent bleeding in a real scenario, occlude the vein with your other hand at the tip of the inserted cannula while you remove the needle until you cap the cannula.



Step 9: When finished practising, remove the cannula, return the needle to the cannula, and return this unit to its sheath for safe storage and further practice

Care and management

- **Flushing should be performed before and after each use of the cannula**
- If not used, the **cannula should be flushed every 24 hours with 0.9% sodium chloride**, using a **pulsated (push pause)** flush to create turbulent flow and positive pressure
- **Needleless injection caps** are used to reduce significantly the incidence of catheter occlusions.
- Cannula can be **secured using clean tape or a securement device**, which have been shown to reduce the risk of dislodgement and other complications such as mechanical phlebitis.
- A **transparent dressing or low-linting gauze** should be applied **and then a bandage** may be applied. Transparent dressings, particularly moisture-permeable dressings, should not be bandaged as visibility and moisture permeability are obscured

Never forget...Documentation

- Date and time of insertion
- The location of device
- Type and gauge size of device
- Signature of the practitioner inserting the device
- Any other information that the practitioner feels is necessary to ensure continuity of care, such as problems with access and/or anxiety related to needles
- Assessment of the site should be documented using relevant tools (Visual Infusion Plebitis Score) – next slide

Visual Infusion Phlebitis (VIP) Score

Intravenous (IV) site appears healthy	0	No signs of phlebitis • Observe cannula
One of the following is evident: ▶ Slight pain near IV site ▶ Slight redness near IV site	1	Possible first signs of phlebitis • Observe cannula
Two of the following are evident: ▶ Pain near IV site ▶ Erythema ▶ Swelling	2	Early signs of phlebitis • Re-site cannula
All of the following are evident: ▶ Pain along path of cannula ▶ Erythema ▶ Induration	3	Medium stage of phlebitis • Re-site cannula • Consider treatment
All of the following are evident and extensive: ▶ Pain along path of cannula ▶ Erythema ▶ Induration ▶ Palpable venous cord	4	Advanced stage of phlebitis or start of thrombophlebitis • Re-site cannula • Consider treatment
All of the following are evident and extensive: ▶ Pain along path of cannula ▶ Erythema ▶ Induration ▶ Palpable venous cord ▶ Pyrexia	5	Advanced stage of thrombophlebitis • Initiate treatment • Re-site cannula

Removal of the device

- It is recommended that **peripheral devices should be re-sited every 72-96 hours**, although some literature supports extending the dwell time **up to 144 hours under certain circumstances** (E.g. Infusion of non-irritant medications or fluids).
- Removal of cannula should be conducted under **aseptic conditions**
- Site should be **inspected to ensure bleeding has stopped** and should be covered with a **sterile dressing**.
- Cannula integrity should be checked to ensure that the **complete device has been removed**
- **Date, time** and **reason for removal** of the cannula should be **DOCUMENTED**

Complications

Complications need to be recognised and managed at the **earliest possible stage**, as they can result in pain, patient anxiety, haematoma, inflammation, infiltration or extravasation.

- **Haematoma formation**
- **Inadvertent arterial puncture**
- **Neural puncture**

If these occur, then they **MUST BE DOCUMENTED** and the patient must be informed of **who and when to contact if they develop numbness or tingling** in the limb

- **Phlebitis** and **infiltration** are most common complications – management depends on cause and also depends on extravated materials

A Little test

1. Peripheral cannulation provides intravenous access for:

- a) Hydration
- b) Feeding
- c) Medications
- d) All of the above

2. Which of the following statements is correct?

- a) Arteries and veins pulsate
- b) Arteries do not pulsate
- c) Veins do not pulsate
- d) Veins pulsate

3. Which of the following is not a form of phlebitis:

- a) Chemical
- b) Physical
- c) Infectious
- d) Mechanical

4. The ideal vein for cannulation should:

- a) Have a number of valves
- b) Refill when depressed
- c) Be rigid
- d) Be located over a joint

5. How often should a cannula that is not in use be flushed?

- a) Every hour
- b) Twice a day
- c) Every other day
- d) Every 24 hours

6. The success of cannulation may be influenced by a patient's

- a) Age
- b) Nutritional status
- c) Physical condition
- d) All of the above

7. What percentage of chlorhexidine solution should be used to clean the skin?

- a) 2
- b) 5
- c) 10

References

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