

Canterbury

District Health Board

Te Poari Hauora o Waitaha

PERIPHERAL INTRAVENOUS CANNULATION RESOURCE BOOK

First Edition
2010



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Introduction

Intravenous (IV) therapy is commonplace in acute care settings, with patients having peripheral IV cannula (PIVC) inserted as part of their treatment. Yet it is not without risk. Complications range from mild local irritation to blood stream infections associated with significant mortality and morbidity (CDC Guideline 2011). It is imperative that clinicians involved in the care of IV access devices, are competent to do so, because the level of skill is critical in reducing and preventing complications (Robert, et al., 2000).

Scope: Registered Nurses, Midwives, Enrolled Nurses (transitioned), Doctors, MRTs, MRIs, Anaesthetic Technicians, IV Technicians who are required to routinely perform peripheral IV cannulation.

Professional accountability:

- 1) Accurate assessment skills
- 2) Identify patient-specific indications, contraindications and associated risks
- 3) Maintain the technical skills necessary to perform PIVC
- 4) Use critical thinking skills and evidence-based practice to achieve best patient outcomes
- 5) Identify limitations and seek appropriate assistance

PIVC endorsement is achieved by:

- 1) Completing the healthLearn on line cannulation course
- 2) Attending a lab practicum
- 3) Completing work place practical assessment of four cannulations with approved IV cannulation assessors - IV link staff, Preceptors, NE, CNS
- 4) Return completed practical assessment form to the PDU within **8 weeks** from the Workshop attendance

NOTE: Non CDHB staff return completed Practical Assessment form to your Line Manager

- 5) PIVC endorsement is recorded on your HealthLearn Record of Learning

CHILD HEALTH. To be credentialed in Child Health you are required to complete:

1. 5 infant (under one) cannulations,
2. 5 toddler cannulations supervised by registrar
3. Refer to local Paediatrics Guidelines on IV cannulation.
4. Child Health Consideration – refer to page 23 of this book

PIVC is a permanent endorsement. All staff have a professional obligation to maintain their knowledge and skills with ongoing compliance monitored through audit.

It is the responsibility of each participating organization to support and provide their staff with practical training and skills assessment.

Learning Outcomes

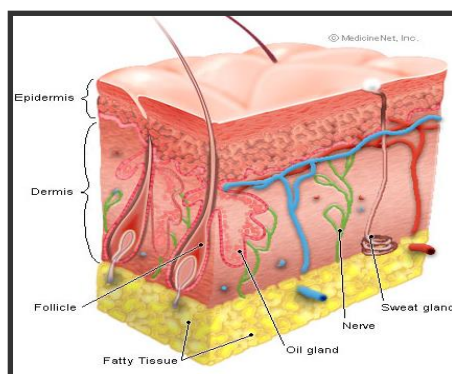
- Describe relevant anatomy and physiology of peripheral venous system
- Identify Blood borne pathogens
- Adhere to infection prevention and control practices
- Identify peripheral veins suitable for cannulation using the ZONE method
- Demonstrate how to safely use equipment components to meet the goals of IV therapy
- Cannulate peripheral veins safely
- Identify measures to minimize and address difficulties encountered during cannulation
- Describe prevention and management strategies associated with PIVC complications and removal
- Describe the action required in the event of a hollow bore needle stick injury
- Articulate essential aspects of patient communication

Anatomy & Physiology

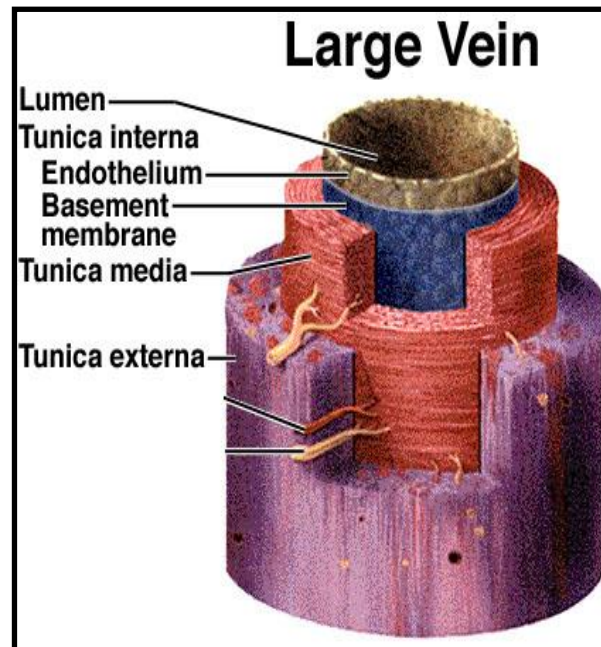
Seventy five percent of blood volume is contained in the venous system. The veins, because of their abundance and location, present the most readily accessible route for cannulation. To initiate PIVC effectively, a clinical understanding of the anatomy and physiology of the skin and peripheral venous system is essential.

The first barrier to successful cannulation is the skin. It consists of two main layers:

- 1) The Epidermis** – is the least sensitive layer, largely comprised of dead squamous cells. In general, the epidermis is thinnest on the inner surfaces of the extremities. But, thickness can vary depending on age and exposure to the sun or wind. The most important function of the epidermis is to act as the first line of defence against infection.
- 2) The Dermis** – is the thicker and more sensitive layer, as it is well supplied with nerves. It contains blood vessels, hair follicles, sweat glands sebaceous glands, small muscles and nerves. For example, one square cm contains 4 metres of nerves, 200 nerve endings for pain and a metre of blood vessels.



3) **Veins** - Knowledge of the basic anatomy and physiology of the vein is essential and will assist you to become a successful IV cannulator. It will enable you to utilise normal physiological responses to your advantage, for example, using venous dilation techniques such as opening and closing the hand, tapping the vein or applying heat to the area of choice. The following diagram depicts the three layers of the vein, also known as coats or 'tunics' (hence the Latin tunica).



- 1) The outermost layer is the **tunica externa** or **adventitia**, and is composed of connective tissue, which supports the vessel.
- 2) The middle layer, the **tunica media** is composed of primarily smooth muscle. It contains nerve fibres that cause veins to contract or relax in response to cold or heat. This layer also responds to chemical or mechanical stimulation, such as pain. Pain sensed in the tunica media can elicit vasovagal response (Hadaway, 1999) and should be anticipated in sensitive individuals.
- 3) The third or inner layer is the **tunica intima**. This innermost layer is less muscular and thin, accounting for only about 10% of the vessel diameter. It consists of three parts. 1) An innermost layer of squamous epithelium, 2) a basement membrane, overlying some connective tissue and 3) a layer of elastic fibres, or elastin. Elastin fibres make the lumen very distensible and one-way valves of endothelial tissue direct blood flow. This means that cannula should only be placed in the direction of blood flow. The valves are usually found near branches of the vein and may inhibit threading of the cannula into the lumen. There are approximately 40 venous valves between the hand and the subclavian veins.

Differences between Arteries & Veins

It is important to be able to distinguish between arteries and veins because the aim is to perform a venous cannulation NOT arterial. The following table describes the distinguishing features.

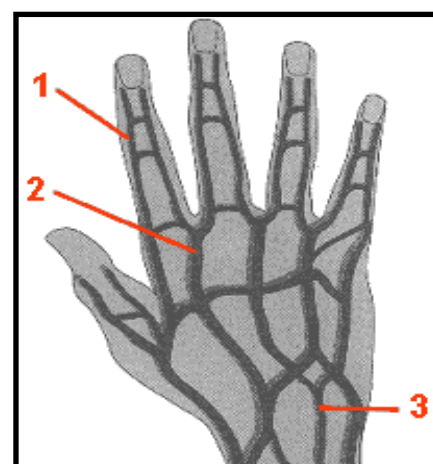
Arteries	Veins
<ul style="list-style-type: none"> • More muscle for their diameter, therefore appear more round in cross-section • No valves • Deep and protected • Pulsatile 	<ul style="list-style-type: none"> • Less muscle therefore tend to look more collapsed in cross-section • Have a stress relaxation phenomena • Have valves • More superficial /often visible • Non-pulsatile

While an artery can inadvertently be cannulated, it is uncommon. Having a good understanding of the venous anatomy and checking for pulsation prior to cannulation is important.

Veins of the Hand & Wrist

Not always a suitable choice for longer term cannula dwell or for the administration of irritant or vesicant drugs/fluids, because of frequent movement at points of flexion, causing vessel irritation, phlebitis and cannula failure.

Location/ Characteristics
1) Dorsal digital veins <ul style="list-style-type: none"> • Found along the lateral portion of the fingers and thumb • Veins small & fragile
2) Dorsal metacarpal veins <ul style="list-style-type: none"> • Between the metacarpal bones on the back of the hand • Superficial veins usually of good size and easily visualised
3) Dorsal venous network <ul style="list-style-type: none"> • Formed by the union of metacarpal veins, on the dorsal aspect of the forearm • Not always prominent



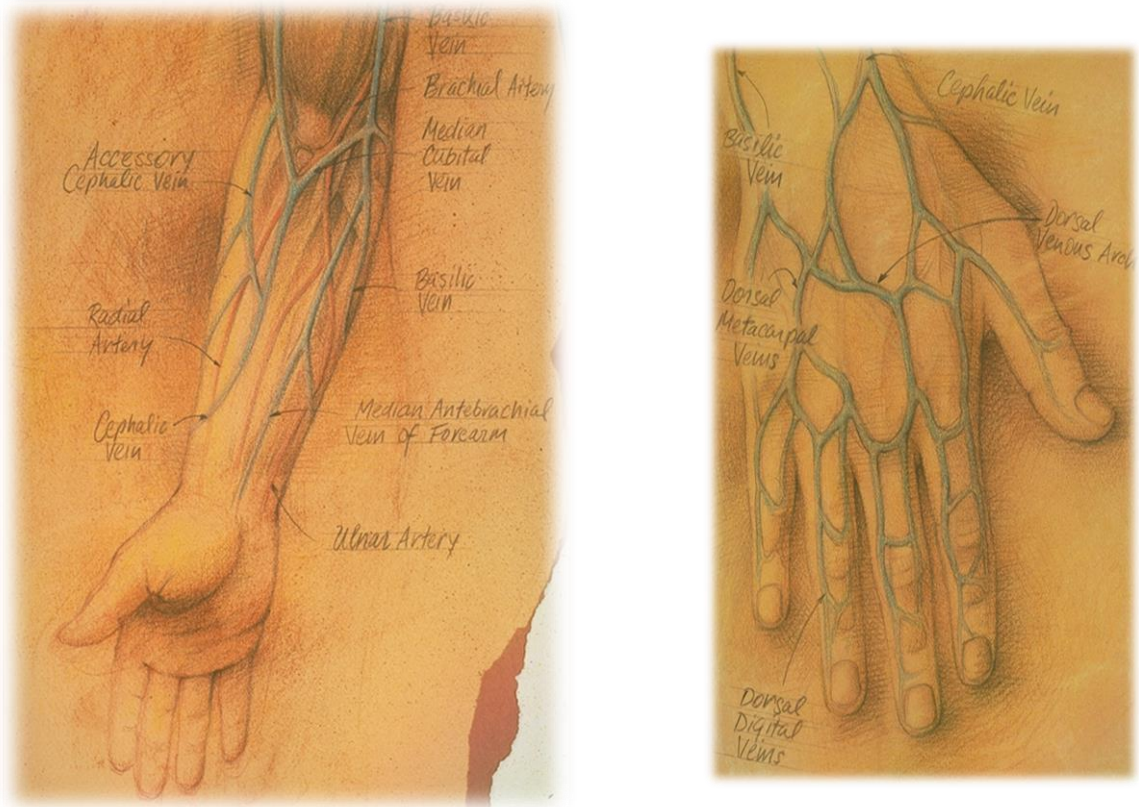
Veins of the Forearm

The veins of the forearm are best suited for cannulation because they are away from points of flexion. Forearm vein placement promotes a longer cannula dwell supporting 'clinical indication for removal'. PIVC should be re-sited when 'clinically indicated' and not routinely (Webster et al 2010)

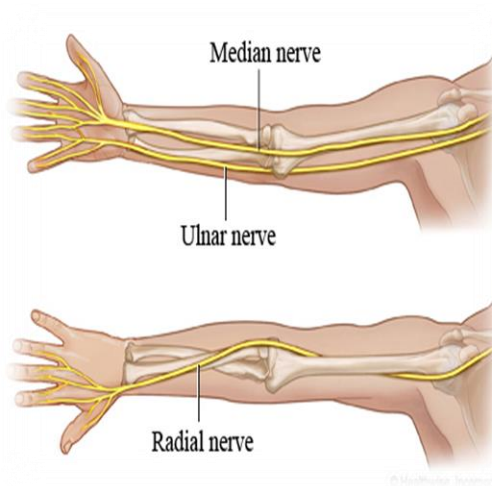
The following list of veins are identified by the corresponding number in the arm diagram p10.

Location/ Characteristics	Clinical Considerations
<p>1) Cephalic Vein</p> <ul style="list-style-type: none"> • Runs entire length of arm from wrist to shoulder • Located above antecubital fossa, may be difficult to visualize 	<ul style="list-style-type: none"> • Excellent choice for forearm cannulation • Accommodates 22-18g cannula • Vein size dependent • Avoid if require fistula formation • Radial nerve runs parallel so avoid wrist area
<p>2) Median Cubital Vein</p> <ul style="list-style-type: none"> • Lies in antecubital fossa • Large vein, easily visualised and accessed 	<ul style="list-style-type: none"> • Used to draw blood • For emergency/resuscitation, CT contrast. • Accommodates 16-14g (high flow) cannula • Avoid for routine cannulation due to joint flexion. High risk for complication • Complications at this site mean veins below this point cannot be used
<p>3) Accessory Cephalic Vein</p> <ul style="list-style-type: none"> • Branches off the cephalic vein • Located on the top of the forearm • Usually good size 	<ul style="list-style-type: none"> • Easily stabilized • Accommodates 22-18g cannula • Avoid catheter tip placement at joint flexion
<p>4) Basilic Vein</p> <ul style="list-style-type: none"> • Runs the entire length of the arm from wrist to axilla • Depicted in the diagram along medial aspect of upper forearm 	<ul style="list-style-type: none"> • Excellent vein of choice • Can accommodate 22-16g cannula • Vein rotates around the forearm,(dorsal basilic) easy to stabilize.
<p>5) Dorsal Basilic Vein</p> <ul style="list-style-type: none"> • Runs along back of forearm 	<ul style="list-style-type: none"> • Excellent vein of choice • Accommodates 22-16g cannula • If accessing the dorsal basilica have the patient flex the forearm at the elbow (this will also enhance venous filling and minimize 'rolling') and face the patients' feet to work on the exposed underside of the arm • Alternatively have the arm fully extended and supinate the arm with palm up
<p>6) Median Vein</p> <ul style="list-style-type: none"> • Arises from the palm of the hand, flows upward in the centre of underside of forearm • Medium size & generally easy to visualise 	<ul style="list-style-type: none"> • Good vein of choice • Accommodates 24-20g cannula • May be difficult to palpate • Runs in close proximity to the nerve, be alert for patient feedback regarding tingling or sharp pain during insertion

Veins and Nerves of the Forearm



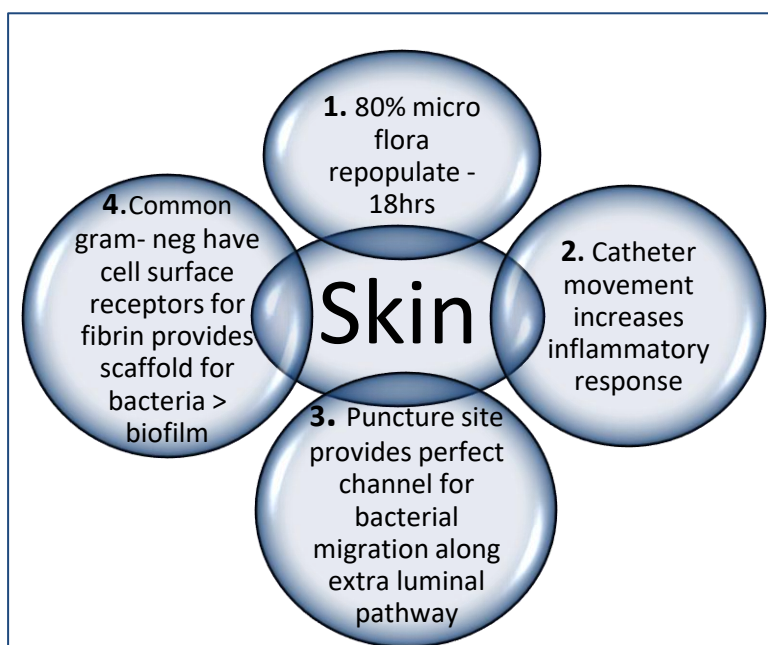
Source: BD Medical



Risks of infection and needle stick injury seroconversion associated with cannulation can be minimised by adherence to standard precautions, a strict aseptic technique and the use of safety engineered devices.

Risks of Infection:

- 1) During the insertion process when a cannula penetrates and bypasses the protective barrier of the patient's skin
- 2) The cannula provides a portal of entry for micro-organisms to enter directly into the patient's bloodstream.
- 3) Immunosuppressed or compromised patients are especially vulnerable to infection.
- 4) Ineffective skin antiseptics and hand hygiene.
- 5) Difficulty inserting the cannula - multiple manipulation of device
- 6) Inadequate dressing and securement increase movement placing the patient at risk of phlebitis and infection.
- 7) Not adhering to Aseptic Non-Touch technique (ANTT)

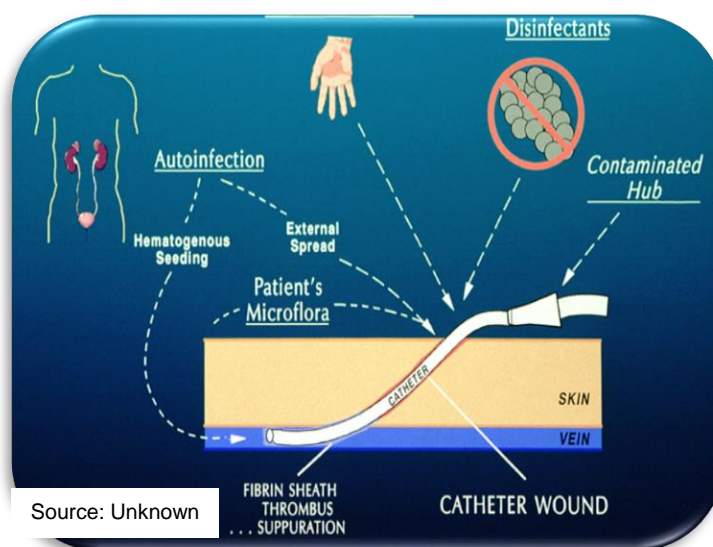


The source of infection may be endogenous (part of the patient's own skin flora) or exogenous (from the surrounding environment or people).

Ports of bacterial entry, in order of significance are:

- 1) Skin colonization.
- 2) Hub colonization.
- 3) Contaminated infusates.
- 4) Haematogenous seeding of infection from remote sources within the body.

The following diagram summarises the possible routes of bacterial entry



Infection can occur at the insertion site in the absence of phlebitis. It is usually a local infection at the catheter-skin entry point. However, it may develop into phlebitis with the presence of pus and progress to:

1. Cellulitis in the surrounding tissues
2. Bacteraemia (bloodstream infection), is the most serious infection associated with IV therapy. This is frequently life threatening and involves additional pain and suffering for patients and their families, as well as extra treatment costs. (Maki et al 2006) Some of the common causes of cannula related infection are Staph Aureus, Staph epidermidis, Pseudomonas, Enterobacter and MRSA.

Bloodborne Pathogens:

There are many different bloodborne pathogens. Healthcare workers need to be aware that any bloodborne pathogen has the potential to be transmitted by needle stick injury. A wide variety of organisms, including **bacteria, viruses, prions-Creutzfeldt-Jakob Disease (vCJD)** and parasites can be transmitted through blood. This includes malaria, syphilis, brucellosis, Staph Aureus and most notably Hepatitis B (HBV), Hepatitis C (HCV) and the Human Immunodeficiency Virus (HIV) (CDC2011)

Prevention of Infection:

Hand hygiene is key to minimizing /avoiding cross contamination.

Effective hand hygiene is achieved by using either hand washing or alcohol hand gel that kills both transit and normal skin flora. Hands should be cleaned before and after palpating, inserting, accessing, replacing or dressing an IV cannula (CDC Guidelines 2011).



PERFORM THE FIVE MOMENTS OF HAND HYGIENE FOR ALL CANNULATION PROCEDURES



Insertion and Maintenance Care Bundles:

A care bundle is a 'small set of evidence-based interventions for a defined patient population and care setting that, when implemented together, will result in significantly better outcomes than when implemented individually' Bundles are designed to be used in their entirety so usually contain no more than five items, with each item founded on high-level evidence, such as effectiveness proven by randomised controlled trials (Resar et al, 2012).

The advantage of using insertion Bundles is that they hold people to process.

Care bundles are not intended to represent comprehensive care; instead, they focus quality improvement on items with robust evidence, and encourage teamwork and communication to achieve bundle compliance, which ideally has a knock-on effect of improving overall care.

(Ray-Burrell et al 2018, Crowell et.al 2020)

Aseptic Non-Touch Technique (ANTT)

Effective hand hygiene, sterile equipment and a non-touch technique is used for the insertion and management of peripheral IV cannula. Non-sterile gloves are usually the logical choice and should be used when inserting a cannula or changing a dressing (CDC Guidelines 2011, Rowley 2010).

If it is necessary to touch key sites or key parts of equipment, then sterile gloves should be worn to minimise risk of contamination (Rowley 2010). Gloves are essential because of the significant health and safety risk from blood-borne pathogens.

Where breaks in aseptic technique are likely to have occurred e.g. ambulance or emergency situation, it is recommended that cannula be re-sited within 24 hours, in order to minimize the risk of infection to the patient. (CDC Guidelines, 2011, CDHB Cannulation Policy 2019)

Skin Antisepsis

Chlorhexidine 0.5% up to 2% has proved superior for skin antisepsis because its effect is not reduced when in contact with blood and its antibacterial activity persists for hours following application.(Maki et al 2006).When combined with 70% Isopropyl Alcohol becomes a very effective skin disinfectant. (CDC 2011) The importance of the cleaning technique using friction to remove pathogens from skin and also prior to accessing the access port is very important. (INS 2016)

Dressing

Transparent bordered occlusive dressings have been widely accepted due to their advantages of improved visualisation with early detection of complications, less catheter manipulation, less frequent dressing changes and increased patient comfort. IV cannula dressings must provide securement in a manner that prevents movement or dislodgement. (Rickard et al 2018)

When the dressing becomes loose, damp or soiled it must be removed. A Cannulation Kit is used to redress a cannula. The exit site cleaned with antiseptic, and a new sterile dressing applied to site. (CDC 2011, INS 2016) If the skin is fragile or to achieve better adherence of the dressing, use Cavilon skin protectant before applying the dressing.

The most conclusive sign of infection is purulent discharge, but this may not be evident until the device is removed. If the site appears red or other local and systemic signs of infection are present, such as pyrexia, inflammation and pain, remove and re-site the cannula if it is still needed. Record electronically or in clinical notes.

In order to prevent infection, observe the cannula site when administering medication or performing a flush. The cannula should be flushed every 8 hours with 5-10mL 0.9% sodium chloride when not in use. Peripheral IV cannula are replaced when clinically indicated.

Safe disposal of all sharps

'Sharps must be handled with care at all times, disposed of safely immediately following use, and not re-sheathed, bent, broken or manipulated by hand' (Australia, New Zealand College of Anaesthetics (p 4 2005)



Source: Original

It is the responsibility of the individual using the cannula to ensure the sharp is safely disposed of into a sharp's container at point of use. Ensure sharps containers are conveniently placed, either on the trolley or on a stable surface.

In the event of a needle stick injury follow CDHB policy found in the Infection Control Manual and follow prompts on the Staff Accident form.

In the event of a Needle Stick Injury:

1. Wash wound under running water with soap
2. Cover with dressing
3. Have blood samples taken from you by a colleague trained in venipuncture. (go to the Emergency department if out of hours)
4. Have blood taken from the source (the patient)
5. Complete separate laboratory forms for self and the source
6. Send both blood specimens, lab forms and blood/serum/fluid report form to Microbiology Canterbury Health Laboratories immediately
7. If you have been exposed to a known hepatitis B, C or HIV source contact the Microbiologist on call immediately via the switchboard

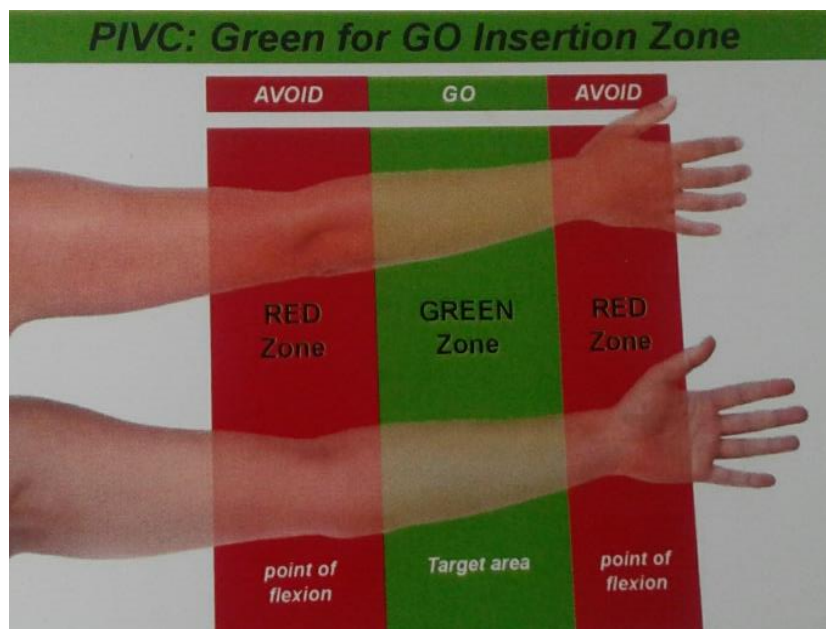
Preparation

The cannula is an extension of your hand and outcomes are greatly influenced by your skill.

Damage or abrasion occurring to the tunica intima during cannula insertion; duration of cannula dwell; during removal; encourages thrombus formation, caused by cells and platelets adhering to the roughened vessel wall. This leads to phlebitis, thrombophlebitis or even result in occlusion of the vessel from a thrombus.

Successful cannulation placement and preserving extended dwell of the cannula is reliant on thorough assessment and careful planning. This includes the following considerations:

- 1) Peripheral vein preservation is considered when planning for vascular access. Use the ZONE Method for selecting the most appropriate site for insertion.
- 2) Appropriate size and length of cannula selection to accommodate the patient's vascular access needs based on the prescribed therapy of treatment regime; anticipated duration of therapy; vascular characteristic; and patient's age, comorbidities, history of infusion therapy and away from points of flexion
- 3) Skill and experience of individual
- 4) Factors that will influence effective cannulation e.g. extremes of age, steroid therapy, anticoagulation therapy, repeated cannulation, history of phlebitis. Identify and establish the patient's previous experience of cannulation and history of a vasovagal response. Patients with a positive history of vasovagal reactions are more likely to have a reaction during venepuncture (Deacon et al 2006). Anxiety and pain can exacerbate this. Topical anaesthetic creams such as LMX4 or Amitop are useful.



The ZONE Method of Vein Selection

PIVC Vessel Health Preservation, Selection and Placement: (INS 2016 S 26.1, Hallam et al 2016)

Vessel Health Preservation (VHP) concept is a proactive patient focused approach to vascular access: timely, intentional, vascular access device selection. VHP assists clinical decision-making preserves vessels, prevents complications and maximises patients experience (Hallam et al 2016)

Table 1 below provides appropriate insertion management.

Table 1. Peripheral vein assessment tool.

Grade	Vein quality	Definition of vein quality	Insertion management*
1	Excellent	4-5 palpable/visible veins suitable to cannulate	Cannula may be inserted by trained/ authorised healthcare practitioner
2	Good	2-3 palpable/visible veins suitable to cannulate	Cannula may be inserted by trained/ authorised healthcare practitioner
3	Fair	1-2 palpable/visible veins suitable to cannulate (veins may be small, scarred or difficult to find and require heat packs to aid vasodilation)	Cannula may be inserted by trained/ authorised healthcare practitioner but may require Infrared Viewer or ultrasound
4	Poor	Veins not palpated/visible (requires ultrasound assistance or Infrared Viewer)	Cannula may be inserted by an experienced practitioner [†] in cannulation. Use Infrared Viewer, ultrasound, transillumination or other aids
5	None identifiable	No visible (naked eye or aids) or palpable veins	Peripheral cannulation should not be performed

Source: UK Vessel Health Preservation Framework 2016

Patient Consent and Teaching:

Patients have the right to be fully informed and to have informed consent (NZ Code of Rights) this includes:

- The need for therapy
- Medications, fluids to be infused
- Probable duration of therapy
- Possible related complications
- A response to any questions or concerns
- Consider the family/Whanau wishes
- Verbal consent for the procedure.

Explanation and information should help reduce the autonomic 'fear' response and minimise venous vasoconstriction which could potentially hinder successful cannulation. Explaining the procedure and ongoing care considerations will also encourage the patient's participation in monitoring for possible complications and side effects.

Key Determinants to Vein Selection:

- 1) The vein itself
- 2) The location or site.

Selection of a suitable vein is achieved by applying a tourniquet and examining the veins of the patient's forearm or hand. A suitable vein for cannulation should feel round, firm, elastic, and engorged, not hard, bumpy or flat. Inspect and palpate the vein for any potential problems. Avoid cannulating veins where the area is:

- bruised, inflamed
- skin disease or injured skin
- sclerosed or thrombosed (hard and/or tortuous)
- distal to the site of an infiltration or phlebitis or at flexion of joints

Always have adequate lighting when selecting and cannulating a vein

Selection of Appropriate Site:

The general guidelines to selection of an appropriate site, includes:

- Select veins in the forearm or hand and away from points of flexion
- Assess both arms before deciding as to the best vein available
- Start at a distal site so that there are veins available for subsequent cannulae to be placed proximal to the previous site.
- If replacing cannula, alternate the sites by cannulating above the previous site avoiding tributaries of that vein. Use a vein that runs parallel to the previous site or select a vein in the opposite arm.
- Before performing cannulation, palpate for arterial pulsation to exclude / prevent inadvertent arterial cannulation. The brachial and ulnar arteries can be closer to the skin surface therefore this area should be avoided.
- Avoid areas where the radial or ulnar nerves run

Sites to be avoided:

Veins in the antecubital fossa and above should ***not routinely*** be used for insertion of peripheral cannula. Use of the antecubital fossa limits the patient's range of movement, is uncomfortable, and interferes with blood flow and limits the ability to cannulate distally if infection occurs, (Rickard et al 2018) and is responsible for vessel trauma. In addition, the following sites should also be avoided:

- Lower extremities
- Any areas of flexion
- Hands and joints of arthritic patients or those using crutches or walkers,
- Previous cannulated sites
- Presence of a plaster, dressing, or wounds
- Areas of poor venous return or lymphoedema
- Arm with a fistula
- Arm where a PICC is in place

Selection of Cannula:

Therapy requirements should determine the most appropriate sized cannula. (Alexandrou et al 2015) The decision on cannula length and gauge size may change when examining the condition of the patient's veins. Ensure you have a selection of cannula available on the trolley to take to the bedside.

Use the Vessel Health Preservation model for cannula selection:

- 1) The smallest diameter to allow blood flow around the cannula thereby lessening the risk of phlebitis and thrombosis.
- 2) Good length to accommodate the gauge and length of cannula.
- 3) Acceptable diameter to allow infusion of the product.

Table 2 is a general guide for Cannula to assist selection of an appropriate cannula.

Colour	Ga	Uses (Guide only)
Yellow	24	suitable, most infusions/flow rates slow. neonatal, paediatric, elderly, haematology /oncology
Blue	22	suitable AB's, blood, hydration. Use for small thin veins haematology oncology / compromised vein
Pink	20	suitable for most infusions. Most frequently used gauge
Green	18	For higher flow rate requirements, emergency situations, requires vein large enough to accommodate.
Gray	16	Rapid transfusions of whole blood. Emergency situations / obstetrics, for most GI bleeds may require LA. Will increase vein irritation
Orange	14	Rapid blood transfusions. Emergency situations, resuscitation

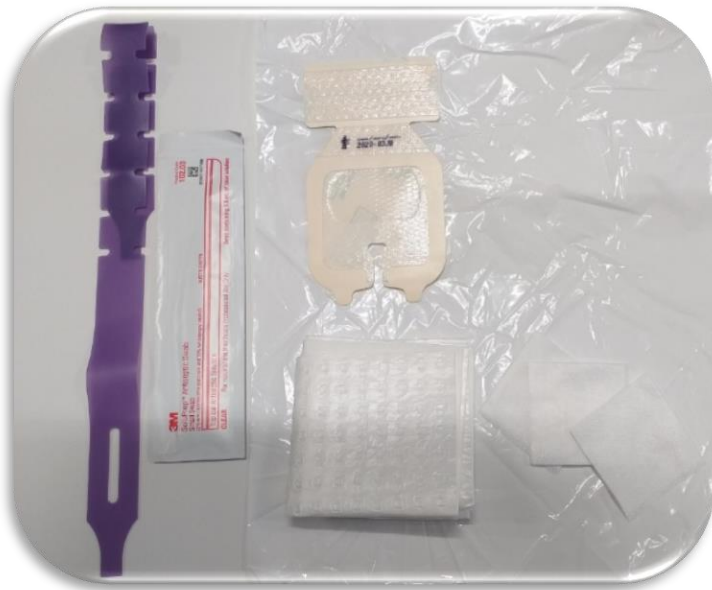
Table 2

Equipment:

Collect all the equipment needed for IV cannulation before going to the bedside and use a cannulation trolley where practicable. Using the bundled approach improves compliance, guarantees effective ANTT and ensures you: (DeVries et al 2019)

- Can create an aseptic field to work from
- Organise the equipment in logical order
- Eliminate the need to leave the patient until the procedure is completed
- Avoid breaks in asepsis
- Promote patient confidence in your skills

The Insertion Bundle



Source: Original



Cannula. Source: BD

- ✓ IV Starter Kit:
 - Plastic backed sheet for under arm
 - Tourniquet
 - Antimicrobial wand
 - Dressing
 - Gauze
- ✓ Add:
 - Cannula
 - Posiflush syringe/s
 - Extension set to minimise cannula movement & extend life of cannula
 - Non-sterile gloves. If re-palpatating the site use sterile gloves

In addition to providing adequate explanation and gaining consent for the procedure, ensure:

1. The patient is warm and comfortable
2. Restrictive clothing on the arm is removed
3. Have good lighting to promote easy visualisation

Initially, only attempt to cannulate patients with good veins, when there is adequate time and when you feel relaxed and have support available.

If you are not successful at first don't feel discouraged. This skill takes time to perfect and with consistent practice your skill will improve.

Procedure

Check the Cannula for integrity prior to use. Check expiry date on the package. Be familiar with the manufacturers recommendations i.e. don't attempt to re-insert the stylet. Discard if any irregularities are evident.

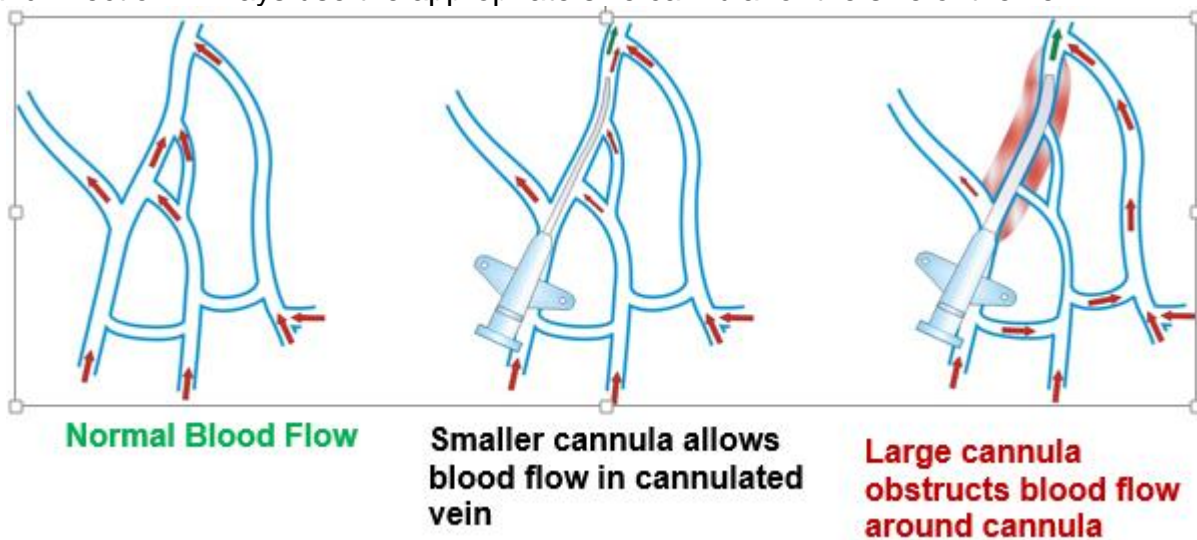
INSERTION BUNDLE: Bundling essential best practices into sequential steps is an evidence-based approach to preventing complications. (Crowell et al 2017, Green et al 2017)

ENSURE THESE ESSENTIAL ELEMENTS ARE COMPLETED DURING CANNULA INSERTION

HAND HYGIENE	PERSONAL PROTECTION	ANTT
<ul style="list-style-type: none"> Do not touch cannula or equipment unless you are compliant with hand hygiene 	<ul style="list-style-type: none"> Gloves are required when performing procedure The choice of sterile or non-sterile glove depends on level of expertise 	<ul style="list-style-type: none"> During insertion ensure key parts of equipment are protected for touch contamination
PROCEDURE	SKIN PREPARATION	DRESSING INTACT
<ul style="list-style-type: none"> Protect key parts from touch contamination Use PIVC starter kits to promote effective ANTT 	<ul style="list-style-type: none"> Clean skin with chlorhexidine 2% & Alcohol 70% for 30 second and allow to air dry 	<ul style="list-style-type: none"> Ensure dressing is applied correctly and cannula is stable. Write date on additional dressing strip and place along the side of dressing
FLUSHING	SHARPS SAFETY	DOCUMENTATION /CARE PLAN
<ul style="list-style-type: none"> Flush cannula with 0.9% sodium chloride. Use a short extension set with needless device to prevent premature cannula failure 	<ul style="list-style-type: none"> On removal of the stylet dispose into a sharp's container. Do not use needles to access a needless connector 	<ul style="list-style-type: none"> Document procedure on Patient Track or if not available in clinical notes.

Table 3

Vein to cannula ratio is important in minimizing complications such as phlebitis, infiltration and infection. Always use the appropriate size cannula for the size of the vein



Applying the Tourniquet:

The tourniquet is applied approximately 15 cm above the selected site. Placing a finger between the patient's skin and the tourniquet will prevent pinching the skin. The tourniquet should be tightened enough to cause engorgement of the lower capillaries and veins, without cutting off arterial flow. If the skin becomes mottled or blue or you can't feel a pulse below the tourniquet, or if the patient complains of discomfort, the tourniquet is too tight.

If using a reusable tourniquet these must be cleaned after each use to prevent cross contamination between patients by soaking in Precept. Single-use disposable tourniquets eliminate the potential for bacterial cross contamination.(Abeywickrama et al 2018)

Preparing the Site:

Remove any excess hair that prevents dressing adhesion with clippers. A chlorhexidine base solution combined with alcohol 70% is applied to the skin using repeated back-and-forth or circular movement for 30 seconds and allowed to air dry. The prepared area should be 20-25cms in diameter. Do not re-palpate the site once skin antisepsis is complete, unless you are wearing sterile gloves (CDC Guidelines, 2011).N.B. clippers come with detachable single-use heads. **Shaving is not recommended** it can cause micro abrasions of the skin and increase the potential for infection (INS, 2016, Infusion Nursing 2010).

Methods of Vein Dilation:

There are a number of techniques that can be used. Success can be achieved by using one or more of the following in combination. (Yamagamia et al 2017)

- Apply localised warmth to the area 5 – 10 minutes beforehand to dilate veins
- Using a tourniquet combined with heat improves dilatation
- Use a combination of the tourniquet and the 'muscle pump' to engorge veins. This is achieved by open and closing the hand
- Position arm below the level of the heart engorges the veins and increase visibility then tighten tourniquet.
- Gently tap the area over the selected vein to release histamine beneath the skin to initiate vasodilation.
- Use a BP cuff inflated to 40-60 pressure.

The vein should feel elastic and have rebound resiliency i.e. when you press and release the vein, it should spring back to a rounded, filled state. Achieving this may take some time or may not occur at all and reselection of a vein may be required.

Where vein accessibility is challenging follow the steps in Table 4

Fair	1-2 palpable/visible veins suitable to cannulate (veins may be small, scarred or difficult to find and require heat packs to aid vasodilation)	Cannula may be inserted by trained/ authorised healthcare practitioner but may require Infrared Viewer or ultrasound
Poor	Veins not palpated/visible (requires ultrasound assistance or Infrared Viewer)	Cannula may be inserted by an experienced practitioner ¹ in cannulation. Use Infrared Viewer, ultrasound, transillumination or other aids
None identifiable	No visible (naked eye or aids) or palpable veins	Peripheral cannulation should not be performed

Table 4

Holding the Device:

Becoming comfortable when holding the cannula may take time, however it is important for successful cannulation.

- Hold the cannula horizontal with hand on top of the device. This way the entry angle is assured and allows maximum flexibility of wrist when inserting the device.
- Fingers should be on the white finger grip (as indicated in image below) – not on the cannula hub. This is to ensure you are ready to thread the cannula into the vein. (You can't do this if you have hold of the cannula hub).
- Never hold cannula like a 'dart'. Cannulation is distinctly different from an IM injection. Using the cannula like a 'dart' will not only cause discomfort but is likely to result in transecting the vein.



Source: Original

Stabilising the Vein:

Vein stabilisation is performed with the non-dominant hand and maintained until the cannula has been threaded into the vein.

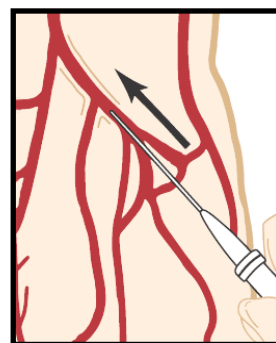
1. Stretching the skin distal to the vein will maintain the vein in a taut, distended, stable position and reduce the tendency to roll. This can be done by gently pulling the skin in a downward motion.
2. Using a good technique to immobilise the vein is critical to success.

Approaching the Vein:

There are several ways an IV cannula can be inserted. Regardless of which method is used, the cannula should enter the skin at such an angle that the needle punctures the vein wall and enters the lumen without piercing the opposite wall.

The most common methods are:

- Approaching the vein from the top
- Approaching the vein from the side
- Approaching the vein at a bifurcation



Practice Point: Always keep your fingers behind the point of the stylet at all times

Inserting the Cannula: ([click here for Insertion video](#))

- 1) Stabilise the vein and perform the venepuncture with the stylet bevel up at 10 - 45° angle depending on the depth of the vessel. The stylet is inserted bevel up to minimise discomfort and reduce the risk of puncturing the back wall of vein
- 2) **When using a cannula with blood control initial flash back will be observed in the cannula body first**, then in the cannula hub.
- 3) Advance the cannula by lowering the angle and advancing the entire cannula and needle unit slightly to ensure the cannula tip is in the vein
- 4) Secondary blood return can be seen in the flash chamber of the hub
- 5) While stabilising the vein, push the cannula off the stylet and into the vein. ***Don't pull the stylet out simultaneously while pushing the cannula into the vein***
- 6) Release the tourniquet
- 7) Place finger gently on the cannula hub(coloured portion)
- 8) Withdraw the stylet until the safety shield releases from the cannula hub.
- 9) Blood flow is restricted immediately after stylet removal allowing time to secure extension set or access device to cannula hub. Discard the stylet immediately into the sharps container.

The acronym below will help reinforce the crucial steps in the cannulation procedure

B-L-A-T-S

Blood return, advance cannula slightly

Level off

Advance into vein using push off tab

Tourniquet removal

Stylet removal

Attaching the Extension Set:

With the cannula hub stabilised, attach a primed extension set with injection port. Firmly push and twist this onto the cannula hub. The use of an extension set prevents cannula movement during connection of IV administration sets or syringes, extends the life of the cannula and minimises complications. (CDC Guidelines 2011, INS 2016). Flush the cannula to ensure patency. It should flush freely. If any immediate swelling is observed the cannula should be removed. If stinging, or significant patient discomfort occurs, reassess the site, the ease of insertion and consider the need for removal

Dressing and Securement: ([click here for dressing video](#))

It is essential that an appropriate dressing and securement technique is used. (Alexandrou et al 2015)

Use the recommended Tegaderm™ advanced IV cannula dressing which includes sterile securing tape.

Place the dressing over the cannula and hub. Use the wide tape to cover the extension set and hub connect. Do not obscure the entry site with tape to allow for observation.

Inadequate securing of the cannula will allow catheter movement and provide access for bacteria, potentially leading to phlebitis, thrombosis, infiltration and infection.

Practice Point: do not stretch the dressing during application. This may cause the patient's skin to itch / or trauma to fragile skin.



Source: Original

'Clinically indicated' cannula removal occurs when: (Webster et al 2010, DeVries et al 2019))

1. The cannula is no longer required (treatment discontinued)
2. A VIP score 2 or greater
3. Cannula dysfunction e.g. resistance when flushing
4. Cannula dislodgement/kinking

Documentation:

Enter insertion / actions / complications in Patienttrack. Where Patienttrack is not available or not in use, document in the patient's clinical notes.

Child Health Considerations- Pressure Injury:

Prevention:

1. Place Hubguard/gauze/meptilite under the cannula /extension set hub after the dressing is in place.
2. Ensure the splint is covered with no rough edges.
3. Taping is secure but not tight.
4. Cover with tubifast.

Site Assessment:

Take the tubifast down each time you use the cannula, hourly > 4hourly if on continuous infusion or at least once a shift if not in use and review the whole site including edges.

Child Health: refer to local Paediatrics Guidelines on IV cannulation

Troubleshooting During the Cannula Insertion Process

Problem	Practice tips
Difficulty dilating the vein	<p>If the patient is cold, hypotensive or nervous and experiencing vasomotor changes, spend time dilating the vein before cannulation. Apply the tourniquet and assess the veins. If they are slow to fill, try the following:</p> <ul style="list-style-type: none"> • Apply heat to area for 5-10 minutes • Position the arm below heart level or hang the arm down to encourage capillary filling. • Gently tapping over the vein to release histamine • Get patient to open and close hand to aid venous dilation • Use a BP cuff and inflate to 40-60
Transecting the vein	<p>If blood backflow stops, the cannula may have passed through the opposite vein wall. A haematoma will appear at the site.</p> <ul style="list-style-type: none"> • Remove the tourniquet and cannula • Apply pressure to the site • Cover with a pressure pad and attempt a re-site in opposite arm
Failure to Insert the Cannula	<p>Inappropriate insertion angle (too steep or not steep enough) can cause the cannula to ride on top of or below the vein. If the cannula won't move freely, usually it means that it has been inserted too deep, and it is embedded in fascia or muscle. The patient may also complain of severe discomfort. Action:</p> <ul style="list-style-type: none"> • Adjust the angle of entry. • If still not successful, remove and reassess. • Repeat attempt no more than two times, before seeking assistance from a more experienced clinician
Inability to Advance the Cannula	<p>This can occur if you have hit a valve or if you have failed to adequately anchor the surrounding skin. Try:</p> <ul style="list-style-type: none"> • Attaching a saline filled syringe and gently flushing. If no resistance is felt, advance the cannula, while flushing, as this may open the valve allowing the catheter to move through. • Any twisting of the vein or continued resistance, abandon the cannulation attempt and re-site elsewhere.
Fragile skin	<p>Patients with fragile skin are at increased risk of tissue trauma.</p> <ul style="list-style-type: none"> • Use the smallest cannula possible e.g. 24g or 22 g • Encourage vein dilation with warmth. • Apply minimal tourniquet pressure or substitute for a blood pressure cuff inflated just enough to distend veins • Use decreased angle of entry • Consider the application of Cavilon before the dressing is applied. This will protect the skin and enhance dressing adherence
Venous Spasm	<p>Venous spasm is a sudden involuntary contraction of the vein into which a cannula or solution is being placed. It may also result from traumatic cannulation. It is characterised by sharp, cramping pain above the insertion site, skin blanching with the vein becoming hard.</p> <ul style="list-style-type: none"> • A warm compress can be applied over the vein • If unrelieved, remove cannula and re-site

Troubleshooting continued

Complication	Action
<p>Haematoma</p> <p>Haematoma is an interstitial swelling at / near insertion site caused by bleeding into the tissues.</p> <p>Possible causes include:</p> <ul style="list-style-type: none"> • Insertion angle too deep, or not steep enough • Failure to 'level off' after entering the vein • Fragile veins due to age, medical condition, medications. • Vein has been transected • Capillaries have been damaged at point of insertion 	<ul style="list-style-type: none"> • Correct angle of insertion and level off once in the vein lumen • Choose best possible vein, with good blood volume • Use a smallest cannula required • Avoid small capillaries that lie over the vein • Remove cannula depending on extent of haematoma • Record incident and actions in Patienttrack or clinical notes • Complete Safety 1st
<p>Nerve Injury</p> <p>Nerve injury should be suspected if the patient complaints of pain, 'pins and needles' / or sharp sensation going down to the fingertips.</p>	<ul style="list-style-type: none"> • Immediately remove the cannula and inform the doctor • Explain possible cause and actions to patient • Provide reassurance as appropriate • Record incident and actions in Patienttrack or clinical notes • Complete Safety 1st report

POST INSERTION COMPLICATIONS and MANAGEMENT

The cause of cannula failure is the interaction of two basic forces applied over time: Trauma and contamination. (Helm,2019)

They interact in varying degrees to cause the five(5) general modes of failure:

1. Phlebitis
2. Infection
3. Infiltration/extravasation
4. Occlusion/mechanical failure
5. Dislodgement

Phlebitis:

The most common complications of peripheral intravenous cannulation and is caused by three sources; bacterial, chemical and mechanical (Ray-Barruel, Polit, Murfield, & Rickard, 2014). Early detection of phlebitis greatly increases the patient's safety and comfort.

Early signs of phlebitis present as erythema and pain. It is important to remember however, that by the time erythema is visible, inflammation has progressed through all layers of the vein wall to the epidermis. Pain may only initially be felt on palpation and may not be a reliable indication of phlebitis. Induration and cording (hardness), of the vein on the other hand, is considered highly indicative of phlebitis. If left unchecked, phlebitis quickly advances and may

result in thrombophlebitis and thrombosis and complete occlusion of the vein or infection leading to septicaemia. The four causative factors are as follows:

1. **Mechanical phlebitis** is caused by trauma to the vessel during insertion, cannula size and poor securement causing movement of the cannula inside the peripheral vein resulting in irritation to the vessel wall.
2. **Chemical phlebitis** occurs when the pH or osmolality of infusates irritates the lining of the peripheral veins. Because flow rates in the peripheral vessels are lower than those of larger central veins, haemodilution of solutions is less, resulting in intima damage. Length of therapy, method of delivery and dilution need to be considered.
3. **Bacterial phlebitis** is caused through inadequate hand hygiene and skin antisepsis. Cannula movement from ineffective dressing and stabilization results in bacteria entering the extra luminal pathway along the vein. Contaminated infusates and unsterile equipment can also be a contributing factor. Using ANTT along with thorough cleaning of access ports is essential to prevent bacterial migration into the blood stream.
4. **Post-infusion phlebitis** can occur up to 96 hours post cannula removal therefore continued assessment of the site post removal is recommended (Ray-Barruel 2014, Helm 2019).

Cannula and Site Assessment:

Early detection is important in preventing more serious associated complications such as infiltration, thrombosis and infection.

Know the properties of the medications/IV fluids and their compatibility with the peripheral venous system.

Patient factors that increase risk of phlebitis include: (Ray-Barruel 2014)

- skill of cannulator
- age
- gender
- obesity
- elderly
- diabetes
- nutritional status
- severe debilitation
- level of activity

There is some evidence to suggest that there is variable individual susceptibility to phlebitis. Patients who develop phlebitis with the first cannula are more likely to develop severe phlebitis with the second. (Maki et al 1991) In addition, forearm cannula insertions have lower risk of phlebitis than those inserted at points of flexion i.e. hand, wrist or antecubital area.

Management of Phlebitis:

Using an extension set extends cannula dwell by minimising movement and subsequent irritation of vein. (CDC 2011, INS 2016).

- Use the VIP score to guide your assessment and actions
- Remove the cannula at VIP 2 or greater, clean site with antimicrobial swab and cover with sterile dressing
- Monitor site
- Warm, moist compresses to site
- Rest and elevate the affected arm on pillow
- Record event in Patienttrack if used or in clinical notes



Actions in the event that the VIP score is 5:

1. Take swab from insertion site
2. Remove cannula- send to lab
3. Clean site with antimicrobial swab and cover with sterile dressing
4. Warm, compresses to site
5. If temperature greater than 37.5 take blood cultures from A/C vein in the opposite arm
6. Re assess vascular access- do not cannulate the same arm
7. Consider antibiotics and analgesics
8. In extreme cases a PICC may need to be inserted to administer antibiotics
9. Initiate safety 1st report as 'VIP score 5' Document in patients records in CORTEX

Use the Visual Infusion Phlebitis Score (VIP) to identify the stage of phlebitis and associated complications. Early intervention can reduce the incidence of phlebitis.

V.I.P Score		<i>Visual Infusion Phlebitis Score should be evaluated during each shift and documented on the observation chart.</i>	
• IV Site appears healthy	0	no signs of phlebitis	Observe Cannula
One of the below is evident: • Slight pain near IV site • Slight redness near IV site	1	Possible fist signs	Observe Cannula
Two below are evident: • Pain near or at IV site • Swelling • Erythema	2	early stage of phlebitis	Resite Cannula
All below are evident: • Pain along path of cannula • Erythema • Induration	3	mid-stage of phlebitis	Resite Cannula Consider Treatment
All below are evident & extensive: • Pain along path of cannula • Induration • Palpable venous cord • Erythema	4	advanced stage of phlebitis or start of thrombophlebitis	Resite Cannula Consider Treatment
All below are evident & extensive: • Pain along path of cannula • Palpable venous cord • Erythema • Induration • Pyrexia	5	advanced stage of thrombophlebitis	Initiate Treatment Resite Cannula

Source: Jackson. A

Practice Point: Where adherence to aseptic technique has been compromised, i.e. when a cannula is inserted during emergency situations, replace cannula as soon as possible and after no longer than 24 hours (CDC 2011).

Infiltration:

Infiltration is the leaking of non-vesicant drugs or infusates from the cannulated vein into the surrounding tissue causing inflammation, pain and oedema but not usually necrosis.

However, the distinction between vesicant versus irritant is not absolute. Some irritants can cause tissue necrosis if large volumes of concentration solutions are extravasated.

Causes of infiltration:

- Cannula inserted at a point of flexion
- Cannula too large for the vein
- Inadequate cannula dressing and securement
- Tight tape, bandage, clothing or ID bracelet above the cannulation site
- Opposite wall of the vein has been transected.
- Infusates administered too quickly

Signs and symptoms of Infiltration:

- Moderate to severe swelling at site
- Pain at site
- Skin cool to touch
- Blanching of skin
- Diminished or absent pulse
- Capillary refill > 4 seconds



Management of Infiltration:

- Stop infusion
- Remove cannula and apply a dressing to the site
- Elevate the arm and apply a warm compress to increase circulation
- Do not apply a bandage or any restrictive cover to the arm



Source: Original. Secure the PIVC effectively

Extravasation:

The Vesicant & Irritant Extravasation of Non-Cytotoxic Medication Guidelines for the Adult Patient.

Extravasation refers to the inadvertent leaking or infiltration of a vesicant drug or solution into the surrounding subcutaneous tissues with the potential of causing blistering of the skin, tissue necrosis and sloughing (INS Infusion Nursing 2010). ***This requires immediate attention to limit further injury.***

Causes of Extravasation:

- Inserting cannula at points of flexion
- Selecting a cannula size too large for the intended vein (small fragile veins)
- Trauma to the vein during cannulation
- Inadequate cannula dressing and securement
- Using limbs with compromised circulation
- Using sites that have been exposed to radiation
- Areas with multiple venepuncture sites
- Infusing the drug or solution too quickly by push or via an electronic infusion pump
- Properties of medication
- Tight clothing, bandages or ID bracelets above the cannula site

Practice point: The IV flow rate should never be increased to determine the infiltration of a vesicant nor should blood return be used as a reliable method to determine an extravasation. (INS Infusion Nursing 2010)

Signs and symptoms of Extravasation:

- Pain and burning at the insertion site and along the vein pathway
- Erythaema and oedema
- Blistering of skin
- Tissue sloughing becomes apparent within 1 week up to 4 weeks
- Necrosis can involve a small area or a larger area including underlying connective tissue, muscle, tendons and bone necessitating surgical intervention

Prevention of Extravasation:

- Do not place a cannula at any point of flexion
- Flush cannula and check for blood return prior to administering medication
- Know the properties of IV fluids and drugs to be being infused
- Educate the patient on the effects of the drug/s
- Vesicants can seep into the tissues at the vein entry site of a previous cannulation
- Recognize signs of infiltration / extravasation
- A complete assessment of the patient, the IV site, the involved extremity and the infusion system must be performed at regular intervals
- Ensuring the appropriate concentration and infusion rates of medication (refer to Notes on Injectable Drugs - [Notes on Injectable Drugs](#) (only available on a CDHB computer))

Initial Management:

Time is critical for minimising harm to the patient and any of these measures can be initiated before contacting the supervising medical team or ward pharmacist.

For all suspected infiltration & extravasation injuries:

Immediate Management:

- Stop administration immediately
- Leave cannula in-situ until further assessment
- Do not flush cannula
- Aspirate as much solution from the cannula as possible
- Elevate limb to minimise swelling
- Obtain extravasation kit from nearest location, Follow appropriate pathway on chart
- Notify medical staff and ward pharmacist

Further management:

- Administer pain relief if required
- Classify injury (see below)
- Mark area with a pen
- Take digital image for documenting in clinical notes
- Remove cannula, place sterile dressing with integrate dressing pad over area. **Do not use occlusive or tight dressings**
- Complete daily assessment of site and take digital images
- Document in clinical notes -CORTEX and complete the Safety 1st report

Classification of the extravasation:

Mild – Minimal volume of irritant or vesicant causing little pain / swelling.
No erythema / blistering

Moderate – Small volume of extravasation causing a local inflammatory reaction, moderate tenderness, with or without erythema but no blistering

Severe – Larger volume extravasation of typically vesicant infusions resulting in extreme pain, marked swelling, cool to touch, diminished or absent pulse, erythema and often blistering

Staging tool for Classification:

Link: [Staging Tool for Non-Cytotoxic Medication Extravasation](#)

Classification / Staging Tool for Non-cytotoxic Extravasation Injuries in Adults

Site Assessment	Mild	Moderate	Severe
Ability to flush cannula	Difficult	Difficult or unable to flush	Unable to flush
Skin Colour	Unremarkable to slight blanching Minimal redness May have discolouration at cannulation site	Blanching of skin Moderate redness	Blanching of skin Redness and/or discolouration may be purple or black
Skin integrity	Intact	Altered	Altered
Skin temperature	Normal to warm	Warm	Cool to touch / Cold
Blistering	No	No	Yes
Swelling	None	Mild	Moderate to severe swelling above and/or below the site of insertion. Pitting
Leakage around site	Yes/no	Yes/no	Yes
Hardened area around site	No	Possible	Yes
Palpable pulse	Good	Good	Weak or absent
Capillary refill / return below site	1-2 seconds distal to site	1-2 seconds distal to site	>3 seconds distal to site
Pain at site	Mild	Moderate	Extreme Note: Degree of extravasation may mean there is altered sensation to limb resulting in no pain at site

Printable Flowchart for Management:

Link:

[Management of Extravasation and Infiltration of non-cytotoxic Medication in Adults](#)

Management of Extravasation and Infiltration of non-cytotoxic medications in adults		
<i>(Radiology, oncology and haematology please refer to your local extravasation protocols)</i>		
Extravasation and infiltration refers to the leakage of intravenous fluid from the vein into the surrounding tissue. It can result in blistering and tissue necrosis and requires immediate attention to limit further injury.		
Suggested management:		
At first concern of extravasation / infiltration: <ul style="list-style-type: none"> <input type="checkbox"/> Stop the injection / infusion immediately <input type="checkbox"/> Leave the IV cannula in-situ until further assessed <input type="checkbox"/> Aspirate as much back from cannula as possible (do not flush cannula) <input type="checkbox"/> Elevate limb to minimise swelling <input type="checkbox"/> Obtain extravasation kit from nearest location <input type="checkbox"/> Inform medical team & ward pharmacist <input type="checkbox"/> Initiate substance specific measures 	Further management: <ul style="list-style-type: none"> <input type="checkbox"/> Give pain relief if needed <input type="checkbox"/> Classify injury (see below) <input type="checkbox"/> Mark area with a pen <input type="checkbox"/> Take digital image for documentation in clinical notes <input type="checkbox"/> Remove cannula if not severe, place dressing over site <input type="checkbox"/> Arrange daily assessments and images <input type="checkbox"/> Complete Safety 1st report 	
Classification:		
Mild:	Minimal volume of irritant or vesicant causing little pain / swelling, and no erythema / blistering	
Moderate:	Small volume of extravasation causing a local inflammatory reaction, moderate tenderness, with or without erythema but no blistering	
Severe:	Large volumes, typically vesicant infusions, resulting in extreme pain, marked swelling, cool to touch, diminished or absent pulse, erythema and often blistering Immediate plastic surgery consultation is required for severe injuries – contact plastics via on-call service	
<ul style="list-style-type: none"> • For specific drug management see below. <i>NB. for drugs not listed see Hospital Health Pathways regarding information on physiological properties</i> • Thermal compressors should only be applied after determining if the extravasated drug requires a warm or cold compress. Applying a compress that is the wrong temperature can exacerbate the injury. Wet compresses should never be used as this increases the risk of tissue maceration. 		
Extremes of pH	Extremes of osmolarity	Vasopressors
Aciclovir Cefotaxime Promethazine Vancomycin	Aminophylline Diazepam Digoxin Mannitol	Adrenaline Dobutamine Dopamine Methylene blue Noradrenaline
↓	↓	↓
Cold compress	Warm compress +/- hyaluronidase*	Warm compress +/- phentolamine*
Cold induces vasoconstriction and limits damage to surrounding tissue <ul style="list-style-type: none"> • cold, dry (not moist) compress • apply proximal to injury for 15-20 minutes at least 4 x daily for 24-48 hours • no specific antidote 	Warm increases blood circulation and encourages drug dispersal away from affected area <ul style="list-style-type: none"> • warm, dry (not moist) compress • apply proximal to injury for 15-20 minutes at least 4 x daily for 24-48 hours 	Warm increases blood circulation and encourages drug dispersal away from affected area <ul style="list-style-type: none"> • warm, dry (not moist) compress • apply proximal to injury for 15-20 minutes at least 4 x daily for 24-48 hours

Consider immediate Plastics Surgical Consultation if:

- Increased pain or swelling after 2-4 hours
- Altered tissue perfusion (decreased capillary refill over or distal to the injury site)
- Change in sensation distal to the site of injury
- Skin blistering or ulcerations

Plastics Surgical Team may consider sodium chloride 0.9% irrigation (saline irrigation) as part of the treatment plan.

Extravasation Kits are located in the following areas:

Christchurch Main Hospital:

- Riverside – Ward 23 (Medication Room)
- Parkside East- Ward 18 (Medication Room)
- Parkside West- Ward 14 (Medication Room)

Waipapa:

- Medical Assessment – Ground Floor (West Medication Room)
- Ward 3A - Level 3 (Clean Utility)
- Ward 8B - Level 8 (Medication Room)

Christchurch Women's:

- Gynae Ward (Medication Room)

The kits contain:

- *Management of Extravasation and Infiltration of non-cytotoxic medications instructional flow chart*
- Extravasation Sign out / return sheet
- 2x Accu-therm reusable gel packs (1x kit in box 1x stored in ward refrigerator)
- 1x fine tip skin marker pen single use
- Sterile gauze 2 swabs
- Chlorhexidine 2% alcohol 70% antimicrobial wipes
- Hydrofilm Plus transparent dressing 5cm x 7.2cm
- Posiflush
- Poly amps 10mL sterile sodium chloride 0.9%
- Sterile 10mL syringes
- Sterile 5mL syringes
- Blunt drawing up needles
- Tape measure single use

Ensure the Kit is returned to the ward it has been borrowed from

Additional requirements (not in kit): *Non-sterile gloves, pillow, camera.*

Further Information on follow up Guidelines

Note: This guideline does not cover cytotoxic medications or contrast media extravasation. Please refer to the service's own guidelines.

Links

Cytotoxic medications: <https://www.eviq.org.au/>

(search "Extravasation" and choose relevant management)

Contrast Extravasation Treatment Guidelines: <https://radiology.streamliners.co.nz/index.htm>

Other medications reported in the literature

- There is limited and conflicting information with regard to treatment
- For extravasated medications that are not in the flowchart, please refer to the physiological properties of the medication.

Physiological Properties of the Medications

- To guide specific management.
- Contact your ward pharmacist to discuss this.

Extremes of pH

Acidic medications can cause oedema, vasoconstriction, sloughing and ulceration of the surrounding tissue

Alkaline substances form hydroxide which results in cell membrane compromise, apoptosis and vasoconstriction.

Drugs that are pH 5 or less and pH 9 and greater are considered vesicant

The most harmful of the vesicant medications are antineoplastic agents.

A variety of non-cytotoxic fluids and drugs which are of different osmolality or pH and have a vasoconstrictive action are also capable of causing severe tissue damage if peripheral extravasation occurs.

Extremes of Osmolarity

Osmotically active substances cause a shift in the intra and extracellular fluid which leads to inflammation and cell death. This increases risk of phlebitis and compartment syndrome.

Vasopressors

A vasopressor causes constriction of the blood vessels of the area leading to inadequate distal blood flow. This increases hydrostatic pressure causing further effusion of medication leading to tissue ischaemia.

Compress

- DO NOT apply pressure to an area of extravasation

How to apply a warm compress

- Warm compresses increase blood circulation and encourages the drug to disperse away from the affected area
- Need to be warm and dry (consider wrapping a dry towel around compress)
- Cannot be moist as this increases risk of tissue maceration
- Warm compresses should be applied proximal to the injury for 15-20 minutes at least four times a day for the next 24-48 hours

How to apply a cold compress

- Cold compresses induce vasoconstriction and limits damage to the surrounding tissue.
- Need to be cold and dry (consider wrapping a dry towel around compress)
- Cannot be moist as this increases risk of tissue maceration
- Cold compresses should be applied proximal to the injury for 15-20 minutes at least four times a day for the next 24-48 hours.

Antidotes

- **Not routinely used but available to use in severe cases of extravasation**
- The decision to use an antidote is a medical decision under the guidance of the medical team or the Plastics team
- Limited evidence to their usefulness in extravasation
- For afterhours supply, contact on call pharmacist (via CTC)

Hyaluronidase

- Used for treatment of severe extremes of osmolarity induced injuries.
- Typical administration includes: 1500 units dissolved in 1mL of water for injection or 0.9% sodium chloride. This is injected intradermally around the boarder of the extravasated area typically in 5-10 injections.
- For best results initiate treatment within ONE hour of extravasation occurring

Phentolamine

- Used for treatment of severe vasopressor induced injuries.
- Typical administration includes: 0.5 mg – 5 mg in 5 mL of 0.9% sodium Chloride injected intradermally in 1 mL amounts around the boarder of the extravasated area.
- For best results initiate treatment within 12 hours

Other medications that may be useful

- Hydrocortisone 1% cream every SIX hours for as long as the erythema exists to help minimise inflammation.
- Chlorhexidine solution to wash the area to help prevent infections.
- Silver sulfadiazine 1% cream applied daily to prevent infection
- Pain relief given on an as required basis.
- Antihistamines may have usefulness if itchiness is present

Information

For Health Professionals

This guideline serves as a local CDHB management guidance. Please note that there are conflicting literature and external protocols presenting nil or limited evidence based local preferences.

Increasing Safety First reports will help improve evidence for this management document.

For further education is found on HealthLearn

Search : *Extravasation Course*

Taking a Blood Sample from a Cannula:

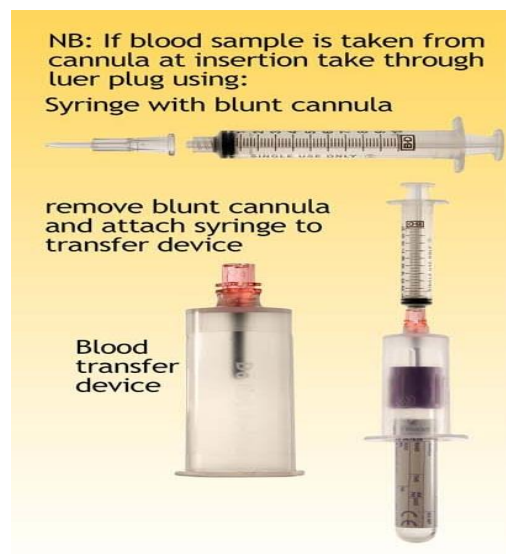
Blood samples should only be taken at the time of the cannula insertion. Blood draws beyond this may not guarantee accuracy of results.

There are two methods that can be used.

Vacutainer method: connect the BLUE blood transfer device directly on to the extension set or the access device and insert the blood tubes in correct order of draw.



Syringe Method: If blood flow is not brisk withdraw the sample into a syringe, attach to a PINK blood transfer device then insert the blood tubes into the blood transfer device. The vacuum within the tube will draw the blood into the tubes.

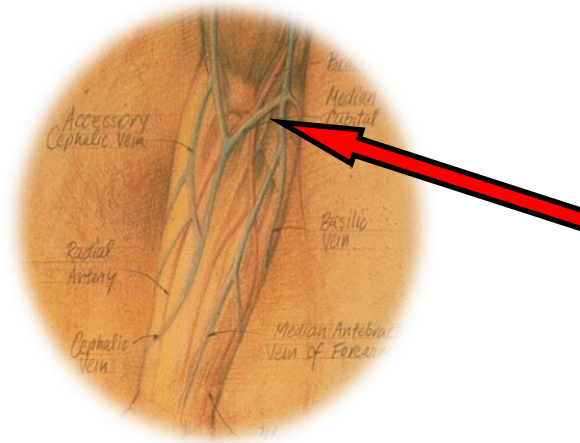


Additional Information:

Midwives are expected to cannulate in a wide variety of situations including emergencies, where women are in labour. When pregnant women bleed during or following delivery, large volumes of blood can be lost. Blood flow over the placental site is approximately 500mls per minute. When the uterus does not contract efficiently following placental separation, a woman is at risk of losing her entire blood volume in under 10 minutes. This is categorised as a medical emergency.

Whilst the veins of choice for midwives are usually the dorsum of the hand or lower forearm, in an emergency situation the large veins of the anti-cubital fossa are the veins of choice. These veins provide easy access, the ability to accommodate 16-14gauge cannula and allow for high flow rapid infusions of IV fluids, blood and blood products

Practice Point: When cannulating the antecubital area intra-arterial cannulation may occur. The riskiest area is the medial side of the antecubital fossa where the brachial artery is shallow and lies close to the median cubital vein



Practice point: To provide patient comfort, it is recommended local anaesthetic be administered sub-dermally to the area alongside the vein prior to inserting a 18g-16g cannula.

VASCULAR ACCESS

BEST PRACTICE: Every time - Every patient - Every line – Every touch

Bundling essential best practices into sequential steps is an evidence-based approach to preventing complications. (Crowell et al 2017)

Cannula management greatly influences cannula and patient outcomes.

Always ensure the essential elements in Table 5 below form part of regular assessment and are completed during cannula care.

ENSURE THESE ESSENTIAL ELEMENTS ARE COMPLETED DURING CANNULA CARE		
HAND HYGIENE	ANTT	DRESSING INTACT
<ul style="list-style-type: none"> Do not touch cannula or equipment unless you are compliant with hand hygiene 	<ul style="list-style-type: none"> During any subsequent interaction with cannula Protect key parts 	<ul style="list-style-type: none"> Ensure the dressing is intact at all times. Replace at 5-7 days if VIP score 0. Clean site, apply new dressing, and consider use of Cavilon skin protectant to assist with dressing adhesion.
VIP SCORE	CANNULA REQUIRED	ACCESSING CANNULA
<ul style="list-style-type: none"> Visually check the condition of the cannula site using the VIP score as a measure and document results every shift 	<ul style="list-style-type: none"> Remove cannula when no longer required or when clinically indicated (following assessment using VIP score) Replace cannula if VIP score indicates and only if ongoing therapy is require 	<ul style="list-style-type: none"> Use gloves Clean access device vigorously chlorhexidine 2% & Alcohol 70% wipe, allow to dry before attaching syringes or IV tubing.
CHECKLIST SUMMARY		
IN USE	DRESSING	VIP Score
<ul style="list-style-type: none"> Check if in use each shift Remove when no longer required 	<ul style="list-style-type: none"> Check intact Change every 5-7 days 	<ul style="list-style-type: none"> Check every shift Replace at VIP score 2 If VIP score 5- complete safety 1st

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Associated Documents:

CDHB Volume 12. 2019 Fluid & Medication Management

- Peripheral IV Policy
- Peripheral Cannulation Policy 4742
- Complications of IV therapy 4764

Further Reading:

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