PERIPHERAL INTRAVENOUS CATHETER MANAGEMENT – Adult & Paed

Overview

This Document

This document covers recommended best practices relating to the selection, insertion, care and management of peripheral intravenous (PIV) devices and therapy.

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Introduction

Purpose

To provide the best available evidence on the management of short peripherally inserted venous catheters to reduce the risk of nosocomial infections and catheter related complications for ADHB adult and paediatric patients.

Scope

- Staff who have completed a locally approved training programme for PIV cannulation:
  - Medical personnel
  - Registered Nurses
  - Registered Midwives
  - Phlebotomists
  - Technicians
- Staff who are responsible for preparing, observing, maintaining and discontinuing PIV therapy:
  - Medical personnel
  - Registered Nurses
  - Registered Midwives
  - Enrolled Nurses
  - Technicians

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Associated Documents

Associated Documents

The table below indicates other documents associated with this recommended best practice.

Type	Document Titles
Board Clinical	• Medication Administration - Adult & Paed • Blood Components & Blood Products Administration
Infection Control	• Hand Hygiene • Standard Precautions
Child Health Clinical	• Pain Management - Procedural - Paed
RMO Handbook	• Anaphylaxis algorithm for adults
Starship Clinical Guidelines	• Anaphylaxis • Fluid Therapy - Paed
Newborn Clinical Guidelines	• IV Infiltration Injuries
Oncology Clinical Practice	• Extravasation CP011-Jul07.pdf
References	• Centers for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter – related infections. M*MWR 2002, 51 (no. RR – 10)* http://www.cdc.gov/mmwr/PDF/rr/rr5110.pdf • Joanna Briggs Institute (JBI) for Evidence Based Nursing (1998) Management of Peripheral Intravascular Devices: Best Practice Vol. 2. Issue 1. • Royal College of Nursing (2005) Standards for Infusion Therapy. RCN, London http://www.rcn.org.uk/__data/assets/pdf_file/0005/78593/002179.pdf • Khan, M & Holmes, J (2002). Reducing the morbidity from extravasation injuries. Annals of Plastic Surgery, 48; 628-632 • Thigpen, J. (2007). Peripheral intravenous extravasation: nursing procedure for initial treatment. Neonatal Network, 26(6); 379-384
Education Programme	• IC Therapy E-Learning

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Hand Hygiene & Aseptic Technique

Infection Prevention

- Hand hygiene and aseptic technique remain the major prevention strategies for catheter related infections.
- Hand hygiene is performed as recommended by Infection Control
- An Aseptic Non Touch Technique is used for all peripheral intravascular device management.
- The critical components of an aseptic non touch technique are:
  - Always perform hand hygiene effectively
  - Never contaminate key parts
  - Touch non key parts with confidence
  - Take appropriate infective precautions (gloves)
- Skin antisepsis is achieved using a 2% chlorhexidine / 70% alcohol wipe.
- Prior to accessing any injection sites, clean with an approved antiseptic wipe.

Caution

- **The use of gloves does not replace the need for hand hygiene.**
- **Hand hygiene must be performed when gloves removed.**

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Selecting a Cannula

Considerations

Understand intended use.

- Catheter selection is based on:
  - Patient age
  - Intended purpose of the therapy
  - Duration of the therapy. Consider a 'midline' catheter or PICC if therapy > 10-14 days.
  - Known potential complications
- For a deep vein consider using a longer cannula, this may be preferable for longer term vesicant therapies.
- A smaller gauge cannula will allow for blood flow around the catheter, lessening risk of phlebitis.
- Rapid infusion of fluids requires a larger gauge cannula
- Patient preference

Guidance for Cannula Selection

Gauge	Use
24 gauge	• Paediatrics • Cytotoxic therapy
22 gauge	• Paediatrics • Cytotoxic therapy • Small fragile veins
20 gauge	• Maintenance fluids • Antibiotics • CT scan
18 gauge	• Blood and blood products • Large volume fluids
16 gauge	• Multi trauma • Multiple blood transfusions • High volume fluid replacement • Major surgery • Labour and elective LSCS
14 gauge	• Multi trauma • Rapid high volume fluid replacement • Major surgery

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Insertion Sites

Adult & Paediatric

- Upper limbs should be used in preference to lower limbs
- Dorsal veins of the foot and long saphenous veins are acceptable in infants and young children.
- Distal veins should be used in preference to proximal veins.
- Consider avoiding dominant limb
- All cannulae inserted into a lower limb should be changed as soon as a satisfactory site can be found elsewhere

Exceptions

Certain specialties, such as Oncology, Haemataology and Renal may require specific catheter sites and/or sizes.

Please liaise with the relevant department if a patient:

- Is to receive chemotherapy
- Has a haematological problem with which you are unfamiliar

Renal patients may require an A.V. Fistula or graft for haemodialysis:

- Avoid siting cannula in the forearm of these patients.
- If an existing A.V. Fistula or graft is present, do not use this arm for IV cannulation.

Sites to Avoid

- Compromised limbs (known or suspected), e.g.
  - Impaired lymphatic or venous drainage
  - A recent or current fracture
  - Burns
- Sites recently used for cannulation
- Sites that are tender/inflamed/infected
- Areas of flexion, as occlusion, ‘mechanical’ or accidental damage appear to be more prevalent
- Veins in the antecubital fossa should not be routinely used for insertion of peripheral catheters as it may limit the patient’s range of movement, interfere with blood sampling and prevent the use of these veins for PICC insertion. However, this site may be required for initial or short term placement of catheter for general anaesthesia or for CT scanning injector pump use.

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Insertion of Cannula

Prior to IV Therapy

- Prior to initiating intravenous therapy all patients (and caregivers where appropriate) should be provided with information on all aspects of his / her care in a manner he / she can understand.
- Assess the patients need for local anaesthesia and obtain prescription.
  - Consider the use of topical anaesthesia (EMLA or Ametop) (see N:\Groups\EVERYONE\POLICY\Master file of Intranet\Clinical Practice\Starship Childrens\Images\ Appendix1 Pain Relief Micro Collect.pdf)
  - Serious consideration should be given to using local anaesthetic infiltration for catheter size 18G and larger.

Insertion Technique

Follow the steps below to insert a peripheral intravascular device.

Step	Action
1.	Maintain an aseptic non touch technique throughout.
2.	Thoroughly clean the insertion site with 2% chlorhexidine / 70% alcohol wipe and allow to dry
3.	Position tourniquet above proposed venepuncture site and tighten. Ensure vein dilation has occurred
4.	Stabilise vein by drawing skin taut over vessel
5.	Insert prepared cannula smoothly with bevel of introducer uppermost
6.	Observe for flashback of blood in chamber
7.	Decrease the angle of the cannula until almost parallel with the skin
8.	Advance the whole unit to ensure cannula tip is in the vein
9.	Hold the introducer still and maintain skin tension
10.	**Handling the sides of hub only**, advance supported cannula fully into the vein up to the hub
11.	Release tourniquet
12.	Place gauze swab under hub of cannula to keep site dry while removing introducer

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Insertion of Cannula, Continued

Step	Action
13.	Apply pressure to tip-end of cannula with one hand and remove the introducer, placing it immediately into a sharps container
14.	Attach needle free device or short extension set
15.	Establish patency of cannula by flushing with sodium chloride 0.9%. • Adults use 5mls • Paediatrics use 2mls
16.	Secure with sterile tape included with the dressing as required and apply sterile, transparent, semi permeable, occlusive IV dressing. Secure IV tubing.
17.	Apply splint to immobilise limb joint as required
18.	If cannulation unsuccessful, a total of 3 attempts may be made before escalating procedure to a staff member with significant expertise in IV cannulation.

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Insertion Documentation

Reason for Documentation

Documentation allows for audit of practice and tracking of peripheral IV related infection.

Minimum Requirements

The minimum documentation requirements for any ADHB patient requiring a peripheral IV device are:

- At the insertion site:
  - On self-adhesive label supplied, write the date and time
  - Place on outside of transparent dressing
  - **Note**: Do not place over puncture site
- In the clinical notes and include the:
  - Type of venous access device
  - Gauge
  - Insertion site
  - Identification of individual inserting device
  - Date and time of insertion

Note

If there are no insertion details / or date and time recorded on the IV dressing, it is the responsibility of the person evaluating the site to ensure that details are ascertained and recorded in the clinical notes.

0.9% Sodium Chloride Flush Sticker

Insert a 0.9% sodium chloride flush sticker on the patients medication chart and ensure this is signed by a registered prescriber.

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IV Site Ongoing Management

Catheter Site Dressing Regimes

A sterile transparent semi-permeable occlusive dressing should cover the insertion site:

- Sterile tape included with the IV dressing can be used to stabilise the cannula prior to applying the dressing. It should not obscure the insertion site.
- Unsterile tape can be used on the outside of the sterile dressing to give extra stability; however, the insertion site must remain visible at all times.
- The dressing should be replaced if there is blood pooling under the dressing or if there is a loss of integrity.
- If patient is allergic to transparent occlusive dressings, sterile gauze dressings are to be used and changed daily.

Observation of Site

- Any patient with an intravenous device in situ must have the catheter site monitored visually or by palpation:
  - Paediatrics: 1 hourly
  - Adults: 8 hourly
  - Community: daily
- Assessment and identification of peripheral sites for signs of catheter related complications using the infiltration and phlebitis scales (RCN, 2005) or malfunction must be recorded in the clinical record a minimum of once a shift.
- Nurses are accountable for evaluating, monitoring, achieving and documenting effective delivery of prescribed fluid therapy to prevent the occurrence of fluid overload. The frequency of flow rate monitoring and documentation should be determined by the patients' clinical requirements.
- Patients within Children's Health with continuous intravenous therapy are to have the hourly and cumulative volume infused recorded.

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IV Site Ongoing Management, Continued

Infiltration Scale

Grade	Clinical Criteria
0	• No symptoms
1	• Skin blanched • Oedema <1 inch (2.5cm) in any direction • Cool to touch • With or without pain
2	• Skin blanched • Oedema 1-6 inches (2.5cm-15cm) in any direction • Cool to touch • With or without pain
3	• Skin blanched, translucent • Gross oedema >6 inches (15cm) in any direction • Cool to touch • Mild to moderate pain • Possible numbness
4	• Skin blanched, translucent • Skin tight, leaking • Skin discoloured, bruised, swollen • Gross oedema >6 inches (15cm) in any direction • Deep pitting tissue oedema • Circulatory impairment • Moderate to severe pain • Infiltration of any amount of blood product, irritant, or vesicant

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IV Site Ongoing Management, Continued

Phlebitis Scale

Grade	Clinical Criteria	Action
0	• IV site appears healthy • No signs of phlebitis	Observe cannula
1	**One** of the following is evident: • Slight pain near IV site **or** • Slight redness near IV site Possibly first signs of phlebitis	Observe cannula
2	**Two** of the follow are evident: • Pain at IV site • Erythema • Swelling Early stage of phlebitis	Resite cannula
3	**All** of the following signs are evident: • Pain along path of cannula • Erythema • Induration Medium stage of phlebitis	• Resite cannula • Consider treatment
4	**All** of the following signs are evident and extensive: • Pain along path of cannula • Erythema • Induration • Palpable venous cord Advanced stage of phlebitis or the start of thrombophlebitis	• Resite cannula • Consider treatment
5	**All** of the following signs are evident and extensive: • Pain along path of cannula • Erythema • Induration • Palpable venous core • Pyrexia Advanced stage thrombophlebitis	• Initiate treatment • Resite cannula

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IV Site Ongoing Management, Continued

Replacement of IV

When adherence to aseptic non touch technique cannot be ensured (i.e. Catheters inserted in an emergency) replace catheters:

- As soon as possible and
- No longer than 48 hrs

Adult:

- In adults the cannula should be changed / resited routinely every 96 hours provided no catheter related complications requiring cannula removal are encountered before this.
- If a PIV cannula is clinically indicated, a new cannula must be inserted prior to the removal of a patent, complication free cannula.

In exceptional circumstances it is permissible to leave a cannula in place for more than 96 hours if: (**All three of these conditions must apply**.)

- Previous experience indicates that re-siting a cannula will prove particularly difficult **and**
- The existing cannula is functioning satisfactorily **and**
- There are no signs of infection or phlebitis.

Paediatric:
The IV devices may remain in place until the completion of IV therapy, provided no catheter related complications requiring cannula removal are encountered before this.

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IV Site Ongoing Management, Continued

IV Removal

- Any intravascular device no longer clinically indicated must be removed.
- Apply gauze over the insertion site, hold firmly and remove cannula.
- When insertion site clotted, cover the site with a suitable dressing
- Dispose of waste according to local practice
- Cannula removal must be documented in the clinical notes

Discharging Patient with Peripheral Lines

Paediatric patients can be discharged home with a peripheral cannula insitu as per service guidelines. In general, adult patients should not be discharged with a peripheral cannula insitu.

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0.9% Sodium Chloride Flush

Flushing

Flushing is performed:

- At least 12 hourly to maintain patency of the catheter
- To prevent mixing of medications and / or solutions that are incompatible.

PIV cannulae are flushed with 0.9% sodium chloride using a turbulent (push pause) technique.

- Adults – 5mls
- Paeds – 2mls

Note

- **When using an extension set with a needle free access device (e.g. Smartsite) a positive pressure technique must be used.**
- **When you have approximately 0.5 mls of 0.9% sodium chloride left start clamping the line while continuing to flush.**

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IV Administration Sets

Intravenous Fluids	• Intravenous fluids with no ward based additives are changed when the container is empty and/or when the administration set is changed. • Intravenous fluids with additives added on the ward are changed every 24 hours.
Adult	The commencement time and date of administration must be documented on a time strip label and attached to the fluid bag.
Paediatric	• Time strip labels are not routinely used as the majority of infusions are administered via an infusion device or burette set. • Each bag of fluid is independently double checked and a signed patient label is put on the bag.
Continuous Infusions	Administration sets should be changed routinely every 96 hours for continuous infusion therapy (including infusion pump sets).
Intermittent Infusions	• Administration sets should be changed routinely every 24 hours when used for intermittent infusion therapy (including infusion pump sets) • A sterile cap must be attached to the end of the IV set upon completion of an infusion if the set is not being immediately discarded.
Blood and/or Blood Products	<u>Blood administration sets or filters are to be changed</u> • After every 3 - 4 units • When the transfusion of blood/blood products is complete • After twelve hours of continuous use.
TPN	Administration sets are changed every 24hours

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IV Administration Sets, Continued

Secondary Infusions

Any "add on" administration sets must be attached using an aseptic non touch technique to the primary line and are changed when the primary administration set is changed

Extension Sets

- The use of extension sets is recommended when using a needle free access valve except, when taking blood sample from line, or in emergency situations / or when large volumes of fluids are required e.g. Emergency Care / Theatre / CT scanning.
- Extension sets are to be primed and attached to the cannula at the time of IV insertion using an aseptic non touch technique
- When not in use, extension sets must be clamped
- When exiting the extension set you must use a positive pressure clamping technique
- Extension sets are to be changed when the access device is changed or immediately upon suspected contamination or break in integrity.

Needle Free Access Device

The needlefree access device is changed every 96 hours or when integrity compromised.

Anti-Siphon Valve

- The Anti-siphon valve has the effect of suppressing bubble formation. This is useful when infusing medications or fluids through a volumetric pump which repeatedly alarms due to the formation of bubbles in the line.
- Anti-siphon valves are to be considered part of the administration set and changed when the administration set is changed.

<u>Recommended uses:</u>

- Intragram
- Blood and blood products
- TPN
- Some cytotoxic medications.

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IV Accessories

Accessories

- Bag spikes are to be discarded when fluids are changed @ 24hrs
- A drawing up access pin may be used for multi vial access
- A blunt drawing up needle or filter needle may be used for access to glass ampoules
- To prevent contamination of syringe tip during transport to the patient's bed the drawing up access pin is to remain attached, or a blind end cap attached, to the syringe and be discarded at patient bedside prior to accessing any needle-free access device.
- The blind end cap is to be used to provide a sterile cap for syringes and administration sets.

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Complications – Catheter Related

Infiltration / Tissuing

- Occurs when a non vesicant infusate leaks from the vessel into the surrounding tissue as a result of dislodgement of the cannula.
- The cannula may completely slip out of the vein or only the tip of the cannula may remain in the vein or vessel wall, so there is no seal around the cannula and infusate infiltrates the surrounding tissue.
- This is more likely with traumatic insertions / cannulas inserted in areas of flexion or inadequately secured cannulae.
- Infiltration resulting in an infiltration score of 1 or 2:
  - Stop the infusion
  - Remove the IV catheter
  - Elevate the limb
  - Notify medical staff
- Infiltration resulting in an infiltration score of 3 or 4 may cause significant morbidity (infants and children more susceptible) and requires **immediate** medical attention for further management. Treatment must be carried out as soon as possible after the adverse event and before any signs of skin damage has occurred.
- Medical staff may perform multiple punctures of oedamatous area to allow free drainage or clysis (Infiltration management - NICU)
- Ongoing regular site assessment and interventions (including pain management) are documented in the clinical record.
- Complete a Risk Monitor Pro
- Ensure early plastic surgery referral if required
- Refer to infiltration score

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Complications – Catheter Related, Continued

Extravasation

- Refers to the inadvertent administration of a vesicant solution or medication into surrounding tissues.
- This is more likely with IV's sited over joints / areas of flexion, poorly secured or inappropriate route of administration for the solution/medication.
- Ulceration and tissue necrosis may occur as early as 6 hours after extravasation. Treatment must be carried out as soon as possible after the adverse event and before any signs of skin damage occur.
- Compartment syndrome may result if large volumes of fluid are involved.
- If extravasation occurs:
  - Stop the infusion immediately
  - Aspirate residual medication if possible
  - Leave the catheter in situ.
  - Elevate the limb
- Contact medical staff immediately for further advice on possible antidote and treatment: (refer to Extravasation Policy)
  - Instil antidote when appropriate and as prescribed (IV or subcut/intradermal)
  - Remove IV catheter if not required for antidote or following antidote treatment.
- Observe the site frequently for signs of necrosis, undertake pain assessments and document description in clinical notes.
- Complete a Risk Monitor Pro.
- Ensure early plastic surgery referral if required
- Refer to infiltration score

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PERIPHERAL INTRAVENOUS CATHETER MANAGEMENT – Adult & Paed

Complications – Catheter Related, Continued

Phlebitis

- Is inflammation of the lining of the vein due to a physical (mechanical), chemical or bacterial irritant.
- The use of a phlebitis scale has been shown to aid in the early detection of phlebitis and to improve accuracy of site assessments.
- Refer to phlebitis score on page 11 and manage accordingly.
- Check patient's vital signs.
- Notify medical staff for review. If patient is febrile, consider purulent thrombophlebitis and notify medical staff for urgent attention
- Document in clinical record and complete a Risk Monitor Pro.

Thrombophlebitis

- Denotes a two fold injury: the formation of thrombus and presence of inflammation. Usually the first symptom is inflammation and pain along the vein, which then becomes hard and tortuous as it thromboses. Any irritation to the intima of the vein can predispose the vein to inflammation and clot formation as platelets adhere to the traumatised wall of the vein
- If thrombophlebitis is present, discontinue infusion and remove cannula immediately.
- Check patient's vital signs
- Notify medical staff for review. If patient is febrile, consider purulent thrombophlebitis and notify medical staff for urgent attention.
- Document in clinical record and complete a Risk Monitor Pro.
- Refer to phlebitis score

Suspected Infection

- Is a potentially life threatening complication of infusion therapy; which may be local, systemic or both. Peripheral line infections usually occur at the insertion site.
- If infection is present, remove the IV cannula immediately, swab insertion site and contact medical staff to review
- Document in clinical record and complete a Risk Monitor Pro.

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Complications – systemic

Anaphylaxis

- A serious and profound state of shock brought about by hypersensitivity to an allergen such as a drug, foreign protein or toxin resulting in cardiovascular and / or respiratory collapse.
- Signs and Symptoms include:
- Cutaneous –erythema, urticaria, angioedema
- Respiratory – bronchospasm, upper airway angioedema
- Cardiovascular – tachycardia, hypotension
- When an anaphylactic reaction is detected the following must be undertaken

Environment	Step	Nursing Intervention
Hospital	1.	• Stop infusion immediately • Assess patient's ABCD's and • Commence any resuscitative/emergency procedures as per the: – Anaphylaxis algorithm for adults (RMO handbook) – Anaphylaxis guidelines for children (Starship Clinical Guidelines).
	2.	• Call 777 • For adult cardiac arrest ask for Code Blue • For adult collapse ask for Code Red. • For paediatric patient where you require immediate assistance ask for Paediatric Code Blue.
	3.	<u>Once patient is stabilised:</u> • Document the event • Complete a Risk Monitor Pro • Initiate a medication alert.
	4.	• A medication reaction investigation should be undertaken
Community	1.	• Manage according to the anaphylaxis policy.

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Complications – systemic, Continued

Accidental Circulatory Overload

An effect of increased blood volume that raises the blood pressure. The condition can lead to heart failure or pulmonary oedema, with associated shortness of breath and collapse.

Those particularly at risk from fluid volume overload are:

- The elderly
- Children and infants
- Patients with cardiac / pulmonary disease, or
- Patients with significant cerebral / renal disease injury

Signs and Symptoms that may present are:

- Deteriorating respiratory status:
  - Tachypnoea
  - Dyspnoea
  - Hypoxia
  - Cyanosis (not necessarily in children)
- Cardiovascular compromise:
  - Tachycardia
  - Hypertension
  - Raised CVP measurement
  - Distended neck veins (difficult to assess in children)
  - Increased urine output (children)

Procedure

Follow the steps below when circulatory overload is present.

Step	Action
1.	Discontinue infusion
2.	Check patient's ABCD's
3.	Initiate treatment
4.	Notify medical staff as appropriate to patient condition
5.	Document in the clinical record and complete a Risk Monitor Pro

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PERIPHERAL INTRAVENOUS CATHETER MANAGEMENT – Adult & Paed

Complications – systemic, Continued

IV related Bacteraemia or Possible Fluid Contamination

Follow the steps below if a PIV system is discontinued because of suspected IV related bacteraemia or suspected fluid contamination

Step	Action
1.	The following must be sent to the laboratory: • The fluid • Administration set
2.	Notify: • Infection Control and • IV Therapy team
3.	Record the lot and batch number of fluids and additives