Guideline

Peripheral intravenous catheter (PIVC)

1. Purpose

This guideline has been developed as part of the I-Care intervention bundle for the management of intravascular devices (IVDs). This guideline provides recommendations regarding best practice for the use and management of invasive devices based on current evidence for the prevention and control of healthcare associated infection (HAI).

2. Scope

This guideline provides information for all employees, contractors and consultants within the Hospital and Health Services, divisions and commercialised business units within the Queensland public health system.

3. Related documents

Authorising Policy and Standard/s:

- NSQHS Standard 3 – Preventing and Controlling Healthcare Associated Infections

Standards, procedures, guidelines

- Australian guidelines for the prevention and control of infection in healthcare
- Guideline for surveillance of healthcare associated infection
- Hand hygiene guideline

Forms, templates

- Peripheral intravenous catheter (PIVC): insertion – Point of care tool
- Peripheral intravenous catheter (PIVC): maintenance – Point of care tool

4. Guideline for Peripheral Intravenous Catheter (PIVC)

Contents

Key critical points

- IVD requirements should be constantly reassessed and any non-essential intravenous devices should be promptly removed.
- Only competent staff (or training staff supervised by competent staff) are to insert Peripheral Intravenous Catheters (PIVC)
- Accurate documentation and record keeping should be maintained to ensure patient safety

General recommendations

- The clinician should choose an appropriate Intravascular Device (IVD) – consider catheter type, number of lumens, length, type of therapy, site of insertion, risk of complications including infection, and patient factors.[1]
- Only competent staff (or training staff supervised by competent staff) should insert IVDs to minimise infection and other complications.[1-3]
- The clinician should explain to the patient (if possible) or parent/guardian the procedure and need for catheterisation.
- All sterile fields should be set up immediately prior to any procedure by the clinician or suitably trained assistant.
    - Trolleys/carts that include all necessary supplies should be dedicated for PIVC insertion.[4, 5]
- Accurate documentation and record keeping should be maintained by the clinician to ensure patient safety, to allow for audits, and to track outbreaks of infection.[6] The documentation should include the date and time of insertion including type of IVD, gauge, length of line on insertion and removal, anatomical site, skin preparation solution used, name of operator, site observations and device removal/replacement details.[3, 7, 8]

Education and competency assessment

All clinicians involved in the insertion and maintenance of IVDs must ensure that this is within their scope of clinical practice, determined by the individual's credentials, education, training, competence and maintenance of performance at an expected level of safety and quality. The clinician's scope of practice is also dependent upon the capacity and capability of the service in which they are working.[9, 10]

- All staff involved in the insertion and maintenance of IVDs should complete all competency assessments as required by the healthcare facility.[11] A record of this should be maintained by the facility.[1]
- Education provided to healthcare professionals targeting key components of PIVC care including dressings, documentation, catheter duration, line care and infection control measures is recommended. This has been associated with significant improvements in processes and outcomes related to PIVC care, including lower rates of PIVC-related complications such as catheter associated bloodstream infection.[11]
- It is recommended that patients be provided with education on symptoms of phlebitis or infection, and encouraged to alert clinicians to any changes or concerns.[7] Clinicians should also answer any questions the patient has about the PIVC. This may enhance patient cooperation and reduce risk of complications.[8]

Hand hygiene

- It is recommended that healthcare workers perform hand hygiene with an antiseptic-containing soap solution or use an alcohol-based waterless cleanser:
  - before and after palpating catheter insertion sites
  - before and after accessing, repairing, or dressing an intravascular catheter; this includes associated components such as administration sets and access ports.[1, 7, 12-15]
- The use of gloves does not obviate the need for hand hygiene.
- It is recommended that the clinician educate patients and carers about the importance of hand hygiene and ask that they remind all caregivers to clean their hands.[2]

Surveillance

It is recommended that surveillance be conducted in high-risk patient populations by a facility appointed person to determine healthcare associated (HCA) IVD-related Bloodstream Infection (BSI) rates, monitor trends in rates and assist in identifying lapses in infection control practices.

- A facility-appointed person should:
  - report HCA IVD-related BSIs at least monthly to all stakeholders
  - investigate all clusters of HCA IVD-related BSIs for common cause problems
  - investigate all episodes of HCA IVD-related *Staphylococcus aureus* BSI using an Investigation Checklist e.g. The *Staphylococcus aureus* BSI Checklist available from: https://www.health.qld.gov.au/publications/clinical-practice/guidelines-procedures/diseases-infection/infection-prevention/icare-bsi-checklist.pdf
- It is recommended that the introduction of new products or processes should be monitored to identify any increase or decrease in the occurrence of device associated infection.[2]

Insertion & management requirements

General

- Solutions and medications should be considered by the clinician for potential to cause infusate-induced vessel damage including osmolality (or tonicity), pH and chemical properties of the solution or medication e.g. potassium chloride, vancomycin.[6, 8, 16] Repeated administration of chemical irritants warrants central venous access to limit peripheral venous damage.[3, 8]
- It is recommended that clinicians make no more than two attempts at cannulation before seeking assistance from a more experienced clinician, unless it is a medical emergency or no other clinicians are available.[3, 8]
- Assistance should be provided when inserting a PIVC to ensure asepsis and appropriate technique.
- Adhesive labels indicating insertion details should be placed onto the dressing.

Catheter types and materials

- It is recommended that the use of steel needles should be avoided due to the risk of extravasation and needlestick injury.[1]
  - PIVCs made of polyurethane have been shown to significantly reduce incidence of phlebitis compared to tetrafluorethylene-hexafluoropropylene (teflon) or silicone catheters.[6, 8]

- PIVC and steel-winged infusion sets (if used) should incorporate safety-engineered protection mechanisms.

Size/gauge

- It is recommended that specific characteristics of the patient and anticipated therapy are considered in the selection of PIVC gauge and length. These include:
  - age
  - condition of veins
  - degree of cardiovascular stability
  - medical or surgical interventions.[8]
- Clinicians should use the smallest gauge and shortest length PIVC that will accommodate the prescribed therapy to reduce the risk of phlebitis.[8, 17]
- It is recommended that the size of the target vein is also considered when selecting PIVC size. Large bore catheters are often required for rapid infusions or resuscitation, however high flow rates are only achieved if the catheter is inserted into a large (low resistance) vein.[8]
- A central venous catheter should be considered for patients with cardiovascular instability, intended extensive surgery, or requiring long-term intravenous therapy.[3, 8]
- Size-related risk of complication:
  - Larger gauge PIVCs (18 gauge or larger) have been observed to have a lower rate of occlusion.[18]
  - Large gauge and longer PIVCs have been observed to increase risk of phlebitis.[6, 8, 14, 18-21]
  - Smaller gauge PIVCs (22 gauge or smaller) have been observed to increase risk of accidental removal.[18]
  - Longer PIVCs have been observed to have a decreased incidence of infiltration and extravasation, which is especially important when infusing highly irritant (e.g. vesicant) substances.[8]

Prophylactic antibiotics

- Prophylactic antibacterial or antifungal agents (oral, intranasal or parenteral) are not recommended at the time of insertion or during use of a PIVC to prevent catheter colonisation or bloodstream infection.

Catheter site selection

- Clinicians should assess specific patient factors such as pre-existing catheters, anatomic deformity, site restrictions (e.g. mastectomy, arteriovenous [AV] fistula or graft), the relative risk of mechanical complications and the risk of infection.[3, 17]
- Selection of catheterisation site:
  - The distal areas of the upper extremities are optimal for site selection.[1, 8, 16] Subsequent catheterisation should be made proximal to the previously catheterised site.[3, 17]
  - Catheters inserted into the lower limbs have a greater risk of phlebitis, thrombophlebitis and thrombosis than the upper limbs.[6, 14, 16, 17] It is recommended that catheters inserted in a lower extremity site should be replaced to an upper extremity site as soon as possible.[1, 8]

- Veins should be selected on the non-dominant forearm (especially if the catheter is to remain in position for any length of time).[3, 8]
- The basilic or cephalic veins on the posterior (dorsal) forearm[22] are the preferred site for catheterisation.[3, 17]
- The metacarpal veins on the dorsum of the hand[22] are easiest to visualise but are more liable to block, difficult to stabilise, and prone to infusate or medication induced vessel damage.[3]
    - The use of antecubital fossa or forearm veins has been observed to have a significantly lower risk of phlebitis than the dorsal veins of the hand.[20]
- The use of the anterior (ventral) forearm veins (particularly the cephalic veins) should be avoided in patients with chronic kidney disease and impending need for dialysis in whom preservation of upper-extremity veins is needed for fistula or graft implantation.[23]
    - It is recommended that the dorsum of the hand should be used for PIVC in patients with chronic kidney disease.[23]
- Site selection should avoid areas of flexion[3, 8] as this may predispose to phlebitis[14] due to excessive movement causing vessel wall trauma.[15, 16, 20] This may not always be possible in an emergency situation (e.g. resuscitation) when the antecubital fossa is recommended due to the need for a larger vessel.[17]
- When venepuncture of the arm veins is necessary, sites should be rotated.

- Site-related risk of complication:
    - PIVCs inserted into the hand, antecubital fossa or upper arm have been observed to have a significantly higher rate of occlusion compared with forearm.[18]
    - A higher incidence of phlebitis has been observed when the PIVC is inserted in the wrist compared with the hand or forearm.[19]
    - PIVCs inserted into the antecubital fossa and forearm veins have been observed to have a significantly lower risk of phlebitis than the dorsal veins of the hand.[20] PIVCs inserted into the antecubital fossa have been observed to have a higher risk of infection than in the forearm,[15] potentially due to catheter movement with flexion.[3, 8, 14]
    - PIVCs inserted into the hand or antecubital fossa have been associated with increased risk of accidental removal compared to forearm.[18]

Local anaesthesia

- Topical local anaesthetic e.g. ‘eutectic mixture of local anaesthetics’ (EMLA) - lignocaine with prilocaine, can be applied by clinicians 60 minutes prior to catheterisation to reduce discomfort during insertion,[24] particularly in children.
    - Creams can leave a lipid residue that may create a focus for microbial growth; therefore residue of topical anaesthesia should be removed with a soap and water scrub, prior to skin preparation (disinfection).
    - Soap and water has been found to be superior to alcohol-impregnated swabs for removing residual lipid from the skin.
- Local anaesthetic (i.e. subcutaneous lignocaine) can be considered by clinicians for use in adults, before insertion of any size of intravenous catheter.

Procedure for insertion

It is recommended that the following steps are followed by clinicians to insert a PIVC using aseptic technique. Staff should also refer to locally developed procedures for PIVC insertion.

1. Assess patient. Consent patient. Explain procedure.
2. Clean trolley with alcohol/detergent wipes. Perform routine hand hygiene.
3. Collect all equipment required and check for sterility and/or expiry date.
4. Ensure patient comfort and privacy. Draw curtains around treatment area ensuring there is adequate space available in which to perform procedure. Adjust level of bed for staff member.
5. Perform routine hand hygiene. Place patient in appropriate position free from jewellery.
6. Assess and select patient vein by applying a clean tourniquet. Place protective sheet under site to be cannulated. If unable to locate vein, release tourniquet, postpone procedure and seek assistance.
7. Perform routine hand hygiene. Don appropriate personal protective equipment (e.g. apron, goggles).
8. Perform routine hand hygiene. Prepare aseptic field and equipment.
9. Aseptically prepare IV flush and prime extension set.
10. Perform routine hand hygiene. Prepare insertion site as per Skin preparation: insertion site:
    - Clip hair if necessary
    - Apply skin preparation solution and allow to air dry.
11. Retighten tourniquet.
12. Perform clinical hand hygiene. Don non-sterile or sterile gloves. Sterile gloves are necessary if touching key parts and key sites.
13. Anchor vein below puncture site and insert cannula using aseptic technique.
14. Attach extension tubing, flush IV cannula and dress and secure cannula.
15. Dispose of waste into the appropriate waste bin.
16. Remove gloves and apron. Perform routine hand hygiene.
17. Return patient to a comfortable position.
18. Provide patient with information on care of cannula. Perform routine hand hygiene.
19. Document device.
20. Clean trolley with alcohol/detergent wipes. Perform routine hand hygiene.[25]

These steps have been developed by the Vascular Access Surveillance Team (VAST) at the Princess Alexandra Hospital. VAST have also developed a visual diagram and video explaining these steps.

Skin preparation: insertion site

- Hair at the insertion site should only be removed by the clinician (prior to antiseptic application), using clippers (not shaved) to improve adherence of the dressing.[3, 17]
- The skin should be physically cleaned with soap and water (if necessary) prior to applying the antiseptic solution and inserting the catheter.[3]
- Removal of skin lipids (defatting) with alcohol, ether or acetone is not recommended.
- Use alcohol-containing preoperative skin preparatory agents if no contraindication exists. The most effective disinfectant (chlorhexidine or povidone iodine) to combine with alcohol has not been established in the literature (be aware that either agent may be contraindicated e.g. sensitivity, allergy)
    - A solution containing 2% chlorhexidine gluconate (CHG) in ≥ 70% (ethyl or isopropyl) alcohol (alcoholic chlorhexidine) should be used by clinicians for preparation of the insertion site.[3, 13, 17]

    or

    - A solution containing povidone-iodine 10% in 70% ethyl alcohol (ethanol)[7] (povidone-iodine should remain on the skin for at least two minutes and until dry before inserting the catheter).
- If alcohol is contraindicated (e.g. allergy, sensitivity, skin condition) clinicians should use aqueous povidone-iodine[26] 10%* or sterile normal saline 0.9% (*NB: the drying time for aqueous based antiseptics is longer than alcohol based products).
- Note: The same antimicrobial agent shall be used for all phases of the patient's skin preparation, to ensure full residual benefit and consistent action.[27]
- The solution should be applied meticulously by the clinician to an area of skin approximately 10cm x 10cm in a circular motion beginning in the centre of the proposed site and moving outward, for at least 30 seconds.[17]
- The clinician should allow the antiseptic to air dry completely prior to inserting the catheter; do not wipe or blot.
- Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.[3, 7, 8] If the operator needs to re-establish the identification of the vein, the site should be re-prepped with the antiseptic solution and allowed to thoroughly dry.
- Clinicians should not use antimicrobial ointment or creams under the dressing at the insertion site.
- Topical venodilators (e.g. glyceryl trinitrate) or anti-inflammatory agents (e.g. cortisone) should not be used near the insertion site.

Catheter fixation

- Poor PIVC securement has been observed to increase risk of phlebitis,[19] infection, occlusion, infiltration and dislodgement.[22]
- The catheter should be stabilised by the clinician with a transparent dressing and sterile adhesive tape or sterile adhesive/wound closure strips, to prevent catheter dislodgement.[3, 17] (refer: Dressings: type, replacement intervals and procedure).
- Using a short extension set attached to the catheter can reduce complications associated with catheter movement.[28]

- Clinicians should not:
  - use adhesive tape directly on the insertion site[3, 17]
  - apply non-sterile adhesive tape under the transparent dressing
  - obscure the ability to visualise the PIVC site and surrounding tissues with adhesive tape.[3]
- A catheter that has migrated externally should not be readvanced by the clinician prior to restabilisation.[3, 17]

Dressings: types, replacement intervals and procedure

- Sterile, transparent, semi-permeable, self-adhesive, (standard or hyperpermeable) polyurethane dressings should be used by clinicians to protect the site from extrinsic contamination, allow continuous observation of the insertion site, and to help stabilise and secure the catheter.[3, 7, 12-14, 17]
- The dressing (including polyurethane types) should not be immersed or submerged in water.
- Clinicians should replace dressing on insertion site routinely every seven days or if the dressing becomes damp, loosened, no longer occlusive or adherent, soiled, or if there is excessive accumulation of fluid under the dressing.[12-14, 17]
- If the dressing on a PIVC needs to be changed:
  - the clinician should utilise an aseptic technique[14] including sterile dressing change pack with dressing towel and clean non-sterile gloves when changing the dressing on a PIVC[3]
  - the clinician should remove blood or ooze from catheter insertion site with sterile 0.9% sodium chloride[3]
  - 2% alcoholic chlorhexidine is the preferred solution for skin preparation for dressings[17] however, if contraindicated the clinician should use the same solution utilised for site preparation prior to PIVC insertion (refer: Skin Preparation: Insertion Site)
  - the clinician should cleanse the area (the size of the final dressing) around the catheter including under the hub
  - cleansing should be performed by the clinician using a circular motion moving in concentric circles from the site outward
  - the clinician should apply the antiseptic solution meticulously for at least 30 seconds and allow to air dry prior to applying the new dressing; do not wipe or blot.[3]
- Each catheter should be dressed by the clinician as a separate procedure.[3]

PIVC review

- The insertion site should be visually inspected by the clinician hourly with continuous infusions and at least every eight hours if no infusion.[3, 8, 13] More frequent assessments are necessary when using high-risk solutions and medications.
- Review of the PIVC should be documented in the patient record each shift.(3)
- Patients should be encouraged by the clinician to report any discomfort such as pain, burning, swelling or bleeding.(3)
- The need for the PIVC should be reviewed each shift[29] and those that are no longer clearly needed should be promptly removed.[3, 12-14, 30]

- Nursing staff should discuss the possibility for changes in medication from IV to oral with the relevant medical staff to expedite device removal.[3]

Table 1: Assessment of PIVC

Assess for:		
• Catheter position	• Occlusion/patency	• Infiltration/extravasation*[6]: o Insertion site: - Cool skin temperature - Blanched, taut skin - Oedema - IV fluid leaking - Burning/stinging pain - Redness o Change in infusion flow.
• Phlebitis[6, 18, 19, 22, 31, 32]: o Erythema o Tenderness o Swelling o Pain o Palpable venous cord o Purulent discharge.	• Systemic infection[6]: o Rigor o Fever o Tachycardia o Hypotension o Malaise o Nausea/vomiting.	
*In addition, extravasation may also lead to tissue necrosis, ulceration and blistering[6].		

In-line filters

- In-line filters are not recommended for infection control purposes.

Flushing of PIVCs

- Where possible, continuous intravenous fluids should be administered.[3]
- If the patient is receiving intermittent injections or infusions, flushing under positive pressure is recommended to promote and maintain patency and prevent the mixing of incompatible medications and solutions.[3, 17]
- The optimal volume and frequency of flushing of catheters used for intermittent injections or infusions is unclear.
  - The literature suggests the volume of flush should equal at least twice the volume of the catheter and add on devices.[17]
  - The volume of the lumen is approximately 0.5mL, a small extension set approximately 0.2mL +/- access device 0.1mL, therefore a minimum of 2mL flushing solution should be sufficient (check manufacturers advice).
  - Sterile 0.9% sodium chloride for injection should be used by clinicians to flush a catheter.
  - Only single-dose solutions should be used.
- Clinicians should use a syringe with the internal diameter of a 10mL syringe (or larger), to avoid excessive pressure and catheter rupture (the diameter of 10mL syringes varies slightly between manufacturers but is usually around 14.5-15.5mm). Syringes with an internal diameter smaller than that of a 10mL syringe can produce higher pressure in the lumen and rupture the catheter).[33]

  - Infusion pressure should never exceed 25 psi because pressures higher than that may also damage blood vessels.
  - The internal diameter of a standard 3mL syringe generates pressure greater than 25 psi, whereas a syringe with the internal diameter of a 10mL syringe generates less than 10 psi.[34]
  - 3mL syringes with the internal diameter of a 10mL syringe do not produce higher pressure and are acceptable for use.
- Clinicians should use an aseptic technique including cleaning the access port with a single-use 70% alcohol-impregnated swab or 2% alcoholic chlorhexidine vigorously for at least 15 seconds and allowing to dry prior to accessing the system.[3, 14, 35]
- The clinician should flush in a pulsatile (push-pause or start-stop-start) motion.
- Clinicians should flush catheters immediately:
  - after placement
  - prior to and after fluid infusion (as an empty fluid container lacks infusion pressure and will allow blood reflux into the catheter lumen from normal venous pressure) or injection
  - prior to and after blood drawing[3] (refer: PIVC blood collection), or
  - at least every 24 hours if not in use (strong consideration should be given to removing the PIVC if not in use).
- Disconnecting the flush syringe allows reflux of blood into the tip of the catheter to displace the space occupied by the syringe. To prevent this source of occlusion, clinicians should clamp the extension set or withdraw the syringe while administering the last 0.5 ml of flush (positive pressure technique).[1, 36, 37]
- Positive- or negative-pressure mechanical valve needleless connectors have been associated with increases in rates of catheter-related bacteraemia and therefore are not recommended for use.[38-41]
- The flush solution and flushing intervals should be documented by the clinician in the patient record and/or the medication chart as per facility guidelines.

IV admixtures

It is recommended that:

- Clinicians should admix all intravenous fluids using an aseptic technique.[35]
- Clinicians should not use containers of intravenous fluid that have visible turbidity, leaks, cracks or particulate matter, or if the manufacturer's expiration date has passed.
- Clinicians should use single-dose vials for parenteral additives or medications when possible.
- Clinicians should use the recommended needle gauge for injecting additives into infusion bags and/or burettes.[17]

Replacement of IV fluids

Table 2: IV fluid replacement intervals

Fluid	Replacement interval
Standard (crystalloid) and non-lipid parenteral solutions	Every 24 hours
Lipid-containing solutions	Within 24 hours
Lipid emulsions	Within 12 hours
All blood components (excluding factor VIII or IX for continuous infusion)	Within 4 hours
Drug infusions (e.g. heparin, insulin)	Every 24 hours[17, 42]

- When any IVD is resited, it is recommended that both the infusion and administration set be replaced by the clinician regardless of when the infusion was initially commenced.[3]
- IV administration sets should be spiked into IV fluid bags the whole way.[43]
- Each bag of IV fluid should only be spiked once.[44]
- It is recommended that all IV fluids be stored by facilities according to manufacturer's guidelines.
- It is recommended that bags or bottles of intravenous solution should not be used as a common source of supply for multiple patients.[2]

Administration set changes

It is recommended that:

- Clinicians should ensure all components of the administration system are compatible (this includes burettes), including needleless intravascular devices to minimise leaks and breaks in the system.
    - Add-on equipment should be of luer-lock design.[17]

Table 3: Administration set replacement intervals

Administration set	Replacement interval
Not containing lipids, blood or blood products	Up to 96 hours*[2, 35]
Lipid/lipid-containing parenteral nutrition	Within 24 hours*[1, 13, 35, 45]
Chemotherapeutic agents	Remove immediately after use*
Propofol	Within 12 hours or as per manufacturer* [1, 2]
Heparin	Every 24 hours*[17, 42]
Other infusions (not including blood products)	When disconnected or new catheter*
*All administration sets should be replaced when disconnected or if the catheter is changed[1, 3, 45] or after blood has refluxed into the administration set and the blood can't be cleared by flushing. When an administration set is changed, the IV fluid bag should also be changed.[44]	

Blood components

- Must be transfused using an administration set approved for this purpose, incorporating a standard filter which removes clots and small clumps of debris that may form during collection and storage. The recommended filter pore size is 170-200 micron.[17, 42]
- Any number of red cell units may be transfused during a 12-hour period provided the flow rate remains adequate. However specific manufacturer's recommendations defining the maximum number of units per blood administration set must not be exceeded.[42] Administration sets should be removed by the clinician immediately after use.[13, 35]

Disconnection of administration sets

- Administration sets should not be intermittently disconnected (including for patient showering/toileting).[2, 3]
- If administration sets are disconnected from the intravascular device, the set should be discarded and a new administration set connected using aseptic technique and observing standard precautions.
- Intermittent disconnection of administration sets increases risk of infection through manipulation of the hub and contamination, and occlusion due to reflux of blood into the catheter tip.[17]

Medication labelling

- It is recommended that clinicians abide by labelling recommendations for all injectable products prepared in the ward or clinical area, including recommendations for labelling containers (bags, bottles and syringes) and conduits (lines and catheters).[2, 17]
- It is recommended that clinicians ensure labelling complies with the national recommendations for user-applied labelling of injectable medicines, fluids and lines (current edition) as set out by The Australian Commission on Safety and Quality in Healthcare.

Needleless access ports

- Clinicians should minimise catheter manipulation (e.g. number of intermittent infusions).[46]
- Closed catheter access systems are associated with fewer CRBSIs than open systems.[1] Therefore, needleless access ports should be used on all lumens.
  - Stopcocks should be end-capped with a needleless access port/cap when not in use.[1, 47]
- All persons handling or accessing the intravascular system should first perform hand hygiene.[13, 14, 33]
- Needleless access ports should be used by clinicians according to manufacturer's recommendations.
- Clinicians should not use adhesive tape as a means of junction securement between the hub and connector or infusion line.
- All intravenous access ports should be meticulously cleaned by the clinician with a single-use 70% alcohol-impregnated swab or 2% alcoholic chlorhexidine vigorously for a minimum of 15 seconds and allowed to dry prior to accessing the system.[17, 33, 35] For example a typical intermittent infusion of medication may involve swabbing the access port:
  - before the initial saline injection to assess catheter patency,
  - before attaching the sterile infusion tubing or syringe, and

  - before flushing and/or locking the catheter with saline after administering the medication.
- The access port should be accessed by the clinician with a sterile single-use device.
- Anytime an access port is removed from a catheter, the clinician should discard it and a new sterile access port should be attached.
- The integrity of the access port should be confirmed by the clinician before and immediately after each use. If the integrity of the access port is compromised or if residual blood remains within the access port, it should be replaced immediately and consideration given to changing the administration set.[17]
- Needleless access ports should be changed as per manufacturer's instructions, or if the integrity of the port is compromised.[17] In general, a lot of manufacturers recommend that their needleless components be changed weekly or when there are signs of blood, precipitate, leaks or other defects.[33]
  - CDC guidelines currently recommend that needleless components be changed at least as frequently as the administration set, but no more frequently than every 72 hours.[1] A recent study has identified an increased CLABSI rate when needleless access ports were changed every 24 hours with lines containing blood products or lipids.[48]
  - More frequent changing of access ports may reduce the burden of access port contamination that could lead to bloodstream infection, however more frequent manipulation of the catheter for access port changes could increase the risk of infection.[48]

Catheter duration and replacement

It is recommended that facilities locally determine through their Infection Control Committee which of the following two options they will adopt. A single option should be selected for the entire facility. The decision to use option two is to be based on a formal risk assessment including a point prevalence survey.

Additional factors to be considered as part of the risk assessment include:

- availability of a dedicated IV Service which includes monitoring for complications
- patient and staffing profiles
- local Healthcare Associated Blood Stream Infection data related to PIVC
- PRIME incident reporting data
- availability of staff appropriately trained to insert PIVCs on all shifts
- whether stringent documentation processes are in place to prompt and record regular review of devices.

OPTION 1:

Replace every 72-96 hours unless extenuating circumstance criteria is met.[1, 15, 17, 20]

- PIVCs should be removed as soon as they are no longer required.[11, 30] If it can be forecast that a PIVC would be *in situ* for more than 96 hours, an alternative device should be considered such as a peripherally inserted central catheter (PICC).[1, 3] If the PIVC is *in situ* for 72-96 hours and is necessary for an extended period it should be removed and resited at this time.[20]
  - Some studies have indicated that the incidence of thrombophlebitis and bacterial colonization increases when catheters are left in place >72 hours,[1, 19] and that the incidence of phlebitis is highest when catheters are left in place >96 hours.[20]

- In extenuating circumstances a cannula may be left *in situ* after 96 hours if the all of the following criteria are fulfilled:
  - the patient has very poor peripheral access
  - no one else can cannulate the patient
  - the patient still requires peripheral access
  - the cannula is patent
  - there is no sign of phlebitis or infection.
- If the PIVC is not re-sited, the following criteria should be fulfilled:
  - the risk assessment for the above must be carried out and documented each shift while the PIVC remains in-situ
  - reasons for not re-siting the cannula must be clearly documented.
- PIVCs should be removed by the clinician at the first sign of phlebitis (warmth, tenderness, erythema, palpable venous cord).[1, 8, 12, 49]
- Catheters inserted in emergency situations, when adherence to asepsis cannot be ensured, should be replaced by a clinician within 24 hours[3, 14, 15, 17] or sooner if the patient's condition is stabilised.
  - Patients transferring from other healthcare facilities with a PIVC *in situ* should have this device removed by a clinician upon arrival, unless otherwise clinically indicated.
- Clinicians should replace all fluid administration tubing and connectors when the PIVC is replaced.

OPTION 2:

Replacement of a PIVC when clinically indicated

- Clinically indicated replacement of PIVCs, with daily and random PIVC site assessment, has been shown in some studies to lower healthcare expenditures without posing any additional risk of complication including phlebitis or catheter-related bloodstream infection.[29, 34, 50-52]
- A recent study observed the highest incidence of phlebitis within the first 48 hours of insertion, which decreased for catheters remaining in place 49-96 hours, and was lowest between 97-120 hours.[21]
- It has also been observed that the first PIVC is the least likely to fail, with subsequent resites failing more often due to occlusion[18] and phlebitis.[16]
- Clinicians should remove PIVCs at the first sign of phlebitis, as well as when no longer required.[1, 8, 11, 12, 29, 30, 34, 49, 51]
- Catheters inserted in emergency situations, when adherence to asepsis cannot be ensured, should be replaced by a clinician within 24 hours[3, 14, 15, 17] or sooner if the patient's condition is stabilised.
- Patients transferring from other healthcare facilities with a PIVC *in situ* should have this device removed by a clinician upon arrival, unless otherwise clinically indicated. There may be emergency situations where access via the original device is necessary; in this case the device should be replaced in 24 hours.[3, 14, 15, 17]
- Clinicians should replace all fluid administration tubing and connectors when the PIVC is replaced.[3]

PIVC blood collection

- Clinicians can draw blood from a PIVC if necessary, but only if it is in a relatively large vein and only immediately following insertion.[3, 17]
- Blood cultures should never be collected through a peripheral venous cannula due to the increased rate of blood culture contamination at the time of collection.[53]

Blood culture for diagnosis of a BSI

Also refer to local hospital procedure for blood culture collection and Pathology Queensland and Queensland Health Recommendations for Blood Culture Collection – Adults (Queensland Health Intranet access only).

- PIVC blood should not be used for blood cultures.
- Blood cultures should always be collected by clinicians from a peripheral vessel.
  - Approximately 20 mL is required and 10 mL should be placed in each of the anaerobic and aerobic blood culture bottles.[54, 55]
  - Staff should read the instructions on the blood culture bottle as different blood culture systems have different requirements.
  - Each anaerobic and aerobic bottle constitutes a blood culture 'set'. No more than three sets are required in one episode. Two sets has a sensitivity of >90% while collecting three sets will increase that to >98%.[53]
- If catheter-related bloodstream infection is suspected:
  - the clinician should use strict aseptic technique and hand hygiene prior to blood culture collection to reduce the risk of microbial contamination(56)
  - the clinician should utilise sterile collection equipment
  - the clinician should use standard precautions when collecting blood cultures, including eye protection
    - Non-sterile gloves can be used in accordance with aseptic technique. If key parts or key sites are touched, sterile gloves should be used.[56] If there is a high rate of contamination, routine sterile gloving and/or sterile blood culture kits have been shown to significantly decrease contamination rates.[57-59] Cost vs benefit should be considered.[56, 60]
  - the clinician should meticulously cleanse the skin using alcoholic chlorhexidine[53] or ≥70% alcohol[56, 61-64] and allow to dry prior to venepuncture[49]
  - the blood culture bottle diaphragm should be swabbed by the clinician with a sterile 70% alcohol-impregnated wipe prior to inoculating the bottle[53, 56]
  - there is no need to change the blood culture collection needle between venepuncture and bottle inoculation[53] (careful skin preparation is a more important factor than changing needles in reducing contamination during blood culture collection).
- If further blood tubes are required for testing, they should be collected by the clinician after the blood cultures are drawn.[56]

Culturing of PIVC tips

- Culture of PIVC tips may be useful in confirming the source of line related bacteraemia when performed concurrently with peripheral blood cultures. Depending on local laboratory practice, vascular catheter tips are only processed if there is an associated positive blood culture.[53] Consult with local laboratory.
- The tip should be aseptically cut from the end of the catheter directly into a sterile yellow top specimen container. Transport to laboratory as quickly as possible to prevent excessive drying.[65]
- If pus is present at the insertion site, the clinician should swab the site prior to cleaning and send for culture.

Removal of PIVC

- Also refer to local hospital procedure for removal of PIVC.
- Clinicians should perform hand hygiene and don non-sterile gloves and protective eyewear.[3]
- Digital pressure should be applied by the clinician until haemostasis is achieved.
- Clinicians should cover site with gauze and a transparent dressing; remove the dressing in 24 hours.[3]
- PIVC sites should be observed for 48 hours after device removal to detect post-infusion phlebitis.[3, 32, 52]
- PIVC removal should be documented in the patient's medical record.[3, 14]

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5. Definitions of terms used in the policy and supporting documents

Term	Definition / Explanation / Details	Source
Catheter-related bloodstream infection (BSI)	Blood cultures are positive for the presence of bacteria with or without the accompanying symptom of fever, and no apparent source for the infection other than the catheter.	NKF K/DOQI, 2006[66]
Exit site infection	Inflammation (erythema, warmth, tenderness, induration within 2cm of the exit site) or purulence, confined to the area surrounding the catheter exit site, not extending superiorly beyond the cuff if the catheter is tunnelled, with exudate confirmed to be positive by microscopy/culture and no systemic symptoms or positive blood cultures.	NKF K/DOQI, 2006[66]
Extravasation	Inadvertent leakage of a vesicant solution into surrounding tissue.	Carson, 2012[6]
Healthcare Associated Infection (HAI)	Healthcare associated infections (HAI) are those infections that are not present or incubating at the time of admission to a healthcare program or facility, develop within a healthcare organisation or are produced by micro-organisms acquired during admission.	ACSQHC[2]
Infiltration	Inadvertent leakage of a non-vesicant solution into surrounding tissue.	Carson, 2012[6]
Phlebitis	An inflammation of the wall of a vein, characterised by pain, erythema, swelling and palpable thrombosis of the cannulated vein.	Carson, 2012[6]
Thrombophlebitis	Inflammation of the wall of a vein, caused by a blood clot in the vein, characterised by pain, erythema, swelling and palpable thrombosis of the cannulated vein.	Carson, 2012[6]

6 . Approval and Implementation

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Approval date: 10 June 2015

Review date: 10 June 2018

7. Version Control

Version	Date	Prepared by	Comments
1.0	2012	CHRISP	[QH-GDL-321-6-5:2012] Rescinded
2.0	March 2013	CHRISP	
3.0	January 2015	CDIM	