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Prevention and Control of Healthcare Associated Infection (HAI)

Insertion and Management of Peripheral Intravascular Catheters

Custodian/Review Officer: Centre for Healthcare Related Infection Surveillance and Prevention

Version no: New

Applicable To: All acute and sub-acute healthcare facilities that manage patients with Peripheral Intravascular Catheters

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Accreditation References:
ACHS EQuIP 5, Standard 1.5.2

Australian Commission on Safety and Quality in Health Care, *National Safety and Quality Health Service Standard 3*

1. Purpose

This Protocol describes the mandatory steps for the Insertion and Management of Peripheral Intravascular Catheters used as part of the clinical care of adult patients within Queensland Health.

2. Scope

This Protocol applies to all Queensland Health employees (permanent, temporary and casual) and all organisations and individuals acting as its agents (including Visiting Medical Officers and other partners, contractors, consultants and volunteers) that are involved in the insertion and management of peripheral intravascular catheters.

3. Supporting documents

Authorising Policy and Standard/s:

- Prevention and Control of Healthcare Associated Infection (HAI) Policy
- Prevention and Control of Healthcare Associated Infection (HAI) Implementation Standard
- Implementation Standard for the Management of Intravascular Devices (IVDs)

Procedures, Guidelines, Protocols

- Protocol for the Insertion and Management of Percutaneous Central Venous Catheters (CVC)
- Protocol for the Insertion and Management of Tunnelled Central Venous Catheters (CVC)

- Protocol for the Insertion and Management of Haemodialysis Catheters
- Protocol for the Insertion and Management of Peripherally Inserted Intravenous Catheters (PICC)

Forms and templates

- Implementation Checklist
  http://www.health.qld.gov.au/chrisp/icare/implement_guide.doc
- I-Care Intravascular Device Insertion Checklist
  http://www.health.qld.gov.au/chrisp/icare/insert_ckl.pdf
- I-Care Peripheral Intravenous Catheters Procedure Compliance Checklist
  http://www.health.qld.gov.au/chrisp/icare/pivc_proc_ckl.pdf
- I-Care Preventing IV Device Infection
  http://www.health.qld.gov.au/chrisp/icare/ivd_factsheet.pdf
- I-Care Sustainability Plan
  http://www.health.qld.gov.au/chrisp/icare/sustain_plan_09.doc
- I-Care Healthcare Related Intravascular-Device (PIVC) Related *Staphylococcus aureus* Bloodstream Infection Investigation Checklist
  http://www.health.qld.gov.au/chrisp/icare/pivc_bsi_ckl.pdf

4. Related documents

- Centres for Disease Control and Prevention. Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011 accessed at
  http://www.cdc.gov/hicpac/BSI/BSI-guidelines-2011.html
- Institute for Healthcare Improvement (IHI). Getting Started Kit: Prevent Central Line Infections. How-to-Guide accessed at
  http://www.ihi.org/IHI/Programs/Campaign/CentralLineInfection.htm

5. Process for Insertion and Management of Peripheral Intravenous Catheters (PIVC)

5.1 General

5.1.1 Solutions and medications shall 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. Repeated administration of chemical irritants warrants central venous access to limit peripheral venous damage.

5.1.2 Assistance shall be provided when inserting a PIVC to ensure asepsis and appropriate technique.

5.1.3 Adhesive labels indicating insertion details, on dressings shall be utilised.

5.2 Catheter Types and Materials

5.2.1 Steel needles shall not be used by clinicians due to the risk of extravasation and needlestick injury.

5.2.2 PIVC and steel-winged infusion sets (if used) shall be equipped with a safety device with engineered sharps injury protection.

5.2.3 For infusions of viscous fluids such as blood and for rapid infusions, the largest catheter (14 – 16 gauge) shall be used by clinicians. Smaller sizes (18 – 20 gauge) suffice for crystalloids. The smallest catheters (20 – 24 gauge) are adequate for the intermittent administration of drugs, except those given by rapid infusion. A minimum of 20 gauge is recommended for peripheral parenteral nutrition (PPN).

5.3 Prophylactic Antibiotics

5.3.1 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.

5.4 Catheter Site Selection

5.4.1 Clinicians shall 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.

5.4.2 Selection of catheterisation site:

- site selection shall avoid areas of flexion and bony prominences
- site selection shall be routinely initiated in the distal areas of the upper extremities; subsequent catheterisation shall be made proximal to the previously catheterised site
- catheters inserted into the lower limbs have a greater risk of thrombophlebitis and thrombosis than the upper limbs
- veins shall be selected on the non-dominant forearm (especially if the catheter is to remain in position for any length of time)
- the basilic or cephalic veins on the posterior (dorsal) forearm are the preferred site for catheterisation (also refer Figures 1 & 2, Page 11)
- the metacarpal veins on the dorsum of the hand are easiest to visualise but are more liable to block, difficult to stabilise, and prone to infusate- or medication-induced vessel damage
- the use of the anterior (ventral) forearm veins (particularly the cephalic veins) shall be avoided in patients with renal failure and impending need for dialysis in whom preservation of upper-extremity veins is needed for fistula or graft implantation

- the dorsum of the hand shall be used for PIVC in patients with chronic renal failure. When venipuncture of the arm veins is necessary, sites shall be rotated
- the antecubital fossa veins shall be reserved for emergency use.

5.4.3 Clinicians using a short extension set attached to the catheter can reduce complications associated with catheter movement.

5.5 Local Anaesthesia

5.5.1 Topical local anaesthetic e.g. 'eutectic mixture of local anaesthetics' - lignocaine with prilocaine, can be applied by clinicians 60 minutes prior to catheterisation to reduce discomfort during insertion, particularly in children:

- creams can leave a lipid residue that may create a nidus for microbial growth; therefore residue of topical anaesthesia shall 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.

5.5.2 Local anaesthetic (i.e. subcutaneous Lignocaine) can be considered by clinicians for use in adults, before insertion of any size of intravenous catheter.

5.6 Procedure for Insertion

5.6.1 The following steps shall be followed by clinicians. Staff shall also refer to local hospital procedure for PIVC insertion:

- perform routine hand hygiene and don plastic apron and protective eyewear
- apply tourniquet, select and palpate an appropriate vein for catheterisation
- release tourniquet and set up equipment (sterile dressing/insertion pack)
- remove hair from insertion site using clippers if necessary (refer Skin Preparation: Insertion Site)
- wash hands and forearms for at least 2 minutes using a soap or antiseptic-containing soap solution
- prep catheter insertion site (refer 5.7: Skin Preparation: Insertion Site)
- allow skin preparation to dry then reapply tourniquet
- apply clean (well-fitting) non-sterile gloves
- drape the insertion site with a sterile drape
- insert the catheter using an aseptic (no-touch) technique
- apply dressing over the site (refer 5.9: Dressing Type and Replacement Interval)
- secure adhesive label to dressing or record insertion details on dressing and in the patients chart.

5.7 Skin Preparation: Insertion site

5.7.1 Hair at the insertion site shall only be removed by the clinician (prior to antiseptic application), using clippers (not shaved) to improve adherence of the dressing.

5.7.2 The skin shall be physically cleaned (if necessary) prior to applying the antiseptic solution and inserting the catheter.

5.7.3 Removal of skin lipids (defatting) by clinicians with alcohol, ether or acetone is not recommended.

5.7.4 A solution containing 2% chlorhexidine gluconate (CHG) in ≥ 70% ethyl or isopropyl alcohol (alcoholic chlorhexidine) shall be used by clinicians for preparation of the insertion site.

5.7.5 If CHG contraindicated (e.g. sensitivity, allergy) clinicians shall use povidone-iodine 10% in 70% ethyl alcohol (ethanol) (povidone-iodine shall remain on the skin for at least 2 minutes or until dry before inserting the catheter).

5.7.6 If alcohol contraindicated (e.g. allergy, sensitivity, skin condition) clinicians shall use aqueous povidone-iodine 10%* or sterile normal saline 0.9% (*NB: the drying time for aqueous based antiseptics is longer than alcohol based products).

5.7.7 70% alcohol solution (including alcohol impregnated swabs) shall only be considered by clinicians for PIVC that will be *in situ* for < 24 hours in patients having day-only procedures e.g. Endoscopy, Day Surgery, Radiology, as it has no residual antimicrobial activity on the skin.

5.7.8 The solution shall 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

5.7.9 The clinician shall allow the antiseptic to air dry completely prior to inserting the catheter; do not wipe or blot.

5.7.10 Palpation of the insertion site or stabilisation of the vein shall not be performed by the clinician after the application of antiseptic, unless aseptic technique is maintained. If the operator needs to re-establish the identification of the vein, the site shall be re-prepped with the antiseptic solution and allowed to thoroughly dry.

5.7.11 Clinicians shall not use antimicrobial ointment or creams under the dressing at the insertion site.

5.7.12 The use of topical venodilators (e.g. glyceryl trinitrate) or anti-inflammatory agents (e.g. cortisone) near the insertion site shall not be used by clinicians.

5.8 Catheter Fixation

5.8.1 The catheter shall be stabilised by the clinician with the transparent dressing and sterile adhesive tape or sterile adhesive/wound closure strips, to prevent catheter dislodgement (refer 5.9: Dressing Type and Replacement Interval).

5.8.2 Clinicians shall not use adhesive tape directly on the catheter-skin junction site.

5.8.3 Clinicians shall not apply non-sterile adhesive tape under the transparent dressing.

5.8.4 Clinicians shall not obscure the ability to visualise the PIVC site and surrounding tissues with adhesive tape.

5.8.5 A catheter that has migrated externally shall not be readvanced by the clinician prior to restabilisation.

5.9 Dressings: Types, Replacement Intervals and Procedure

5.9.1 Sterile, transparent, semi-permeable, self-adhesive, (standard or hyperpermeable) polyurethane dressings shall 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.

5.9.2 A sterile gauze dressing (secured with adhesive tape) shall only be used by a clinician if there is a true contraindication to the above e.g. diaphoresis.

5.9.3 A gauze dressing shall be replaced by a clinician with a transparent dressing as soon as possible.

5.9.4 The dressing (including polyurethane types) shall not be immersed or submerged in water.

5.9.5 Clinicians shall replace dressing on insertion site when the dressing becomes damp, loosened, no longer occlusive or adherent, soiled, if there is evidence of inflammation, or excessive accumulation of fluid under the dressing.

5.9.6 If gauze is used, it shall be changed daily by the clinician OR if damp, no longer adherent or soiled:

- if gauze is used in combination with a semi-permeable dressing, it is considered a gauze dressing and shall be changed every 24 hours.

5.9.7 If the dressing on a PIVC needs to be changed:

- the clinician shall utilise an aseptic technique including sterile dressing change pack with drape and clean non-sterile gloves when changing the dressing on a PIVC
- the clinician shall remove blood or ooze from catheter insertion site with sterile 0.9% sodium chloride
- alcoholic chlorhexidine is the preferred solution for skin preparation for dressings however, if contraindicated the clinician shall use the same solution utilised for site preparation prior to PIVC insertion (refer Skin Preparation: Insertion Site)
- the clinician shall cleanse the area (the size of the final dressing) around the catheter including under the hub
- cleansing shall be performed by the clinician using a circular motion moving in concentric circles from the site outward
- the clinician shall 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.

5.9.8 Each catheter shall be dressed by the clinician as a separate procedure.

5.10 Daily Review

5.10.1 PIVC shall be reviewed daily by the clinician, and those that are no longer clearly needed shall be promptly removed.

5.10.2 The insertion site shall be visually inspected by the clinician hourly with continuous infusions and at least every 8 hours if no infusion, for phlebitis, tenderness, catheter position and infiltration. More frequent assessments are necessary when using high-risk solutions and medications.

5.10.3 Patients shall be encouraged by the clinician to report any discomfort such as pain, burning, swelling or bleeding.

5.11 In-line Filters

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

5.12 Flushing of PIVCs

5.12.1 Where possible, continuous intravenous fluids shall be administered by the clinician.

5.12.2 If the patient is receiving intermittent injections or infusions the PIVC shall be flushed under positive pressure by the clinician after each injection and/or infusion.

5.12.3 Flushing is recommended to promote and maintain patency and prevent the mixing of incompatible medications and solutions.

5.12.4 The optimal volume and frequency of flushing of catheters used for intermittent injections or infusions is unclear:

- the literature suggests the volume of flush equal at least twice the volume of the catheter, the extension set (if used), and the injection port
- the volume of the lumen is approximately 0.5ml, a small extension set approximately 0.2ml +/- access device 0.1ml, so a minimum of 2ml flushing solution shall be sufficient
- sterile 0.9% sodium chloride for injection shall be used by clinicians to flush a catheter
- only single-dose solutions shall be used by the clinician
- clinicians shall use a 10mL (or larger) syringe to avoid excessive pressure (syringes smaller than 10mL can produce higher pressure in the catheter)
  - infusion pressures shall never exceed 25 psi because pressures higher than that may also damage blood vessels
  - a 3mL syringe generates pressure greater than 25 psi, whereas a 10mL syringe generates less than 10 psi
- clinicians shall use an aseptic technique including cleaning the access port(s) with a single-use 70% alcohol-impregnated swab and allowing to dry prior to accessing the system
- the clinician shall flush in a pulsatile (push-pause or start-stop-start) motion
- clinicians shall 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 (refer Blood Collection from PIVC)
  - or at least every 24 hours if not in use (strong consideration shall 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 shall clamp the extension set or withdraw the syringe while administering the last 0.5 ml of flush (positive pressure technique).

5.12.5 The flush solution and flushing intervals shall be documented by the clinician in the patient record.

5.13 Catheter Duration and Replacement

5.13.1 Clinicians shall replace PIVCs every 48 hours (unless removal at 72 hours is anticipated), to minimise the risk of phlebitis:

- facilities with a dedicated IV Service which includes monitoring for complications, could replace the catheter every 72 hours
- in situations where peripheral venous access is limited, the decision to leave the catheter dwelling beyond 72 hours shall depend on assessment of the catheter, skin integrity, and length and type of prescribed therapy, and shall be documented in the patient's permanent medical record.

5.13.2 PIVCs shall be removed by the clinician at the first sign of phlebitis (warmth, tenderness, erythema, palpable venous cord) and when they are no longer needed.

5.13.3 Catheters inserted in emergency situations, when adherence to asepsis cannot be ensured, shall be replaced by a clinician within 24 hours or sooner if the patient's condition is stabilised.

5.13.4 Patients transferring from other healthcare facilities with a PIVC *in situ* shall 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 shall be replaced in 24 hours.

5.13.5 Clinicians shall replace all fluid administration tubing and connectors when the PIVC is replaced.

5.14 PIVC Blood Collection

5.14.1 Clinicians can draw blood from a PIVC if necessary, but only if it is in a relatively large vein and only if the PIVC is newly inserted.

5.15 Blood Culture Collection for Diagnosis of a BSI

5.15.1 Also refer to local hospital procedure for blood culture collection and Queensland Health Pathology and Scientific Services (QHPSS) and CHRISP Recommendations for Blood Collection - Adults

(http://qis.health.qld.gov.au/DocumentManagement/Default.aspx?DocumentID=26423- Queensland Health Intranet access only)

5.15.2 Blood cultures shall always be collected by clinicians from a peripheral vessel; PIVC blood shall not be used for blood cultures.

5.15.3 If catheter-related bloodstream infection is suspected:

1. the clinician shall use strict aseptic technique and hand hygiene prior to blood culture collection to reduce the risk of microbial contamination
2. the clinician shall utilise sterile collection equipment
3. the clinician shall use Standard Precautions when collecting blood cultures including sterile gloves and eye protection
4. the clinician shall cleanse skin with alcoholic chlorhexidine and allow to dry prior to venipuncture
5. the blood culture bottle diaphragm shall be swabbed by the clinician with a sterile 70% alcohol-impregnated wipe prior to inoculating the bottle
6. there is no need to change the blood culture collection needle between venipuncture and bottle inoculation (careful skin preparation is a more important factor than changing needles in reducing contamination during blood culture collection)

5.15.4 If further blood tubes are required for testing, they shall be collected by the clinician after the blood cultures are drawn.

5.16 Culturing of PIVC Tips

5.16.1 Routine culturing of catheter tips is not recommended.

5.16.2 If fever (>38°C) develops and/or if there is pain or tenderness at the catheter site, the catheter shall be removed by the clinician and the tip sent for culture in a sterile screw-capped container.

5.16.3 If pus is present at the insertion site, the clinician shall swab the site prior to cleaning and send for culture.

5.16.4 If systemic symptoms are present blood cultures from a peripheral vessel shall be obtained.

5.17 Removal of PIVC

5.17.1 Also refer to local hospital procedure for removal of PIVC.

5.17.2 Clinicians shall perform hand hygiene and don non-sterile gloves.

5.17.3 Clinicians shall clean site thoroughly with alcoholic chlorhexidine and allow drying prior to removal of catheter.

5.17.4 Digital pressure shall be applied by the clinician until haemostasis is achieved.

5.17.5 Clinicians shall cover site with gauze and a transparent dressing; remove the dressing in 24 hours.

5.17.6 PIVC sites shall be observed for 48 hours after device removal to detect post-infusion phlebitis.

6. Definition of Terms

Term	Definition / Explanation / Details	Source
BSI	Bloodstream infection	
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
PIVC	A short peripheral venous catheter (≤ 7.5cm in length) usually inserted in the veins of the forearm or hand, mainly used for short-term venous access.	

7. Approval and Implementation

Policy Custodian

Centre for Healthcare Related Infection Surveillance and Prevention

Approving Officer:

Dr Michael Cleary – A/Chief Health Officer

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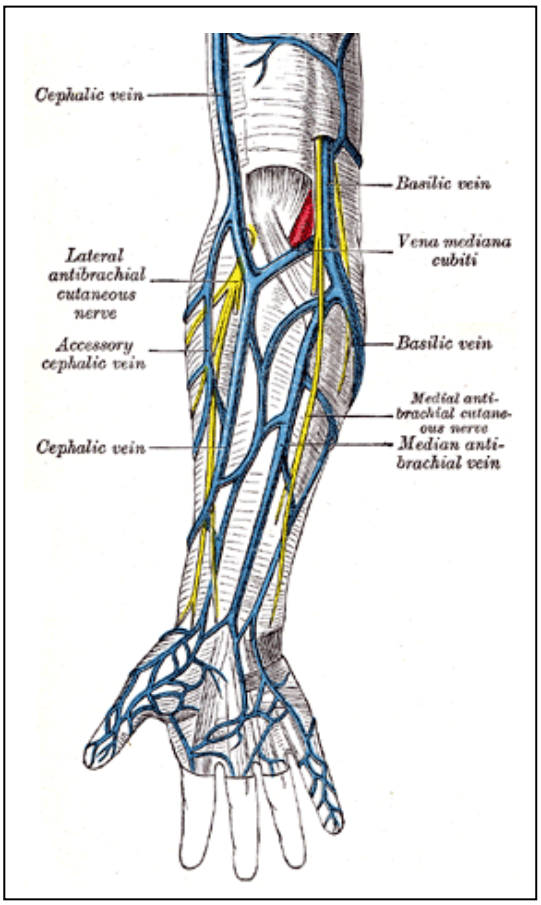

Figure 1: Arm vasculature

(Reference: http://en.wikipedia.org/wiki/Image:Gray574.png - Internet access required)

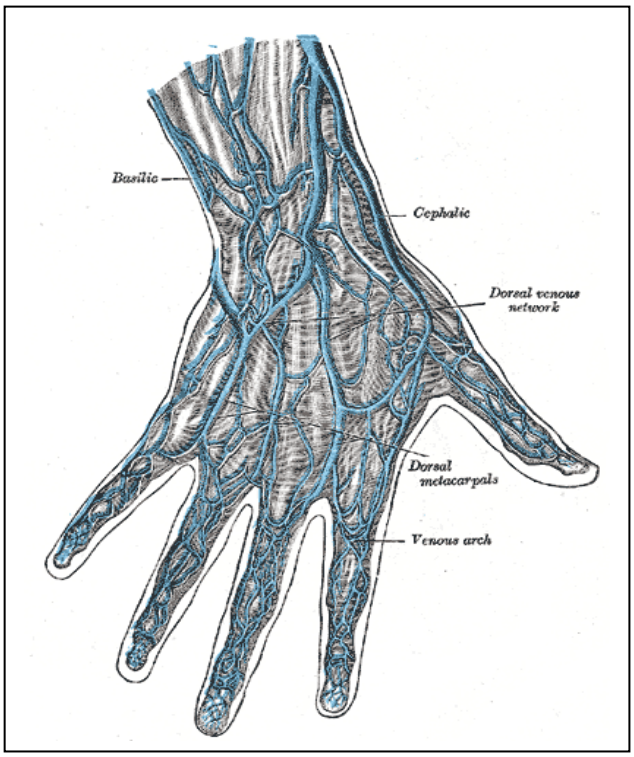

Figure 2: Hand vasculature

(Reference: http://en.wikipedia.org/wiki/Image:Gray573.png - Internet access required)