Intravascular Access Devices (IVAD) - Infection Prevention and Control

Summary This Policy Directive outlines minimum standards for insertion, management and removal of IVADs to reduce patient harm and healthcare associated infections (HAIs). It must be read with the CEC publication Infection Prevention and Control in Healthcare Settings.

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Audience All NSW Health Organisations (including Affiliated Health Organisations) and NSW Ministry of Health

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NSW Health

Policy Directive

Intravascular Access Devices (IVAD) – Infection Prevention and Control

Policy Statement

NSW Health is committed to providing safe and high-quality to patients during insertion and post-insertion of intravascular access devices (IVADs).

This Policy Directive provides requirements to NSW Health organisations, including affiliated health organisations, on the minimum standards for insertion, management and removal of IVADs, with the specific aim of minimising adverse health impacts on patients and reduce burden of healthcare associated infections (HAIs).

This Policy Directive is to be read in conjunction with the NSW Health Policy Directive *Infection Prevention and Control in Healthcare Settings* (PD2023_025).

Summary of Policy Requirements

IVADs are commonly used in a variety of settings to provide a route for administering intravenous medications, fluids, blood products and nutrients and may also be used for haemodynamic monitoring. Depending on the IVAD type, insertion technique and site, IVADs can be for short or long-term use.

Correct use and management of IVADs minimises the risk of device-related infection and air embolism in patients during insertion, removal and during dwell time.

This Policy Directive outlines the minimum infection prevention and control requirements for IVADs before, during and post insertion. It applies to all clinicians who insert, manage and remove IVADs, as well as those responsible for the surveillance and reporting of IVAD-related infections across hospital, outpatient, and home healthcare settings.

This Policy Directive integrates evidenced-based knowledge with clinical expertise to:

- Support device management within NSW Health organisations
- Prevent device related infections and adverse events
- Assist NSW Health organisations to meet the requirements of the National Safety and Quality Healthcare Services (NSQHS) Standard on preventing and controlling infection.

While this Policy Directive focuses on infection prevention and control, some guidance on overall IVAD management is included.

This Policy Directive should be read in conjunction with the IVAD manufacturer's instructions relating to individual catheters, connections, administration set dwell time, and compatibility with antiseptics, medications and other fluids. NSW Health organisations must have local

guidelines or procedures to support the technical and procedural aspects for managing these devices.

All clinical staff who insert or care for patients with an IVAD must comply with this Policy Directive. For each insertion a record of insertion must be completed.

Revision History

Version	Approved By	Amendment Notes
PD2026_005 March-2026	Deputy Secretary, System Sustainability and Performance	Updated policy directive reflects emerging evidence about best practice for managing IVAD insertion, post-insertion care and removal. This includes: • Education requirements strengthened for all health workers. • Reference to Child Safe Standards and education to children and young people under the age of 18. • Additional information on discharge for patients/carers - signs and symptoms of infection and complications and advised what to do if symptoms present. • ECG changed to intra-cavity ECG. • PIVC duration if aseptic technique is compromised – replace once patient is stable and within 24hrs. • SAC2 changed to harm score 2. • Procedural safety level 1, 2 and 3 classifications. • Blood sampling and considerations in the paediatric setting.
PD2019_040 August-2019	Deputy Secretary, Patient Experience and System Improvement	New policy developed to replace and supersede: 1) PD2011_060 *Central Venous Access Device Insertion and Post Insertion Care*. 2) GL2013_013 *Peripheral Intravenous Cannula (PIVC) Insertion and Post Insertion Care in Adult Patients*.
GL2013_013 December-2013	Deputy Director General, Governance, Workforce & Corporate	New guideline.
PD2011_060 September-2011	Deputy Director-General Health System Quality Performance Improvement	New policy directive.

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1. Background

Intravascular access devices (IVADs) are commonly used in a variety of settings. They provide a route for administering intravenous medications, fluids, blood products and nutrients and may be used for haemodynamic monitoring. Depending on the IVAD type, insertion technique and insertion point, IVADs can be for short or long-term use.

All IVADs provide direct access to the patient's bloodstream and therefore pose a serious risk for infection via introduction of microorganisms either at the time of insertion or while the device is in situ. Device-related infections are associated with increased morbidity and mortality, prolonged hospital stay and additional healthcare costs [1, 2].

Correct use and management of IVADs minimises the risks of device-related infection to patients and risk of air embolism in patients during insertion, removal and during dwell time [3].

1.1. About this document

This Policy Directive outlines the minimum infection prevention and control requirements for IVADs for NSW Health organisations and to be read in conjunction with the NSW Health Policy Directive *Infection Prevention and Control in Healthcare Settings* (PD2023_025).

It has been developed for all clinicians who insert, manage and remove IVADs, as well as for clinicians responsible for the surveillance and reporting of infections related to IVADs in hospital, outpatient, and home healthcare settings.

This Policy Directive recognises that in a time-critical clinical emergency it may be challenging to meet the outlined principles of insertion. In these situations, a risk assessment should be conducted, and the intravascular device must be replaced as soon as clinically appropriate.

This Policy Directive integrates evidenced-based knowledge with clinical expertise to:

- support device management within NSW Health organisations
- prevent device related infections
- prevent adverse events
- assist NSW Health organisations to meet the requirements of the National Safety and Quality Healthcare Services (NSQHS) Standard 3 Preventing and Controlling Infection.

1.2. Scope

1.2.1. Application

This Policy Directive focuses on infection prevention and control for IVADs, while also including aspects outside of infection prevention to guide overall management. It outlines the minimum standards for the safe management of IVADs and should be read in

conjunction with the manufacturer's instructions relating to individual catheters, connections, administration set dwell time, and compatibility with antiseptics, medications and other fluids. NSW Health organisations that use these devices must have local guidelines or procedures in place to support the technical and procedural aspects for managing these devices.

1.2.2. Devices and settings

This Policy Directive applies to all patient care settings in which devices are inserted, managed or removed regardless of dwell time (for example, paramedic/ambulance, radiology, nuclear medicine, imaging, hospital, hospital in the home).

The following devices are included:

- peripheral intravenous catheters (PIVC)
- midline catheters (MLC)
- central venous access devices (CVADs)
    - non-tunnelled CVADs (short–medium term use)
        - peripherally inserted central catheter (PICC)
        - centrally inserted central catheter (CICC)
        - femorally inserted central catheter (FICC)
    - tunnelled CVADs (long-term use)
        - tunnelled PICC (t-PICC)
        - tunnelled CICC (t-CICC)
        - tunnelled FICC (t-FICC)
        - tunnelled, cuffed catheters (tc-CICC, tc-FICC)
    - specialised tunnelled CVADs
        - apheresis-specific (A-CICC, A-FICC, tc-A-CICC, tc-A-FICC)
        - haemodialysis-specific (H-CICC, H-FICC, tc-H-CICC, tc-H-FICC)
    - totally implanted venous access devices (TIVADs/Ports)
        - chest or peripheral TIVADs
        - specialised ports: apheresis TIVAD (A-TIVAD)
- umbilical catheters
- peripheral artery catheters
- pulmonary artery catheters (PAC)
- intraosseous access.

This Policy Directive does not include the management of specialised intravascular catheters, such as:

- extracorporeal membrane oxygenation (ECMO) catheters
- impella catheters
- intra-aortic balloon pump (IABP) catheters.

1.3. Key definitions

Accreditation	A quality assurance process under which health care services and operations are evaluated and verified by an external body to determine if recognized standards are met [3].
Administration set	A tubing set composed of components that is used to deliver infusions.
Air embolism	The presence of air in the vascular system that obstructs venous blood flow primarily to the lungs and brain [3].
Alcohol Based Hand Rub (ABHR)	A TGA-listed[1] alcohol-containing preparation designed for reducing the number of viable microorganisms on the hands without the use or aid of running water, and which is listed on the Australian Register of Therapeutic Goods (ARTG) as a medicinal product [2].
Antimicrobial	A chemical substance, usually a medicine, that inhibits or destroys bacteria, viruses, fungi, or protozoa [2].
Antiseptics	A substance used to reduce the risk of infection by killing or inhibiting the growth of microorganisms [2].
Arteriovenous fistula (AV)	Surgical anastomosis between an artery and vein to provide vascular access for long-term dialysis [3].
Aseptic technique	Consists of a set of specific practices and procedures performed under carefully controlled conditions. Aseptic technique protects patients during clinical procedures by utilising infection prevention measures that minimise the presence of microorganisms. While the principles of aseptic technique remain constant for all procedures, the level of practice will change depending upon a standard risk assessment [2].
Asepsis	The absence of pathogenic organisms in sufficient quantity to cause infection, achievable through aseptic technique [3].
Bloodstream infections (BSIs)	The presence of live pathogen(s) in the blood, causing an infection [2].

[1] The TGA refers to the Therapeutic Goods Administration.

Care Bundle	A small set of evidence-based interventions for a defined patient population and care setting.
Central line-associated bloodstream infection (CLABSI)	A laboratory confirmed, primary bloodstream infection in a patient with an intravascular access device in place, and the BSI is not related to an infection at another site [3].
Central Vascular Access Device (CVAD)	A catheter that is inserted via a peripheral vein of the upper or lower limbs or large vein of the chest or groin with the tip advanced to a central position, either the superior vena cava (upper body insertion) or inferior vena cava (lower body insertion) [3].
Clinician	A healthcare provider, trained as a health professional, including registered and non-registered practitioners. Clinicians may provide care within a health service organisation as an employee, a contractor or a credentialed healthcare provider, or under other working arrangements. They include nurses, midwives, medical practitioners, allied health practitioners, technicians, scientists and other clinicians who provide health care, and students who provide health care under supervision [2].
Competency	A required level of effective performance in the work environment defined by adherence to professional standards, including knowledge, skills, abilities, and judgment based on established science [3].
Competency assessment	A dynamic process used to verify an individual's performance; designed to empower the individual and support positive behaviour in patient care activities [3].
Electrocardiogram (ECG)	A test that measures and records the electrical activity of the heartbeat.
Erythema	Redness of skin in a specific area or more generalised [3].
Extravasation	Inadvertent infiltration of vesicant solution or medication into surrounding tissue; rated by a standard tool [3].
Flushing	The act of moving fluids, medications, blood, and blood products out of the vascular access device into the bloodstream; used to assess and maintain patency system as it responds to acute stress, such as myocardial infarction and cardiogenic or septic shock. For example, a pulmonary artery catheter is used to directly measure intracardiac pressure changes, cardiac output, blood pressure, and heart rate [3].

Guidewire	A long, flexible metal structure, composed of tightly wound coiled wire in a variety of designs; contains safety mechanisms that allow it to be inserted into the vein or artery [3].
Hand hygiene	A general term applying to processes aiming to reduce the number of microorganisms on hands. This includes application of a waterless antimicrobial agent (for example, alcohol-based hand rub) to the surface of the hands; and use of soap/solution (plain or antimicrobial) and water (if hands are visibly soiled), followed by patting dry with single-use towels [2].
Healthcare Associated Infection (HAI)	Infections acquired in healthcare facilities ('nosocomial' infections) and infections that occur as a result of healthcare interventions ('iatrogenic' infections), and which may manifest after people leave the healthcare facility [2].
I-DECIDED® Tool	Derived from evidence-based guidelines, the I-DECIDED device assessment and decision tool is a simple checklist that promotes comprehensive device assessment and management and prompts timely removal of temporary invasive devices[2].
Incident Management System (ims+)	The Incident Management System developed specifically for NSW Health. Further information is available at ims+ information site.
Implantable vascular access port TIVAD	A catheter inserted into a vein, attached to a reservoir located under the skin [3].
Infection	The presence and growth of a pathogenic microorganism(s) having a local or systematic effect [3].
Infiltration	Inadvertent administration of a nonvesicant solution or medication into surrounding tissue; rated by a standard tool or definition [3].
Intravascular device (device)	Catheters, tubes or devices inserted into the vascular system, including veins, arteries and bone marrow [3].
Key parts	The sterile components of equipment used during an aseptic procedure, such as bungs, needle hubs, syringe tips, dressing packs [2].

[2] Source: Griffith University QLD, Australia

Key sites	Any non-intact skin and insertion or access sites for medical devices connected to the patient, such as insertion/access sites of intravenous devices, urinary devices, open wounds using aseptic technique [2].
Locking	The instillation of a solution into a vascular access device (VAD) used to maintain patency in between VAD use and/or reduce risk of catheter-associated bloodstream infection [3].
Lumen	The interior space of a tubular structure, such as a blood vessel or catheter [3].
Maximal sterile barrier precautions	Equipment and clothing used to avoid exposure to pathogens, including sterile coverings for the clinicians and patient, such as masks, gowns, protective eyewear, caps, gloves, large or full body drapes, and towels [3].
Midline catheter	Inserted into a peripheral vein of the upper arm via the basilic, cephalic, or brachial vein with the terminal tip located within or distal to the axillary vein. In children and adults - and for neonates, in addition to arm veins - midline catheters may be inserted via a scalp vein with the distal tip located in the jugular vein above the clavicle or in the lower extremity with the distal tip located below the inguinal crease.
Needleless system	A device that does not use needles for: (1) the collection of bodily fluids or withdrawal of body fluids after initial venous or arterial access is established (2) the administration of medication or solutions; or (3) any other procedure involving the potential for occupational exposure to bloodborne pathogens due to percutaneous injuries from contaminated sharps [3].
Neonate	Birth to 28 days of life; pertaining to the first 4 weeks of life [3].
Non-tunneled central vascular access device (CVAD)	A type of CVAD for short-term use that is inserted percutaneously, usually via the axillary-subclavian, internal jugular, or femoral vein [3].

NSW Health organisation	A health service organisation is a separately constituted health service that is responsible for implementing clinical governance, administration and financial management of a service unit or service units providing health care at the direction of the governing body. Health service organisations include acute, primary and community healthcare services, as well as other services involved in the delivery of health care [2].
Osmolarity	The number of osmotically active particles in a solution [3].
Palpation	Examination by application of the hands or fingers to the surface of the body in order to detect evidence of disease or abnormalities in the various organs; also used to determine location of peripheral superficial veins and their condition [3].
Peripheral arterial catheter	An arterial line inserted in the radial artery; can be placed in femoral, axillary, brachial, posterior tibial arteries.
Peripheral Intravenous Catheter (PIVC)	A catheter that is inserted into and resides in veins of the periphery that includes all extremities, the external jugular vein, and scalp veins in neonates. PIVCs are inserted into superficial veins located just under the skin in the superficial tissue, as well as deep veins located under the muscle tissue [3].
Peripherally Inserted Central Catheter (PICC)	A catheter inserted through veins of the upper extremities in adults and children. For infants, it may be inserted through veins of the scalp or lower extremity. The catheter tip is advanced to the superior vena cava, preferably at the cavoatrial junction (upper limb insertion), or inferior vena cava, above the diaphragm (lower limb insertion) [3].
Personal Protective Equipment (PPE)	A variety of barriers used alone or in combination to protect mucous membranes, skin, and clothing from contact with infectious agents. PPE includes gloves, masks, respirators, protective eyewear, face shields, and gowns/aprons [2].
Phlebitis	Inflammation of a vein; may be accompanied by pain/tenderness, erythema, edema, purulence and/or palpable venous cord; rated by a standard scale or definition [3].
Pulmonary Artery (PA) Catheter	Also known as a Swan-Ganz catheter, is a CVAD inserted into a large central vein, with the tip residing in a pulmonary artery. Its purpose is diagnostic and therapeutic; it is used to detect heart failure or sepsis, monitor therapy, evaluate the effects of drugs and infuse medication.

Sterile	Free from viable microorganisms; usually described as a probability (for example, the probability of a surviving microorganism being 1 in 1 million) [2].
Surveillance	Disease surveillance is an epidemiological practice by which the spread of disease is monitored in order to establish patterns of progression. The main role of disease surveillance is to predict, observe and minimise the harm caused by outbreak, epidemic and pandemic situations, as well as increase knowledge as to what factors might contribute to such circumstances [2].
Tunnelled CVAD	A central vascular access device (CVAD) with a segment of the catheter lying in a subcutaneous tunnel with or without the presence of a cuff into which the subcutaneous tissue grows to offer security for the catheter; indicates that the skin exit site and vein entry site are separated by the subcutaneous tunnel [3].
Vesicant	An agent capable of causing tissue damage when it escapes from the intended vascular pathway into surrounding tissue, for example, some chemotherapy [3].
Visual Infusion Phlebitis (VIP) score	Used when monitoring the existence or the extent of phlebitis and is a reliable measure to determine if the catheter should be removed [3].

2. Education and documentation

2.1. Clinician education and training

Educational program requirements

NSW Health organisations must ensure that all clinicians who insert, manage and remove intravascular access devices (IVADs) complete a formalised educational program for the care being provided as described within this Policy Directive.

The formalised educational program must incorporate:

- theory (eLearning)
- practical workshop that reflects local policies and practices
- competency assessment in insertion, management and removal.

The following eLearning modules are available in My Health Learning (MHL) and are required to be incorporated in the formalised educational program:

- Peripheral Intravenous Access for Adults and Paediatrics (code: 492224480)
- Central Venous Access Devices: the fundamentals (code: 92708229).

Infection prevention and control mandatory training, as described in the NSW Health Education and Training Institute (HETI) Mandatory Training Matrix and Targeting Guide must be completed and up to date before commencing any IVAD training.

Practical training and competency

NSW Health organisations are responsible for ensuring clinicians complete the training stated above and undergo onsite practical training and competency assessments on the following:

- hand hygiene
- aseptic technique
- sharps use and disposal
- waste management
- donning and doffing of personal protective equipment (PPE) including respiratory protective devices.

NSW Health organisations must ensure clinicians achieve competence through specific training before performing ultrasound guided IVAD insertions.

Roles, responsibilities, and record keeping

Clinicians are responsible and accountable for attaining and maintaining currency of practice for device insertion, management and removal within their scope of practice.

NSW Health organisations are responsible for:

- maintaining records of training, assessment and competency, including the provision of reports.
- establishing systems to facilitate recognition of prior learning for theory and competency assessment.
- clearly defining the role, responsibilities and accountability for each type of clinician involved with these devices in organisational policy and/or procedure [3].

2.1.1. Competency assessment for Intravascular Access Devices (IVADs)

Clinicians responsible for inserting, managing, and removing IVADs must complete training and formal competency assessment.

This includes:

- didactic lectures
- simulation-based training; and
- supervision when performing procedures on patients.

Competency assessments must be conducted to establish proficiency in performing the skills of insertion, management and removal of IVADs independently and may be

undertaken on an ongoing basis as necessary. For example, accessing, de-accessing, line change and dressing change.

Competency validation must be documented in accordance with organisational policy.

2.2. Patient education

The level of education provided to the patient, client and/or caregiver should be determined by their:

- age
- acuity
- health literacy
- cognition
- ability to manage the IVAD
- type and duration of the IVAD.

The clinician should provide the following IVAD education to the patient and/or caregiver while in hospital or NSW Heath Hospital in the Home (HITH) and prior to discharge:

- the procedure and need for the device
- signs and symptoms of infection and air embolism (for central venous access devices [CVADs]) and how to escalate and/or who to contact if concerned
- what to do if the device becomes disconnected or accidentally removed
- how to care for the device
- how and when to perform hand hygiene and appropriate aseptic technique
- IVAD dressing information that includes keeping the dressing intact and when to remove the dressing after catheter removal.

Patients and/or carers in the community must be provided:

- appropriate information regarding who to contact for advice or in the case of an emergency. An example of such information is available in the IV-WISE patient discussion tool.

For children and young people under the age of 18, refer to the Child Safe Standards. They must be provided with IVAD education:

- appropriate to their age, development and level of understanding [28].
- to support their participation in decisions about their care [28].
- that is communicated in a way tailored to individual circumstances, for example, considering health literacy, level of understanding, age, cultural and linguistic background and any additional accessibility or support needs [28].

2.3. Documentation

Documentation in health care records must provide an accurate description of each patient/client's episodes of care or contact with a clinician as per NSW Policy Directive *Health Care Records - Documentation and Management* (PD2025_035).

All clinical incidents must be reported and documented as per the NSW Health Policy Directive *Incident Management* (PD2020_047). Additionally, clinicians are to follow the Australian Commission on Safety and Quality in Health Care (ACSQHC) guideline *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines*.

2.3.1. Insertion

Minimum documentation requirements at insertion by the clinician/proceduralist are:

- patient education and consent, refer to the NSW Health *Consent to Medical and Healthcare Treatment Manual*
- identification of the insertion site by anatomical descriptors and landmarks
- site preparation, infection prevention and safety precautions taken such as hand hygiene, aseptic technique
- date and time of insertion, number of attempts, reason for insertion, local anaesthetic (if used) and the technique used, including visualisation and guidance technologies
- the type, length, and gauge/size of the device for peripheral intravenous catheter (PIVC), including the lot number for all CVADs and implanted devices
- confirmation of the location of the catheter tip for all CVADs prior to initial use
- confirmation of patency and ready for use.

This must be documented in the health care record.

2.3.2. Post-insertion

While the patient is admitted to hospital, the condition of every IVAD must be documented at a minimum once per nursing shift. The documentation must detail:

- condition of the site, dressing, catheter securement, dressing change details, site care, and any changes related to the device or site
- for CVADs, external catheter length
- patient reported symptoms
- device function related to all lumens in use (for example, patency, lack of resistance when flushing, presence of a blood return upon aspiration)
- equipment/infusion type used for administration of intravenous (IV) therapy
- the visual infusion phlebitis (VIP) score if used or any signs of infection
- the post insertion care bundles such as the I-DECIDED Tool, if used.

2.3.3. Administration sets

All labelling of administration sets used in continuous infusion must be:

- documented in accordance with the *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines* [5]
- if the lumen has an indwelling lock solution, the lumen must be clearly labelled so that it is not inadvertently flushed into the patient [5].

2.3.4. Removal

Minimum documentation requirements on removal of devices are:

- date and time of device removal, reason for removal, condition of the site, and whether the catheter length and/or tip were complete and intact
- clinicians' names
- dressing applied
- any continuing management of complications including site observation.

2.3.5. Infection

To determine whether an infection prevention and control risk or breach constitutes a reportable incident, NSW Health organisations are to refer to NSW Health Policy Directive *Incident Management* (PD2020_047) which describes a state-wide system for managing clinical and corporate incidents.

Incidents of infection/phlebitis at the insertion site must be:

- reported using the NSW Health incident management system, or as per other local reporting requirements
- managed appropriately, including removal of the PIVC if the insertion site is inflamed, painful or shows signs of infection, in consultation with the medical officer and/or treating team.

If a catheter-related site infection or blood stream infection (BSI) is suspected or confirmed, this must be documented clearly in the health care record and if cultures are obtained, document the source of culture/s. The documentation should include a management plan and actions taken.

Compliance with reporting mandatory key performance indicators (KPIs), including routine reports on IVAD-associated infections, should be communicated to relevant stakeholders, peak organisational, governing and executive committees.

3. Pre-insertion

3.1. Considerations when choosing a device

Vascular access decisions are a collaborative approach reviewing patients' diagnosis, presentation and therapy required [3]. The risk of infection and other risks can be dependent on device site and selection. NSW Health organisations should develop a systematic decision support framework for device selection, local policy or procedure, noting that this is an indicator for local monitoring under the Australian Commission on Safety and Quality in Health Care (Clinical Care Standards).

The following should be considered as contributing to this risk (see Section 4.2 Prophylaxis, antimicrobial impregnation, coating or use of bonded connections and valves for more information):

- comorbidities, prolonged use and sites with frequent movement
- history of lymphoedema, arteriovenous (AV) fistula or graft, haematological disorders, history of device complications, obesity, coagulopathy, previous surgery, failed or difficult vascular access or immunocompromised
- frequent movement when cannula is inserted across a joint, for example, the antecubital fossa
- therapeutic purpose: the infusate characteristics, complexity of infusion regime, availability of peripheral access sites
- estimated length of time: long-term intermittent therapy, treatment anticipated for more than 3 weeks
- vein status: veins may be difficult to access, torturous, fragile, deep and/or history of difficult intravenous access
- patient's lifestyle, body image, preferences for therapy, location of the device, and whether treatment can be delivered safely per their preferences.

3.2. Infection prevention and control care bundles

Infection prevention and control care bundles are proven to reduce the risk of healthcare associated infections [2, 6]. Facilities should develop care bundles that are both evidence-based and include local clinical risks. The principles for adopting a care bundle includes:

- a manageable list of interventions that are descriptive and meet local requirements
- processes for documentation and assessment that considers clinical judgment in decision making
- input from the multidisciplinary team in developing the care bundle
- monitoring and communication to clinical teams.

4. Insertion

4.1. Procedural safety

Under the NSW Health Policy Directive *Clinical Procedure Safety* (PD2025_006):

- insertion of a peripheral intravenous catheter (PIVC) is classified as a Level 1 procedure
- insertion of a midline catheter may be classified as Level 1 or Level 2, depending on patient complexity and clinical context
- insertion of a central vascular access device (CVAD) is classified as a Level 2 or Level 3 procedure.

Level 2 and Level 3 procedures require the presence of an assisting clinician, who should:

- be present for the insertion of any CVAD (peripheral or central)
- assist with setup
- help with tying sterile gowns
- support the required procedural timeout process
- verify medications used, such as local anaesthetic and catheter locking agents
- confirm removal of components such as guidewires and introducers used to access the patient's blood vessels
- ensure asepsis is maintained in accordance with the NSW Health *Central Venous Line Insertion Record* (SMR090200) form or digital equivalent
- support escalation plans in the event of complication or emergency
- complete procedure checklists and documentation, as well as meet the needs of the patient, such as reassurance.

4.2. Prophylaxis, antimicrobial impregnation, coating or use of bonded connections and valves

The following must not routinely be used for the prevention of infection when inserting an intravascular device:

- systemic antibiotic prophylaxis [3]
- antibiotic or antiseptic ointment [3]
- antimicrobial-impregnated catheters – these may be considered for specific population based on patients' risk factors and clinical presentation [3].

The use of bonded connections and valves are beneficial in reducing the risk of air embolism and infection [3].

4.3. Device selection, site selection, and device securement

4.3.1. Peripheral Intravenous Catheter (PIVC)

Device selection

Clinicians must use the most appropriate gauge and length PIVC to achieve 2/3 or 60% of the catheter in the vein. See Appendix 8.1 PIVC Device Selection Guide for more information.

Site selection

Site selection must be based on clinical assessment, be accessible and functional during surgery and procedures and follow the below principles:

- Optimal site selection for PIVC is the distal areas of the upper extremities, for example, forearms [2].
- The antecubital vein should generally be avoided for PIVC due to its increased risk of infection, malfunction, and patient discomfort. Exceptions may be made in specific clinical scenarios, such as power injection procedures or during resuscitation, where rapid access is required. The antecubital vein may also be used and should be reserved for pathology collection [3]. If the antecubital vein is used, the PIVC should be replaced within 24 hours [3].

  This replacement must occur only after the patient is clinically stable and a comprehensive assessment confirms the ongoing need for intravenous access. Decisions regarding the retention or removal of the cannula must be guided by current clinical indications and prioritise patient safety.

  The decision to retain the PIVC is to be documented by the patient's medical team and reviewed regularly for prompt removal.
- Basilic or cephalic veins on the posterior (dorsal) forearm are the preferred site for catheterisation [2]. Caution is advised when cannulating the cephalic vein in patients with progressive renal disease, to preserve vessels for potential arteriovenous fistula or graft creation.
- Veins should be selected on the non-dominant forearm if practical (especially if the catheter is to remain in position for any length of time) [2].
    - Avoid veins of the lower extremities unless necessary, due to risk of tissue damage, thrombophlebitis, and ulceration. Replace a catheter to an upper extremity as soon as possible.
    - Rotate PIVC site and arm where possible for repeated cannulations.
    - Patients who have had axillary clearance without lymphoedema can still have intravenous treatment in the affected side.
- For paediatrics, preference should be given to sites that are long lasting for duration of therapy (for example, non-dominant forearm).

- Upper or lower extremities or the scalp (last option) can be used as the catheter insertion site [6].
- Avoid the right arm of infants and children after procedures treating congenital cardiac defects that may have decreased blood flow to the subclavian artery.

Securement

The catheter should be stabilised:

- with a transparent dressing and sterile adhesive tape or sterile adhesive/wound closure strips, and/or mechanical stabilisation device to prevent catheter dislodgement [6]
- with a tissue adhesive glue.

An extension set is recommended to avoid manipulation at insertion site.

For paediatrics, use of intravenous (IV) board/splints are recommended to secure PIVC placed in or adjacent to areas of flexion. Follow local policy or guidelines for strapping and securement of PIVCs.

4.3.2. Midline catheters

Device selection

- Use the smallest gauge of midline catheters that will accommodate the prescribed therapy to reduce the risk of phlebitis and thrombosis [7, 8].
- A midline catheter should not be used for infusion of vesicant therapy, parental nutrition, or other infusates with extremes of pH or osmolarity. Some infusates with physiologically normal pH and osmolarity can be cytotoxic, potentiating cell damage or death [3].

Site selection

- Vein selection should be based on the biggest and most superficial vein above the antecubital fossa to allow normal arm movement and function (aim middle 3rd upper arm).
- The catheter should not be placed at the antecubital fossa crease/fold and may terminate within or distal to the axillary vein or subclavian vein (mid clavicular).

Avoid the use of a midline catheter when the patient has a history or increase risk of thrombosis, hypercoagulability, decreased venous flow to the extremities, or end-stage renal disease requiring vein preservation [3].

Securement and dislodgement

A sutureless securement device is preferred for all devices.

4.3.3. Central Venous Access Device (CVAD)

Device selection

- Use the smallest gauge of CVAD that will accommodate the anticipated therapy to reduce the risk of catheter-related thrombosis.
- Use a device with a minimum number of lumens necessary to accommodate therapy.
- Where high flow catheters have additional lumens, the high flow lumens should be used for intended purposes such as dialysis or apheresis and additional lumens that are not considered high flow should be accessed and managed like any other CVAD.

Site selection

For peripherally inserted central catheter (PICC) insertion, use the middle third of the upper arm (the 'Green Zone' of the Zone Insertion Method [ZIM]) [26].

The basilic is preferred, with brachial then cephalic veins as alternatives. Select a vein of sufficient calibre to maintain a catheter-to-vessel ratio of 33-45% (for example, a 4 Fr PICC requires a vein diameter ≥ 4 mm, a 5 Fr PICC requires ≥ 5 mm, etc.) [6].

In neonates, the upper and lower extremities have similar complication rates.

To minimise infection risk for adults with non-tunnelled centrally inserted central catheter (CICC) placement, use a subclavian or internal jugular/axillary or low internal jugular site where ultrasound is used rather than a traditional femoral site where possible [6, 9].

If the patient has chronic kidney disease (CKD), consider the internal jugular vein or, secondarily, the external jugular vein or femoral vein, weighing benefits and risks for each access site due to the risk of central vein stenosis [3]. Subclavian vein access should be avoided for temporary access in patients with CKD due to the risk of central vein stenosis [3].

Femoral veins should be avoided where patients have undergone a renal transplant to preserve the iliac veins commonly used.

In patients with chronic renal failure be aware if a limb is being preserved for arteriovenous fistula (AVF) formation.

For internal jugular sites, where ultrasound is used, preferencing a lower approach optimises the exit site and can aid in maintaining dressing integrity [3].

Securement

The CVAD must be secured at the skin insertion point, anchor point and in order of best practice:

1. sutureless securement device
2. sutures
3. subcutaneous anchoring device.

4.3.4. Totally Implanted Venous Access Devices (TIVAD)

Device selection

- TIVAD are made of various materials including plastic, titanium, silicone rubber, polyurethane and a combination of these materials can be used.
- Catheters made of radiopaque silicone rubber or polyurethane are preferred.

The longevity of the septum is influenced by both the gauge of the access needle and the number of punctures. Larger gauge needles accelerate septum deterioration, reducing the number of safe punctures, whereas smaller gauge needles are associated with longer septum life [10].

Site selection

- The patient's preferences should be considered.
- Port pocket site selection should allow for placement in an area that provides good port stability, does not interfere with patient mobility, avoids pressure points and does not interfere with clothing [11].

Securement of the accessed TIVAD

The clinician will put a specially designed needle through the skin and into the silicone pad in the middle of the TIVAD and will apply a dressing to ensure the needle and the first part of the non-coring needle extension tubing is covered.

4.3.5. Peripheral artery catheter

Device selection

Select a catheter manufactured for arterial access that will achieve a catheter to vessel ratio of 30-45% and 66% arterial purchase (2/3rd of catheter in artery) [3].

Site selection

- Radial artery is preferred due to its accessibility and good collateral flow; however, the femoral, brachial or pedal artery may also be used [3].
- When the radial artery is used aim 4-10cm proximal to the wrist.
- The brachial site should not be used in paediatrics [3] and should be a last option in adults as it's a terminal vessel.

Securement

A sutureless securement device is preferred to reduce the risk of infection, or direct suturing at the hub and three-way bifurcation anchor point.

4.3.6. Pulmonary artery catheter

Site selection

- The preferred site is the right internal jugular vein followed by the left subclavian vein.
- The femoral and antecubital veins should be avoided if possible.

Securement

A sutureless securement device is preferred to reduce the risk of infection or direct suturing at the hub and three-way bifurcation anchor point.

4.4. Confirmation of tip position for CVAD catheters

The catheter tip position must be confirmed when a device is inserted, by any of the following techniques prior to use [6]:

- intra-cavity ECG
- transthoracic echocardiography for placement during cardiac and thoracic surgery
- chest x-ray or image intensifier
- ultrasound
- fluoroscopy imaging and digital subtraction angiography (DSA)
- pressure monitoring of the central venous waveform in operating theatre until formal confirmation post-surgery.

Once the CVAD distal tip position is confirmed via any of the above, the “final Tip position” of the catheter must be:

- documented using an anatomical position, for example, at cavoatrial junction (CAJ) in the health care record
- completed for all insertions by the clinician inserting the device, their assistant or delegate; and
- used as the clinician’s primary referral source for written confirmation of tip position.

Femoral catheters do not require tip confirmation unless there is catheter dysfunction attributed to suspected malposition, or the catheter is long enough to reach the level of the renal or hepatic veins where it is then necessary to ensure the tip is located in the inferior vena cava.

4.5. Standard precautions for insertion, management and removal

Standard precautions are the minimum precautions required and must always be applied when caring for patients [12].

During a medical/clinical emergency and/or resuscitation situation (for example, rapid deterioration and insertion via paramedic/ambulance officer) time does not always permit use of aseptic technique or full maximal barrier precautions. The clinician should make every effort within their environment to maintain asepsis and adhere to standard precautions.

If inserted in a medical/clinical emergency and/or resuscitation, the intravenous access device (IVAD) must be replaced as soon as the patient is stable (within 24 hours).

4.5.1. Hand hygiene

Perform hand hygiene before insertion procedures, refer to Table 1 below.

Hand hygiene should be performed:

- before and after palpating catheter insertion sites
- before and after inserting, replacing, accessing, repairing or dressing.

The use of gloves does not eliminate the need for hand hygiene (before putting on gloves and after removal).

Table 1. Hand hygiene for device insertion

Activity		Hand cleansing product*	Duration of hand wash*
Aseptic procedure	Insertion of PIVC	Alcohol based hand rub (ABHR)*	30-60 seconds
		Liquid antimicrobial soap and running water	40-60 seconds
	Insertion of CVADs, midlines and peripheral arterial catheter umbilical catheters	Liquid antimicrobial soap and running water	2 minutes
		Alcohol based surgical hand rub*	Refer to manufacturer's instructions. Note: prior to surgical rub, wash hands, forearms and nails using a non-medicated soap and running water.

*Manufacturer's recommendations should be followed for the amount of solution and duration of contact.

4.5.2. Aseptic technique

All clinicians involved in the insertion of devices must have appropriate training and assessment of aseptic technique, refer to Section 2.1 Clinician education and training.

Aseptic technique must be maintained for the duration of the procedure, this includes:

- hand hygiene
- maintaining aseptic fields

- once the insertion site has been prepped, aseptic technique must be maintained, and the site must not be touched (unless sterile gloves are worn)
- palpation of the PIVC insertion site must not be performed after the application of skin antiseptic. If you need to palpate the planned insertion site after skin antisepsis to confirm anatomy, repeat the application of the antiseptic
- procedures must be performed using non-touch technique, protecting key sites and key parts. The micro-critical aseptic fields (such as caps and covers) must remain on the device to maintain asepsis
- personal protective equipment (PPE) must be worn as per standard precautions
- ensure an efficient and safe order of the procedure
- equipment or items dropped on the floor must be discarded (even if there is a cap/cover on) and replaced.

When ultrasound transducers are used for imaging the vascular system for insertion of venous access devices, the following is to occur:

- a sterile probe cover and sterile gel must be used
- transducer probe must be cleaned and disinfected adequately in between use
- follow manufacturers' instructions for use and local guidelines or procedure.

In preparation of the IVAD insertion, a clean environment must be maintained. Environmental controls to achieve this include:

- cleaning the IVAD insertion trolley
- no room cleaning (buffing or polishing) immediately prior to, or during the procedure
- procedure should take place in a closed room or with curtains drawn around the patient zone to minimise air currents.

4.5.3. Personal protective equipment (PPE)

Clinicians should wear appropriate personal protective equipment (PPE) based on risk assessment and likelihood of exposure to blood and body substances [12, 13].

Glove use and when required

The use of non-sterile examination or sterile gloves will depend on:

- the procedure being undertaken
- contact with susceptible key sites or clinical devices
- risks involved in exposure to blood and body substances
- local guidelines or procedures that are in place.

Gloves may include sterile procedural gloves, sterile gloves, non-sterile gloves.

When used, gloves must be donned immediately after performing hand hygiene.

NSW Health organisations should have in place local guidelines or procedures determining the type of gloves for PIVC insertion based on local needs and clinical risk.

See Section 4.5.4 Maximal barrier precautions below for more information [3].

4.5.4. Maximal sterile barrier precautions

Use maximal sterile barrier precautions for all line insertions apart from PIVC. This involves:

- All personal involved in the procedure must wear a mask, hair covering (including beard if necessary), sterile gown and sterile gloves.
- For PIVC insertion, compliance with asepsis is required.

4.6. Skin preparation

Hair removal and skin cleansing

- Hair at the insertion site should be removed if necessary, using clippers to improve adherence of the dressing.
- The use of razors is not recommended.
- Wash skin and intended site with soap and water, if necessary, prior to applying the antiseptic solution before inserting the catheter.
- Sterile saline or water solutions alone are not acceptable antiseptic solutions and should only be used to clean the skin of gross contaminants prior to applying antiseptic solution.

Antiseptic application

- The same antimicrobial agent must be used for all phases of the patient's skin preparation, to ensure full residual benefit and consistent action.
- The application of antiseptic must follow manufacturers recommendations for dosage and contact/drying time. Overapplication should be avoided. All solutions must be allowed to dry before beginning insertion. Do not wipe, blot or fan.
- Some of the alcohol chlorhexidine solutions now contain tint to allow easier identification of prepped area.
- Take care when applying liquid solutions to minimise the risk of eye injury to the patient due to splashes.
- Care should be taken during internal jugular approaches that chlorhexidine solutions are not introduced to the ear canal as this can lead to deafness.

Palpation

- Palpation of the insertion site should not be performed after the application of antiseptics, unless aseptic technique is maintained.

- If the clinician needs to re-establish the identification of the vein, the site should be re-prepped with the antiseptic solution and allowed to dry completely.

Refer to Table 2 for recommended antiseptic agents and concentrations for skin preparation prior to catheter insertion:

Table 2. Skin preparation for adults and children ≥ 2 months [10]

Skin cleansing prior to PIVC insertion	0.5-2% chlorhexidine gluconate (CHG) and 70% isopropyl alcohol
Skin cleansing prior to all other device insertions	2%-4% chlorhexidine gluconate (CHG) and 70% isopropyl alcohol
Use an iodophor (for example, povidone-iodine) or 70% alcohol if there is a contraindication to chlorhexidine solution. Consider use of aqueous chlorhexidine if there is a contraindication to alcohol-based chlorhexidine.	

4.6.1. Skin preparation in neonates

NSW Health organisations who care for neonates must have a local policy or guideline in place for skin preparation and/or antisepsis for pre-term infants. This should consider:

- using topical antiseptics with extreme caution, particularly alcohol-based preparations
- the risk of chemical burns in premature babies
- avoiding povidone iodine for skin antisepsis.

5. Post insertion management

5.1. General information

If parenteral nutrition (PN) is being administered, one lumen should be dedicated for total parental nutrition (TPN) where possible.[3].

The use of an extension set is recommended between a peripheral intravenous catheter (PIVC) and needleless connector to reduce catheter pistoning, mechanical phlebitis and early failure.

Refer to Section 2.3 Documentation for minimum documentation requirements.

5.2. In-patient settings

To ensure the safe and effective use of intravascular access devices (IVADs) in in-patient settings, a comprehensive daily review must include assessment of the following:

- the intravascular device site
- the entire infusion system

- signs of complications/infection at each shift
- the ongoing need for the IVAD.

Promptly remove the IVAD if it is no longer required. Refer to Table 3 for daily assessment of IVADS. This is to check for migration, infection and functionality. For further information refer to the *Intentional Patient Rounding - Information for Clinicians & Health Professionals*. For high-risk medicine, clinicians should refer to the local protocols or the current version of the *Australian Injectable Drugs Handbook* (AIDH).

Ensure the primary treating team review the need for intravenous (IV) therapy, including antimicrobials on a daily basis, and switch to oral administration as clinically appropriate.

Table 3. Daily assessment of IVADs

Daily Assessment			
Phlebitis – Erythema – Tenderness – Swelling – Pain – Palpable venous cord – Purulent discharge	Systemic infection – Rigor – Fever – Tachycardia – Hypotension – Malaise – Nausea/ vomiting	• Infiltration/ extravasation • Insertion site – Blanched, taut skin – Oedema – IV fluid leaking – Burning/ stinging pain – Catheter-associated skin injury • Change in infusion flow	• Catheter position • Integrity of suture • Dressing integrity • Occlusion/ patency* • Ongoing need for line
For peripherally inserted central catheters (PICCs) and midline catheters, if limb swelling is suspected, or the patient is complaining of same, an ultrasound of the limb to exclude deep vein thrombosis (DVT) is recommended.			

* Where the lumen is intentionally locked and the device is not currently used, it is not necessary to assess patency, for example, dialysis catheters/totally implanted venous access devices (TIVADs) that are commonly used for intermittent therapies.

For more information and references, refer to the Queensland Health Guideline *Vascular access device clinical management for infection prevention*.

5.3. Community settings

To ensure the safe and effective management of IVADs in community settings, the following practices should be followed:

- Routine assessment: All intravascular devices must be checked at every clinical visit to assess function, patency, and signs of complications.
- Timely removal: Devices must be removed when no longer required. Assessment and removal must be documented appropriately (refer to Table 3).
- Patient education: Patients should be educated to visually inspect the insertion site of all IVADs (as per Section 2.2 Patient education). Education must include:
    - Recognition of signs and symptoms of complications (for example, redness, swelling, pain, discharge).
    - Clear instructions on who to contact and what actions to take if concerns arise.

5.4. Transferring and transporting patients with central venous access devices (CVADs)

There is an increased risk of CVAD dislodgment and accidental removal during transfer or transportation of patients. Devices must be visually inspected and secured before transfers occur.

Consideration should be given to the weight of lumen sets. Lines must be supported with additional fixation to reduce the risk of unplanned dislodgement.

If a catheter is not in use, check that the catheter is clamped prior to commencing transport.

5.5. Accessing devices

To reduce the risk of infection:

- accessing IVADs should be kept to a minimum
- use a continuous infusion wherever possible based on an individual patient risk assessment
- where continuous flow is not possible, the device should be flushed and locked as per local guidelines and procedures
- aseptic technique must be always maintained
- ensure line clamps are used if required, to reduce the risk of air embolism noting some lumens have internal valves.

Table 4 provides antiseptic preparation requirements to support infection prevention measures when accessing devices.

Table 4. Accessing devices

PIVC, Midline, PICC, CVC (tunnelled & non-tunnelled), Umbilical Catheters, Pulmonary Artery & Peripheral Artery Catheters, TiVAD	
Aseptic technique principles, relevant to the procedure: • sequencing • hand hygiene • environmental control • maintain asepsis • PPE.	**Antiseptic prep pads** 2 – 4% chlorhexidine gluconate and 70% isopropyl alcohol OR 70% isopropyl alcohol **TIVAD with needle insertion** 2 – 4% chlorhexidine gluconate and 70% isopropyl alcohol If allergic to chlorhexidine or alcohol use 10% povidone-iodine prep-pad

Accessing a catheter

All intravenous access ports should be meticulously cleaned with a prep-pad large enough to cover the top and side of the needleless connector for at least 15 seconds generating friction by scrubbing in a twisting motion and allowing to dry. Pre-pads are single-use only and impregnated with 70% alcohol or a combination of alcohol and chlorhexidine. If the patient has a known allergy to alcohol or chlorhexidine, 10% povidone-iodine can be used and allowed to air dry prior to accessing the system.

The catheter should be accessed with a sterile single-use device.

Accessing a TiVAD

Only a non-coring (for example, Huber) needle should be used to access TiVAD. Safety needle is preferred.

Use a new needle for each access attempt.

Needles should be changed every 7 days.

Reinsertion through the immediately preceding needle site should be avoided.

For more information and references, refer to the Queensland Health Guideline *Vascular access device clinical management for infection prevention*.

5.6. Blood collection

Limit drawing blood from IVADs as it increases hub manipulation and the potential for contamination and occlusion [3].

For some patients, blood sampling via a CVAD is appropriate based on individual patient risk assessment prior to collection.

Risks of venepuncture can include anxiety, pain, damage to skin and nearby nerves, and hematoma in patients receiving anticoagulants or with bleeding disorders [3].

Blood sampling from a PIVC is generally discouraged due to the increased risk of haemolysis, infection, and contamination. However, sampling may be considered at the time of insertion and in specific circumstances when:

- the PIVC is suspected to be the source of infection.
- the practice is supported by National or NSW Health guidelines.
- frequent blood collection is required, to optimise patient comfort.
- difficult venous access has been identified.

In all cases, the clinical justification must be documented in the health care record.

PICC in newborns should not be used for blood sampling or infusing blood products.

5.7. Dressings

Use a sterile, transparent semi-permeable dressing to protect the insertion site from contamination, continuously observe the site, and stabilise and secure the device.

Consider the following for selecting the appropriate dressing:

- **Adults:** consider chlorhexidine gluconate (CHG)-impregnated dressings/discs to reduce central line associated bloodstream infection (CLABSI).
- **Paediatrics:** risk-assess prior to use.
- **Neonates/infants:** follow local paediatric/neonate guidelines.

Use of chlorhexidine impregnated dressings or discs in infants and children may require individual risk assessment and prescription and should be considered in local guidelines [9].

5.7.1. Consideration and maintenance

When the patient is diaphoretic or has excessive bleeding or oozing from the site, use sterile gauze secured with a sterile transparent, semi-permeable dressing until this is resolved [6]. Umbilical catheters do not routinely use an occlusive dressing over the insertion site, refer to local guideline or procedure for more information.

When the patient has multiple devices, each should be dressed separately unless the puncture sites are too close together.

All equipment used for dressing the insertion site must be sterile, with the exception of the antiseptic solution. Dressing must be placed so the insertion site is visible for regular inspection, therefore do not place non-sterile or opaque tape directly over the insertion site.

All dressings must be replaced if they become:

- damp
- loose
- no longer adherent
- soiled
- associated with signs of inflammation; and/or
- accumulated with fluid.

If a medical adhesive-related skin injury (MARSI) is identified, use a low allergy/reaction dressing. Loose dressings should not be reinforced as this compromises the evaporative nature of transparent dressings and increases infection risk.

The recommended dressing change intervals for different dressing types are outlined in Table 5.

Table 5. Dressing change intervals

Dressing type	Replacement intervals
Transparent, semi-permeable, polyurethane (including chlorhexidine impregnated dressings)	Every 7 days or sooner if signs of the dressing failure (loss of skin contact) or compromise (blood or ooze)
Gauze	Every 24 – 48 hours or whenever loose, soiled, moist or complication is suspected

For more information and references, refer to the Queensland Health Guideline *Vascular access device clinical management for infection prevention*.

5.8. Needleless valve connectors/injection ports

Removal of a needleless connector must be performed using aseptic technique. The line should be clamped if required; some devices have a self-closing internal valve that engages when the connector is removed.

Removal of a needleless connector from a catheter requires immediate replacement with a new sterile connector, applied using appropriate aseptic technique.

Needleless connectors that are not bonded to the CVAD should be changed (using correct clamp/flush sequence depending on connector type (positive, negative, anti-reflux) [6]:

- at least every 7 days (coinciding with administration set changes), or
- at the frequency recommended by the manufacturer, or
- if the integrity of the needleless connector is compromised (for example, residual blood remains within the housing of the needleless connector), or
- daily with infusions sets for TPN.

Note: Needleless connectors are also known as:

- needleless IV catheter systems
- swabable capless valves
- swabable capless access devices
- needleless access ports
- needle-free injection ports
- needleless connector needle-free connector
- bungs.

5.9. Arterial catheters

Replace disposable or reusable transducers at 1-week intervals or when clinically indicated [3]. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced [3].

Keep all components of the pressure monitoring system (including calibration devices and flush solution) as a closed system [3].

5.10. Administration sets

IV administration sets include both the IV lines and any additional attachments, such as needleless injection ports, sideline syringe infusion pumps, three-way stopcocks, multi-flow adaptors and extension tubing that may be added.

IV administration sets must be attached to the patient so that no tension is applied to the catheter to reduce the risk of dislodgement.

Ensure all components of the administration system are compatible (including sideline syringe infusion pump or burettes and needleless injection ports) with the devices to minimise leaks and breaks in the system. All connections must be of a luer-lock design to ensure connection is secure [3].

Refer to section 2.3 Documentation for labelling requirements.

Disconnection of administration sets

A continuous circuit should be maintained as intermittent disconnections of administration sets increases the risk of infection.

All administration sets must be replaced:

- after being disconnected, or
- if the catheter is changed, or
- after blood has refluxed into the administration set and the blood is unable to be cleared by flushing.

When an administration set is changed, the IV fluid bag must also be changed.

Note: **Disconnection of administrations sets must be avoided for routine care, such as showering, changing nightwear/gowns. If disconnected, IV lines must be replaced.**

Infusions with blood and blood products and high-risk medicines may require special consideration to the continuation of the product. A risk assessment must be conducted to assess if the product should be discarded and replaced with new lines or continue with the existing set. Where an obvious contamination has occurred, all lines must be changed.

Controlled disconnections where reconnection of the set is immediate may be appropriate in certain situations based on clinical requirements (for example, changing IV access or infusions in operating theatres, administration of blood products or medical imaging departments).

For transient controlled disconnections, aseptic technique must be maintained to prevent contamination of the set.

If disconnection becomes more than transient, or if the line is contaminated in any way, the IV giving set must be discarded and replaced.

In-line filters

In-line filters are not recommended for prevention of bloodstream infections (BSI), however, certain agents such as chemotherapeutic, immunological drugs, etc. require filtering for other reasons [3].

Table 6 provides guidance on how often administration sets should be changed for different types of infusions.

Table 6. Frequency of administration set changes

Administration set use	Frequency of change
Continuous use (not containing lipids, blood or blood products)	• Every 7 days or as recommended by the manufacturer. • Change intermittent infusion sets without a primary infusion every 24 hours or whenever their sterility is in question.
Blood and blood products	• When the transfusion is complete, or every 12 hours if the transfusion is not complete. • When the maximum number of blood products as per the manufacturer's recommendations has been reached. • Any number of red cell units may be transfused during a 12-hour period, provided the flow rate remains adequate. • Platelets must be transfused via a new blood administration set. • Note: Manufacturer's recommendations defining the maximum number of units per blood administration set must not be exceeded.
Lipid containing solutions and parenteral nutrition	• Changed every 24 hours or as recommended by the manufacturer.
Lipid containing medications (for example, Propofol, Clevidipine)	• Changed at minimum every 12 hours or as recommended by the manufacturer.
Chemotherapeutic agents	• Remove immediately after use. • On completion of infusion including the line flush. • The chemotherapy infusion episode may include more than one agent, it is common practice to use the same administration set, with line flush in between in order to ensure the full dose has been administered.

5.11. Flushing

Flushing is recommended to promote and maintain line patency and prevent the mixing of incompatible medical solutions. Sterile 0.9% sodium chloride for injection must be used, unless the manufacturer recommends flushing with an alternate solution [14-19].

Use commercially manufactured prefilled flush syringes to reduce the risk of CLABSI, device failure, to save time for syringe preparation, and aid optimal flushing technique and objectives.

Clinicians must flush catheters immediately:

- after placement

- before and after each fluid infusion or injection
- prior to and after drawing blood.

PIVCs must be flushed at least every 8 hours for hospital patients and must be documented on the medication chart, for example, Electronic Medication Management (eMM), or every 24 hours for patients in the community, if not on a continuous infusion.

CVADs not being accessed must be flushed and locked every 7 days.

TIVAD not being accessed must be flushed and locked every 4-12 weeks, in line with manufacturer's instructions for use and local policy/procedures.

5.12. Locking

Sterile 0.9% sodium chloride for injection should be routinely used to lock a catheter/unused lumen no longer required for continuous infusions, unless the manufacturer recommends catheter lumens be locked with an alternate solution [3].

NSW Health organisations who determine a need to use alternative locking solutions (for example, heparin, antibiotic, antimicrobial citrate+/- antithrombolytics and antiseptics), must have local policy or guidelines to support the appropriate use of these solutions.

Locks containing medication must be prescribed by a medical officer or nurse practitioner.

Catheters with a medicine 'in situ' to lock the catheter must be labelled as per the *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines* [5].

5.13. Catheter migration

If external length changes or migration is suspected: stop use, escalate, and confirm tip position (for example, ECG-guided or imaging) before deciding on repositioning or replacement.

A catheter that has migrated externally must not be re-advanced [21]. The treating medical team must be notified immediately if this has occurred.

If a CVAD is noted to have migrated inwards from the documented marking point, the CVAD must be retracted to the original insertion measurement as documented on the SMR090.200 *Central Venous Line Insertion Record*. The medical team must be notified and a risk assessment for infection/contamination must be conducted.

This procedure can only be done by a clinician who has achieved CVAD competency. Refer to Section 2.1 Clinician education and training for more information.

6. Replacement and removal

6.1. Device duration

All devices must be checked at each shift and removed when no longer required or if mechanical complications occur.

IVADs can be kept in place until clinically indicated to be removed [3]. This is reliant on adherence to good intravascular access device (IVAD) management, monitoring controls and documentation.

Admitting services must assess any devices in patients transferring from other healthcare facilities whose device may or may not be documented. The clinician must inspect for infection, mechanical complications and correct distal tip position. Correct position can be determined through previous documentation and correct external length comparison, or via radiological confirmation. Where possible, ascertain date of insertion of the IVAD.

When adherence to aseptic technique is compromised (such as, catheters inserted during a medical emergency or in ambulance transportation), replace the catheter as soon as possible (for example, when the patient is stable or within 24 hours) [3].

Devices must be removed based on the following clinical indications:

- the catheter is no longer required
- evidence of systemic infection after discussion with the treating team, noting this does not apply to all infections if appropriately treated with antibiotics
- damage to the catheter
- evidence of local infection as per visual infusion phlebitis (VIP) score
- persistent catheter occlusion.

Note: If a patient leaves the facility or is discharged against medical advice (DAMA) with a peripheral intravenous catheter (PIVC) or IVAD in place, follow local procedures and policies to ensure appropriate documentation, risk management, and follow-up. A police welfare check may also be required if the patient is unable to be contacted.

6.2. Catheter/IVAD removal

Processes must be in place to ensure appropriate authority or order/instruction and written documentation to remove devices. NSW Health organisations should develop standing orders or local protocols/processes for the routine removal of IVADs (for example, nurse initiated PIVC removal).

Standard precautions and aseptic technique must be used to prevent catheter site infections [3].

Following device removal, the site must be sealed with a sterile occlusive dressing, remain intact for a minimum 24 hours and until the site is healed.

Dressings are not routinely applied upon removal of umbilical catheters but must be clean and dry. Consider the use of cyanoacrylate glue to seal the exit site of large bore catheters to reduce bleeding and air embolism risk.

If the patient is being discharged, the patient and/or carer should be educated (as per Section 2.2 Patient education) on the signs and symptoms of infection and complications, and advised what to do if symptoms present.

On removal, the clinician must visually check the integrity of the line. Routine collection of the tip is not required except in circumstances where infection is suspected. Refer to Section 7 Diagnosis of infection and surveillance.

Totally implanted venous access devices (TiVAD) and tunnelled cuffed central vascular access devices (CVADs) are only to be removed by a medical officer or nurse practitioner/registered nurse who has been deemed competent in this skill.

TiVAD require surgical removal in clinically appropriate area (dedicated clinic, operating theatre, radiology).

Requirements for removal of CVADs

To prevent air embolism during CVAD removal, NSW Health organisations must have a local guideline or procedure with the following considerations:

- Clinical guidance and competency:
  - Refer to the Agency for Clinical Innovation Clinical Practice Guide *Central Venous Access Device (CVAD)*
  - Removal of CVAD must only be undertaken by trained or supervised clinicians. Refer to Section 2.1.1 Competency assessment for Intravascular Access Devices (IVADs).
  - Clinicians working towards formal removal competency must be directly supervised by an experienced and competent clinician.
- Removal technique and patient positioning:
  - Removal of the CVAD must be undertaken using an aseptic technique that will minimise the risk of infection.
  - The patient is to be positioned supine with head slightly down (if tolerated) during CVAD removal. This is to increase the pressure in the large veins to above that of atmospheric pressure, which reduces the risk of aspirating air into the venous circulation.
  - During peripherally inserted central catheter (PICC) removal, positioning the exit site below the heart and the patient's arm may need to be extended to 90 degrees to aid in removal.
- Post-removal care and monitoring:
  - Following CVAD removal, the site must be sealed with an airtight dressing which remains insitu for at least 24 hours to reduce the risk of late air embolism [3].

    The patient must remain in the supine position (or Semi-Fowlers if supine not tolerated) for between 30 and 60 minutes following CVAD removal.

    At least one set of observations should be done during this period, as well as immediately prior to retrieving the patient to the upright position.

    Observe for sign of respiratory distress, assess site for bleeding or haematoma and report any changes in status immediately.

- The removal of the CVAD and the presence of an intact tip must be documented in the health care record.
- Following removal, the CVAD site will require daily review and dressing until healed.
- Routine observations are to be conducted after the removal of the IVAD.

Removal of catheter in presence of bloodstream infection (BSI)

Do not remove a functioning catheter solely due to elevated temperature. Clinical decisions should be based on a comprehensive assessment [3]. If an infection is actual or suspected, the treating medical team must be notified and an assessment made for the ongoing need of the device, persisting relapse of catheter related BSI, patient deterioration and alternative IV access.

6.2.1. Peripheral intravenous catheter (PIVC)

Replacement and dwell time

The routine replacement of PIVC may not prevent infection or phlebitis but they must not be left in place indefinitely. PIVC dwell time should not exceed 72-96 hours, unless a senior clinician deems the risk of replacement outweighs the risk of infection. In the pediatric cohort, replace the PIVC based on clinical indication.

Current evidence supports replacing a PIVC based on clinical indications, including:

- physical inspection of the site
- VIP score documentation
- Review by the consulting team to confirm ongoing need for IV access.

If peripheral intravenous access is required beyond short-term use, clinicians should transition to a suitable long-term vascular access device (refer to Section 4.3 Device selection, site selection, and device securement). The decision to replace a PIVC based on clinical indication must be supported by a formal risk assessment. Removal of a PIVC is indicated if the patient develops signs of local infection, pain or tenderness and is to follows local reporting guidelines (for example, documenting in ims+).

Surveillance, documentation and compliance

Effective PIVC care relies on both skilled clinical staffing and robust surveillance systems within the healthcare facility, including:

- availability of clinicians appropriately trained in the insertion and maintenance of devices on each shift
- assurance that PIVC surveillance in the healthcare facility is adequate, including regular inspection of the site and device, and of PIVC-related *Staphylococcus aureus* bacteremia (SAB).

The Australian Commission on Safety and Quality in Health Care *Management of Peripheral Intravenous Catheters Clinical Care Standards* require comprehensive documentation of insertion, maintenance and removal of PIVCs. Also observe the insertion

site for 48 hours after the PIVC is removed for signs of post-infusion pain, redness or swelling.

Audits should look for sustained compliance with daily PIVC assessment documentation, including consistent documentation of device insertion (site ease and date), site appearance and complications experienced with devices.

6.2.2. Midline catheters

Midline catheters inserted using aseptic technique may stay in place until clinically indicated for removal [3].

6.2.3. Umbilical catheters

Remove umbilical venous and umbilical arterial catheters in neonatal intensive care unit (NICU) patients as soon as possible and when no longer needed due to the concern for increasing risk of central line associated blood stream infection (CLABSI) associated with each day of increasing dwell time [3].

Remove and do not replace the umbilical catheter if there are any signs of catheter-related BSI, vascular insufficiency in the lower extremities, or thrombosis present.

An umbilical catheter may be replaced if it is malfunctioning, breaks or splits, and there is no other indication for catheter removal.

Refer to local policy or guideline for further information.

6.2.4. Peripheral arterial and pulmonary artery catheters

To prevent infections, do not routinely replace arterial catheters. Replace only when there is a clinical indication [22].

6.2.5. CVADs

Do not routinely replace CVADs, replacement should be based on clinical indication.

Do not remove CVADs on the basis of fever alone. Use clinical assessment to determine whether infection is evident elsewhere or if there is another non-infectious cause of the fever, refer to Section 7 Diagnosis of infection and surveillance.

6.2.6. TiVADs

TiVADs are long-term vascular access devices designed for repeated use. The lifespan of a port is limited by the number of needle punctures it can safely tolerate – typically between 1,000 to 2,000 punctures, depending on the needle gauge and manufacturer instructions specifications. Replace ports based on clinical indications.

6.3. CVAD guidewire exchange

Guidewire exchanges to replace catheters is not recommended. A small number of patients may benefit from this in exceptional circumstances based on patient assessment, risk and suitable environment. A new site of insertion reduces the risk of BSI compared to guidewire exchange.

7. Diagnosis of infection and surveillance

7.1. Diagnosis of infection

For a suspected catheter-related bloodstream infection (BSI), obtain blood cultures (refer to section 7.1.1 Blood cultures).

If pus, exudate or erythema is present at the insertion site, swab the site prior to removal of the device and send for culture.

Catheter tip cultures are not a substitute for blood cultures and not routinely sent for the determination of a BSI, a negative catheter tip culture does not exclude infection [23].

7.1.1. Blood cultures

To support timely and accurate diagnosis of sepsis and other BSIs, the following standardised procedures for blood culture collection must be followed by clinical staff:

- Adults:
  - Number of sets: collect 2 sets (4 bottles) per suspected infection episode.
  - Timing: collect prior to commencement of antimicrobials.
  - If hemodynamically unstable, collect 1 set before antimicrobials. Do not delay antimicrobial administration in cases of severe sepsis or septic shock.
  - Collection sites and volume:
    - One set from a pre-existing device.
    - One set from a peripheral site.
    - If peripheral access is not possible, collect from 2 or more lumens of the device.
    - Ensure bottles are well filled per specified sample volume.
- Paediatrics and Neonates
  - Number of bottles: collect 1 bottle only.
  - Type and volume: use aerobic bottle, collect 0.5–1 mL.
  - Refer to local policy for additional guidance.
- Special considerations:
  - Occur prior to commencement of antimicrobials.
  - If catheter was locked with an antimicrobial (for example, antibiotic or taurolidine), discard twice the catheter lumen volume before collecting.
  - If blood volume is limited, prioritise aerobic bottles.
  - If patient is hemodynamically unstable, take one set prior to commencement of antimicrobials. Do not delay the administration of antimicrobials in patients with severe sepsis or septic shock.

- Collect one set from the pre-existing device and one set from a peripheral site.
- If a peripheral set is not possible, a blood culture set from each of 2 or more lumens is required.
- Bottle should be well filled per the specified sample volume per bottle (for adult patients only).
- The culture should consist of first drawn blood and no discard is necessary unless the catheter has been previously locked with an antimicrobial solution (for example, an antibiotic or taurolidine), where twice the catheter lumen volume should be discarded.
- Needleless connectors (bung) should be removed prior to sampling from a catheter and replaced with new needleless connector (bung).
- Use aseptic technique to minimise contamination and reduce the risk of false-positive results.

Note the collection site on the specimen collection request form and the time of collection.

For further information, refer to local policy or guideline and the Clinical Excellence Commission resources:

- Sepsis pathways
- *Adult Blood Culture Guidance*
- *Paediatric Blood Culture Guidance*
- *Neonatal Blood Culture Guidance.*

7.1.2. Culturing tips

Do not send catheter tips for culture on routine line removal. If infection is suspected, consult with the treating medical team and infectious diseases/clinical microbiology team if catheter tip culture is required.

Catheter tips should be cut using sterile scissors and an aseptic technique.

Ensure the site and type of catheter are noted on the request form as well as any other appropriate clinical information.

7.1.3. Reporting of IVAD related BSI

NSW Health organisations must have procedures in place for the timely reporting of all positive cultures to the treating medical and infection prevention and control teams.

Open disclosure should be performed for all suspected or actual catheter related infections, as per the NSW Health Policy Directive *Open Disclosure* (PD2023_034).

Staphylococcus aureus bloodstream infection (SABSI) and central line associated blood stream infection (CLABSI) require reporting to NSW Health as a harm score 2 (HS2) and must follow the process of identification, investigation and management of these incidents [24, 25].

For healthcare associated BSIs, such as vancomycin resistant enterococcus (VRE) and carbapenemase-producing enterobacterales (CPE), NSW Health organisations must follow internal reporting and escalation processes and key performance indicator requirements (for example, reporting in ims+).

8. Appendices

1. PIVC device selection guide
2. Implementation checklist
3. World Congress on Vascular Access (WoCoVA) expert consensus recommendations
4. Additional resources

8.1. PIVC device selection guide

This is a guide for PIVC device selection and should be used whenever practical. However, clinical risks and patient characteristics may require a different size to be used (for example, paediatrics and neonates).

PIVC Size	Use
14G	Patients with trauma/severe injury Rapid, large-volume replacement
16G	Patients with trauma/severe injury Major surgery Intra-partum or post-partum GIT bleeding Multiple line access Multiple blood transfers High volume of fluids
18G	Blood products Multiple line access large volume of fluids Major surgery Imaging requiring power injection of CT contrast Power injection
20G	General use IV maintenance IV antimicrobials IV analgesia Power injection (depending on pressure requirements)
22G	Small or fragile veins Cytotoxic therapy Power injection (depending on pressure requirements)
24G	Small or fragile veins Cancer services Day only infusion services Paediatrics
Delivery of irritant medications: Use the most appropriate cannula size for the vein. Use of a peripheral intravenous cannula that is too large for the vein increases the risk of phlebitis. Use of a catheter that is too short increases the risk of infiltration and dislodgement [3]. (Refer to the *Infusion Therapy Standards of Practice*, 9th Edition)	

8.2. Implementation checklist

Note: This implementation checklist is NOT mandatory – it is a tool for NSW Health organisations to use to monitor implementation of this Policy Directive.

LHD/SHN/Facility:	Assessed By:				Date:
Implementation Requirements	**Not Applicable**	**Not Started**	**Partial Compliance**	**Full Compliance**	**Action Required**
Local guideline or procedures in place for Peripheral Intravenous Catheters (PIVC).	☐	☐	☐	☐	
Local guideline or procedure in place for Midline Catheters.	☐	☐	☐	☐	
Local guideline or procedure in place for Central Venous Access Devices (CVADs), including implanted venous ports (ports).	☐	☐	☐	☐	
Local guideline or procedure in place for Umbilical Catheters.	☐	☐	☐	☐	
Local guideline or procedure in place for Peripheral Artery Catheters.	☐	☐	☐	☐	
Local guideline or procedure in place for Pulmonary Artery Catheters.	☐	☐	☐	☐	
Roles and responsibilities for each type of clinician involved with these devices is clearly defined in the guideline or procedure.	☐	☐	☐	☐	
Clinicians who insert, manage and remove IVADs have undergone training and formal competency assessment. Assessments are documented and accessible for review.	☐	☐	☐	☐	
Facility wide monitoring of clinician IVAD insertion practices to ensure only trained/experienced clinicians undertake or supervise IVAD insertion.	☐	☐	☐	☐	

All clinicians involved in the insertion, management and removal of devices have completed periodic educational program and assessment.	☐	☐	☐	☐	
Ongoing education is provided to clinicians on preventing and controlling infection risks in relation to intravascular devices.	☐	☐	☐	☐	
All patients, including children and young people under the age of 18, and their families are provided with infection prevention and control education on their device and this education is documented.	☐	☐	☐	☐	
It has been determined where devices are to be documented in the health care record. The CVAD Insertion Record or equivalent is completed for every CVAD insertion.	☐	☐	☐	☐	
There is an evaluation method to ensure that insertion sites are assessed and documented daily in the health care record.	☐	☐	☐	☐	
Processes are in place to support and evaluate the appropriate use of alternative locking solutions (for example, heparin or antimicrobial). Locks containing medication are prescribed by a medical officer or nurse practitioner.	☐	☐	☐	☐	
Confirmation of tip position is documented on the central venous line insertion record or equivalent for all central device insertions.	☐	☐	☐	☐	
NSW Health organisations who care for neonates have a local policy or guideline in place for skin preparation and/or antisepsis for pre-term infants.	☐	☐	☐	☐	
Criteria for PIVC replacement based on clinical indication has been met by the NSW Health organisation	☐	☐	☐	☐	
Processes are in place to ensure appropriate authority to remove devices.	☐	☐	☐	☐	

Procedures in place to investigate positive cultures that are attributed to devices.	□	□	□	□	
All reportable device related BSI events are reviewed at the HO on a case-by-case basis to identify potential opportunity for clinical practice improvement.	□	□	□	□	
Surveillance systems are in place to monitor adverse events and incidents related to devices.	□	□	□	□	
Compliance with this Policy Directive and local procedures is monitored and reported to the nominated peak committee.	□	□	□	□	

8.3. World Congress on Vascular Access (WoCoVA) expert consensus recommendations

The following expert consensus recommendations [6] outline the core competencies necessary for undertaking catheter insertion safely. These are based on vessel health and preservation principles and the minimal training requirements for CVAD insertion programmes.

Recommended core principles and training	Completed
Anatomy and physiology of relevant body systems	☐
Ultrasound for insertion and assessment	☐
Central venous access device tip location	☐
Standard precautions and aseptic technique	☐
Device selection and indications	☐
Insertion procedures, complication prevention, evaluation and management	☐
Care and maintenance practices along with needleless connectors and securement devices	☐
Instructors should have demonstrated qualification and competency to educate on device insertion. This must be an experienced clinician who is considered competent and accredited within their organisation to perform the procedures that they are teaching simulation training	☐
Anatomical models – use of inanimate training aids prior to progressing to human subjects	☐
Objective grading and proficiency – a stepwise theoretical and practical performance assessment	☐
Examination and competency – didactic examination and practical demonstration for final assessment	☐
Supervised instruction – by a qualified, competent and currently experienced practitioner using methods of best practice	☐
Didactic and/or web-based training	☐
Developing clinical competence – determined by objective assessment rather than procedural volume	☐
Specific education for insertion of devices for children and neonates and use of technology for this cohort	☐

8.4. Additional resources

Agency for Clinical Innovation

- Clinical Practice Guide *Central Venous Access Devices (CVAD)*

Australian Commission on Safety and Quality in Health Care (ACSQHC)

- *Cleaning and disinfection of ultrasound transducers*
- *National Safety and Quality Health Service Standards (second edition)*
- *National standard for user-applied labelling of injectable medicines, fluids and lines*
- *Management of Peripheral Intravenous Catheters Clinical Care Standards*
- *IV-WISE patient discussion tool*
- *National Hand Hygiene Initiative Implementation Guide*

Advanced Pharmacy Australia

- *Australian Injectable Drugs Handbook* (AIDH)

Agency for Healthcare Research and Quality (US)

- Toolkit for Reducing Central Line-Associated Blood Stream Infections

Association for Professionals in Infection Control (US)

- *Central Line-associated Bloodstream Infections (CLABSI)*

Alliance for Vascular Access Teaching and Research (AVATAR)

- *I-DECIDED device assessment and decision tool*

Cancer Institute NSW, eviQ Cancer Education Online

- *Central Venous Access Devices*
- *Clinical Resources, Central Venous Access Devices*

Centers for Disease Control and Prevention (US)

- *Central Line-associated Bloodstream Infection (CLABSI) Basics*

Clinical Excellence Commission

- *Healthcare Associated Infection: Clinical Indicator Manual*, version 3.3
- *Infection Prevention and Control Practice Handbook*
- *Intentional Patient Rounding - Information for Clinicians & Health Professionals*

National Services Scotland

- *Inserting and maintaining a peripheral vascular catheter (PVC)*

Health Protection Surveillance Centre (Ireland)

- *Procedure for prevention of peripheral and central venous catheter related infection*

My Health Learning

- Central Venous Access Devices

National Health and Medical Research Council (NHMRC)

- *Australian Guidelines for the Prevention and Control of Infection in Healthcare*

NSW Multicultural Health Communication Service

- *In-language health resources*

NSW Health Policy Directives

- *Clinical Procedure Safety*
- *Health Care Records – Documentation and Management*
- *Infection Prevention and Control in Healthcare Settings*
- *Medication Handling*

Office of the Children's Guardian

- Guide to the Child Safe Standards

Queensland Health Guideline

- *Vascular access device clinical management for infection prevention*

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