



Management of Peripheral Intravenous Catheters

Clinical Care Standard

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The Management of Peripheral Intravenous Catheters Clinical Care Standard has been endorsed by the following organisations:



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Management of Peripheral Intravenous Catheters Clinical Care Standard

Quality statements

- 1 Assess intravenous access needs**

A patient requiring medicines or fluids is assessed to identify the most appropriate route of administration for their clinical needs.
- 2 Inform and partner with patients**

A patient requiring intravenous access receives information and education about their need for the device and the procedure. Their consent is obtained and they are advised on their role in reducing the risk of device-related complications.
- 3 Ensure competency**

A patient's PIVC is inserted and maintained by clinicians who are trained and assessed as competent in current evidence-based practices for vessel health preservation and preventing device-related complications, relevant to their scope of practice. Insertion by a clinician working towards achieving competency is supervised by a clinician who is trained and assessed as competent.
- 4 Choose the right insertion site and PIVC**

A patient requiring a PIVC is assessed to identify the most suitable insertion site and PIVC (length and gauge) to meet their clinical needs and preferences for its location.
- 5 Maximise first insertion success**

The likelihood of inserting a PIVC successfully on the first attempt is maximised for each patient, according to the health service organisation's process for maximising first-time insertion success.
- 6 Insert and secure**

A clinician inserting a patient's PIVC uses standard precautions, including aseptic technique. The device is secured and a sterile, transparent, semipermeable dressing is applied unless contraindicated.
- 7 Document decisions and care**

A patient with a PIVC will have documentation of its insertion, maintenance and removal, and regular review of the insertion site.
- 8 Routine use: inspect, access and flush**

A patient's PIVC and insertion site is inspected by a clinician for signs of complications at least once per shift or every eight hours, when accessing the device, and if the patient raises concerns. Standard precautions including aseptic technique are used when performing site care and accessing the PIVC. Patency is checked and flushing is performed at intervals according to local policy to assess device function and minimise risk of device failure.
- 9 Review ongoing need**

The ongoing need for a patient's PIVC is reviewed and documented at least daily, or more often if clinically indicated.
- 10 Remove safely and replace if needed**

A patient with a PIVC will have it removed when it is no longer needed or at the first sign of malfunction or local site complications. A new PIVC will be inserted only if ongoing peripheral vascular access is necessary, consistent with the replacement recommendations in the current version of the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*.

Indicators for local monitoring

The following indicators will support health service organisations to monitor how well they are implementing the care recommended in this clinical care standard and are intended to support local quality improvement activities.

1 Assess intravenous access needs

Indicator 1: Proportion of patients with a PIVC in situ that has not been used for a therapeutic purpose since it was inserted.

2 Inform and partner with patients

Indicator 2: Proportion of patients with a PIVC in situ that can identify the reason for the device.

3 Ensure competency

Indicator 3: Evidence of a locally approved policy that ensures healthcare professionals are competent in PIVC insertion, monitoring, and removal. The policy should specify the:

- Competency a clinician must demonstrate to insert a PIVC, including for more complex and technology-assisted insertions
- Competency a clinician must demonstrate to monitor and remove PIVCs
- Organisation's process to assess and monitor the ongoing competency of clinicians, including for more complex insertions
- Organisation's process to assess adherence to the policy.

4 Choose the right insertion site and PIVC

Indicator 4a: Evidence of local arrangements that provide systematic support for decisions related to the selection of an appropriate PIVC device.

Indicator 4b: Proportion of patients with a PIVC in situ over an area of flexion.

Note: This indicator is specified to include patients with a PIVC in situ for 24 hours or longer.

5 Maximise first insertion success

Indicator 5a: Evidence of a locally approved policy that defines the local protocol to support PIVC insertion on first attempt. The protocol should specify the:

- Risk assessment process that should be used to identify patients where insertion of a PIVC may be more complex
- Situations when staff should escalate PIVC insertion to more experienced staff and the process to follow
- Clinical situations when more than one attempt is appropriate
- Organisation's process to assess adherence and outcomes of the policy.

Indicator 5b: Proportion of patients who report their PIVC was inserted on the first attempt.

7

Document decisions and care

Indicator 7a: Evidence of a locally approved policy that defines the documentation for PIVC insertion, maintenance, removal, and regular review. The policy should specify:

- The information that must be documented in the medical record for every PIVC inserted, including, indication for insertion, maintenance and removal
- How often documentation should occur
- The organisation's process to assess adherence to the policy.

Indicator 7b: Proportion of patients with a PIVC in situ with the indication for insertion documented in their medical record.

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Routine use: inspect, access and flush

Indicator 8a: Proportion of patients with a PIVC in situ who have their PIVC insertion site inspected for complications at least every 8 hours.

Indicator 8b: Proportion of patients with a PIVC in situ with a clean, dry and secure PIVC dressing.

9

Review ongoing need

Indicator 9: Proportion of patients with a PIVC in situ who have been assessed in the last 24 hours to determine the ongoing need for their PIVC.

10

Remove safely and replace if needed

Indicator 10: Proportion of patients with a PIVC in situ that has not been used for a therapeutic purpose in 24 hours.

The definitions required to collect and calculate indicator data are specified online in [Metadata Online Registry](#) (METeOR). More information about indicators and other quality improvement measures is provided in Appendix B.

Clinical care standards

Clinical care standards help support the delivery of evidence-based clinical care and promote shared decision making between patients, carers and clinicians. They aim to reduce unwarranted variation and improve the appropriateness of care for a specific clinical condition or procedure, regardless of where people are treated in Australia.

A clinical care standard contains a small number of quality statements that describe the level of clinical care expected for a specific clinical condition or procedure. Indicators are included for some quality statements to assist health service organisations monitor how well they are implementing the care recommended in the clinical care standard.

A clinical care standard differs from a clinical practice guideline. Rather than describing all the components of care for a specific clinical condition or procedure, a clinical care standard focuses on key areas of care where the need for quality improvement is greatest.

Clinical care standards aim to support improved health care by considering the various perspectives of the community, clinicians and health service managers.

Clinical care standards are developed by the Australian Commission on Safety and Quality in Health Care (the Commission), an Australian Government agency that leads and coordinates national improvements in the safety and quality of health care, based on the best available evidence. By working in partnership with the Australian Government, states and territories, the private sector, clinical experts, and patients and carers, the Commission aims to ensure that the health system is better informed, supported and organised to deliver safe and high-quality care.

About the Management of Peripheral Intravenous Catheters Clinical Care Standard

Context

This clinical care standard describes the key components of care for reducing the risk of complications associated with the use of peripheral intravenous catheters (PIVCs), commonly known as cannulas. It supports the provision of high-quality, evidence-based care, taking into account the context in which care is provided, local variation and the quality improvement priorities of the individual health services.

It does not replace the need for specialised decision-making for PIVC insertion appropriate to the individual clinical circumstances of the patient and the context in which care is provided (such as during anaesthesia, light sedation, short-term cannulation for diagnostic imaging purposes, acute resuscitation and acute trauma management).

Goal

The goal of the *Management of Peripheral Intravenous Catheters Clinical Care Standard* is to promote the judicious use of PIVCs and to reduce complications by highlighting the importance of maintaining and preserving a patient's vessel health.

Scope

This clinical care standard relates to the care that patients of all ages, in all healthcare settings should receive to reduce complications associated with the insertion, maintenance and removal of PIVCs.

Although many of the quality statements are relevant for vascular access in general, this clinical care standard has been developed specifically in relation to the use of PIVCs.

Pathway of care

This clinical care standard covers the period from when a patient is identified as requiring therapy to be administered by the peripheral IV route, to completing the therapy and removing the PIVC.

Healthcare settings

The *Management of Peripheral Intravenous Catheters Clinical Care Standard* applies to all healthcare settings where PIVCs may be inserted or managed, such as:

- All hospital settings, including public and private hospitals, subacute facilities, and outpatient and day procedure services
- Emergency services, such as ambulance services
- General practice and other community settings where PIVCs may be used, including outreach services such as Hospital in the Home settings.

What is not covered

This clinical care standard does not cover the use of midline catheters, peripherally inserted central catheters (PICC) or central venous catheters.

Evidence sources that underpin this clinical care standard

Key evidence sources that underpin the *Management of Peripheral Intravenous Catheters Clinical Care Standard* are current clinical guidelines from the National Health and Medical Research Council (NHMRC)¹², United States Centers for Disease Control and Prevention¹³ and Infusion Nurses Society^{14,15}, the United Kingdom's Department of Health¹⁶ and Royal College of Nursing¹⁷, and HSE Health Protection Surveillance Centre Ireland.¹⁸ Other resources include Australian statewide policies from Queensland^{19,20}, Western Australia²¹, the Australian Capital Territory²² and New South Wales.²³

A list of the evidence sources for this clinical care standard is available on the Commission's website at: safetyandquality.gov.au/PIVC-CCS.

Supporting documents

Supporting documents for this clinical care standard are available on the Commission's website at safetyandquality.gov.au/PIVC-CCS.

These include the:

- Clinician fact sheet
- Health service organisations fact sheet
- Consumer fact sheet
- Patient information – How to look after your cannula
- IV-WISE discussion tool.

How to use this clinical care standard

The quality statements describe the expected standard for key components of patient care. By describing what each statement means, they support:

- **Patients** to know what care may be offered by their healthcare system, and to make informed treatment decisions in partnership with their clinician
- **Clinicians** to make decisions about appropriate care
- **Health service organisations** to understand the policies, procedures and organisational factors that can enable the delivery of high-quality care.

This clinical care standard should be implemented as part of an overall approach to safety and quality, incorporating the following principles and standards.

General principles of care

When applying the information contained in a clinical care standard, clinicians are advised to use their clinical judgement and to consider the individual patient's circumstances, in consultation with the patient, or their support people.

This clinical care standard aligns with key principles that are the foundation for achieving safe, high-quality care including:

- Person-centred care and shared decision making
- Informed consent
- Cultural safety for Aboriginal and Torres Strait Islander people.

For more information and more Commission resources, see Appendix A.

Measurement for quality improvement

Measurement is a key component of quality improvement processes. The Commission has developed a set of indicators to support clinicians and health service organisations to monitor how well they are implementing the care recommended in this clinical care standard. A number of the indicators recommended in the standard are specified for collection through a point prevalence survey of patients with a PIVC in situ. Clinicians and health service organisations may choose to prioritise some of the suggested indicators based on the focus of quality improvement activities at the health service. To support local quality improvement activities it is important that a point prevalence survey is undertaken as part of a quality improvement cycle, and results are shared with all healthcare professionals involved in patient care. No benchmarks are set for the indicators.

The indicators are listed with the relevant quality statements. The definitions required to collect and calculate indicator data are available online: meteor.aihw.gov.au/content/index.phtml/itemId/732513. More information about indicators and other quality improvement measures is provided in Appendix B.

Information on other quality measures including patient-reported outcome measures and patient experience measures is provided in Appendix C.

Meeting the requirements of national standards and accreditation

Implementing this clinical care standard as part of a quality improvement activity can help health services meet the requirements of the National Safety and Quality Health Service (NSQHS) Standards.

More information about clinical care standards and the NSQHS Standards is included in Appendix D.

Background: Management of Peripheral Intravenous Catheters Clinical Care Standard

A PIVC is a small flexible tube that is inserted through the skin into a small vein in the arm, hand or foot (peripheral vein). A PIVC is also known as a peripheral venous line or peripheral intravenous cannula, and commonly referred to as an 'IV' or a 'drip'. PIVCs are usually inserted in the arm. They allow medicines, hydration fluids, contrast media and blood products to be given directly into the bloodstream.



Quick facts about PIVCs

- Up to 70% of hospitalised patients require at least one PIVC at some point during their hospital stay¹⁻⁴
- Between 4% and 28% of PIVCs inserted are not needed.⁴ This increases to 50% in the emergency department, where a PIVC is often inserted 'just in case'⁶
- Up to 69% of PIVCs are associated with complications, leading to up to 90% of PIVCs being removed before therapy is finished^{2,3,7,8}
- If a patient has one PIVC failure, the risk of future PIVCs failing is greater^{2,9}
- First insertion success rates are poor. First insertion attempts fail in up to 40% of adults, and in up to 65% of children.^{1,10,11}

Call for action

Data from Australia and internationally suggest that a significant proportion of patients do not receive the care recommended for the use of PIVCs.⁷ In an international cross-sectional study across 51 countries (including Australia) comparing insertion techniques and management practices with recommended care, widespread variation was noted. For example, PIVCs were:

- Inserted at inappropriate sites (69%)
- Covered with substandard dressings (20%)
- Showing visible signs of redness and swelling at the insertion site (10%)
- Malfunctioning – for example, leaking (10%)
- In place but not used in the preceding 24 hours (14%).

This gap between guideline recommendations and current practice has prompted calls for clinicians and health service organisations to adopt evidence-based PIVC insertion and maintenance bundles, as well as checklists, with the aim of reducing rates of PIVC-related complications.^{7,23} This clinical care standard was developed in response to these issues.

When PIVCs are used

Sometimes medicines and fluids may need to be given intravenously. In these instances, clinicians need to decide whether to use a PIVC or a central line. Central lines are tubes that are placed into the bloodstream via a large central vein (in the groin, neck or chest) that leads directly to the heart.^{3,7}

Generally, when intravenous (IV) access is needed for a short time, or when direct access to the blood supply near the heart is not necessary, PIVCs are preferred. PIVCs are usually safer, easier to insert and less painful than central lines.

PIVC use in Australia and internationally

Inserting a PIVC is one of the most common procedures performed during a patient's hospitalisation – about 70% of patients require at least one PIVC at some point during their hospital stay.¹⁻⁴ With about 11 million patients admitted to Australian hospitals in 2016–17²⁴, approximately 7.7 million people undergo this procedure each year.

International studies estimate that between 4% and 28% of PIVCs inserted are not used.⁴ Australian studies report that this figure is even higher in the emergency department, where about 50% of PIVCs inserted are not used.⁶ In the emergency department, patients are more likely to have a PIVC inserted as a routine admission procedure – 'just in case' it is needed later, or for the sole purpose of taking blood samples.^{4,6} International comparative studies on PIVC use have also reported that Australia has the highest prevalence of redundant PIVCs: 43% have no documented IV order for fluids or medicines, suggesting that the PIVC may not have been needed.²⁵

Problems associated with using PIVCs

Despite their frequency of use, PIVCs are reportedly associated with complications up to 69% of the time. Such complications can include:^{2-4,25-27}

- Blockage and dislodgement
- Redness, pain or swelling of the vein
- Line-related bloodstream infections, with *Staphylococcus aureus* being the most common pathogen that causes bacteraemia (SAB).

These complications lead to up to 90% of catheters being removed before they are planned to be replaced or before therapy is finished.⁷

Unfortunately, not all attempts to insert a PIVC are successful. Up to 40% of all first insertion attempts in adults^{1,10} and up to 65% of first attempts in children¹¹ fail. Adding to this complexity is that more than a third of adults and up to half of children who have a PIVC inserted have difficult IV access. Difficult IV access is defined as having at least two failed insertion attempts before a successful insertion, and is characterised by veins that are difficult to see and feel.²⁸ People with difficult IV access usually undergo several painful attempts before a PIVC is successfully inserted. Highly skilled clinicians or advanced techniques such as ultrasound are often needed to successfully insert a PIVC in someone with difficult IV access.²⁹

Box 1 contains a list of factors that may contribute to difficult IV access.

Box 1: Factors that may contribute to difficult intravenous access²⁸⁻³²

- Diseases or conditions that affect the integrity of the vessel structure, such as diabetes
- Known history of poor vein accessibility
- History of more than two attempts to successfully insert a PIVC
- Excessive hair on the arms or hands
- Particular skin types in particular populations
- Presence of scars or tattoos
- Age of the patient
- Obesity or malnourishment
- Dehydration
- History of treatment with anticoagulants or corticosteroids
- Intravenous drug use.

When a PIVC fails, it usually needs to be replaced with a new device. This imposes a considerable burden on the patient's quality of life and on the health system. Replacing a PIVC with a new one means that the patient's therapy is interrupted and their vessel health deteriorates because of the further attempts to insert a PIVC.⁷ As a result, the patient experiences more pain and discomfort, especially when IV access is difficult and multiple reinsertion attempts are made.^{3,25} Resources – both hospital workforce and material – are also needed to reinsert a new PIVC so that therapy can continue. The cost of managing a PIVC failure can be considerable, with the average cost of a replacement device estimated at \$70 per episode of care.³³

Improving PIVC use

To reduce rates of PIVC-related complications, a number of evidence-based strategies have been suggested. Best-practice guidelines recommend that clinicians use a variety of techniques to reduce the risk of complications associated with using PIVCs and to preserve a patient's vessel health.³ To avoid medication errors, PIVC labelling should be in accordance with the *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines* (the Labelling Standard).⁵

Box 2 contains a list of techniques to help reduce the risk of PIVC-related complications. Box 3 contains information to ensure that PIVCs are labelled correctly.

Box 2: Techniques to reduce the risk of PIVC-related complications

- Avoid inserting PIVCs when they are not needed in the first instance
- Only insert a PIVC for medicines and fluids suitable for peripheral administration
- Ensure that clinicians are skilled in inserting and maintaining PIVCs, where relevant to their scope of practice (for example, in adults or children)
- Use standard precautions, including hand hygiene and aseptic technique when inserting or accessing a PIVC
- Avoid inserting peripheral cannula when an axillary lymph node clearance has been performed, or if there is an arteriovenous fistula
- Place the PIVC in a stable area – for example, in adults, an area of non-flexion such as the forearm; this will also help to reduce the discomfort associated with having a PIVC in place
- Secure the PIVC to help prevent movement at the insertion site: consider the use of short extension tubing to minimise movement at the insertion site, particularly with intermittent use
- Use sterile, transparent, semipermeable dressings to cover the insertion site and help minimise contamination
- Promptly remove the PIVC if signs of redness or swelling develop, or another complication such as infection is suspected
- Promptly remove PIVCs when no longer needed. If ongoing vascular access is required, replacement of PIVCs should be in accordance with the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*.

Box 3: The *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines*⁵

The Labelling Standard recommends for safe PIVC delivery:

- Catheters must be identified when there is a risk of wrong route of administration (for example, where the patient entry port is distant from the administration site)
- Catheter labels are pre-printed with the route of administration and colour-coded according to route
- Intravenous catheter and line labels are blue (PMS 2985); full specifications are provided in the Labelling Standard
- Any lines attached to the catheter should be labelled immediately according to route
- Lines dedicated to the continuous infusion of a particular medicine should also be labelled to identify that medicine (see Labelling Standard, Section 5.2).

1

Quality statement 1 – Assess intravenous access needs

A patient requiring medicines or fluids is assessed to identify the most appropriate route of administration for their clinical needs.

Purpose

To ensure that all alternative routes of administration are considered and excluded before using the intravenous route.^{12,17,21,23}

What the quality statement means

■ For patients

If you need to have medicines or fluids, your clinician will assess what is the best way for you to have them. It might be as a tablet or liquid that you can swallow, or as an injection into your muscle or under your skin.

Sometimes the best way might be directly into your bloodstream. If this is the case, your clinician will talk with you about whether a PIVC is right for you. In some cases, a different way of delivering treatment into your bloodstream might be needed. This may depend on:

- How long you need to have treatment¹²
- The condition of your veins and the chances of being able to successfully insert a PIVC¹⁵
- The treatment you need to have and whether it could damage your veins, especially if given for a long time^{15,17,21-23}
- Your history of having PIVCs inserted and whether there were any problems, such as finding your veins¹⁷
- Where the PIVC should be inserted, taking into account your preferences^{12,17} and whether therapy can be delivered safely³⁴
- Whether you already have a device in place for receiving medicines and fluids intravenously.¹⁷

■ For clinicians

If a patient requires medicines or fluids, assess the patient to identify the most appropriate route of administration for their clinical needs before starting therapy.^{17,34} Consider whether another route of administration (for example, the oral, intramuscular, subcutaneous, rectal, intra-osseous or intra-peritoneal route) is appropriate, before using the IV route.^{12,15,17,18,21,23,35}

If all other routes of administration have been excluded and IV access is needed, assess whether peripheral or central venous access is appropriate by considering the:

- Patient's medical history, age, clinical and vascular condition^{15,23}
- Expected duration of therapy^{15,23}
- Likelihood of repeated or prolonged administration of vesicants or irritants such as vancomycin, flucloxacillin, potassium or certain types of chemotherapy²¹⁻²³
- Patient's history of infusion therapy and whether there were complications associated with its use – for example, difficulty locating suitable veins^{15,22}
- Availability of appropriate insertion sites²⁹ and the likelihood of first-time insertion success
- Position of the patient during any planned procedures²³
- Patient's lifestyle, body image, and preferences for therapy and location of the device^{12,17,21-23}, and whether therapy can be delivered safely in accordance with their preferences³⁴
- Availability of resources and ability to care for the device.¹⁵

Insertion of a PIVC pre-emptively may be appropriate for patients at risk of clinical deterioration. Collection of pathology samples is not a valid reason to insert a PIVC¹⁷; although this often happens in emergency departments, it can lead to unused PIVCs being left in.⁶ If frequent sampling is required, exceptions may be considered after individual assessment³⁴; examples include, fourth hourly troponin levels, to optimise patient comfort, or if there is difficult venous access. PIVCs should not be used to obtain blood cultures as this leads to an increased risk of contamination to the blood culture and PIVC.²³

By discussion with the patient, ascertain that they understand the need for IV therapy, especially if multiple device options are available, specific clinical issues about the therapy need to be raised, or the patient has concerns.^{12,19,21-23}

■ For health service organisations

Ensure that organisational policies and processes support the consideration of all routes of administration of medications and fluids before therapy is started, and that the IV route is only used if other routes are not suitable.

Indicator for local monitoring

Indicator 1: Proportion of patients with a PIVC in situ that has not been used for a therapeutic purpose since it was inserted.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/732533

More information about this indicator and the definitions needed to collect and calculate it can be found online in the above METeOR link.

2

Quality statement 2 – Inform and partner with patients

A patient requiring intravenous access receives information and education about their need for the device and the procedure. Their consent is obtained and they are advised on their role in reducing the risk of device-related complications.

Purpose

To ensure that, when clinically possible, a patient is given information about their need for IV access and the procedures associated with inserting, maintaining and removing a PIVC.^{12,16,18,19,21-23} This is so patients can consider the risks and benefits, and make a decision about whether it is right for them.^{15,17} Patients also have the opportunity to ask questions so that they can be engaged in the management of their PIVC and help reduce the risk of device-related complications.

What the quality statement means

■ For patients

Unless you are unconscious or unable to respond, your clinician will explain why you need to have a PIVC before it is inserted.^{15,21,23} If your PIVC is inserted in an emergency or while you are unconscious, a carer, relative, or someone who is authorised to make decisions for you, if available, will receive this information.^{21,23}

Your clinician will discuss the risk of complications that might happen if you have a PIVC, how likely they are, and their potential impact. Complications could include blockage, pain, redness, swelling, skin irritation or infection.^{15,17,23,36} Information will be presented in a way that you understand so that you can make an informed decision about having a PIVC, and know how you can help prevent complications.

You may need to have a PIVC inserted as part of another procedure you are having. For example, if you are having surgery, a PIVC might be needed to give you the anaesthetic. In these instances, the need for a PIVC will be explained to you as part of your broader treatment plan.

Your clinician will ask questions to make sure you understand the information you have been given.¹⁵ You can ask questions and tell them about problems you have had in the past with PIVCs, or anything that you are concerned about. The information you provide your clinician is important for your comfort, and to reduce the risk of complications.

Your healthcare team will also check with you to make sure your PIVC continues to function properly and is safe for use. You can ask questions and discuss any concerns you have while your PIVC is in place, as well as after it has been removed.¹⁷

■ For clinicians

Support the patient to have an active role in preventing PIVC-related complications by providing information and education – for example, by using the principles suggested in the IV-WISE discussion tool on page 16.

Unless it is an emergency, ensure that the need for IV access is discussed with, and understood by, the patient before the PIVC is inserted.^{15,21,23} This is especially important if several options are available for delivering therapy intravenously or there are specific clinical issues to raise.¹⁷ If a PIVC is required as part of another procedure, provide information about the PIVC when informing the patient about the procedure. If IV access is required in an emergency, ensure that information is provided to a relative or carer, if available.

Ask the patient about previous PIVC insertions to identify any concerns, such as difficulty with particular access sites, allergies to tapes or antiseptics, or certain sites where a PIVC should not be inserted.^{15,17,21,23} This will also help to identify whether insertion is likely to be difficult and whether assistance will be required to increase the chances of first-time insertion success.

Invite the patient to ask questions, and use methods such as **teach-back** to confirm they understand the information they have received.³⁷ Continue to ask the patient if they have any concerns while the PIVC is in place and for at least 48 hours after it has been removed.³⁷ This is important because it helps patients have informed discussions with their healthcare team¹⁷, adhere to their care plan and participate in activities that may help to reduce the risk of PIVC-related complications.

■ For health service organisations

Ensure that systems are in place for clinicians to provide information and education to patients about their PIVC, to support shared decision making. Also ensure that patients have access to ongoing advice when needed. When consent is being obtained, ensure that policies enable patients to receive enough information to inform their decision about having a PIVC inserted, and support patients to ask questions before the device is inserted and while it is in place. This will help the patient to be engaged in their care and to participate more effectively in decision-making about their treatment. This is consistent with the Partnering with Consumers Standard in the NSQHS Standards (second edition).³⁸

Indicator for local monitoring

Indicator 2: Proportion of patients with a PIVC in situ that can identify the reason for the device.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/732553

More information about this indicator and the definitions needed to collect and calculate it can be found online in the above METeOR link.

The IV-WISE patient discussion tool

IV-WISE* lists key discussion points for clinicians and patients, to involve patients in their care and prevent PIVC-related complications:

What clinicians should discuss with patients:	What patients can ask and do:
I Intravenous access needs	
<ul style="list-style-type: none"> ■ Discuss why IV fluids or medicines are needed ■ Explain how the PIVC will be inserted ■ Ask patients about their PIVC history and any current needs. 	<p>Tell your healthcare team about your past experiences including:</p> <ul style="list-style-type: none"> ■ Difficulty inserting a PIVC ■ Anything that has worked well ■ Your preference or any physical problems that could affect where the PIVC is placed ■ Any allergies you have, such as to tapes and dressings.
V Vascular access checks	
<ul style="list-style-type: none"> ■ Advise that the PIVC will be checked regularly ■ Ask patients to report any concerns or any problems they notice (e.g. redness, swelling). 	<ul style="list-style-type: none"> ■ Your clinician will regularly check your PIVC ■ Tell your clinician if you have any concerns or notice any problems.
W What patients can do to reduce the risk of complications	
<ul style="list-style-type: none"> ■ Advise patients what they can do to help reduce the risk of PIVC-related complications and infection ■ Provide patients with the 'Looking after your cannula' information sheet. 	<p>To help to look after your PIVC:</p> <ul style="list-style-type: none"> ■ Protect the PIVC from knocks or being pulled ■ Wear loose clothing so that the PIVC does not get caught ■ Keep the PIVC dry while washing and showering ■ Ensure that the protective dressing stays in place.
I Infection risk	
<ul style="list-style-type: none"> ■ Discuss how to prevent infection. 	<p>To prevent infection:</p> <ul style="list-style-type: none"> ■ Keep your hands clean by washing with soap or using sanitiser ■ Do not touch, fiddle with, or move the device.
S Signs and symptoms of complications	
<ul style="list-style-type: none"> ■ Discuss the signs and symptoms to look out for ■ When removing the PIVC, advise patients that symptoms can occur up to 48 hours later and what to do. 	<p>Tell your clinician as soon as possible about:</p> <ul style="list-style-type: none"> ■ Redness, pain or swelling at the insertion site ■ Feeling hot, cold or shivery ■ Leakage from the device ■ The dressing getting wet, bloodstained or loose.
E Expected removal	
<ul style="list-style-type: none"> ■ Tell patients when the PIVC is expected to be removed (e.g. when therapy is finished). 	<ul style="list-style-type: none"> ■ If your PIVC has not been used in the last 24 hours, ask if you still need it ■ If you are going home and your PIVC is still in place, ask your clinician if it can be removed.

* Developed by the Australian Commission on Safety and Quality in Health Care, 2021.

3

Quality statement 3 – Ensure competency

A patient's PIVC is inserted and maintained by clinicians who are trained and assessed as competent in current evidence-based practices for vessel health preservation and preventing device-related complications, relevant to their scope of practice. Insertion by a clinician working towards achieving competency is supervised by a clinician who is trained and assessed as competent.

Purpose

To minimise trauma to the patient by ensuring that PIVCs are inserted and/or maintained by appropriately skilled members of the healthcare team.

What the quality statement means

■ For patients

If you need to have a PIVC inserted, you have a right to expect that the member of your healthcare team who performs the procedure has relevant training and assessment of their skills in this area.^{12,21-23} In some instances, clinicians who are in training may insert your PIVC under supervision.^{18,19,21,23} You can also expect that the clinicians inserting and looking after your PIVC will keep their skills and knowledge up to date.^{15-17,19,21,23}

■ For clinicians

Ensure that you complete training and education as specified by your health service organisation that is relevant to your scope of practice, and that you are assessed as competent in using and adhering to the current, evidence-based practices to preserve vessel health and prevent complications associated with using a PIVC.^{12,15-17,21-23} If you are working towards achieving competency, when you insert a PIVC ensure you are supervised by someone who has successfully completed a competency assessment of their practical skills and knowledge in this area.^{18,19,21,23}

Maintain continuing education to ensure that your practical skills and knowledge remain in line with current practice recommendations, and that your competency is maintained and documented according to your health service organisation's policies.^{15,17}

■ For health service organisations

Use evidence-based guidelines to identify the practical skills and knowledge required to successfully insert and manage PIVCs. Based on these guidelines, develop policies outlining the competency and assessment required for clinicians, relevant to their scope of practice, and how competency will be monitored.

Validate competency using systems such as checklists or forms that focus on measurable assessment of performance, and use a standardised approach to assess competency so that infusion therapy practices are consistent across the organisation.^{15-17,39} Have a system for assessing competency of clinicians who have come from other facilities.¹⁵⁻¹⁷

Ensure that competency is documented according to local policy. Monitor and review competency for feedback to clinicians and ongoing quality improvement.

Develop workforce competency as appropriate to the size of the organisation¹⁵, as well as the availability of a competent work force after hours. Options include subspecialty or vascular access champions for greater first-time insertion success.⁴⁰⁻⁴²

Indicator for local monitoring

Indicator 3: Evidence of a locally approved policy that ensures healthcare professionals are competent in PIVC insertion, monitoring, and removal. The policy should specify the:

- Competency a clinician must demonstrate to insert a PIVC, including for more complex and technology assisted insertions
- Competency a clinician must demonstrate to monitor and remove PIVCs
- Organisation's process to assess and monitor the ongoing competency of clinicians, including for more complex insertions
- Organisation's process to assess adherence to the policy.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/732559

More information about this indicator and the definitions needed to collect and calculate it can be found online in the above METeOR link.

4

Quality statement 4 – Choose the right insertion site and PIVC

A patient requiring a PIVC is assessed to identify the most suitable insertion site and PIVC (length and gauge) to meet their clinical needs and preferences for its location.

Purpose

To ensure that an appropriate PIVC is selected and inserted in a suitable site that minimises the risk of failure and other PIVC-related complications, taking into account the patient's clinical condition and preferences for the location of the PIVC.¹²

What the quality statement means

■ For patients

Your clinician will assess you to see where your PIVC should be placed, considering^{12,15,17,21-23,34}:

- Your preferences for its location and whether therapy can be delivered safely there
- The condition of your veins and skin
- How much you can move
- Whether it will be painful
- How likely it is that they will be able to insert it on the first attempt.

If possible, your PIVC will be placed in the arm that you use the least and locations where problems are more likely to develop will be avoided.¹²

■ For clinicians

Identify a suitable insertion site by taking into account the potential risk of infection, mechanical complications and patient comfort, preferably using veins in the non-dominant arm.^{12,15-18} Ask the patient if they have a preference for the location of the PIVC, and follow their preference if this would allow safe administration of therapy. When choosing an appropriate site, consider for each patient:

- The condition of the patient's skin and vasculature at the insertion site
- Any contraindication to choosing which limb for example, axillary lymph node clearance, or presence of arteriovenous fistula
- How painful insertion might be for the patient
- Whether your expertise matches the complexity of the insertion procedure at the site so that the device can be inserted successfully on the first attempt; ultrasound may assist you to identify more appropriate sites.

Use a site that is likely to last the duration of the prescribed therapy to maximise dwell time and patient comfort.¹⁵ This means choosing a site that will promote self-care, prevent accidental removal or blockage, and facilitate the safe administration of therapy.³⁴ Avoid areas of flexion unless clinically necessary; re-site cubital fossa IVs as soon as appropriate. Do not use veins in the lower extremities unless this is necessary; for example, because of a risk of tissue damage and local site complications in the upper extremities.^{12,15-17}

Choose the right peripheral device (length and gauge) by considering the type of therapy the patient needs^{21-23,39}, including whether the PIVC is to be used to administer contrast media for diagnostic purposes, and the duration of treatment. Use devices with safety-engineered protective features to reduce the risk of injury involving a sharp.^{12,15}

■ For health service organisations

Ensure that policies describe the criteria for selection of PIVC insertion sites and types of devices.

Ensure that clinicians involved in choosing insertion sites are adequately trained, and know how to select the most appropriate PIVC and insertion site for the patient's intended therapy. This includes knowing the:

- Patient's clinical condition
- Insertion technique for the specific device
- Potential for complications
- Appropriateness of the device for the prescribed therapy.

Ensure devices with safety-engineered protective features are available at the point of care to reduce the risk of injury involving a sharp. Examples include devices such as needles with guards, sliding sheaths, shields, blunted tips or retracting needles.¹²

Indicators for local monitoring

Indicator 4a: Evidence of local arrangements that provide systematic support for decisions related to the selection of an appropriate PIVC device.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/733358

Indicator 4b: Proportion of patients with a PIVC in situ over an area of flexion.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/733360

This indicator is specified to include patients with a PIVC in situ for 24 hours or longer.

More information about these indicators and the definitions needed to collect and calculate them can be found online in the above METeOR links.

5

Quality statement 5 – Maximise first insertion success

The likelihood of inserting a PIVC successfully on the first attempt is maximised for each patient, according to a health service organisation’s process for maximising first-time insertion success.

Purpose

To reduce multiple failed insertion attempts that increase the risk of device failure and cause patients undue pain and anxiety, as well as diminished vascular health.

What the quality statement means

■ For patients

Your health service organisation will have a process that describes what your healthcare team should do to avoid too many attempts at inserting your PIVC.^{12,23} For example, if your clinician cannot locate your veins, the process outlines what steps they should follow. They might need to refer you to another clinician or use an ultrasound to help, or use other supportive therapies such as local anaesthetics to help keep you comfortable while your PIVC is inserted.^{21,23}

If they try to insert your PIVC and cannot, it can cause your treatment to be delayed. This is why it is important for your clinician to conduct a thorough assessment of the risk factors that might make inserting your PIVC difficult, and for you to say if you have had any issues with PIVCs in the past.

■ For clinicians

If the clinical presentation of a patient is such that the likelihood of inserting a PIVC successfully on the first attempt is low given your current experience in PIVC insertion, follow your health service organisation’s policy for guidance on how to maximise first-time insertion success. Strategies to optimise first-time insertion success include escalating to a more experienced clinician, using technology-assisted devices such as ultrasound, or adjunct supportive therapies such as local anaesthetics.^{15,17,21,22,43} For paediatric patients, consider using parental support or child play therapy to maximise the likelihood of successful insertion on the first attempt.

Difficult or unsuccessful insertions can cause bruising, thrombosis, delays in treatment, reduced access to veins for future health needs, and undue pain and anxiety for the patient. This is why it is important to conduct a thorough assessment of risk factors that may contribute to difficult insertion, ask the patient about whether they have had issues with PIVC insertions previously, and escalate as per your health service organisation’s policy when required to maximise first-time insertion success. If more than one attempt to insert the PIVC is required, specify the reason (for example, lack of more experienced staff to escalate to in the after-hours setting, or patient dehydration) in the patient’s medical record and act according to local policy.

■ For health service organisations

Support clinicians and promote a culture of maximising first-time insertion success by having policies describing how to achieve this goal. Policies and processes should include:

- What to do if insertion is likely to be difficult
- Recommendations to escalate before any attempt to insert a PIVC if the complexity of the insertion is outside the clinician's expertise
- Specified conditions under which more than one attempt may be appropriate (such as lack of more experienced staff in the after-hours setting).

Strategies to support first-time insertion success may involve referring to a more experienced clinician to ensure that the expertise to insert the PIVC matches the complexity of the patient's clinical presentation, or use of technology-assisted devices such as ultrasound, especially after hours when staffing may be limited. Adequate staff training in the use of technology-assisted devices is required to ensure that they maximise first-time insertion success.^{15,21,23,39}

Indicators for local monitoring

Indicator 5a: Evidence of a locally approved policy that defines the local protocol to support PIVC insertion on first attempt. The protocol should specify the:

- Risk assessment process that should be used to identify patients where insertion of a PIVC may be more complex
- Situations when staff should escalate PIVC insertion to more experienced staff and the process to follow
- Clinical situations when more than one attempt is appropriate
- Organisation's process to assess adherence and outcomes of the policy.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/733362

Indicator 5b: Proportion of patients who report their PIVC was inserted on the first attempt.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/733385

More information about these indicators and the definitions needed to collect and calculate them can be found online in the above METeOR links.

6

Quality statement 6 – Insert and secure

A clinician inserting a patient's PIVC uses standard precautions, including aseptic technique. The device is secured and a sterile, transparent, semipermeable dressing is applied unless contraindicated.

Purpose

To emphasise the need for correct infection prevention and control measures regarding PIVC insertion. The device is secured to minimise complications and unintentional loss of IV access, and the PIVC and insertion site can be easily monitored.

What the quality statement means

■ For patients

Standard precautions are steps your clinician will use to help reduce your risk of infection when they are providing care for you, including when they insert your PIVC. This will include thoroughly cleaning their hands immediately before they touch you and your PIVC, using gloves, and other techniques to prevent germs from getting onto your PIVC and into your bloodstream.

If there is any hair at the insertion site, your clinician will remove it with clippers. They will not shave the hair with a razor as this increases the risk of infection. An antiseptic liquid will be used to clean your skin before your PIVC is inserted, and a dressing will be applied after insertion to help the PIVC stay in place and prevent infection. This is why it is important to tell your clinician about any allergies you have, including allergies to any tapes, so the antiseptics and dressings that are used are best for you.^{16,21–23,36}

■ For clinicians

Insert and secure a PIVC using standard precautions, including aseptic technique.^{12,16–18,21–23}

Carry out a risk assessment to identify the standard precautions required to safely perform the procedure, including performing hand hygiene consistent with the '5 Moments for Hand Hygiene', and adhering to aseptic technique.^{12,44} See Box 4 for standard precautions.

If there is hair at the insertion site, remove with clippers as shaving with a razor increases the risk of infection. Decontaminate the skin with 2% chlorhexidine gluconate in 70% alcohol unless contraindicated, allowing for appropriate cleaning and drying time.¹²

Use a sterile, transparent, semipermeable dressing to secure the PIVC, and consider patient characteristics such as allergies to tapes.^{12,21,23} Secure the dressing, taking care not to contaminate the insertion site.^{15,17} Ensure that the dressing remains intact for the duration of the insertion to prevent complications such as unintended dislodgement.

Ensure that PIVCs are labelled in accordance with the *National Standard for User-applied Labelling of Injectable Medicines, Fluids and Lines*⁵ (the Labelling Standard, see Box 3). Specifically, catheters must be identified when there is a risk of wrong route of administration (for example, where the patient entry port is distant from the administration site).

■ For health service organisations

Ensure that policies and procedures are in place that describe the requirements for the safe insertion and securement of PIVCs. Ensure that policies and procedures outline¹⁷:

- Who can insert a PIVC
- What is needed to insert and secure a PIVC, including skin preparation, equipment and dressings
- What infection control measures to use
- How to dispose of the equipment used to insert and secure the PIVC.

Ensure that systems are in place to enable clinicians to complete training in standard precautions, including the '5 Moments for Hand Hygiene' and aseptic technique.⁴⁴

Ensure compliance with the Labelling Standard.⁵

Box 4: What are standard precautions?^{12,45}

Standard precautions are the minimum work practices that clinicians must use at all times for all patients to minimise the risk of transmitting infection.

Standard precautions include the following nine elements:

- Hand hygiene before and after touching each patient, consistent with '5 Moments for Hand Hygiene'⁴⁴
- Use of personal protective equipment. This may include wearing gloves (wear sterile gloves if there is a risk of touching the skin again after it has been disinfected), impermeable gowns, plastic aprons, masks, face shields and eye protection
- Safe use and disposal of sharps
- Routine environmental cleaning
- Appropriate disinfection and sterilisation of reusable medical equipment and instruments
- Respiratory hygiene and cough etiquette
- Use of aseptic technique for all invasive procedures, including the use of skin disinfectants
- Waste management
- Appropriate handling of linen.

7

Quality statement 7 – Document decisions and care

A patient with a PIVC will have documentation of its insertion, maintenance and removal, and regular review of the insertion site.

Purpose

To ensure that the plan of care for a patient's PIVC is clear and that decisions relating to the PIVC and its condition are accurately recorded and accessible to all clinicians involved in the patient's care.

What the quality statement means

■ For patients

Information about your PIVC will be discussed with you and recorded in your healthcare record or chart. This may include why the PIVC is needed, the type of PIVC, when it was inserted and by whom, its location, the therapy you are receiving, when the PIVC is expected to be removed and when it is actually removed. Your PIVC will be checked regularly and the findings will be noted down. If complications develop, the complications and what your clinician did about them will also be recorded.^{12,15,17,20–23,39} This will help your healthcare team to be aware of decisions made about your PIVC and any problems that arise.

■ For clinicians

Ensure that the plan of care for a patient's PIVC is recorded according to local policy in a place that is easily accessible to all clinicians involved in the patient's care (see Box 5).

Box 5: Plan of care for a patient's PIVC

The following should be recorded for all PIVCs* intended to remain in situ and made accessible to all clinicians^{12,15,17,20-23,39}.

Insertion

- Why a PIVC is needed
- Length and gauge of the PIVC
- Where the PIVC is located
- Who inserted the PIVC
- Date and time of insertion (this should also be recorded on the label where required)
- Infection prevention and control methods used (use of aseptic technique, dressing, and any issues arising during insertion).

Maintenance

- Results of site assessments, including condition of the dressing
- Any patient-reported changes
- Care provided, including by whom and when.

Removal

- Details about when the device is expected to be removed
- Results of assessments of the need for the PIVC
- Date and time the PIVC is removed, by whom and the reason for removal
- Observations of the insertion site after removal.

* Excludes PIVCs inserted for diagnostic imaging only.

■ For health service organisations

Support clinicians to maintain accurate and complete healthcare records about a patient's infusion therapy by ensuring that organisational policies and procedures describe the complete requirements for documentation, where to document and how often documentation should occur.

At a minimum, documentation should include information about inserting, maintaining and removing PIVCs, and reviewing the insertion site.¹⁷

If an electronic system is used for records, ensure that it captures the date and time of insertion, and confirms that the PIVC has been removed before the patient is discharged from hospital. Details about any adverse events such as infection, infiltration or extravasation, and the actions taken to deal with them, should also be documented.^{15,17,20-23}

Ensure that complete and accurate healthcare records are available at the point of care so that all clinicians involved in the patient's care are aware of the plan for the patient's infusion therapy. Monitor documentation procedures to ensure that they adhere to the organisational process, and provide feedback to clinicians as part of ongoing quality improvement.

Indicators for local monitoring

Indicator 7a: Evidence of a locally approved policy that defines the documentation for PIVC insertion, maintenance, removal, and regular review. The policy should specify:

- The information that must be documented in the medical record for every PIVC inserted, including, indication for insertion, maintenance and removal
- How often documentation should occur
- The organisation's process to assess adherence to the policy.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735072

Indicator 7b: Proportion of patients with a PIVC in situ with the indication for insertion documented in their medical record.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735081

More information about these indicators and the definitions needed to collect and calculate them can be found online in the above METeOR links.



Quality statement 8 – Routine use: inspect, access and flush

A patient's PIVC and insertion site is inspected by a clinician for signs of complications at least once per shift or every eight hours, when accessing the device, and if the patient raises concerns. Standard precautions including aseptic technique are used when performing site care and accessing the PIVC. Patency is checked and flushing is performed at intervals according to local policy to assess device function and minimise risk of device failure.

Purpose

To reduce the risk of PIVC device failure and preserve vessel health by ensuring that PIVCs are regularly reviewed and access is maintained using standard precautions, including aseptic technique. PIVCs are also flushed at intervals according to local policy to maintain patency, reduce the risk of blockage, and prevent mixing of incompatible medicines or solutions.

What the quality statement means

■ For patients

To make sure your PIVC continues to function properly, your clinician will check your PIVC at least once every shift or every eight hours^{16,17}, each time they use the device, and if you raise any concerns about it.

Specifically, your clinician will check^{15,17,21,23}:

- For pain, swelling or redness of your skin around your PIVC
- For any signs of infection, including fever (feeling hot, cold or shivery)
- For leaking or blockage
- That your PIVC is still firmly in place
- That the dressing covering the insertion site has not become bloodstained, wet or loose
- Whether anything else about your PIVC is concerning you.

Your clinician will provide regular care to prevent complications from developing, but it is important that you tell your clinician if you notice any of these problems.

Each time your PIVC needs to be touched, your clinician will thoroughly clean their hands and take precautions to make sure the PIVC stays clean.^{12,15,17,21,23} They will check that your PIVC is flowing properly (patency), and will also flush it from time to time to make sure it does not get blocked.^{15-17,20-23}

It is important that you do not touch, fiddle with or move your PIVC.

■ For clinicians

Inspect

Routinely inspect the PIVC and insertion site, for signs of complications that can lead to device failure. This should happen at least once per shift (or per eight hours)^{12,16,17} and when accessing the device, or if the patient raises any concerns about it. More frequent inspection may be required for some patients, or according to local policy, for example for paediatric patients. In particular, check^{15,17,18,21,23,34}:

- For signs of pain, swelling or redness at the insertion site, by visual inspection through the transparent dressing and gentle palpation through the dressing^{46,47}
- The condition of the patient's veins, and whether they have become hardened or thrombosed
- For signs of localised or systemic infection; if either are confirmed, report as per local policy in an incident management system
- For leakage of fluid from the insertion site, signs of occlusion, infiltration or extravasation
- Whether the PIVC remains appropriately dressed and secured.

As part of the review, ask the patient questions to check whether they are tolerating their PIVC¹², and whether they understand why it is needed and the treatment they are having. Explain the reasons for checking the device, and the signs and symptoms you are looking for that might suggest that problems are developing.

Ask the patient if they have any concerns associated with the use of their PIVC and deal with these concerns. Check that the patient knows what signs and symptoms to report, including local site complications such as pain, redness, swelling, skin irritation or fever.¹² Advise about the importance of telling their clinician if they think complications are developing so that they can be addressed immediately.

Access

Use standard precautions, including aseptic technique, when accessing the PIVC or performing site care to help reduce the risk of PIVC-associated infections. Decontaminate needleless connectors before and after access with 70% alcohol¹² or other solution recommended in current evidence-based or best-practice guidelines, and allow to fully air dry.³⁶

Flush

Flush the PIVC using a solution recommended in current evidence-based or best-practice guidelines and at intervals according to local policy, to maintain line patency, reduce the risk of blockage, and prevent mixing of incompatible medicines or fluids.^{15,17,21,23}

■ For health service organisations

Ensure that evidence-based policies and procedures are in place outlining what is needed to access, maintain and flush a PIVC. Ensure that equipment is available at the point of care to ensure that hand hygiene and aseptic technique are maintained every time the PIVC is reviewed, accessed or flushed.

Indicators for local monitoring

Indicator 8a: Proportion of patients with a PIVC in situ who have their PIVC insertion site inspected for complications at least every 8 hours.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735083

Indicator 8b: Proportion of patients with a PIVC in situ with a clean, dry and secure PIVC dressing.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735085

More information about these indicators and the definitions needed to collect and calculate them can be found online in the above METeOR links.

9

Quality statement 9 – Review ongoing need

The ongoing need for a patient's PIVC is reviewed and documented at least daily, or more often if clinically indicated.

Purpose

To ensure that PIVCs are promptly removed when they are no longer needed.⁴⁸

What the quality statement means

■ For patients

Your clinician will review your PIVC at least once a day to make sure that it is still needed. If it is not needed any more, it will be removed.^{12,15,16,18,23,34} If your PIVC has not been used in the last 24 hours, ask your clinician if it is still needed.

■ For clinicians

Review and document the ongoing clinical need for a patient's PIVC at least once per day, or more often if clinically indicated. Review whether switching from IV to oral therapy is possible. Remove the PIVC immediately if it is no longer required.^{12,15,16,18,23,34}

If extended IV therapy is anticipated, consider whether an alternative device, such as a peripherally inserted central catheter or central line, should be inserted (see quality statement 1).

■ For health service organisations

Ensure that policies are in place which describe the need for at least daily review of ongoing need for IV access, and for immediate removal of PIVCs when they are no longer needed.^{12,15,16,18,34}

Indicator for local monitoring

Indicator 9: Proportion of patients with a PIVC in situ who have been assessed in the last 24 hours to determine the ongoing need for their PIVC.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735087

More information about this indicator and the definitions needed to collect and calculate it can be found online in the above METeOR link.

10

Quality statement 10 – Remove safely and replace if needed

A patient with a PIVC will have it removed when it is no longer needed or at the first sign of malfunction or local site complications. A new PIVC will be inserted only if ongoing peripheral vascular access is necessary, consistent with the replacement recommendations in the current version of the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*.

Purpose

To minimise complications by ensuring that PIVCs are removed safely when they are no longer needed, when they malfunction or when complications develop. Replacement with a new device only occurs when IV therapy needs to continue.

What the quality statement means

■ For patients

Your PIVC will be removed when it is no longer needed.^{12,15,17,18,34} If you are unsure when it will be removed, ask your clinician.

If your PIVC has malfunctioned or there are signs of problems such as pain, redness or swelling, and your treatment is not finished yet, your clinician will need to remove your PIVC and replace it with a new one. Your clinician will also make sure that your PIVC is replaced as often as current Australian guidelines recommend.¹²

If you are going home and your PIVC is still in place, ask your clinician if it can be removed.

■ For clinicians

Remove PIVCs as soon as they are no longer needed – for example, if a patient can tolerate oral therapy – or if complications occur.¹⁶ Signs and symptoms that indicate that the PIVC should be removed include^{15,17}:

- Pain and tenderness at the insertion site, with or without palpation
- Warmth, redness or swelling
- Leakage of fluid from the insertion site
- Resistance when flushing or absence of blood return.

Ensure removal and replacement of PIVCs is in accordance with the current version of the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*.¹² See Box 6 for a summary of the recommendations.

Box 6: Recommendations for replacement of PIVCs – from the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*¹²

Do not routinely replace PIVCs in neonates and children.

For adults, there are two options for the replacement of PIVCs. Policies on the replacement of PIVCs should be based on a formal risk assessment that takes into account:

- The availability of staff appropriately trained in the insertion, monitoring, assessment and maintenance of PIVCs on each shift
- The quality of PIVC surveillance in the healthcare facility, including surveillance of regular inspection of the site and device, and of PIVC-related *Staphylococcus aureus* bacteraemia (SAB)
- The need for robust documentation and reporting processes on device insertion, maintenance and removal that is supported by the results of audits.

In considering the above factors, healthcare facilities may routinely follow one of the following two options:

Option 1: Replace a PIVC every 72 hours

This practice is based on observational studies that show an increased risk of bloodstream infection with PIVCs left in place for more than 72 hours.

Option 2: Replace a PIVC based on clinical indication

A strategy of replacing a PIVC when a clinical indication for replacement is identified (rather than routinely at 72 hours) may be considered only when there is:

- Surveillance of PIVC-related bloodstream infection performed at the facility
- Comprehensive documentation of insertion, maintenance and removal of PIVCs (audit results demonstrate a sustained compliance with daily PIVC assessment documentation)
- Compliance with competency requirements for insertion and management.

This option is informed by a systematic review, first published in 2011 and updated most recently in 2015, which concluded that rates of bloodstream infection and thrombophlebitis were not significantly different when PIVCs were changed based on clinical indication rather than routinely replaced.

Replacing a PIVC based on clinical indication can be cost saving and may reduce the discomfort for patients associated with regular replacement.

Quality statement 10

Document the reason for removal of the PIVC and the condition of the site. Observe the insertion site for 48 hours after the PIVC is removed for signs of post-infusion pain, redness or swelling. If the patient is discharged from hospital, explain what signs they should look out for after the PIVC is removed and who they should contact if signs of infection develop.

Replace with a new PIVC if ongoing vascular access is required. If extended IV therapy is anticipated, consider whether an alternative device, such as a peripherally inserted central catheter or central line, should be inserted (see quality statement 1).

Consider re-siting PIVCs, within 24 hours, when adherence to aseptic technique is uncertain or unknown, such as insertion during a medical emergency.^{12,18,23}

For hospitalised patients, ensure that PIVCs are removed before discharge, unless the PIVC is intended to continue beyond discharge as part of the patient's care plan.

For health service organisations

Ensure that systems are in place that state the considerations for when a PIVC should be removed and replaced, and monitor adherence to guideline recommendations for ongoing quality improvement. These systems should be based on a formal risk assessment that takes into account:

- The availability of staff appropriately trained in the insertion, monitoring, assessment and maintenance of PIVCs on each shift
- The quality of PIVC surveillance in the healthcare facility, including surveillance of regular inspection of the site and device, and of PIVC-related *Staphylococcus aureus* bacteraemia (SAB)
- The need for robust documentation and reporting processes on device insertion, maintenance and removal that is supported by the results of audits.²¹

Indicator for local monitoring

Indicator 10: Proportion of patients with a PIVC in situ that has not been used for a therapeutic purpose in 24 hours.

METeOR link: meteor.aihw.gov.au/content/index.phtml/itemId/735089

More information about this indicator and the definitions needed to collect and calculate it can be found online in the above METeOR link.

Appendix A:

General principles of care

This clinical care standard aligns with key principles that are the foundation for achieving safe, high-quality care. When implementing this clinical care standard, health services should ensure quality improvement activities support these principles.

Person-centred care

Person-centred care is health care that is respectful of, and responsive to, the preferences, needs and values of patients and consumers.^{49,50}

Clinical care standards support the key principles of person-centred care, namely:

- Treating patients with dignity and respect
- Encouraging patient participation in decision-making (see 'Shared decision making')
- Communicating with patients about their clinical condition and treatment options
- Providing patients with information in a format that they understand and encouraging them to participate in decision-making.

Shared decision making

Shared decision making involves discussion and collaboration between a consumer and their clinician. It is about bringing together the consumer's values, goals and preferences with the best available evidence about benefits, risks and uncertainties of treatment, to reach the most appropriate healthcare decisions for that person.

Involving support people

The *Australian Charter of Healthcare Rights* (second edition)⁵¹ describes the rights that consumers, or someone they care for, can expect when receiving health care.

Patients have the right to involve the people they want in planning and making decisions about their health care and treatment. This could be a family member, carer, friend or a consumer advocate such as a social worker. Many health services employ different types of liaison officers, such as Aboriginal and/or Torres Strait Islander liaison officers, who can provide patients with advocacy, information and support.

This clinical care standard does not specifically refer to carers and family members, but statements which refer to clinicians' discussions with patients about their care should be understood to include support people if this is what the patient wishes, or a substitute decision-maker if the person is unable to provide their consent.

Informed consent

Informed consent is a person's voluntary and informed decision about a health care treatment, procedure or intervention that is made with adequate knowledge and understanding of the benefits and risks to them, and the alternative options available. The Commission developed an informed consent fact sheet for consumers, available at: safetyandquality.gov.au/informed-consent.

Action 2.4 in the National Safety and Quality Health Service (NSQHS) Standards requires health service organisations to ensure that informed consent processes comply with legislation and best practice.⁴⁹

Cultural safety and patient safety

Cultural safety is about overcoming the cultural power imbalances of places, people and policies to contribute to improvements in Aboriginal and Torres Strait Islander health.⁵²

The *Cultural Respect Framework 2016–2026*⁵³ commits the Australian Government and all states and territories to embed cultural respect principles into their health systems. The framework should be used to develop, implement and evaluate cultural awareness and cultural competency strategies.

Health consumers are safest when clinicians have considered power relations, cultural differences and patients' rights. Part of this process requires clinicians to review their own beliefs and attitudes.⁵⁴

The NSQHS Standards *User Guide for Aboriginal and Torres Strait Islander Health*⁵⁴ describes six specific actions that aim to help health services improve the quality of care and health outcomes for Aboriginal and Torres Strait Islander peoples.⁴⁹

Appendix B:

Indicators to support local monitoring

The Commission has developed a set of indicators to support clinicians and health service organisations in monitoring how well they implement the care described in this clinical care standard. The indicators are a tool to support local quality improvement activities. No benchmarks are set for any indicator.

The process to develop the indicators specified in this document comprised:

- A review of existing Australian and international indicators and relevant research⁵⁵
- Prioritisation, review and refinement of the indicators with the topic working group.

All of the data underlying these indicators are collected from local sources, through the review of policies and protocols.

In this document, the indicator titles and hyperlinks to the specifications are included with the relevant quality statement under the heading 'Indicator for local monitoring'. Full specifications of the Management of Peripheral Intravenous Catheters Clinical Care Standard indicators can be found in the Metadata Online Registry (METeOR): meteor.aihw.gov.au/content/index.phtml/itemId/732513.

METeOR is Australia's web-based repository for national metadata standards for the health, community services and housing assistance sectors. Hosted by the Australian Institute of Health and Welfare, METeOR provides users with online access to a wide variety of nationally endorsed data and indicator definitions.

Other Commission-endorsed indicators to support local monitoring of the overall quality of PIVC management

As the goal of this clinical care standard is to promote the judicious use of PIVCs and to reduce complications, the Commission also recommends monitoring complications relating to management of PIVCs through existing indicators.

Hospital-acquired complications

A hospital-acquired complication (HAC) refers to a complication for which clinical risk mitigation strategies may reduce (but not necessarily eliminate) the risk of that complication occurring.⁵⁶ The HACs list comprises 16 agreed, high-priority complications for which clinicians, managers and others can work together to address and improve patient care. Each of the HACs has a number of associated diagnoses and codes, which allow further exploration of the data. Data for HACs are derived from the admitted patient data collection.

The HACs list can be used to monitor the rate of healthcare-associated infections using already collected data. The HACs can also be used to monitor complications specifically associated with PIVCs using the code T82.75 'Infections or inflammatory complications associated with peripheral catheters'.

The Commission has developed a number of resources for clinicians, managers and executives, governing bodies and others, to put in place strategies that reduce the occurrence of HACs.

These are available at www.safetyandquality.gov.au/our-work/indicators/hospital-acquired-complications.⁵⁷

***Staphylococcus aureus* bacteraemia**

The rate of *Staphylococcus aureus* bacteraemia (SAB) is a key performance indicator for acute care hospitals in Australia. Data on cases of healthcare-associated SAB within Australian hospitals are already collected routinely in all states and territories and reported nationally. Such data can help hospitals track their efforts to monitor and reduce rates of healthcare-associated SAB.

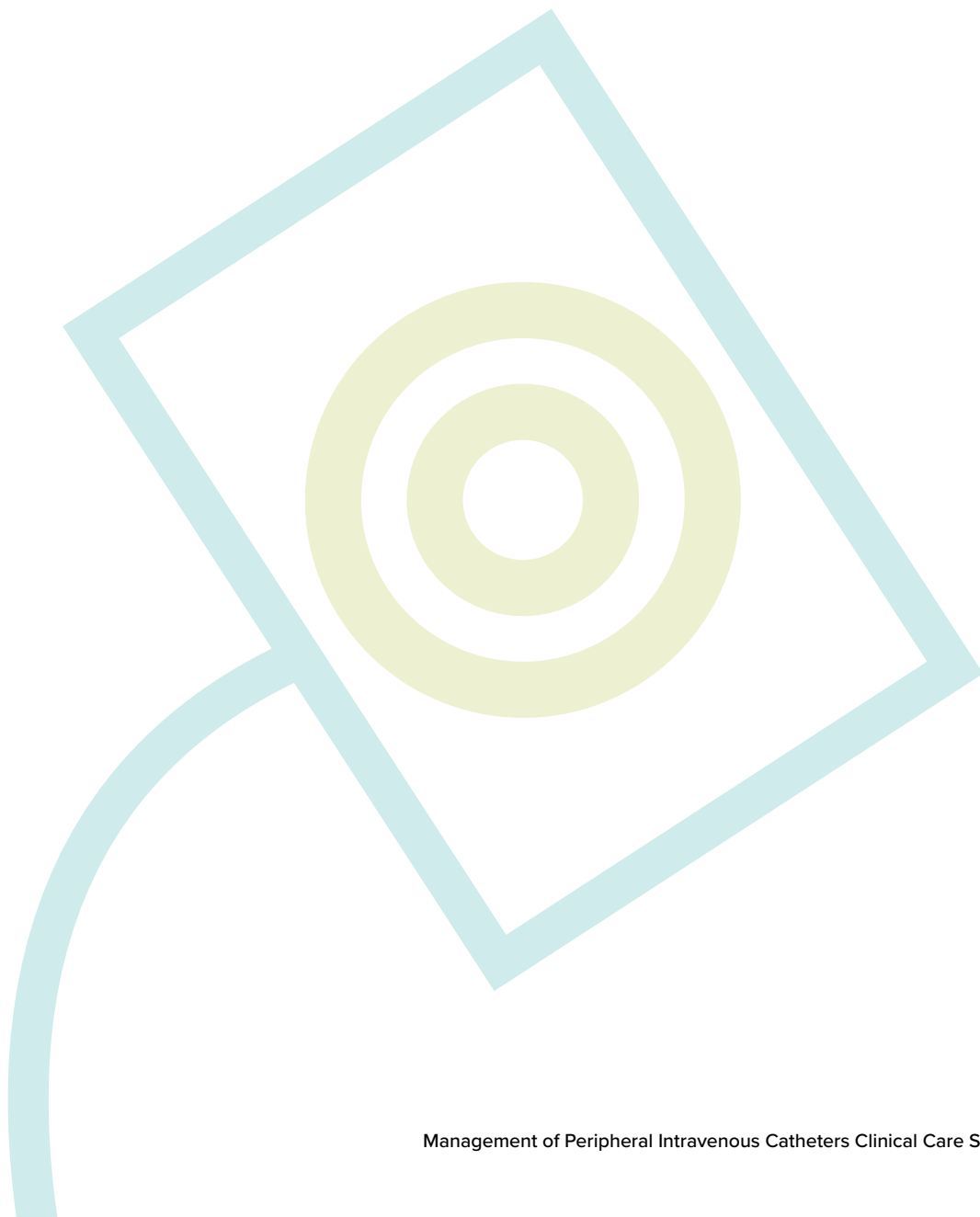
More information about healthcare-associated SAB, including implementation guides for surveillance and dataset specifications, are available at:

- www.safetyandquality.gov.au/our-work/healthcare-associated-infection/national-hai-surveillance-initiative/
- www.safetyandquality.gov.au/our-work/healthcare-associated-infection/national-hai-surveillance-initiative/surveillance-initiative-publications/

National Hand Hygiene Initiative

The Commission established the National Hand Hygiene Initiative (NHHI) in 2008 as part of a suite of initiatives to prevent and reduce healthcare-associated infections in Australia. The NHHI strives to improve infection prevention and control measures in Australian health care facilities. The NHHI has a focus on improving hand hygiene compliance rates across healthcare workers.

More information about the NHHI is available at www.safetyandquality.gov.au/our-work/infection-prevention-and-control/national-hand-hygiene-initiative.



Appendix C:

Measuring and monitoring patient experiences

Systematic, routine monitoring of patients' experiences of, and outcomes from, health care is an important way to ensure that the patient's perspective drives service improvements and person-centred care. This is the case in all health services.

Patient experience measures

While this clinical care standard does not include indicators specific to measuring patient experiences, the Commission strongly encourages health services to use the Australian Hospital Patient Experience Question Set (AHPEQS). AHPEQS is a 12-question generic patient experience survey that has been validated in both day-only and admitted hospital patients across many clinical settings. The [instrument is available for download](#) to both private and public sector health services.

Patient-reported outcome measures

In Australia, patient-reported outcome measures (PROMs) are an emerging method of assessing the quality of health care. The Commission is leading a national work program to support the consistent and routine use of PROMs to drive quality improvement.

PROMs are standardised, validated questionnaires that patients complete, without any input from healthcare providers. They are often administered at least twice to an individual patient – at baseline and again after an intervention, or at regular intervals during a chronic illness. The information contributed by patients filling out PROMs questionnaires can be used to support and monitor the movement of health systems towards person-centred, value-based health care.

PROMs are being used to evaluate healthcare effectiveness at different levels of the health system, from the individual level to service and system levels. There is growing interest across Australia and internationally in the routine interrogation of patient-reported outcome information for evaluation and decision-making activities at levels of the health system beyond the clinical consultation.

Appendix D:

Integration with National Standards

National Safety and Quality Health Service Standards

Monitoring the implementation of this clinical care standard will help organisations to meet some of the requirements of the National Safety and Quality Health Service (NSQHS) Standards (second edition).⁴⁹

The NSQHS Standards aim to protect the public from harm and improve the quality of health service provision. They provide a quality assurance mechanism that tests whether relevant systems are in place to ensure that expected standards of safety and quality are met.

Within the NSQHS Standards, the Clinical Governance Standard and the Partnering with Consumers Standard combine to form the clinical governance framework for all health service organisations that applies to all other standards.

- The Clinical Governance Standard aims to ensure that systems are in place within health service organisations to maintain and improve the reliability, safety and quality of health care.
- The Partnering with Consumers Standard aims to ensure that consumers are partners in the design, delivery and evaluation of healthcare systems and services, and that patients are given the opportunity to be partners in their own care, to the extent that they choose.

Action 1.27b and Action 1.28

Under the NSQHS Standards (2nd ed.), health service organisations are expected to support clinicians to use the best available evidence, including clinical care standards such as the *Management of Peripheral Intravenous Catheters Clinical Care Standard* (see Action 1.27b of the NSQHS Standards).

Health service organisations are expected to implement the NSQHS Standards in a way that suits the clinical services provided and their associated risks. Specific aspects of the NSQHS Standards (2nd ed.) that are relevant to inserting, managing and removing PIVCs include those listed on page 40.

Information about the NSQHS Standards is available at the [NSQHS Standards website](#).

Actions in the NSQHS Standards relevant to this clinical care standard

Standard 1: Clinical Governance Standard

	Action
Governance, leadership and culture	1.1, 1.2
Patient safety and quality systems	1.8, 1.11
Policies and procedures	1.7
Healthcare records	1.16
Credentialing and scope of clinical practice	1.23, 1.24
Evidence-based care	1.27
Variation in clinical practice and health outcomes	1.28

Standard 2: Partnering with Consumers Standard

	Action
Healthcare rights and informed consent	2.3–2.5
Sharing decisions and planning care	2.6, 2.7
Communication that supports effective partnerships	2.9, 2.10

Standard 3: Preventing and Controlling Healthcare-Associated Infection Standard

	Action
Integrating clinical governance	3.1
Applying quality improvement systems	3.2
Partnering with consumers	3.3
Surveillance	3.4
Standard and transmission-based precautions	3.5–3.7
Hand hygiene	3.8
Aseptic technique	3.9
Invasive medical devices	3.10

Standard 4: Medication Safety Standard

	Action
Integrating clinical governance	4.1
Applying quality improvement systems	4.2
Partnering with consumers	4.3
Medicines scope of clinical practice	4.4
Information and decision support tools for medicines	4.13
High-risk medicines	4.15

Standard 8: Recognising and Responding to Acute Deterioration Standard

	Action
Responding to deterioration	8.10

Glossary

Term	Definition
adverse events	Unintended and sometimes harmful occurrences associated with the use of a medicine, vaccine or medical device (collectively known as therapeutic goods). Adverse events include side effects to medicines and vaccines, and problems or incidents involving medical devices. ⁵⁸
antiseptics	Antimicrobial substances that are applied to the skin to reduce the number of microorganisms. Examples include topical alcohols, chlorhexidine, triclosan and iodine. ²³
aseptic technique	A technique that aims to prevent microorganisms on hands, surfaces and equipment from being introduced to susceptible sites. Unlike sterile technique, aseptic techniques can be achieved in typical ward and home settings. ³⁸
attempt	An effort at inserting a PIVC at one site. ²³
assessment	A clinician's evaluation of a disease or condition, based on ⁵⁹ : <ul style="list-style-type: none"> ■ The patient's report of the symptoms and course of the illness or condition ■ Information reported by family members, carers and other members of the healthcare team ■ The clinician's objective findings (including data obtained through tests, physical examination and medical history, and information reported by family members and other members of the healthcare team).
best available evidence	The best research evidence available that is used to support decisions about the care of individual patients.
best practice	The diagnosis, treatment or care provided, based on the best available evidence, which is used to achieve the best possible outcomes for the patient.
bloodstream infection	The presence of live pathogen(s) such as bacteria in the blood, causing an infection. ²³
carer	A person who provides care and support to a family member or friend who has a disease, disability, mental illness, chronic condition, terminal illness or general frailty. Carers include parents and guardians caring for children. ³⁸
central line	A catheter inserted into a large vein with the tip residing in the superior or inferior vena cava. ¹⁵
clinical practice guidelines	Systematically developed statements to assist clinician and consumer decisions about appropriate health care for specific circumstances. ³⁸
clinician	Any trained health professional who provides direct clinical care to patients. Clinicians may be registered or non-registered practitioners working individually or in teams. They include medical practitioners, nurses, midwives, allied health professionals, nurses' assistants, phlebotomists (blood collectors), technicians, scientists, students who provide health care under supervision, Aboriginal health workers and all other people who provide healthcare services. ^{37,38}

Term	Definition
competency	For the purpose of this clinical care standard, competency refers to a satisfactory standard of ability based on completion of a relevant training program, and current experience and expertise in PIVC insertion, including an appropriate number of insertions. A competent clinician is not necessarily more senior and may be a registered nurse, midwife or junior medical officer.
consumer	A person who has used, or may potentially use, health services, or is a carer for a patient using health services. A healthcare consumer may also act as a consumer representative to provide a consumer perspective, contribute consumer experiences, advocate for the interests of current and potential health service users, and take part in decision-making processes. ³⁸
decontaminate	To use physical or chemical means to remove, inactivate or destroy pathogens on a surface or item so that the surface or item is no longer capable of transmitting pathogens, and is rendered safe for handling, use or disposal.
device	For the purposes of this clinical care standard, a peripheral intravenous catheter.
difficult intravenous access	At least two failed attempts to insert an intravenous catheter. ²⁸
escalate	An action whereby a clinician who has not been able to insert a PIVC after two attempts refers the procedure according to local policy, to enhance the likelihood of success by co-opting either technology (for example, ultrasound) or a clinician of greater experience.
evidence-based (or best-practice) guideline	A set of recommended actions that are developed using the best available evidence and are used to achieve the best outcomes for a patient. They provide clinicians with evidence-informed recommendations that support clinical practice, and guide clinician and patient decisions about appropriate health care in specific clinical practice settings and circumstances. ⁶⁰
flushing	Moving fluids, medications, blood and blood products out of the PIVC into the bloodstream; used to assess and maintain patency and prevent precipitation due to mixing of incompatible solutions and medicines. ¹⁵
hand hygiene	A general term referring to any action of hand cleansing. ³⁸
healthcare-associated infection	An infection acquired in a health service organisation facility or as a result of a healthcare intervention which may manifest after the patient is discharged from the organisation. ³⁸
healthcare record	Paper or electronic record of the patient’s medical history, treatment notes, observations, correspondence, investigations, test results, photographs, prescription records and medication charts for an episode of care. ³⁸ Includes My Health Record.
health service organisation	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. A service unit involves a group of clinicians and others working in a systematic way to deliver health care to patients. It can be in any location or setting, including pharmacies, clinics, outpatient facilities, hospitals, patients’ homes, community settings, practices and clinicians’ rooms. ³⁸
hospital	A licensed facility providing healthcare services to patients for short periods of acute illness, injury or recovery. ⁶¹

Term	Definition
informed consent	A process of communication between a patient and clinician about options for treatment, care processes or potential outcomes. This communication results in the patient's authorisation or agreement to undergo a specific intervention or participate in planned care. The communication should ensure that the patient has an understanding of the care they will receive, all the available options and the expected outcomes, including success rates and side effects for each option. ³⁸
infection	Invasion and reproduction of pathogens, such as bacteria and viruses, inside the body. This may cause tissue injury and disease. ³⁸
irritant	An agent capable of causing discomfort, such as burning or stinging, or pain as a result of irritation in the internal lumen of the vein. This can occur with or without signs of inflammation. ^{15,17}
medical practitioner	A medically qualified person whose primary role is the diagnosis and treatment of physical and mental illnesses, disorders and injuries. They include general practitioners, medical specialists, interns and residents.
medical record	Paper or electronic record, including My Health Record. See also healthcare record .
medicine	A chemical substance given with the intention of preventing, diagnosing, curing, controlling or alleviating disease, or otherwise improving the physical or mental wellbeing of people. These include prescription, non-prescription, investigational, clinical trial and complementary medicines, regardless of how they are administered. ³⁸
patency	Where a tube, such as a PIVC, or blood vessel is unblocked.
pathogen	A microorganism that can cause disease.
patient	A person who is receiving care in a health service organisation. ³⁸ (Note: for paediatric and neonatal patients, many of the statements relate to a parent, guardian or carer.)
peripheral intravenous cannula	See peripheral intravenous catheter (PIVC) .
peripheral intravenous catheter (PIVC)	A device that is designed to be inserted into, and remain within, a peripheral vein (excludes peripherally inserted central catheters). Peripheral veins are those in the arms, legs, hands and feet.
point of care	The time and location of an interaction between a patient and a clinician to deliver care. ³⁸
prevention	Care that is provided to reduce the risk of complications.
primary care	The first level of care or entry point to the health care system, such as general practice clinics, community health practice (for example, clinics, outreach or home visiting services), ambulance services, pharmacists, or services for specific populations (for example Aboriginal or refugee health services).
procedure	The set of instructions to make policies and protocols operational, which are specific to an organisation. ³⁸

Term	Definition
quality improvement	The combined efforts of the workforce and others – including consumers, patients and their families, researchers, planners, and educators – to make changes that will lead to better patient outcomes (health), better system performance (care) and better professional development. Quality improvement activities may be sequential, intermittent or continuous. ³⁸ Numerous models can be used; all share the same focus to reduce errors, and unnecessary morbidity and mortality.
quality of life	The general wellbeing of a person in terms of health, comfort, functional status and happiness.
risk assessment	Assessment, analysis and management of risks. It involves recognising which events may lead to harm in the future, and minimising their likelihood and consequence. ³⁸
risk factor	A characteristic, condition or behaviour that increases the possibility of disease, injury or loss of wellbeing. ⁶²
scope of practice	The extent of an individual clinician’s approved clinical practice within a particular organisation, based on the clinician’s skills, knowledge, performance and professional suitability, and the needs and service capability of the organisation. ³⁸
shared decision making	A consultation process in which a clinician and a patient jointly participate in making a health decision, having discussed the options and their benefits and harms, and having considered the patient’s values, preferences and circumstances. ³⁸
side effects	Unintended effects from a medicine, treatment or device.
standard precautions	Work practices that provide a first-line approach to infection prevention and control in the healthcare environment, and are used for the care and treatment of all patients. ³⁸
system	The resources, policies, processes and procedures that are organised, integrated, regulated and administered to provide health care. Systems enable the objectives of healthcare standards to be accomplished by addressing risk management, governance, operational processes and procedures, implementation, and training, and by influencing behaviour change to encourage compliance. ³⁸
teach-back	A method that clinicians can use to confirm they have explained to patients what they need to know about their condition in a manner that the patient understands. The clinician asks the patient to state in their own words the key points of the discussion. The cycle continues until the clinician is certain the key messages have been delivered and understood. ³⁷
vesicant	An agent capable of causing tissue damage, such as blistering, when it escapes from the vein into surrounding tissue. ^{15,17}
veins	Vessels that return blood from the tissues to the lungs.

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