Best practice bundles for reducing PIVC infections

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Acknowledgement of Country

We acknowledge the Traditional Owners and their custodianship of the lands on which we meet.

We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country.

We recognise their valuable contributions to Australian and global society.

The Brisbane River pattern from *A Guidance Through Time* by Casey Coolwell and Kyra Mancktelow.

Learning Objectives

- Describe the common reasons for PIVC failure and the prevalence of PIVC bloodstream infection.
- Discuss the rationale for implementing a PIVC insertion and maintenance bundle.
- Identify bundle components which have demonstrated reductions in PIVC-related bloodstream infection and other adverse events.
- Discuss the challenges of bundle implementation and possible strategies to achieve compliance.

Some terminology

PIVC	Peripheral intravenous catheter. Also called IV cannula, PVC, SPC
PICC	Peripherally inserted central catheter
CVAD	Central venous access device. Includes any line whose tip ends in the superior vena cava or right atrium. e.g. PICC, non-tunnelled line, tunnelled line, implanted port, etc.
BSI	Bloodstream infection
CRBSI	Catheter-related BSI = positive CVAD tip culture matching positive blood cultures
CLABSI	Central line associated BSI = positive blood cultures with central line as the only likely source of infection
PLABSI	Peripheral line associated BSI = positive blood cultures with peripheral line as the only likely source of infection
CABSI	Catheter-associated BSI = positive blood cultures in patient with an intravenous catheter of any type
SABSI	Staphylococcus aureus bloodstream infection
VAD	Vascular access device

PIVC Failure and Bloodstream Infection

What the research says …

Up to 70% of hospital patients need at least one PIVC for fluids or medicines during admission.

20% of PIVCs are inserted but never used!

> 25% of PIVCs have NO documentation

> 30% of PIVCs have painful complications or stop working before treatment completion, requiring the insertion of a new device.

Use of Short Peripheral Intravenous Catheters: Characteristics, Management, and Outcomes Worldwide

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Peripheral intravenous catheter infection and failure: A systematic review and meta-analysis

Nicole Marsh [a,b,c,d,e,*], Emily N. Larsen [a,b,c,d], Amanda J. Ullman [a,b,d,e,f], Gabor Mihala [b,c,d], Marie Cooke [a,b,d], Vineet Chopra [g,h], Gillian Ray-Barruel [b,c,d,e,i], Claire M. Rickard [a,b,d,e,i,j]

Common reasons for PIVC failure

Phlebitis/ Local infection

Image source: Liverpool Hospital

Infiltration/ Extravasation

Google images

Occlusion

Google images

Dislodgement

Lineus Medical®

Bloodstream infection (BSI)

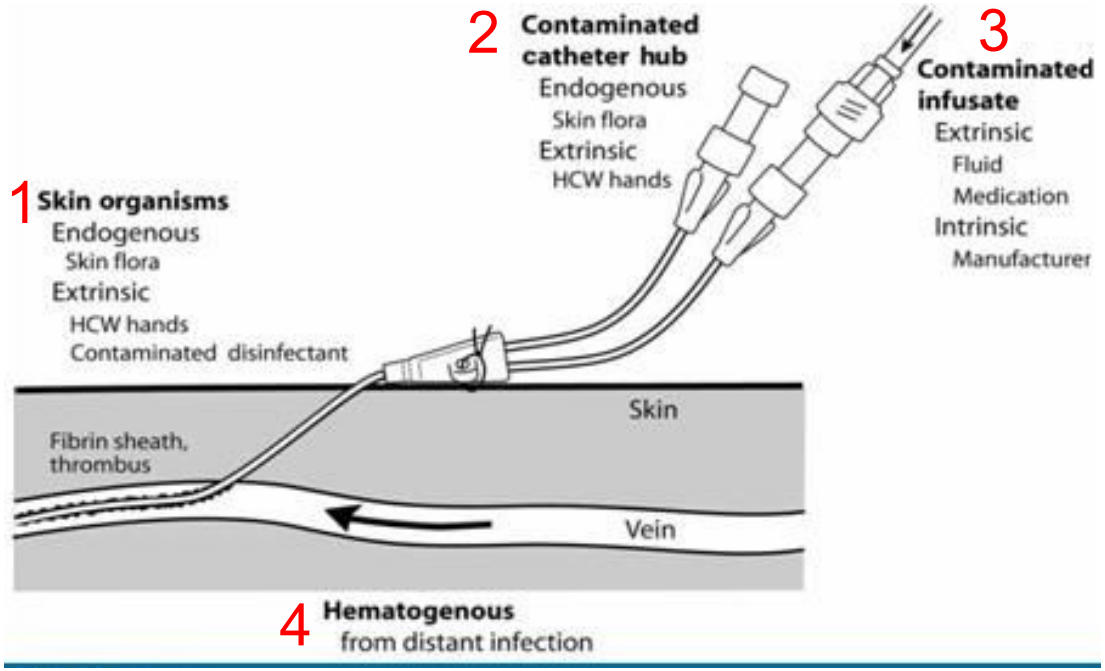
On average, 5 in 1000 patients get a BSI from a CVAD. (Rosenthal, 2023)

On average, 2 in 1000 patients get a BSI from a PIVC. (Marsh, 2024)

These are preventable!

Staphylococcus aureus is the most common pathogen.

Bloodstream Infection (BSI) Pathways



HCW = healthcare worker

Image source: Crnich & Maki, 2002. Open Access.

Care Bundles

What is a care bundle?

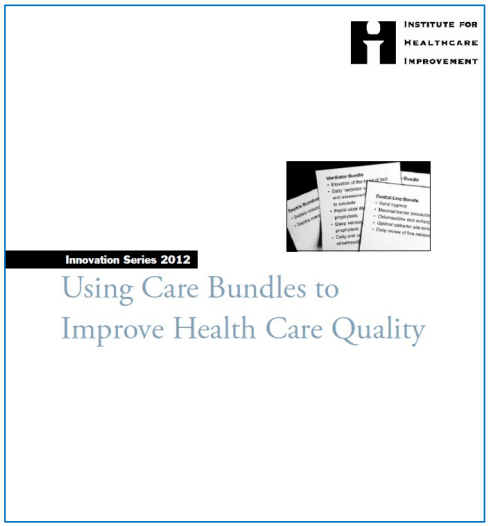
"A small set of **evidence-based** interventions for a defined patient population and care setting that, when implemented together, will result in significantly better outcomes than when implemented individually."

(IHI, 2012)




High reliability of care processes that can prevent serious adverse events "would result in vastly improved outcomes"

(IHI, 2012)



Examples:

1. Surgical checklist
2. Central line insertion bundle

Designing a care bundle …

3 to 5 elements (interventions), with strong clinician agreement.

Each bundle element is based on evidence.

Each bundle element is relatively independent.

Each element should be considered for every patient in that population & location.

Bundles are *descriptive*, not prescriptive (always allow for clinical judgment).

Compliance monitoring is key to success.

(IHI, 2012)

Compliance

"When compliance is measured for a core set of accepted elements of care for a clinical process, the necessary teamwork and cooperation required will result in high levels of sustained performance not observed when working to improve individual elements."

(IHI 2012)

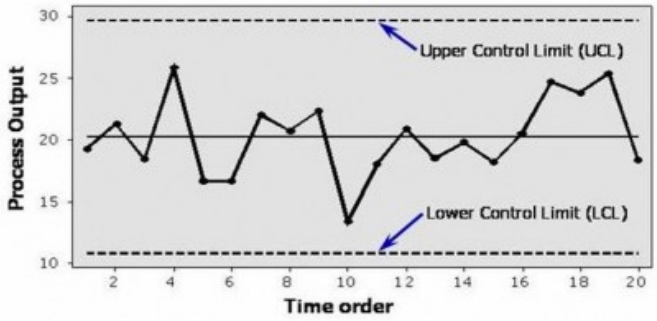
Compliance monitoring builds a safer, reliable system

Compliance is measured by documentation of adherence to all elements of the bundle.

Goal is 95% or greater.

Use Statistical Process Charts to track performance over time.

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Total
Element 1	✗	✓	✓	✓	✗	60%
Element 2	✓	✓	✓	✓	✓	100%
Element 3	✓	✗	✓	✓	✓	80%
Element 4	✓	✓	✗	✓	✓	80%
Element 5	✓	✓	✓	✓	✓	100%
Element 6	✓	✗	✓	✓	✓	80%
Overall	80%	60%	80%	100%	80%	20%



"Measuring compliance with each bundle element, as well as all-or-none compliance, is the first step in building a reliable system."

(IHI 2012)

What makes a good bundle?

*****
Bundle components are evidence-based, with references
Implementation strategies are clearly described
Compliance is measured and reported
Outcomes are fully reported, with raw data as well as percentages
Repeated measures over time
Outcomes clearly demonstrate improvement

(IHI, 2012)

What makes a good bundle?

*****	***
Bundle components are evidence-based, with references	Some bundle components may not be evidence-based
Implementation strategies are clearly described	Implementation strategies may/may not be clear
Compliance is measured and reported	Compliance may/may not be measured/reported
Outcomes are fully reported, with raw data as well as percentages	Some outcomes not reported, or missing data
Repeated measures over time	Inadequate follow-up over time
Outcomes clearly demonstrate improvement	**Unclear evidence for improvement**

(IHI, 2012)

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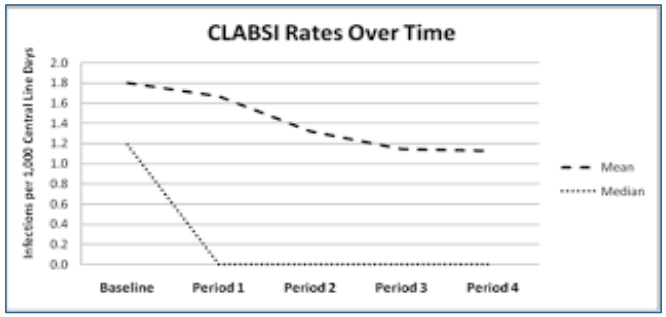
What makes a good bundle?

*****	***	*
Bundle components are evidence-based, with references	Some bundle components may not be evidence-based	Some bundle components are not evidence-based
Implementation strategies are clearly described	Implementation strategies may/may not be clear	Implementation strategies are not clear
Compliance is measured and reported	Compliance may/may not be measured/reported	Compliance is not measured/ reported
Outcomes are fully reported, with raw data as well as percentages	Some outcomes not reported, or missing data	Outcomes not reported, or missing data
Repeated measures over time	Inadequate follow-up over time	Inadequate follow-up over time
Outcomes clearly demonstrate improvement	**Unclear evidence for improvement**	**Lacks evidence for improvement**

(IHI, 2012)

The focus on CLABSI …



The CDC central line bundle

- Hand hygiene
- Aseptic technique
- Maximal barrier precautions
- Chlorhexidine & alcohol skin antisepsis
- Optimal catheter site selection (avoid femoral, especially in obese adults)
- Daily review of line necessity, with prompt removal of unneeded lines
- Ultrasound / ECG guided insertion
- Sterile adherent dressing
  - sterile gauze dressing or sterile transparent, semipermeable dressing
  - CHG dressing for patients >18 years

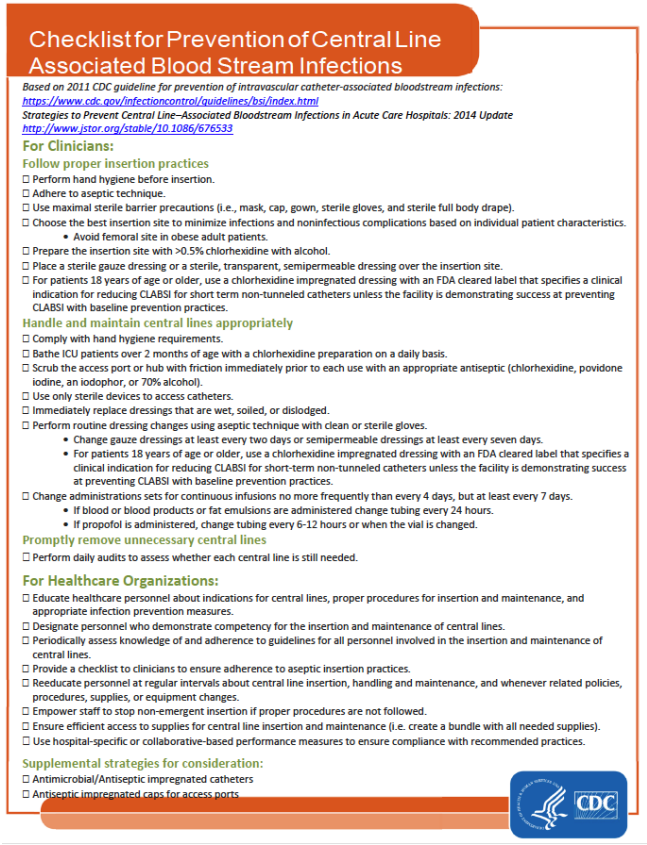
www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf

Image source: AVATAR

Updated CDC central line checklist (bundle)

Updated bundle now includes

- all the elements of the CVAD insertion bundle
- a checklist for healthcare organisations, requiring that hospitals provide:
  - Education for healthcare personnel about central lines, insertion and maintenance, infection prevention
  - Competency assessment for inserters
  - Periodically assess knowledge of and adherence to guidelines for HCWs regarding insertion and maintenance of CVADs.
  - A checklist to ensure aseptic insertion
  - Re-education of staff periodically, particularly when policies, supplies or technology changes.



Checklist for Prevention of Central Line Associated Blood Stream Infections

Based on 2011 CDC guideline for prevention of intravascular catheter-associated bloodstream infections:
https://www.cdc.gov/infectioncontrol/guidelines/bsi/index.html
Strategies to Prevent Central Line–Associated Bloodstream Infections in Acute Care Hospitals: 2014 Update
http://www.jstor.org/stable/10.1086/676533

For Clinicians:

Follow proper insertion practices

☐ Perform hand hygiene before insertion.
☐ Adhere to aseptic technique.
☐ Use maximal sterile barrier precautions (i.e., mask, cap, gown, sterile gloves, and sterile full body drape).
☐ Choose the best insertion site to minimize infections and noninfectious complications based on individual patient characteristics.
- Avoid femoral site in obese adult patients.

☐ Prepare the insertion site with >0.5% chlorhexidine with alcohol.
☐ Place a sterile gauze dressing or a sterile, transparent, semipermeable dressing over the insertion site.
☐ For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.

Handle and maintain central lines appropriately

☐ Comply with hand hygiene requirements.
☐ Bathe ICU patients over 2 months of age with a chlorhexidine preparation on a daily basis.
☐ Scrub the access port or hub with friction immediately prior to each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
☐ Use only sterile devices to access catheters.
☐ Immediately replace dressings that are wet, soiled, or dislodged.
☐ Perform routine dressing changes using aseptic technique with clean or sterile gloves.
- Change gauze dressings at least every two days or semipermeable dressings at least every seven days.
- For patients 18 years of age or older, use a chlorhexidine impregnated dressing with an FDA cleared label that specifies a clinical indication for reducing CLABSI for short-term non-tunneled catheters unless the facility is demonstrating success at preventing CLABSI with baseline prevention practices.

☐ Change administrations sets for continuous infusions no more frequently than every 4 days, but at least every 7 days.
- If blood or blood products or fat emulsions are administered change tubing every 24 hours.
- If propofol is administered, change tubing every 6-12 hours or when the vial is changed.

Promptly remove unnecessary central lines

☐ Perform daily audits to assess whether each central line is still needed.

For Healthcare Organizations:

☐ Educate healthcare personnel about indications for central lines, proper procedures for insertion and maintenance, and appropriate infection prevention measures.
☐ Designate personnel who demonstrate competency for the insertion and maintenance of central lines.
☐ Periodically assess knowledge of and adherence to guidelines for all personnel involved in the insertion and maintenance of central lines.
☐ Provide a checklist to clinicians to ensure adherence to aseptic insertion practices.
☐ Reeducate personnel at regular intervals about central line insertion, handling and maintenance, and whenever related policies, procedures, supplies, or equipment changes.
☐ Empower staff to stop non-emergent insertion if proper procedures are not followed.
☐ Ensure efficient access to supplies for central line insertion and maintenance (i.e. create a bundle with all needed supplies).
☐ Use hospital-specific or collaborative-based performance measures to ensure compliance with recommended practices.

Supplemental strategies for consideration:

☐ Antimicrobial/Antiseptic impregnated catheters
☐ Antiseptic impregnated caps for access ports

CDC

Ref: www.cdc.gov/hai/pdfs/bsi/checklist-for-clabsi.pdf

CVAD bundles decrease BSI

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Original article

Care bundles to reduce central line-associated bloodstream infections in the neonatal unit: a systematic review and meta-analysis

Victoria Payne,[1] Mike Hall,[2] Jacqui Prieto,[1] Mark Johnson[2,3]

Rev. Latino-Am. Enfermagem
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DOI: 10.1590/1518-8345.1233.2787
www.eerp.usp.br/rlae

RLAE Revista Latino-Americana de Enfermagem

Review Article

Evidence-based measures to prevent central line-associated bloodstream infections: a systematic review[1]

Daniele Cristina Perin[2]
Alacoque Lorenzini Erdmann[3]
Giovana Dorneles Callegaro Higashi[4]
Grace Teresinha Marcon Dal Sasso[3]

Objective: to identify evidence-based care to prevent CLABSI among adult patients hospitalized in ICUs. Method: systematic review conducted in the following databases: PubMed, Scopus, Cinahl, Web of Science, Lilacs, Bdenf and Cochrane Studies addressing care and maintenance of central venous catheters, published from January 2011 to July 2014 were searched. The 34 studies identified were organized in an instrument and assessed by using the classification provided by the Joanna Briggs Institute. Results: the studies presented care bundles including elements such as hand hygiene and maximal barrier precautions; multidimensional programs and strategies such as impregnated catheters and bandages and the involvement of facilities in and commitment of staff to preventing infections. Conclusions: care bundles coupled with education and the commitment of both staff and institutions is a strategy that can contribute to decreased rates of central line-associated bloodstream infections among adult patients hospitalized in intensive care units.

Prevention of Central Line–Associated Bloodstream Infections Through Quality Improvement Interventions: A Systematic Review and Meta-analysis

Koen Blot,[1] Jochen Bergs,[3] Dirk Vogelaers,[1,2] Stijn Blot,[1,4] and Dominique Vandijck[1,2,3]

[1]Faculty of Medicine and Health Sciences, Ghent University, [2]General Internal Medicine, Ghent University Hospital, Ghent, and [3]Health Economics and Patient Safety, Hasselt University, Hasselt, Belgium; and [4]Burns, Trauma and Critical Care Research Centre, The University of Queensland, Brisbane, Australia

This systematic review and meta-analysis examines the impact of quality improvement interventions on central line–associated bloodstream infections in adult intensive care units. Studies were identified through Medline and manual searches (1995–June 2012). Random-effects meta-analysis obtained pooled odds ratios (ORs) and 95% confidence intervals (CIs). Meta-regression assessed the impact of bundle/checklist interventions and high baseline rates on intervention effect. Forty-one before–after studies identified an infection rate decrease (OR, 0.39 [95% CI, .33–.46]; $P < .001$). This effect was more pronounced for trials implementing a bundle or checklist approach ($P = .03$). Furthermore, meta-analysis of 6 interrupted time series studies revealed an infection rate reduction 3 months postintervention (OR, 0.30 [95% CI, .10–.88]; $P = .03$). There was no difference in infection rates between studies with low or high baseline rates ($P = .18$). These results suggest that quality improvement interventions contribute to the prevention of central line–associated bloodstream infections. Implementation of care bundles and checklists appears to yield stronger risk reductions.

Keywords. central line–associated bloodstream infection; catheter-related bloodstream infection; quality improvement intervention; meta-analysis.

Effectiveness of insertion and maintenance bundles to prevent central-line-associated bloodstream infections in critically ill patients of all ages: a systematic review and meta-analysis

Erwin Ista, Ben van der Hoven, René F Kornelisse, Cynthia van der Starre, Margreet C Vos, Eric Boersma, Onno K Helder

Summary

Background Central-line-associated bloodstream infections (CLABSIs) are a major problem in intensive care units (ICUs) worldwide. We aimed to quantify the effectiveness of central-line bundles (insertion or maintenance or both) to prevent these infections.

Methods We searched Embase, MEDLINE OvidSP, Web-of-Science, and Cochrane Library to identify studies reporting the implementation of central-line bundles in adult ICU, paediatric ICU (PICU), or neonatal ICU (NICU) patients. We searched for studies published between Jan 1, 1990, and June 30, 2015. For the meta-analysis, crude estimates of infections were pooled by use of a DerSimonian and Laird random effect model. The primary outcome was the number of CLABSIs per 1000 catheter-days before and after implementation. Incidence risk ratios (IRRs) were obtained by use of random-effects models.

Findings We initially identified 4337 records, and after excluding duplicates and those ineligible, 96 studies met the eligibility criteria, 79 of which contained sufficient information for a meta-analysis. Median CLABSIs incidence were 5·7 per 1000 catheter-days (range 1·2–46·3; IQR 3·1–9·5) on adult ICUs; 5·9 per 1000 catheter-days (range 2·6–31·1; 4·8–9·4) on PICUs; and 8·4 per 1000 catheter-days (range 2·6–24·1; 3·7–16·0) on NICUs. After implementation of central-line bundles the CLABSI incidence ranged from 0 to 19·5 per 1000 catheter-days (median 2·6, IQR 1·2–4·4) in all types of ICUs. In our meta-analysis the incidence of infections decreased significantly from median 6·4 per 1000 catheter-days (IQR 3·8–10·9) to 2·5 per 1000 catheter-days (1·4–4·8) after implementation of bundles (IRR 0·44, 95% CI 0·39–0·50, p<0·0001; I^2=89%).

Interpretation Implementation of central-line bundles has the potential to reduce the incidence of CLABSIs.

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Intensive and Critical Care Nursing

journal homepage: www.elsevier.com/iccn

Original article

Prevention of central venous line associated bloodstream infections in adult intensive care units: A systematic review

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ABSTRACT

Background: In adult Intensive Care Units, the complexity of patient treatment requirements make the use of central venous lines essential. Despite the potential benefits central venous lines can have for patients, there is a high risk of bloodstream infection associated with these catheters.
Aim: Identify and critique the best available evidence regarding interventions to prevent central venous line associated bloodstream infections in adult intensive care unit patients other than anti-microbial catheters.
Methods: A systematic review of studies published from January 2007 to February 2016 was undertaken. A systematic search of seven databases was carried out: MEDLINE; CINAHL Plus; EMBASE; PubMed; Cochrane Library; Scopus and Google Scholar. Studies were critically appraised by three independent reviewers prior to inclusion.
Results: Nineteen studies were included. A range of interventions were found to be used for the prevention or reduction of central venous line associated bloodstream infections. These interventions included dressings, closed infusion systems, aseptic skin preparation, central venous line bundles, quality improvement initiatives, education, an extra staff in the Intensive Care Unit and the participation in the 'On the CUSP: Stop Blood Stream Infections' national programme.
Conclusions: Central venous line associated bloodstream infections can be reduced by a range of interventions including closed infusion systems, aseptic technique during insertion and management of the central venous line, early removal of central venous lines and appropriate site selection.

Conclusion There is a substantial body of quasi-experimental evidence to suggest that care bundles may reduce CLABSI rates in the NNU, though it is not clear which bundle elements are effective in specific settings. Future research should focus on determining what processes promote the effective implementation of infection prevention recommendations, and which elements represent essential components of such care bundles.

But implementation can be hard!

- Central line bundles are effective
- Implementation is crucial, but not easy
- "The same strategy can work in one setting, but not in another"

"the question of whether central-line bundles are effective [in CLABSI prevention] is no longer open to debate".[8] Although unquestionably effective, bundles have a major disadvantage—implementation is not easy. Ista and colleagues[8] list education, performance feedback, and checklists as the most frequently used strategies for implementation and briefly discuss the role of written protocols and leadership. This section is the weakest part of their review,[8] but study reports rarely offer details about the implementation process, even if successful. The same strategy can work in one setting,[7] but not in another.[10] The Michigan Keystone and the Matching Michigan programmes in the USA and in England are excellent examples illustrating how much local context affects outcome by interfering with implementation.[11,12] The same intervention that worked in Michigan, USA, did not work in England.

(Zingg & Pittet, 2016)

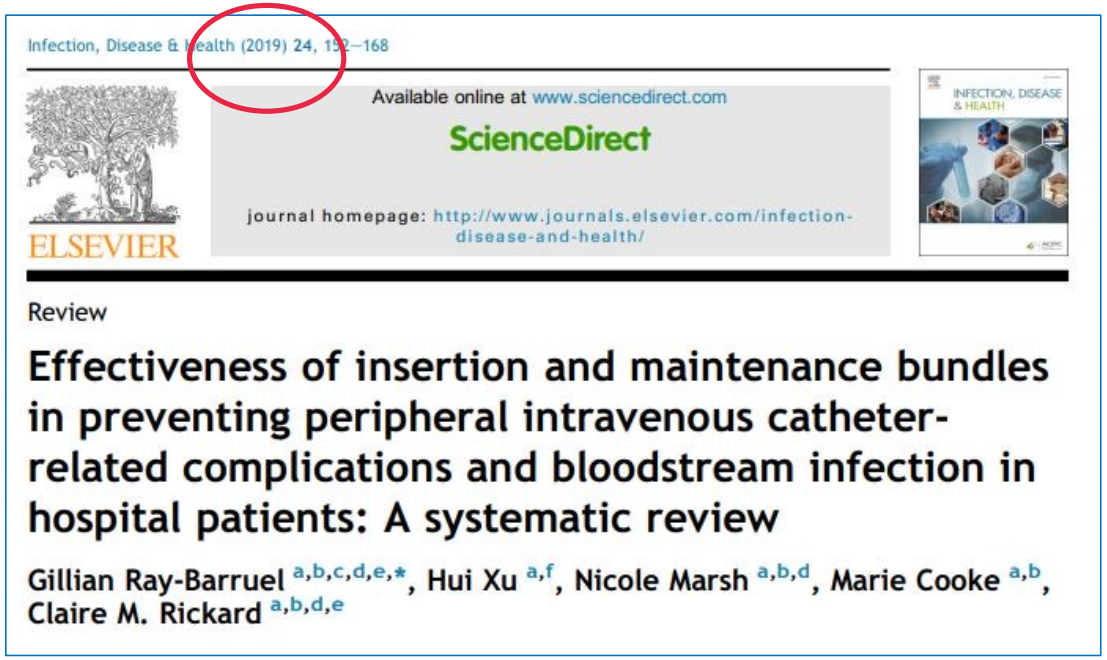
The risk with PIVCs

Bacteria don't know if it's a CVAD or PIVC.

PIVCs also cause BSI.

Images source: AVATAR and Google Images

PIVC Bundles – only one systematic review



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ELSEVIER

Review

Effectiveness of insertion and maintenance bundles in preventing peripheral intravenous catheter-related complications and bloodstream infection in hospital patients: A systematic review

Gillian Ray-Barruel [a,b,c,d,e,*], Hui Xu [a,f], Nicole Marsh [a,b,d], Marie Cooke [a,b], Claire M. Rickard [a,b,d,e]

Research question:

What is the effectiveness of insertion and maintenance bundles in preventing PIVC-related complications and bloodstream infection in hospital patients?

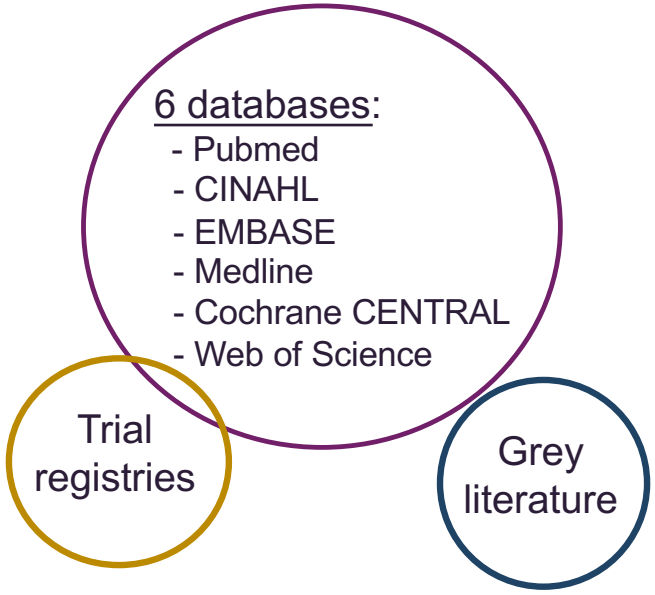
Methods

Systematic review using Cochrane Effective Practice and Organisation of Care (EPOC) guidelines

Inclusion criteria:

- Prospective intervention studies
- PIVC insertion or maintenance care bundle (≥ 2 components)
- Hospital patients
- English
- 2000–2018

Database searches



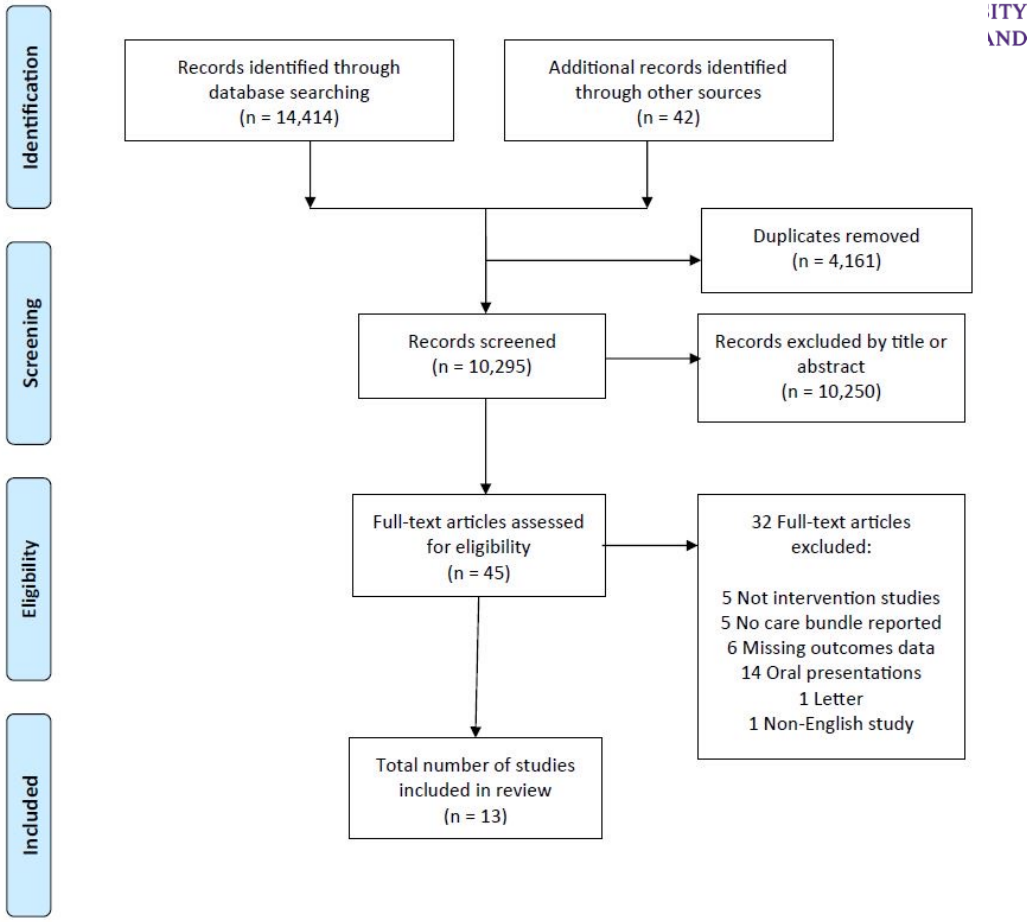
Outcomes:

- Insertion success
- Bloodstream infection
- PIVC complications
- Bundle compliance
- Cost effectiveness

PRISMA search

13 studies included:

Adults = 10 studies
Pediatrics = 2 studies
Neonates = 1 study



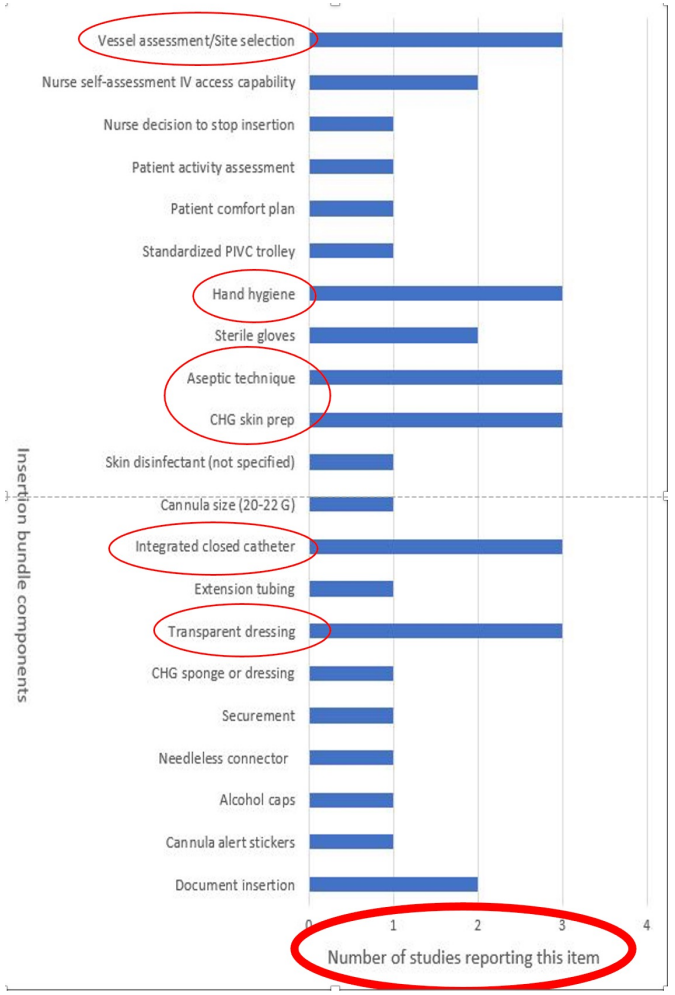
PIVC insertion bundles

10 studies
2–7 items per bundle
21 different items







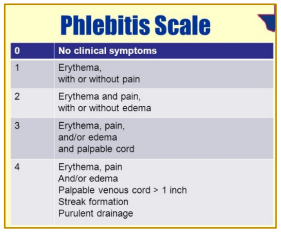



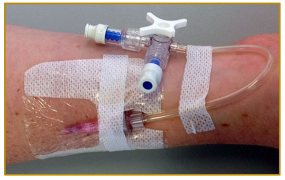
(Ray-Barruel et al, 2019)

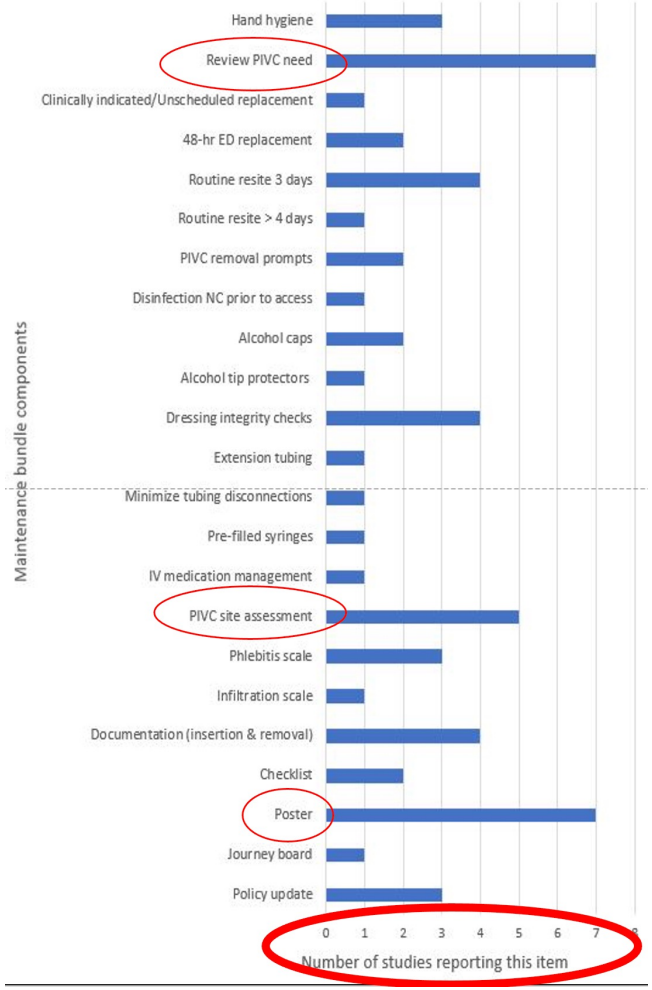
Images source: Google Images and AVATAR

PIVC maintenance bundles

11 studies
2–7 items per bundle
22 different items



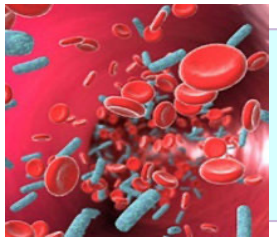




(Ray-Barruel et al, 2019)

Images source: Google Images and AVATAR

Reported outcomes



7 studies reported a reduction (19%–81%) in PIVC BSI

1 study reported no change in PIVC BSI

5 studies did not measure/report BSI rates

12 studies reported reduction in phlebitis

1 study reported increase in phlebitis

2 studies reported reduction in infiltration

1 study reported reduction in 30-day mortality

1 study reported estimated cost savings

(Ray-Barruel et al, 2019)

Bundle implementation strategies used [13 studies]

6 studies

5 studies

5 studies

12 studies

9 studies

(Ray-Barruel et al, 2019)

Images source: Google Images

PIVC bundles – SR findings

All 13 studies implemented different bundles.

Many bundle items were not evidence-based.

Follow-up ranged from 4 months to 14 years.

Quality assessment:
Downs & Black checklist

Excellent (26–28)

Good (20–25)

Fair (15–19)

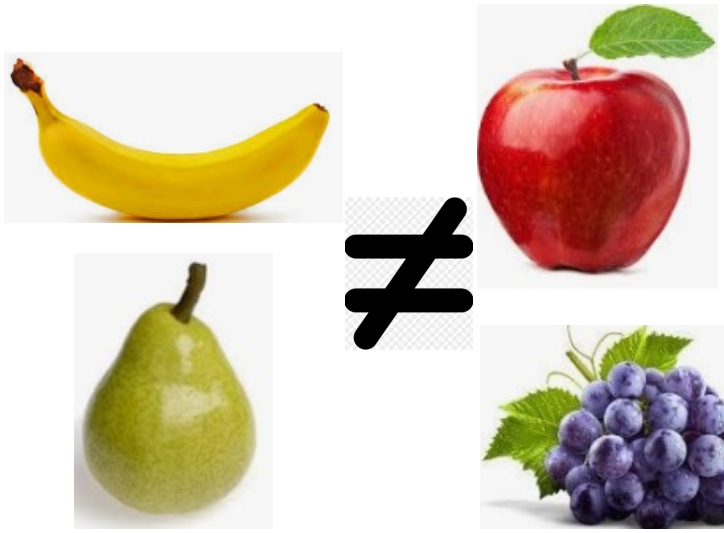
Poor (≤ 14)

Quality:

POOR (7 studies)
FAIR (6 studies)

No consistency between PIVC bundles

- All 13 studies implemented different bundles
- Many bundle items have not been tested rigorously (or at all)
- Follow-up ranged from 4 months to 14 years

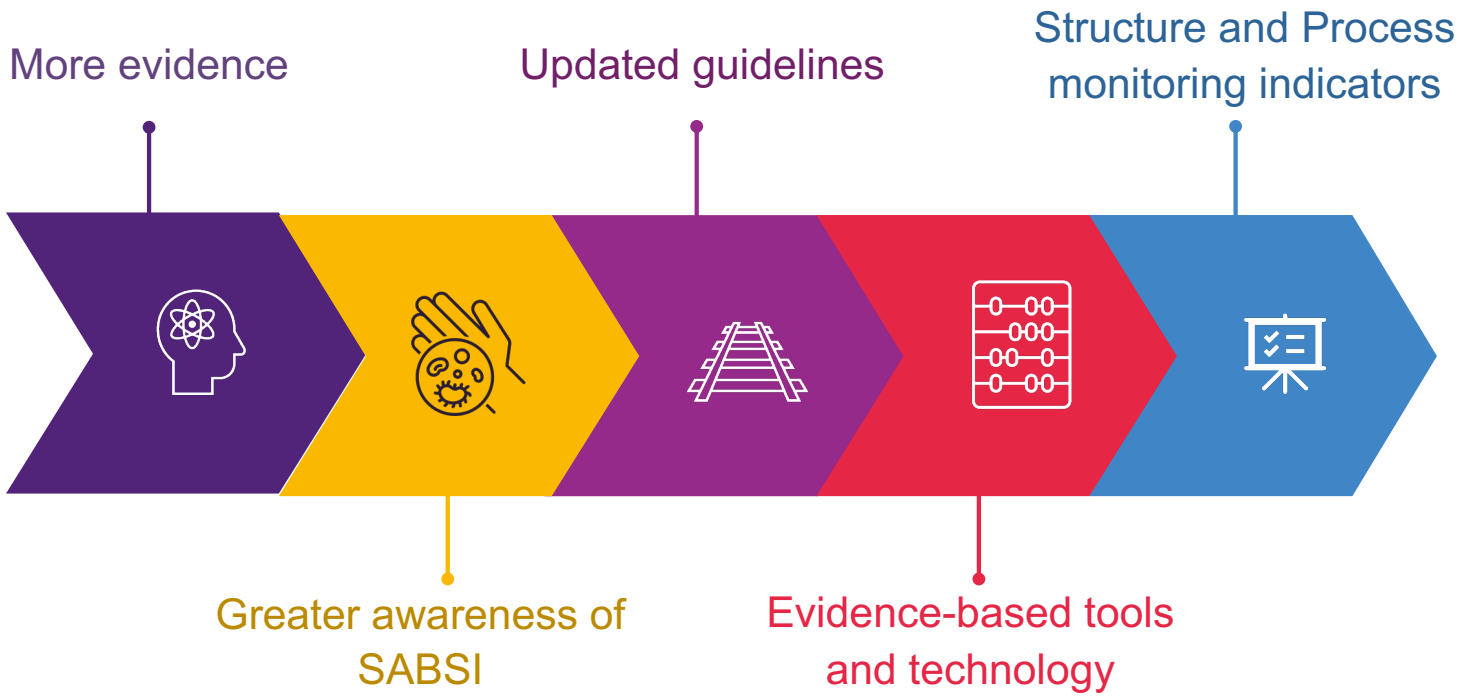


Recommendations from the SR

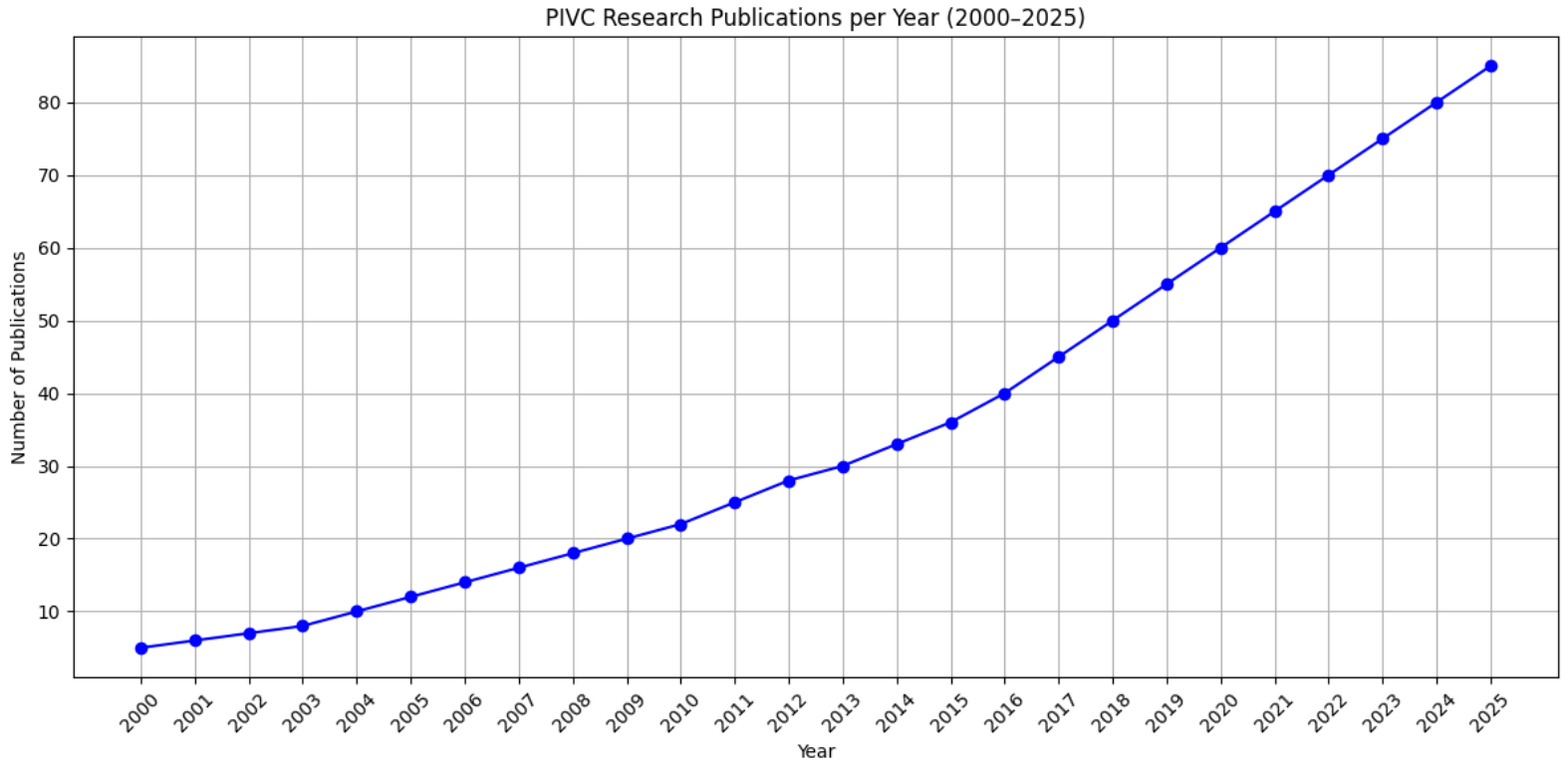
- PIVC bundle items should be evidence-based
- High quality studies are needed to demonstrate effectiveness
- Bundles should be based on high-level evidence (e.g. clinical guidelines, RCTs)
- Randomised studies are always welcome
- Report raw data, not just percentages
- Ongoing, repeated audits for compliance
- Long-term follow-up, if possible

What's changed since 2019?

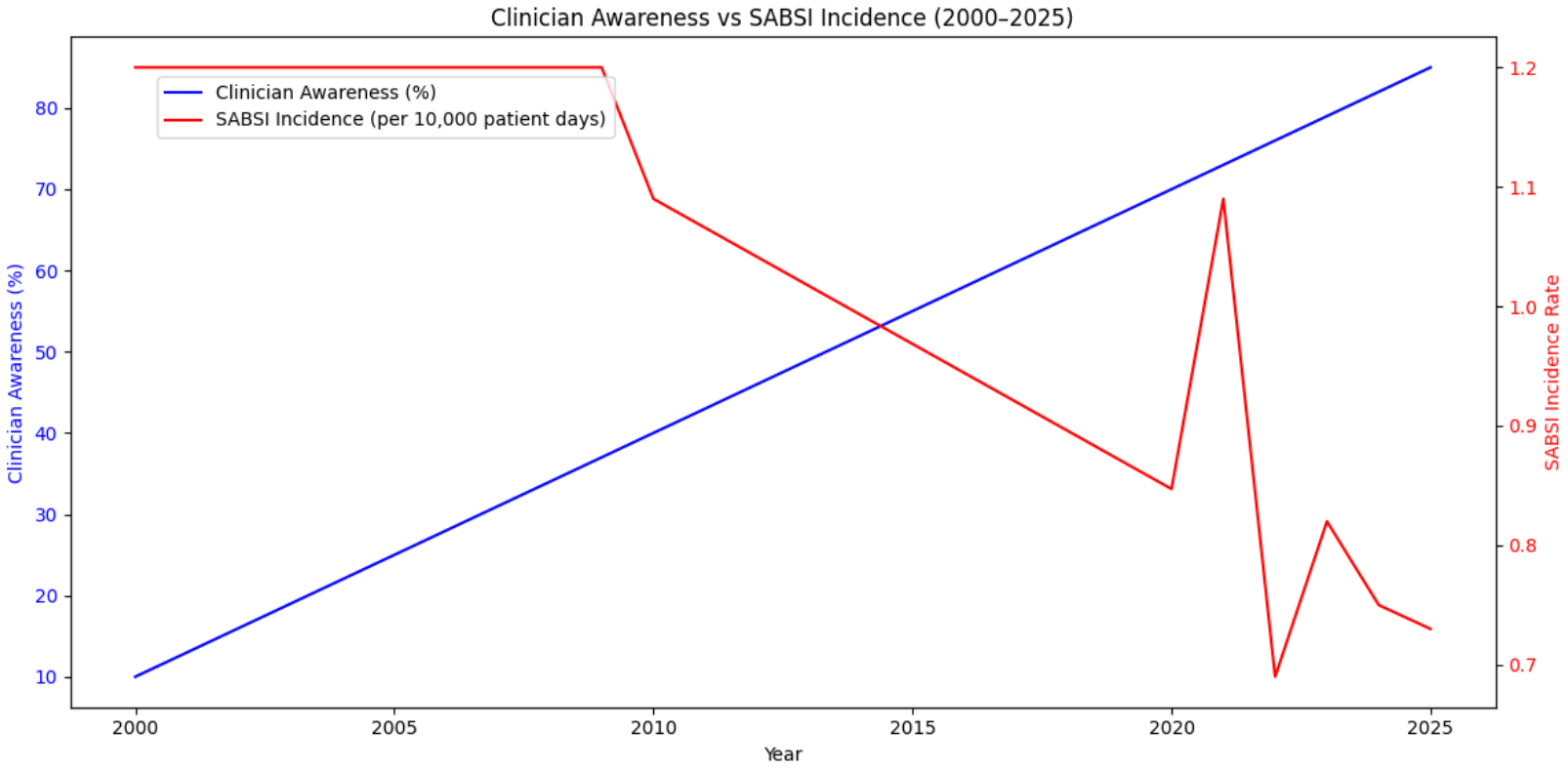
A lot has changed since 2019!



PIVC Research Articles per year since 2000



Clinician Awareness of SABSI vs SABSI Incidence (2000–2025)



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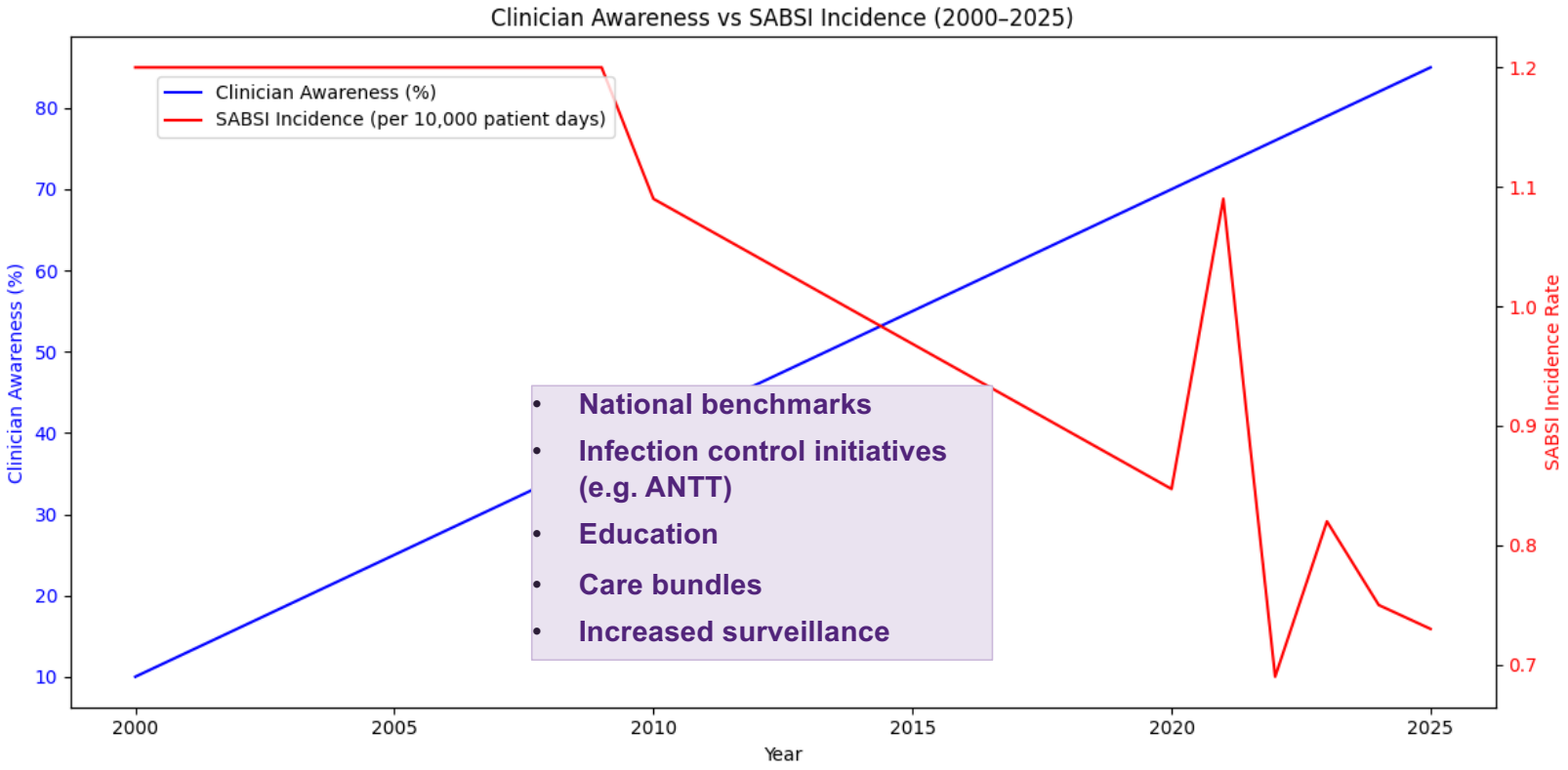
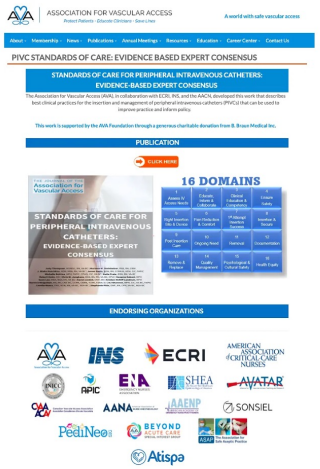


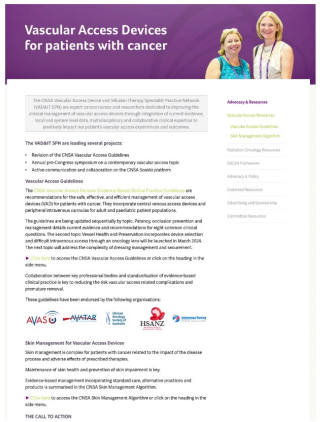
New and Updated Vascular Access Guidelines

www.avatargroup.org.au/clinical-practice-guidelines.html

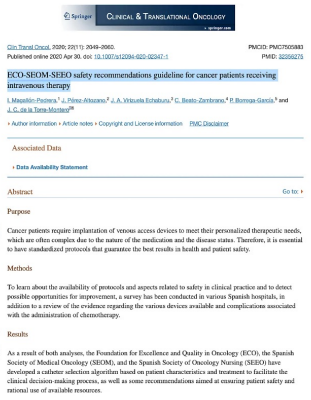
AVA PIVC Standards of Care: Evidence Based Expert Consensus (2024)



Cancer Nurses Society of Australia (CNSA) vascular access guidelines (2024)

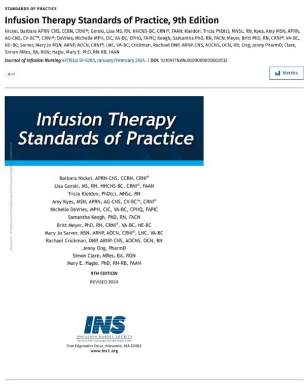


ECO-SEOM-SEEO safety recommendations guideline for cancer patients receiving intravenous therapy (2024)

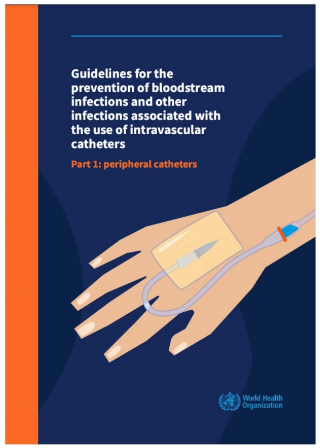


Infusion Therapy Standards of Practice, 9th Edition (2024)

The INS guidelines are free for INS members. Non-members can purchase the guidelines from the INS website.



WHO guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters (2024)



ESPEN practical guideline: Home parenteral nutrition (2023)

Technology and Innovation

- Use of visual aids (ultrasound, near-infrared) for difficult IV access
- Use of virtual/augmented/mixed reality for training
- Integrated catheters
- Longer catheters
- Anti-reflux valves in catheters
- Improved dressings and securement: engineered dressings, cyanoacrylate glue, gum mastic liquid
- Greater focus on vascular access specialists and teams

Standardised tools to reduce variations in care and improve patient safety

	The PIV Five Rights	Description	Evidence-Based Support
P	Right Proficiency	A skilled inserter who demonstrates 1st needlestick success at least 90% of the time and is proficient in ultrasound-guided peripheral catheter assessment and placement.	10 Publications*
I	Right Insertion	The use of ultrasound or vein viewer equipment for vessel selection and needle guidance to avoid "blind sticks." The use of an evidence-based aseptic no touch insertion technique (ANTT) to minimize site contamination.	53 Publications
V	Right Vein	Place peripheral catheter in the forearm cephalic vein about 3" below the antecubital fossa and 2" above the wrist whenever possible to avoid joints and danger zones as well as optimize vessel health and adequate hemodilution.	22 Publications
5	Right 5 Supplies & Technology	Procedural kit for protocol compliance; 22g/1.75" or longer catheter (forearm) to optimize the vein to catheter ratio; CHX Antimicrobial bordered securement dressing to reduce infection and dislodgement; Anti-reflux needleless connector designed to eliminate occlusions; Alcoholic chlorhexidine skin preparation and alcohol disinfecting cap to provide immediate bacterial reduction.	44 Publications
R	Right Review	Routine assessment by proficient nurse to avoid unnecessary catheter replacements leaving in place until clinically indicated to remove. Hub disinfection with passive port protectors between access, routine pulsatile flushing, and dressing changes at 7 days for all catheters to maintain the life of the catheter.	13 Publications

At the Lady Cilento Children's Hospital (LCCH) 48% of Peripheral Intravenous Cannulas (PIVC) fail prior to completion of treatment. Our aim is to reduce the incidence of PIVC complications. A *Care bundle* is a structured way of improving processes of care and patient outcomes. It is a straightforward set of practices that, when performed collectively, reliably and continuously will help improve patient outcomes.

Action: Improve PIVC insertion

S — **Skills of the inserter**
- Consider the location and condition of veins
- Start upper limb and avoid Antecubital Fossa
- Smallest cannula gauge that allows flow rate

U — **Understand and prepare** for patient needs (site assessment). Consider:
- what is the intended use?
- alternative route – are oral medications an option?
- duration and type of therapy – is PIVC appropriate?
- ***Access Device Decision Tree CHQ-PROC-03450***
- pain relief – use Topical Anaesthetics and Sucrose
- availability of necessary equipment, environment and staff support – involve parents and carers in holding and supporting – refer to ***CHQ-NS-62111***

C — **Consent**
Obtain verbal consent – involve patients and parents in decision making – refer to ***Caring for an Intravenous (IV) Cannula*** brochure on CHQ website

C — **Clean site**
- 20 second scrub with friction and allow to air dry completely
- If re-palpation is necessary, use sterile gloves

E — **Escalate**
- After two attempts seek assistance
- Consider vein quality and use of ultrasound guided technology
- Consult ***Difficult Intravenous Access Guidelines***

S — **Secure**
- Ensure the skin is clean and dry before tapes are applied
- Secure as per ***CHQ-PROC-03456***
- Ensure adequate pressure area prevention from PIVC hub and tapes

S — **Sign and document**
- Ensure ieMR, Care Pathways and Daily Record forms are updated daily – date, time, site, cannula gauge, number of attempts, cannulator
- Document insertions, re-sites and removals – include reason for removal

Action: Improve PIVC management

P — **Prompt removal**
- Evaluate clinical indication daily in consultation with medical/surgical team
- Remove under aseptic conditions
- Document removal and reason for removal

I — **Inspect HOURLY**
- Hourly site checks during infusion – refer to ***CHQ-PROC-03450***
- Be aware of possible extravasation injury – refer to ***CHQ-PROC-60579*** for guidelines
- Touch, look, compare "TLC"

V — **Vein patency**
- Ensure medication order for continuous infusion or intermittent flush is prescribed
- Visualise site whilst administering flush and consider the rate of delivery
- Should be pain free – pain is indicative of cannula failure

C — **Clean hands**
Use Aseptic Non-Touch Techniques (ANTT) and remember hand hygiene

S — **SCRUB THE HUB!!!**
- Technique is important – use ANTT
- Treat PIVCs with as much respect as CVADs

AUSTRALIAN COMMISSION ON SAFETY AND QUALITY IN HEALTH CARE

Clinical Care Standards

IV-WISE patient discussion tool

This tool* provides key discussion points for clinicians and patients to help 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	
▪ 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.	Tell your healthcare team about your past experiences including: ▪ 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	
▪ Advise that the PIVC will be checked regularly ▪ Ask patients to report any concerns or any problems they notice (e.g. redness, swelling).	▪ 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	
▪ 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.	To help to look after your PIVC: ▪ 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	
▪ Discuss how to prevent infection.	To prevent infection: ▪ 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	
▪ 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.	Tell your clinician as soon as possible about: ▪ 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	
▪ Tell patients when the PIVC is expected to be removed (e.g. when therapy is finished).	▪ 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.

safetyandquality.gov.au

Best practice device maintenance guidelines at point of care

(Ray-Barruel, 2018, 2020, 2023)

iDECIDED®

device assessment and decision tool

I **IDENTIFY if a device is present**

D **DOES the patient need the device?**
If no longer in active use, consider device removal.

E **EFFECTIVE function?**
Is the device functioning as intended?
If not, troubleshoot as per policy or remove device.

C **COMPLICATION-FREE?**
If complications are noted, troubleshoot or remove device.

I **INFECTION prevention**
Hand hygiene before and after patient and device care.
Careful handling and disinfection of device access points.

D **DRESSING & securement**
Ensure dressings are clean, dry and intact.
Secure devices to prevent tugging or patient injury.

E **EVALUATE & EDUCATE**
Discuss device plan with patient & family. Educate as needed.

D **DOCUMENT your decision**
Continue, troubleshoot, change dressing, or remove device.

Always consider local policy,
and consult with team & patient as required.

AVATAR
Alliance for Vascular Access Teaching and Research

Griffith UNIVERSITY
Queensland, Australia

The PIVC Clinical Care Standard

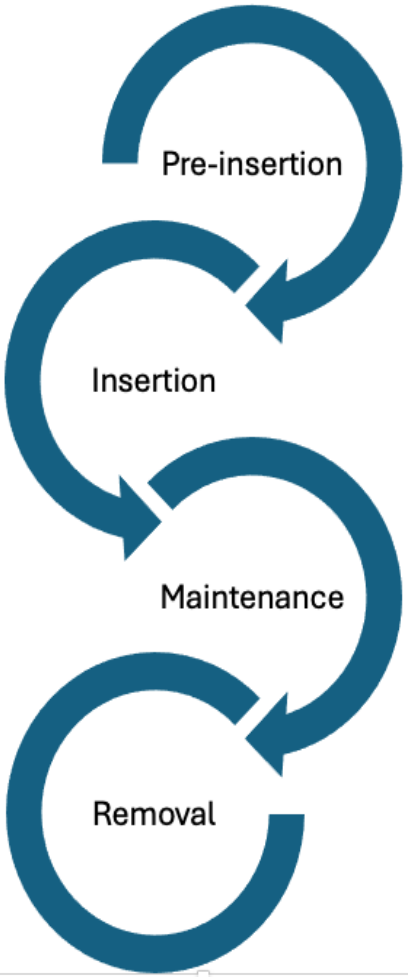
PUBLISHED 2021: To address suboptimal care

GOAL: To promote judicious PIVC use, reduce complications

SCOPE: All ages, all healthcare settings

https://www.safetyandquality.gov.au/sites/default/files/2021-05/pivc_ccs_launch_slides_0.pdf

10 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.

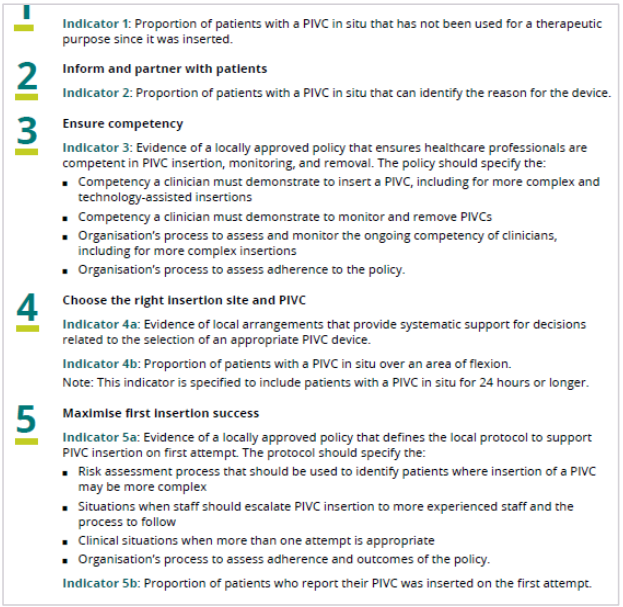
8 Routine use: inspect, access and flush
A patient's PIVC and insertion site is inspected by a clinician for signs of complications at least once per shift or every eight hours, when accessing the device, and if the patient raises concerns. Standard precautions including aseptic technique are used when 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*.

Monitoring indicators

"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." (ACSQHC, 2021)



1

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.

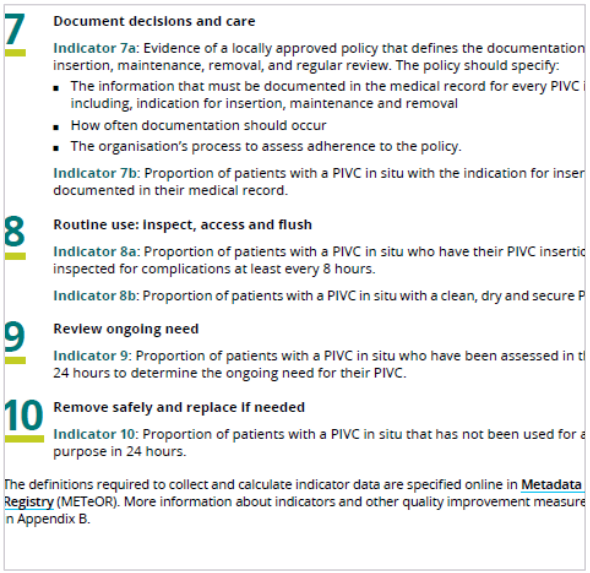
Note: This indicator is specified to include patients with a PIVC in situ for 24 hours or longer.

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 insertion, maintenance, removal, and regular review. The policy should specify:

- The information that must be documented in the medical record for every PIVC 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 inser documented in their medical record.

8 **Routine use: inspect, access and flush**

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

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

9 **Review ongoing need**

Indicator 9: Proportion of patients with a PIVC in situ who have been assessed in t 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 purpose in 24 hours.

The definitions required to collect and calculate indicator data are specified online in Metadata Registry (METeOR). More information about indicators and other quality improvement measure in Appendix B.

https://www.safetyandquality.gov.au/sites/default/files/2021-05/pivc_ccs_launch_slides_0.pdf

Implementation Struggles and Strategies

Implementation hurdles and speedbumps

- Getting support from senior leaders
- Getting consensus from stakeholders
- Competing priorities & timeframes
- Naysayers
- Not enough funds
- Getting consensus about tools
- Updating documentation, electronic medical records
- Plenty of education required (including new hires)

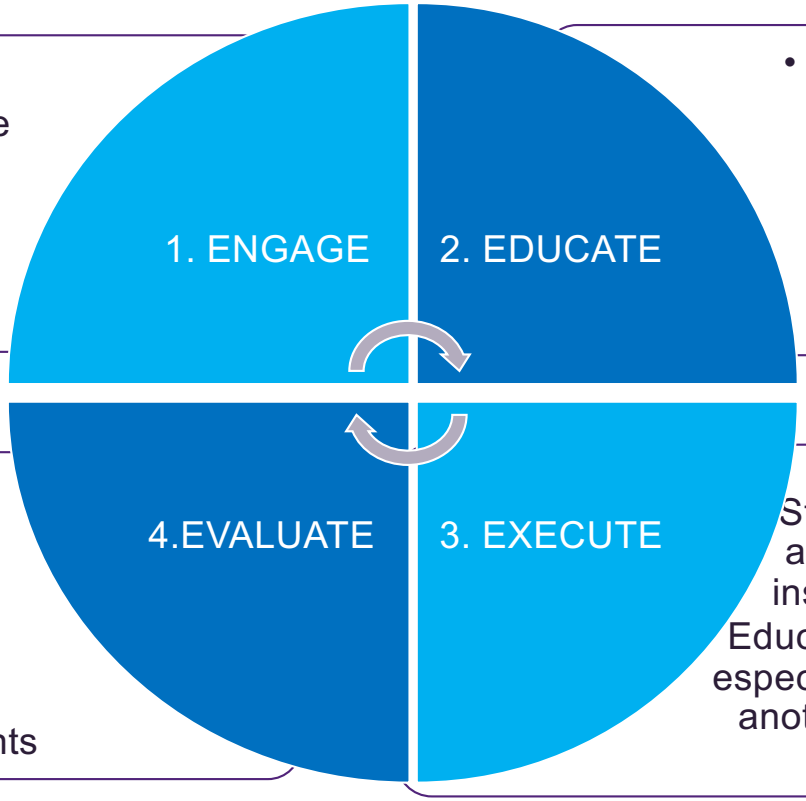
Translating evidence into practice

- SMART goals
- Share the vision with the team
- Understand context
- Implementation plan (who, what, how, when, where)
- Involve other people early on and encourage ideas, build momentum
- Encourage constructive feedback
- Reward success
- Give it time!

Implementation Science Frameworks

Framework	Purpose	Core Components	Best Use Case
CFIR Consolidated Framework for Implementation Research	Identifies factors influencing implementation success	5 domains: Intervention, Inner/Outer Setting, Individuals, Process	Comprehensive assessment of barriers and facilitators
TDF Theoretical Domains Framework	Understands behavior change in clinicians	14 domains including knowledge, beliefs, skills, context	Designing behavior change interventions
RE-AIM	Evaluates public health interventions	Reach, Effectiveness, Adoption, Implementation, Maintenance	Measuring impact and sustainability
NPT Normalization Process Theory	Explains how practices become routine	Coherence, Participation, Action, Monitoring	Embedding new practices into daily workflows
PARIHS	Guides implementation based on context and facilitation	Evidence, Context, Facilitation	Assessing readiness and tailoring support
KTA Knowledge-to-Action	Translates knowledge into practice	Knowledge creation, Action cycle	Bridging research and clinical application

4E Model of Implementation



- Senior Leaders
- Stakeholders (Healthcare practitioners, Patients, Caregivers)
- Multidisciplinary teams
- Clear vision & goals

- Healthcare practitioners, patients & caregivers
- Device selection
- Infection prevention
- Daily evaluation of necessity

- Process measures (compliance audits)
- Outcome measures (VAD-BSI rates)
- Regular feedback
- Review all VAD-BSI events

Standardized competency assessment checklists for insertion and maintenance
Educate patients, caregivers, especially when transferred to another setting or home with VAD

(Buetti et al, 2022)

Implementation of the PIVC Clinical Care Standard

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DOI: 10.1111/jan.16409

EMPIRICAL RESEARCH QUALITATIVE

JAN WILEY

Peripheral intravenous catheter clinical care standard adherence in emergency departments: A qualitative study underpinned by the behaviour change wheel

Hui Xu (Grace)[1,2,3,4] | Julie Bowdery[4] | Yeng To[4] | Jed Duff[1,2] | Bronwyn Griffin[5,6] | Amanda J. Ullman[3,6,7,8] | Claire M. Rickard[3,7,8,9] | Karin Plummer[5,6]

Journal of Advanced Nursing

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EMPIRICAL RESEARCH QUANTITATIVE OPEN ACCESS

Peripheral Intravenous Catheter Care at Australian Emergency Departments: A Cross-Sectional Observational Study

Hui (Grace) Xu[1,2,3,4] | Anna Doubrovsky[1] | Claire M. Rickard[2,4,5,6,7] | Lauryn Rockliff[8] | Christopher Tang[9] | Amanda J. Ullman[2,4,5,7,10]

Conclusion

- PIVC bundles should be based on high-level evidence (e.g. INS Standards)
- Individual PIVC bundle items should be evidence-based
- Implementation should include a clear strategy, involving stakeholders early
- Long-term compliance measures & feedback are essential
- Celebrate wins and keep going!

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AUGUST

7 ... How Do Perceptions of Hygiene and Cleanliness Influence Infection Prevention Behaviours in Our Homes and Everyday Lives, and in Healthcare Settings?
With Dr. Sally Bloomfield, UK

20 ... Insertion and Maintenance of Bundles for Peripheral IVs
Australasian Teleclass
With Dr. Gillian Ray-Barruel, Australia

26 ... Barriers to Implementing IPC Programs in Low Resource Settings and How to Overcome Them
Afro-European Teleclass
With Prof. Shaheen Mehtar, South Africa

SEPTEMBER

18 ... Resource Sustainability and Challenges in the Supply Chain: Implications for Infection Prevention
With Prof. Ruth Carrico, US

23 ... Patience, Patients and Persistent Antimicrobial Resistance
Afro-European Teleclass
With Colm Dunne, UK

25 ... Development of Food Safety Training Materials Through Memory Anchors and Elevated Learning
With Prof. Keith Warriner, Canada

29 ... *IPS Conference Broadcast* – Cottrell Lecture
Afro-European Teleclass
With Dr. Neil Wigglesworth, UK

29 ... *IPS Conference Broadcast* - From Reminder to Reflex: Making IPC Second Nature
Afro-European Teleclass
With Prof. Michael Borg, Malta

30 ... *IPS Conference Broadcast* - Antimicrobial Stewardship: At the Heart of Infection Prevention
Afro-European Teleclass
With Prof. Martin Llewelyn, UK

OCTOBER

15 ... What Can Knowing Something About the Evolution of *Clostridium difficile* Teach Us About IPAC?
Australasian Teleclass
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