Helping nurses help PIVCs: Decision aids for daily assessment and maintenance

Gillian Ray-Barruel, RN PhD

Alliance for Vascular Access Teaching and Research (AVATAR), Menzies Health Institute
Queensland, Griffith University, Brisbane, Australia

Claire M Rickard, RN PhD

Alliance for Vascular Access Teaching and Research (AVATAR), Menzies Health Institute
Queensland, Griffith University, Brisbane, Australia

School of Nursing and Midwifery, Griffith University, Brisbane, Australia

Division of Nursing, Midwifery and Social Work, University of Manchester, UK

Corresponding author

Dr Gillian Ray-Barruel

Griffith University N48_0.09, 170 Kessels Rd, Nathan, QLD 4111, AUSTRALIA

Email: g.ray-barruel@griffith.edu.au

Phone: +61 7 3735 8442

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Helping nurses help PIVCs: Decision aids for daily assessment and maintenance**Abstract**

Improving the safety and quality of health care relies on implementing evidence-based findings into everyday clinical practice. Numerous clinical decision aids have been developed to guide nursing care of the patient with a peripheral intravenous catheter (PIVC), including standards, guidelines, decision frameworks, bundles, policies, procedures, algorithms, pathways, checklists, and scores. While all are created with the intention of facilitating the delivery of safe, effective nursing care and improving patient outcomes, there are distinct differences in methodology and design, and many are based on expert opinion and historical practice rather than high quality evidence.

This paper reviews the types of decision aids for daily PIVC assessment and management, explores the evidence base underpinning them, and considers implications for use in clinical practice. A consistent, systematic and evidence-based approach to PIVC care will provide the optimal environment for achieving quality patient outcomes.

(140 words)

Keywords

Catheterization, peripheral; Guidelines; Quality of Health Care; Assessment; Patient outcomes; Nursing, medical-surgical

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Key points

- A range of strategies are available to promote clinical decision-making. These include standards, guidelines, decision frameworks, bundles, policies, procedures, algorithms, pathways, checklists, and scores.
- Decision aids ideally should be based on best evidence and updated regularly to be most useful to clinicians, but many rely on expert consensus.
- Successful implementation of complex decision aids into clinical practice requires ongoing education and support.
- Checklists can promote team communication and improve patient outcomes, but excessive use can lead to clinician fatigue.
- Some decision aids incorporate patient preference, but many do not.

Reflective questions

1. Are the tools available in your workplace assisting you to make confident, informed decisions about PIVC care?
2. Do you know if your hospital policy is updated regularly to reflect recent evidence?
3. Do the decision aids available in your workplace incorporate patient preference?

Introduction

In the increasingly challenging healthcare environment, quality of health care and safe patient outcomes depend on the incorporation of best evidence into everyday practice. However, this remains a challenge in the clinical area where clinicians are often time-poor or lack the necessary skills to interpret evidence (Saunders & Vehviläinen-Julkunen, 2016). Knowledge transformation strategies that translate best evidence into accessible point-of-care tools are essential for daily care delivery. Decision aids currently available to guide nursing care of the patient with a peripheral intravenous catheter (PIVC) include standards, guidelines, decision frameworks, bundles, policies, procedures, algorithms, pathways, checklists, and scores. While all are created with the intention of facilitating the delivery of safe, effective nursing care and improving patient outcomes, there are distinct differences in methodology and design. Standards and guidelines are compiled from evidence hierarchically graded for quality, whereas other aids such as checklists and scores may be based on expert opinion and historical practice rather than high quality evidence. With an increasing array of available strategies to support PIVC care, it can be somewhat confusing for the busy clinician. Therefore, the purpose of this paper is to review different kinds of decision aids for PIVC assessment and management, explore the evidence underpinning them, and discuss implications for their use in daily practice. (See Table 1)

[Insert Table 1]

Standards

Professional practice standards establish the expected level of performance for clinicians and provide criteria for accountability, supported by graded research evidence and updated by clinical experts at regular intervals. Examples include the Royal College of Nursing *Standards for Infusion Therapy* (Royal College of Nursing, 2016) and the Infusion Nurses

Society (INS) *Standards of Practice* (Infusion Nurses Society, 2016), which define the clinical practice expectations of vascular access and infusion specialists, as well as general clinicians. Both *Standards* list key parameters for catheter care for a variety of vascular access devices, including regular assessment, timely removal, infection prevention, dressing care and documentation. Ideally, standards should be readily available to guide nursing practice for specialists and non-specialists alike; however, some such as INS are only available to society members, therefore many nurses who care for PIVCs and who are not specialists in this field are unable to access them.

Guidelines

Clinical practice guidelines became popular in the 1990s with the demand for evidence-based practice. National guidelines are usually commissioned by government health departments or professional bodies to provide recommendations for care, hierarchically graded according to the supporting evidence. Guidelines differ from standards in that their goal is not to set the benchmark for performance, but rather to translate research findings into broad guidance for safe patient care based on the best available evidence in a given area. Updated regularly by self-selecting multi-disciplinary committee members who are experts in their field, guidelines such as epic3: National Evidence-Based Guidelines for Preventing Healthcare-Associated Infections in NHS Hospitals in England (Loveday et al., 2014) and Centers for Disease Control and Prevention Guidelines for the Prevention of Intravascular Catheter-related Infections (O'Grady et al., 2011) focus on infection prevention for a range of vascular access devices, but they do not cover in any detail other more common complications, such as infiltration, extravasation, dislodgement, and blockage.

Decision frameworks

Decision frameworks have been developed in response to suboptimal complications of

vascular access as a result of inadequate decision-making. Developed through extensive processes of collaboration and expert consensus, decision frameworks combine best evidence with user-friendly algorithms to help clinicians make the best choices in device selection, insertion and management. They aim to promote a standardized approach to vascular access, while taking into consideration individual patient needs and preferences.

The Vessel Health and Preservation (VHP) framework is an evidence-based resource for frontline staff, providing guidance on peripheral vessel assessment and suitability of infusates for peripheral vein administration, appropriate device selection, and prompting daily re-evaluation of device need and detection of complications (Hallam et al., 2016; Moureau et al., 2012). The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC) also assists clinicians to choose the most appropriate vascular access device and insertion site according to the patient's needs (Chopra et al., 2015). Using MAGIC, device insertion is guided by: the proposed duration of access and type of infusates; the availability of suitable vessels and experienced inserters; and the patient's medical condition, device history and preferences. MAGIC also prompts appropriate management of device complications.

Implementing decision frameworks into practice requires extensive education planning and delivery by experienced, knowledgeable vascular access and infusion specialists. Early studies reveal modest improvements in staff knowledge and patient outcomes following implementation of these frameworks (Swaminathan et al., 2017; Weston, Nightingale, O'Loughlin, & Ventura, 2017), but validation of the frameworks is urgently needed. A possible drawback of frameworks is that they can become too complex to be practical at the point of care, unless adequate supporting processes and tools are in place.

Bundles

A *bundle* is 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” (p. 2) (Resar, Griffin, Haraden, & Nolan, 2012). Bundles are designed to be used in their entirety, “all or none”, and so usually contain no more than five items, with each item founded on high-level evidence, such as effectiveness proven by randomised controlled trials (Resar et al., 2012). Care bundles are not intended to represent comprehensive care; instead, they focus quality improvement on items with robust evidence, and encourage teamwork and communication to achieve bundle compliance, which ideally has a flow-on effect of improving overall care.

While central line insertion bundles have proven beneficial for reducing bloodstream infections and subsequently have become accepted practice (Ista et al., 2016; Marsteller et al., 2012; Pronovost et al., 2006), substantially fewer evidence-based interventions are available for PIVCs. In the past five years, PIVC maintenance bundles have become more popular, but the majority of recommendations for PIVC care are still based on expert consensus, rather than high level evidence. A 2015 scoping review found that PIVC research has focused primarily on a small selection of topics, such as pre-insertion analgesia, dwell time, and dressings (Takashima, Ray-Barruel, Keogh, & Rickard, 2015). Many other areas of practice, such as flushing and blood sampling, are lacking in evidence (Goossens, 2015). Several PIVC maintenance bundles have been tested in clinical practice, and although compliance is often improved, so far, the implementation of PIVC bundles have only resulted in modest improvements in reported patient outcomes (Boyd, Aggarwal, Davey, Logan, & Nathwani, 2011; Caguioa, Pilpil, Greensitt, & Carnan, 2012; Crowell, O'Neil, & Drager, 2017; DeVries, Valentine, & Mancos, 2016; Freixas et al., 2013; Mestre et al., 2013; Rhodes et al., 2016; Sriupayo et al., 2014; Talento et al., 2011). More work needs to be done in this area.

Policies

Policies are organization-specific statements produced by senior management to establish organizational expectations of performance, and promote compliance with regulations and accreditation requirements (Irving, 2014). For instance, hospital policies may include recommendations for frequency of PIVC resites and administration set changes, type of dressings, and flushing and locking catheters. Although hospital policies are usually developed from best practice standards and guidelines, they may not be updated regularly and sometimes contradict more recent evidence. For instance, several international guidelines and standards (Bodenham et al., 2016; Infusion Nurses Society, 2016; Royal College of Nursing, 2016) recommend PIVC removal only when clinically indicated, based on a Cochrane review to support this practice (J. Webster, Osborne, Rickard, & New, 2015); however, many hospitals continue routine 72–96 hour removal policies. In reality, experienced nurses often leave functioning PIVCs in place beyond this time if they decide it is clinically appropriate, such as an elderly patient or patient with poor veins (Palese et al., 2011). Staff can feel conflicted when hospital policies contradict best practice guidelines, and they may choose to ignore items that seem contrary to their clinical judgement based on education, previous experience, and individual patient needs (Castro-Sanchez et al., 2014; Johansson, Pilhammar, Khalaf, & Willman, 2008). Most policies contain disclaimer statements that staff should use their judgement to determine when modification to the policy is warranted (Irving, 2014).

Procedures, algorithms and pathways

Procedures prescribe step-by-step guidance to completing an activity, which reduces practice variability across an organization and serves as a resource for staff, particularly new hires (Irving, 2014). By clearly describing each step in a process, procedures reduce reliance on memory and likelihood of subsequent human errors. The steps are agreed upon by local

experts. Like policies, procedures usually are developed from best practice, but they need to be kept updated as new evidence emerges. Examples include Standard Operating Procedures and clinical procedures, such as performing an administration set change. Variation from the designated norm is permitted in special circumstances, but not encouraged.

Similar to procedures, *algorithms* and *pathways* outline an ordered sequence of steps for a specific circumstance. Algorithms and pathways are popular in health settings because they are process and outcomes-focused tools, engineered to deliver efficient, cost-effective and standardised care. Ideally, they should be based on evidence, but may be derived from expert consensus. These tools are particularly suited to directing the care of the uncomplicated and planned procedural or surgical patient, or outlining management protocols that must be completed in a specific order (such as prenatal care, advanced cardiac life support, or chemotherapy regimens). One example is the difficult intravenous pathway, which directs clinicians to obtain clinical support and ultrasound guidance for PIVC insertion in patients with difficult venous access (Sou et al., 2017). Algorithms and pathways are particularly useful for novice practitioners, but they may not meet the needs of the unstable or critically ill patient, or patients with complications where flexibility, patient-specific and unit-specific considerations are essential. Individual patient factors (such as obesity, poor skin integrity, comorbid conditions, and social factors, among others) can make adherence to the tool difficult and unrealistic.

Checklists

Checklists, like algorithms and pathways, are cognitive aids designed to prompt accurate task completion. Due to their successful implementation in the aviation industry, many healthcare settings have incorporated checklists into daily care in an attempt to reduce adverse events and improve patient safety. A checklist may contain the same features as an algorithm or

pathway, but there is more flexibility and the items or actions listed need not follow a prescribed order. Checklists prompt memory recall by ‘chunking’ information into related groups, thereby reducing cognitive load (Hales & Pronovost, 2006). They are most often used for routine assessments or transition periods, such as pre-operative care, shift handover or patient discharge. More recently, checklists are being implemented in many hospitals to encourage compliance with evidence-based bundles.

Like algorithms and pathways, most checklists originate from consensus discussions, rather than research findings, and, unlike bundles, each item on the checklist need not be evidence-based. When strictly adhered to, surgical safety checklists have been credited with a decrease in post-operative complications, most likely due to improved team communication and increased detection of potential errors (C. S. Webster, 2017). However, checklists need to be reviewed and updated regularly in consultation with the end-users, rather than simply implemented by management to improve metrics (Catchpole & Russ, 2015; Oppikofer & Schwappach, 2017). Furthermore, while checklists can improve bundle compliance and patient safety, excessive use of checklists can overburden caregivers and lead to checklist fatigue (Hales & Pronovost, 2006).

Both bundles and checklists are sometimes structured as mnemonics, to provide an organised structure for remembering each item. An example of a mnemonic combination of PIVC bundle and checklist is H.A.N.D.S., which stands for Hand hygiene; Antisepsis with 2% chlorhexidine gluconate in 70% isopropyl alcohol; Non-touch technique; Date on a clear dressing, Daily inspections, Documentation; Scrub the hub for 15 seconds and allow to dry (Caguioa et al., 2012; Crowell et al., 2017). While this approach is promising, evidence that mnemonics improve PIVC outcomes in clinical practice is still lacking.

Scores

With the increased focus on quality improvement and patient safety over the past two decades, scores to measure patient risk in areas such as falls, pressure injury, and nutrition screening have proliferated in nursing practice. However, many scores have not been adequately validated, and the evidence that these tools actually improve patient outcomes is not robust (Aranda-Gallardo et al., 2013; Moore & Cowman, 2014; van Bokhorst-de van der Schueren, Guaitoli, Jansma, & de Vet, 2014).

Phlebitis scores are widely used to assess for PIVC complications (e.g. pain, redness, swelling, purulence, palpable cord); however, the utility of current phlebitis tools is limited, as many use complex scales or do not define phlebitis ‘cut-offs’, and none has been rigorously validated (Ray-Barruel, Polit, Murfield, & Rickard, 2014). To complicate matters, many phlebitis scores have been adapted by individual sites without any assessment of the validity and reliability of the refashioned score. Phlebitis scores rely on a subjective assessment of phlebitis symptoms rather than a gold standard definition, and interrater reliability is poor (Marsh et al., 2015). Only the Visual Infusion Phlebitis (VIP) score specifies actions to accompany the score, but PIVC removal is advised only after inflammation of the vein has already occurred. Phlebitis rates in published studies range widely from 0% to 91%, which reflects discrepancies in how phlebitis is defined and measured (Goransson, Forberg, Johansson, & Unbeck, 2017; Ray-Barruel et al., 2014).

The INS has an infiltration scoring tool as well as a phlebitis score (Infusion Nurses Society, 2016), but neither provides recommendations for action. Without recommendations for action, nurses use inconsistent and potentially fallible judgement rather than objective assessment parameters (Odell, Victor, & Oliver, 2009). Therefore, PIVC assessment tools should include recommendations for action to promote accountability; otherwise they increase paperwork, not patient safety.

A further concern is that most PIVC assessment tools do not assess the continued need for or function of the cannula, dressing and securement integrity, adherence to infection prevention standards, patient preference and education needs. With PIVC failure rates ranging from 30–50% (Marsh et al., 2017; New, Webster, Marsh, & Hewer, 2014; Wallis et al., 2014), assessment should include more than simply identifying phlebitis and/or infiltration. Comprehensive tools to improve patient outcomes need to be developed and validated (Alexander, 2017; Rickard & Ray-Barruel, 2017).

Where to from here?

Integrating best evidence into clinical care for the patient with a PIVC is challenging in the complex health care environment, but a range of strategies are available to support decision making. Decision aids are intended to be complementary, rather than mutually exclusive. For instance, implementing a bundle and accompanying checklist can enhance compliance with guidelines to ensure consistency of PIVC management.

Although national standards and guidelines are reviewed and updated regularly, keeping local policies and procedures current is an ongoing and time-consuming challenge. Recognising that clinicians are time-poor, the goal for managers should be to incorporate decision supports at the point of care that contribute to meaningful patient outcomes without increasing workload and paperwork. Most importantly, the decision strategy should be systematic and evidence-based, enabling care to be standardised and replicable across clinical settings and patient groups. A consistent, reliable and valid approach to PIVC management, based on rigorous research findings, updated regularly, and implemented via a sound education program, will provide the optimal environment for achieving quality patient outcomes.

Table 1. Summary table of decision aids

	Intended application	High level evidence, regularly updated	Specified order of tasks
Guidelines	Broad	Yes	No
Standards	Broad	Yes	No
Decision frameworks	Broad	Yes	Possibly
Bundles	Broad	Ideally	No
Policies	Local	Ideally	No
Procedures	Local	Ideally	Yes
Algorithms	Local	No	Yes
Pathways	Local	No	Yes
Checklists	Local	No	No
Scores	Broad	No	No

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Table 1. Summary table of decision aids

	Intended application	High level evidence, regularly updated	Specified order of tasks
Guidelines	Broad	Yes	No
Standards	Broad	Yes	No
Decision frameworks	Broad	Yes	Possibly
Bundles	Broad	Ideally	No
Policies	Local	Ideally	No
Procedures	Local	Ideally	Yes
Algorithms	Local	No	Yes
Pathways	Local	No	Yes
Checklists	Local	No	No
Scores	Broad	No	No