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

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ABSTRACT

Improving the safety and quality of health care relies on implementing evidence-based findings into every-day 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 scoring tools. 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 between them, 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 the implications for their use in clinical practice. A consistent, systematic and evidence-based approach to PIVC care will provide the optimal environment for achieving quality patient outcomes.

Key words: Catheterisation ■ Peripheral ■ Guidelines ■ Healthcare quality ■ Assessment ■ Patient outcomes ■ Nursing ■ Medical-surgical

In an increasingly challenging healthcare environment, the quality of health care and safe patient outcomes depend on the incorporation of best evidence into everyday practice. However, this remains difficult because practitioners are often time poor or lack the skills needed to interpret evidence (Saunders and 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, care bundles, policies, procedures, algorithms, pathways, checklists and scoring tools. While all were 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 between them. Standards and guidelines are compiled from evidence hierarchically graded for quality, while other aids, such as checklists and scoring tools, may be based on expert opinion and historical practice rather than high-quality evidence.

An increasing array of strategies available to support PIVC care can their choice and use somewhat confusing for the busy clinician. Therefore, the purpose of this paper is to review different decision aids for PIVC assessment and management, explore the evidence underpinning them and discuss the implications for their use in daily practice (*Table 1*).

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Standards

Professional practice standards establish expected levels 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 (RCN)'s *Standards for Infusion Therapy* (RCN, 2016) and the Infusion Nurses Society (INS) *Infusion Therapy Standards of Practice* (2016), which set out the clinical practice expectations for vascular access and infusion specialists, as well as for 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 the INS standards, are available only to society members; therefore, many nurses who care for patients with 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, and are graded hierarchically according to the evidence supporting them.

Guidelines differ from standards in that their goal is not to set the benchmark for performance but to translate research findings into broad guidance for safe patient care based on the best available evidence in a given area. They are updated regularly

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

by self-selecting, multidisciplinary 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 the Centers for Disease Control and Prevention's *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 do not cover in 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 standardised 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, suitability of infusates for peripheral vein administration, device selection and detection of complications, and prompting daily re-evaluation of device need (Moureau et al, 2012; Hallam et al, 2016). 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 provides prompts for appropriate management of device complications.

Implementing decision frameworks in practice requires extensive education planning and delivery by experienced, knowledgeable vascular access and infusion specialists. Early studies have revealed modest improvements in staff knowledge and patient outcomes following the implementation of these frameworks (Swaminathan et al, 2017; Weston et al, 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.

Care bundles

A care 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' (Resar et al, 2012: 2). Bundles are designed to be used in their entirety—'all or none' of their components are used—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 knock-on effect of improving overall care.

While central line insertion bundles have proven beneficial in reducing bloodstream infections and subsequently have become accepted practice (Pronovost et al, 2006; Marsteller et al, 2012; Ista et al, 2016), substantially fewer evidence-based interventions are available for PIVCs. In the past 5 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 et al, 2015). Evidence in many other areas of practice, such as flushing and blood sampling, is lacking (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 has resulted only in modest improvements in reported patient outcomes (Boyd et al, 2011; Talento et al, 2011; Caguioa et al, 2012; Freixas et al, 2013; Mestre et al, 2013; Sriupayo et al, 2014; DeVries et al, 2016; Rhodes et al, 2016; Crowell et al, 2017). More work needs to be done in this area.

Policies

Policies are organisation-specific statements produced by senior management to establish organisational expectations of performance, and promote compliance with regulations and accreditation requirements (Irving, 2014). For instance, hospital policies may include recommendations for the frequency of PIVC resiting 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; INS, 2016; RCN, 2016) recommend PIVC removal only when clinically indicated, based on a Cochrane review to support this practice (Webster et al, 2015); however, many hospitals continue to follow 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 with an elderly patient or one 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 judgment, based on education, previous experience, and individual patient needs (Castro-Sanchez et al, 2014; Johansson et al, 2008). Most policies contain disclaimer statements that staff should use their judgment 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 organisation 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 the likelihood of consequent human errors. The steps are agreed upon by local experts. Like policies, procedures are usually 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 these tools are focused on process and outcomes, and 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 uncomplicated and planned procedural or surgical patients, 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 unstable or critically ill patients, or those 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. Because they have been successfully implemented in the aviation industry, many healthcare settings have incorporated checklists into daily care 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 and Pronovost, 2006). They are most often used for routine assessments or transition periods, such as preoperative 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 postoperative complications, most likely resulting from improved team communication and increased detection of potential errors (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 and Russ, 2015; Oppikofer and 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 and Pronovost, 2006).

Both bundles and checklists are sometimes set up as mnemonics to provide an organised structure for remembering each item. An example of a mnemonic combination of PIVC bundle and checklist is HANDS, 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; and 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 increase in focus on quality improvement and patient safety over the past two decades, scoring tools to measure patient risk in areas such as falls, pressure injury and nutrition screening have proliferated in nursing practice. However, many of these have not been adequately validated, and the evidence that they actually improve patient outcomes is not robust (Aranda-Gallardo et al, 2013; Moore and Cowman, 2014; van Bokhorst-de van der Schueren et al, 2014).

Phlebitis scores are widely used to assess PIVC complications (e.g. pain, redness, swelling, purulence and 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 et al, 2014). To complicate matters, many phlebitis scores have been adapted by individual sites and no assessment has been made of the validity and reliability of refashioned scoring tool. Phlebitis scores rely on a subjective assessment of phlebitis symptoms rather than a gold standard definition, and inter-rater 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 (Ray-Barruel et al, 2014; Göransson et al, 2017).

The INS has an infiltration scoring tool as well as a phlebitis score (INS, 2016), but neither provides recommendations for action. Without recommendations for action, nurses use inconsistent and potentially fallible judgment rather than objective assessment parameters (Odell et al, 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 the function of the cannula, dressing and securement integrity, adherence to infection prevention standards, patient preference and education needs. With PIVC failure rates in a range of 30–50% (New et al, 2014; Wallis et al, 2014; Marsh et al, 2018), 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 and Ray-Barruel, 2017).

Conclusion

Integrating best evidence into clinical care for the patient with a PIVC is challenging in the complex healthcare 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 care bundle and an accompanying checklist can improve compliance with guidelines to ensure PIVC management is consistent.

Although national standards and guidelines are reviewed and updated regularly, keeping local policies and procedures current is an ongoing and time-consuming challenge.

Given 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 aid 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 programme, will provide the optimal environment for achieving high-quality patient outcomes. **BJN**

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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 scoring tools
- Decision aids should be based on best evidence and updated regularly to be most useful to practitioners; however, 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 checklist fatigue
- Some decision aids incorporate patient preference but many do not

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CPD reflective questions

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