

Evidence-Based Practice for Peripheral Intravenous Catheter Management

The reasons to reduce 'just in case' or 'idle' PIVCs.

ABSTRACT: Peripheral intravenous catheters (PIVCs) are among the most common invasive devices used in hospitalized patients, with over 300 million sold in the United States each year. However, about one-fourth of PIVCs are left in situ with no prescriber orders for IV medications or solutions, "just in case" they might be needed. PIVC insertion can be painful, is often unnecessary, and may increase a patient's risk of developing a bloodstream infection. This article reviews the evidence for the appropriate use of short PIVCs in hospitalized patients, assesses the ongoing need for PIVCs, provides recommendations for alternative options, and argues for promptly removing a PIVC that is no longer in use.

Keywords: catheter, complications, decision-making, evidence-based practice, nursing, peripheral intravenous catheter

Jon Wilson, a 20-year-old man, previously healthy and with no premorbid conditions, is admitted for a routine tonsillectomy and adenoidectomy. In the operating room, the anesthesiologist inserts a 22-gauge peripheral intravenous catheter (PIVC) into the back of Mr. Wilson's left hand for administering sedation, then an 18-gauge PIVC into his right antecubital fossa in case a blood transfusion is needed.

The surgery goes well, with no evidence of bleeding, and the patient is returned to the postanesthesia care unit for routine postoperative observation. His condition remains stable, and he is transferred to the surgical unit.

While Mr. Wilson is moving from the stretcher to the bed, the PIVC in his left hand becomes dislodged. The surgical resident asks the nurse to insert another PIVC. The nurse reports that the patient

already has a PIVC in his right antecubital fossa. The resident replies that it would be best to insert another PIVC to deliver the prescribed analgesia and to keep the antecubital PIVC available in case of postoperative bleeding.

The nurse inserts a 20-gauge PIVC into the patient's left forearm.

Mr. Wilson's pain is well controlled, he shows no signs of bleeding, he continues to recover well, and both PIVCs are removed the following day. As this case shows, maintaining one or more catheters that may not be needed is a common occurrence. But is it best practice?

'IDLE' PIVCS: SCOPE OF THE PROBLEM

For many years, every patient admitted to the hospital automatically had a short PIVC inserted "just

in case” they might need it. It was believed that having a PIVC in situ was best for the patient, in preparation for any event, any scenario, any crisis.¹ Furthermore, when inserting a PIVC, a blood sample could be obtained at the same time as cannulation was performed. No need for two needlesticks!

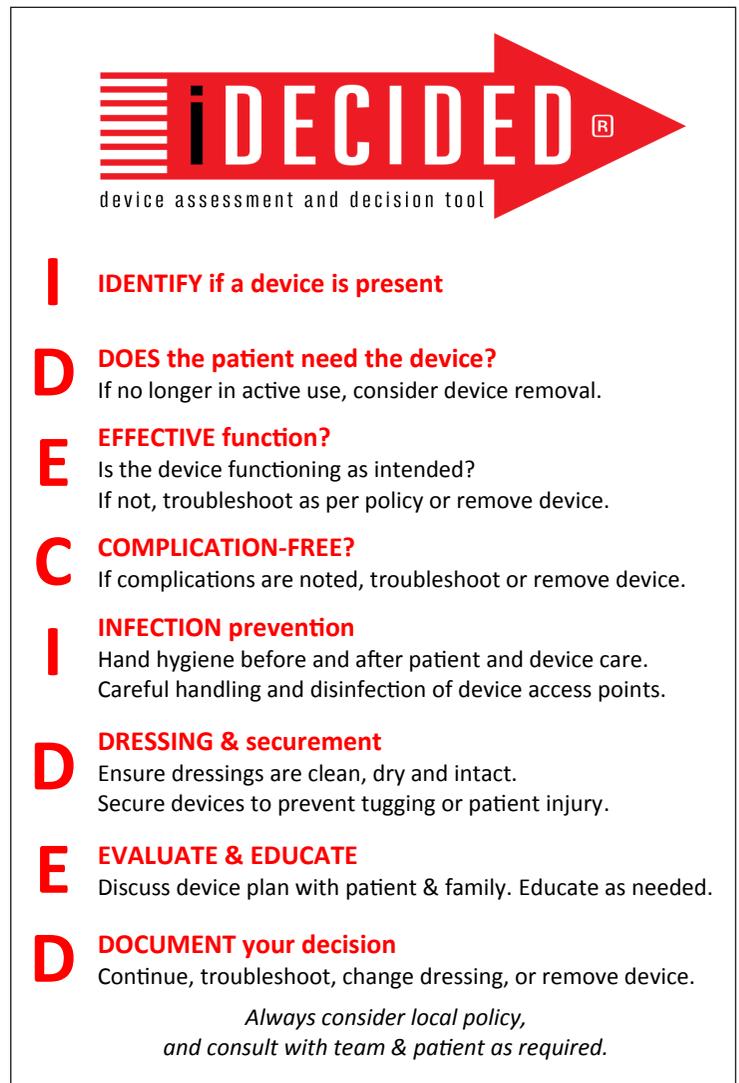
However, the practice raises many issues. Not every patient who requires a blood sample drawn needs a PIVC. Blood sample results often come back within normal limits, and the PIVC isn’t needed for IV treatment. Moreover, patients may endure numerous painful venipunctures to have a PIVC inserted, resulting in anxiety and needle phobia,^{2,4} which in turn can make them reluctant to seek necessary treatment.⁵ Repeated cannulations can also result in venous depletion (fewer usable veins), with peripheral vessels becoming thrombosed and friable, making more invasive central venous catheters necessary.⁶ Finally, the staff time needed to insert a PIVC and the financial costs of inserting a PIVC when it might not be needed can no longer be justified.⁷

PIVCs are among the most common invasive devices used in hospitalized patients, with over 300 million sold in the United States each year.⁸ However, PIVCs that were initially necessary for acute treatment are often left in place after they are no longer needed. These “idle” catheters are a pervasive problem. An idle catheter is defined as a device “in situ over 24 hours without a clear purpose” (see *What Defines an ‘Idle’ PIVC?*).⁹ An integrative review of 13 studies with a total of 38,940 patients found that up to 50% of PIVCs remained idle after insertion in case they might be needed, despite no prescribed orders for IV medications, solutions, blood products, or planned procedures.¹⁰

Multiple studies have confirmed that idle catheters are a problem. A global study of 40,620 PIVCs in 51 countries found the prevalence of idle PIVCs to be 14% overall, but higher in developed nations.¹¹ In North America, Australia, and New Zealand, for instance, nearly one-fourth (23%) of all PIVCs had not been accessed in the past 24 hours.¹¹ In an Australian study, one-third of PIVCs inserted in the ED remained unused at 24 hours.¹² Another Australian study reported 25% of PIVCs in hospitalized patients had not been used in the previous 24 hours, and nurses stated they would not replace 32% of PIVCs if the devices failed in the next hour, indicating they did not believe the patients needed them.¹³

Health care professionals have given many reasons for not removing idle catheters. “Just in case” they might be needed is often top of the list,^{1,14} but other reasons include concerns over inadequate

Figure 1. A Guide to Assessing the Need for a PIVC



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staff skills if a patient requires urgent cannulation¹; the expectations of others and fear of criticism from coworkers¹; staff convenience and workload efficiency^{1,14-16}; avoiding patient discomfort with potential future recannulation¹; organizational policies or practices¹; and fear of legal repercussions in the case of delays in laboratory testing or PIVC insertion.¹

Sometimes PIVCs remain idle because of “fragmentation of responsibility”—that is, there is confusion or uncertainty about who’s responsible for

What Defines an 'Idle' PIVC?

An 'idle' PIVC^a

- hasn't been used for IV fluids, blood products, parenteral nutrition, or medications in the past 24 hours.
- is not anticipated to be used in the next 24 hours.^a

^aThere are no current IV fluid or IV medication orders, no planned procedures, no cardiac monitoring, no recent history of seizures, and no unstable medical conditions or rapid response/medical emergency calls.

their care.^{15, 16} For instance, it is usually a physician's decision to insert a PIVC, but nurses are mostly responsible for the technical aspects of insertion and maintenance. The decision to remove the PIVC depends on the need for IV therapy (prescriber's responsibility) and site complications (usually the nurse's responsibility).¹⁵

PIVCs may be left idle for more than 24 hours because they are erroneously perceived as a low infection risk.¹⁵ Health care professionals should remember that any invasive device carries a potential risk of infection. Indeed, PIVCs are not less risky than central vascular access devices (CVADs).^{17, 18} The greatest potential risk to the patient who has any intravascular catheter is the development of a serious and potentially fatal bloodstream infection.^{19, 20}

Leaving a PIVC in place unnecessarily increases a patient's risk of infectious and noninfectious complications by 12%,²¹ with an associated risk of an increased length of hospital stay.²² In fact, more hospitalized patients are at risk for developing an infection from a PIVC than from a CVAD, simply because PIVCs are more prevalent. According to a recent U.S. point prevalence study, among 857 patients surveyed who had an IV device, 72.1% had one or more PIVCs, 15.9% had a peripherally inserted central catheter, and 12.7% had another type of central catheter.²³

Based on patient assessment and prescribed therapy, alternative methods can be used when a PIVC is not the appropriate device. For instance, some hospitals have implemented successful midline catheter programs,^{24, 25} and for certain patients, the subcutaneous route is a safe alternative for hydration and some medications.²⁶ In the past, the intraosseous route was used only for emergency access, however it's now used in nonemergent situations in patients with limited or no vascular access.²⁷ If the patient's condition permits, the oral route should be considered for medication and fluid administration. It's preferable to avoid vascular access device placement when possible.

Vascular access specialists should play a major role in determining the appropriate vascular access choice. In one U.S. study, a dedicated vascular

access service of nurses trained to review the need for IV therapy prior to device placement determined that 35% of patients did not require vascular access.²⁸

The need for clinical expertise and documented competency cannot be overstated. Clinicians responsible for vascular access device insertion and infusion therapy administration must receive appropriate training and perform their duties within their scope of practice, according to licensure regulations and organizational policies and procedures.²⁹

The 2021 *Infusion Therapy Standards of Practice* from the Infusion Nurses Society (INS) provides evidence-based guidance on the use of short PIVCs, enabling nurses to perform comprehensive assessments and make informed clinical decisions.²⁹ Implementing evidence-based standards provides consistency in practice and guidance for clinical decision-making. That, in turn, helps ensure that the priorities to reduce patient harm, provide patient comfort, and promote vessel health and preservation are achieved.

VASCULAR ACCESS PLANNING

Unless the patient requires urgent IV access, taking time to plan the vascular access is the best approach. Appropriate device and site selection should be determined based on the patient's diagnosis, age, and comorbidities; vascular characteristics; and prescribed therapy and its anticipated duration.²⁹ Criteria for PIVC placement should be established by the relevant multidisciplinary team.

A PIVC is likely to be suitable for the patient who requires IV medications or fluids for four or fewer days; if medications are required for five to 14 days, an alternative device such as a midline catheter is preferable; and if irritant or vesicant infusates are prescribed, central venous access is a more appropriate choice.²⁹ Evidence-based tools available on smart phone apps, such as the Michigan Appropriateness Guide for Intravenous Catheters (MAGIC)³⁰ or the miniMAGIC for pediatric patients,³¹ can guide appropriate device selection.

It's also important to consider whether a PIVC is even necessary. A quality improvement project in an Australian ED requested staff to critically consider alternatives (such as oral medications or to wait for blood results) and only cannulate if they were "80% sure" a hemodynamically stable patient would require a PIVC within the next 24 hours.³² This example of "deliberate clinical inertia"³³ resulted in a reduction of PIVC insertions by 9.8%, and a cost savings of about \$23 for each cannulation prevented.³²

The INS *Standards* recommend prompt removal of the PIVC when it is no longer needed, if any complications develop, or within 24 to 48 hours if it was inserted under suboptimal aseptic conditions (emergent).²⁹

In the acute care inpatient setting, the ongoing need for a PIVC should be reviewed daily with the patient's health care team. Daily prompts for considering PIVC removal have been incorporated into PIVC maintenance bundles.³⁴ A study in the Netherlands reported a nearly 8% decrease in inappropriate PIVC use following the introduction of a list of guideline-based catheter indications and accompanying staff education.³⁵

Of note, duration of dwell time is not an indication for PIVC removal because there is no known optimal dwell time.²⁹ A Cochrane systematic review found no "clear difference" in the rate of phlebitis or bloodstream infection with routine PIVC replacement every 72 to 96 hours compared with replacement as clinically indicated (no longer needed or complications at the insertion site).³⁶ In addition, several studies have reported cost savings (\$2,100 per month,³⁷ \$7,263.60 per unit per month,³⁸ and \$17,100 per year³⁹), as well as no increase in complications or infections, from the reduction in catheter supplies and staff cannulation time after removing PIVCs when clinically indicated rather than routinely.

PIVC ASSESSMENT

It's vital for nurses to assess every PIVC for every patient in their care and to make an informed clinical decision about the continuing need for each catheter. Tools such as the I-DECIDED IV assessment and decision tool, developed and validated in a multisite study, can help nurses at the bedside make an informed assessment, using a logical, evidence-based approach (see Figure 1).^{9,40,41}

Assessment begins with identifying the presence of a device by asking the patient if they have an IV catheter, checking the patient's extremities, and confirming that the PIVC has been noted in the patient's electronic health record (EHR). Always make sure PIVCs are properly documented (insertion date, time, site, gauge, reason for initial insertion, reason for continued use of the device, ongoing site assessment) so none are missed. Ensure that the PIVC is still necessary for treatment, still functioning, still tolerated by the patient, and still free from signs of complications or infection. If the PIVC has not been used in the past 24 hours or has no indications for use (medical therapy, planned procedure, hemodynamic instability), it should be removed. Leaving an unneeded PIVC in situ after hospital discharge has been attributed to negligence and lack of nursing assessment.^{42,43} Nurses who fail to monitor and assess a patient with a PIVC may be subject to litigation.⁴⁴

The frequency of site assessment, including patency of the PIVC, is guided by the age, condition, and cognition of the patient and the type of infusion (continuous, intermittent, irritant). Prior to injecting medications or administering IV fluids, patency is

assessed by aspirating for blood return and flushing the PIVC with a 0.9% sodium chloride solution in a 10-mL syringe using a push-pause technique.²⁹ If the PIVC cannot be flushed, it should be promptly removed.

The insertion site should be assessed every time the device is accessed and at least every four hours in stable adult patients, every one to two hours for critically ill or sedated patients, hourly for neonates and children, and more often if the patient is receiving vesicant infusates.²⁹

If the PIVC has not been used in the past 24 hours or has no indications for use, it should be removed.

The nurse should assess the PIVC insertion site for any signs and symptoms of complications, such as pain, redness, swelling, leakage, purulence, or hardness of the surrounding area.²⁹ A systematic review of the prevalence of PIVC complications among 76,977 participants in 103 studies found that the most prevalent was phlebitis (inflammation of the vein) at 19.3%, infiltration (nonvesicant solution leaking into the interstitial tissues) or extravasation (vesicant solution leaking into the interstitial tissues) at 13.7%, occlusion at 8%, and pain and catheter dislodgment at 6.4% each.⁴⁵ There is some evidence in adults that the greater the PIVC diameter, the greater the risk of infiltration and phlebitis.⁴⁶ Less common but more serious complications can include local site infection⁴⁷ and catheter-associated bloodstream infection.⁴⁸

HOW TO REDUCE IDLE PIVCS

A variety of interventions have been used to reduce the prevalence of idle catheters, including implementing a protocol for appropriate device selection; daily reminders for PIVC removal in the EHR, on electronic dashboards, and at staff huddles and shift handoffs; conducting regular PIVC surveillance audits; and engaging the patient in their own care when possible. Such strategies prompt PIVC awareness among health care professionals and patients, reducing the likelihood of leaving a PIVC in situ "just in case."

Evidence-based decision tools for device appropriateness such as the MAGIC and miniMAGIC

provide health care professionals with valuable guidance on device selection.^{30,31} Hospital protocols should be reviewed at least yearly and updated to reflect the latest infusion guidelines, such as the *INS Standards*.²⁹ Hospital protocols should also include an expectation that nurses will assess the continued need for the PIVC daily and remove any that are idle.

Health care professionals on multidisciplinary hospital committees can work with informaticians and the information technology department to ensure that the EHR contains a drop-down menu containing reasons for insertion and for the continued need for all invasive devices, including PIVCs.⁴⁹ Shift handoff tools could also incorporate a prompt to consider the continued need for the PIVC.

Another effective strategy is to conduct regular (every three to six months) local clinical surveillance audits to identify the extent of idle catheters and PIVC complications. With PIVCs so commonly used in hospitalized patients, it's not necessary to audit the whole hospital at one time, particularly in larger centers. Smaller audits of between 150 and 250 PIVCs have demonstrated a precise estimate of PIVC complications.⁵⁰ (It's important that the audit is not too small, however, because this could lead to under- or overestimating problems.) Audit results should be shared with the clinical staff and education implemented to improve practice.⁵¹

Wherever possible, educate patients on the reason for the PIVC and the signs and symptoms of phlebitis, and encourage them to speak up if they have questions or concerns. A study in New Zealand found that among nearly 200 patients with one or more PIVCs in situ, 44% were unaware of the reason for the PIVC.⁵² Similarly, researchers in Ireland found that 38% of 275 PIVCs in situ were unnecessary, and that patients who were unaware of the reason for their PIVC were approximately seven times more likely to have an unnecessary PIVC.⁵³

The "just in case" PIVC must no longer be accepted practice. Paying greater attention to the need for a PIVC and considering less invasive, alternate treatment delivery methods where possible will preserve vessel health, reduce patient distress, improve patient safety outcomes, save clinician time, and deliver cost savings. Vessel health and preservation should be on every clinician's mind. Real patient-centered infusion care demands it. ▼

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