Standards of Care for Peripheral Intravenous Catheters: Evidence-Based Expert Consensus

Judy Thompson, MSNEd, RN, VA-BC
Association for Vascular Access, San Diego, CA
Marlene M. Steinheiser, PhD, RN, CRNI
Infusion Nurses Society, Norwood, MA
J. Blake Hotchkiss, MSN, MBA, RN, VA-BC
MaineHealth Franklin Hospital, Farmington, ME
James Davis, MSN, RN, CCRN-K, HEM, CIC, FAPIC
ECRI, Plymouth Meeting, PA
Michelle DeVries, MPH, FAPIC, CPHQ, CIC, VA-BC
ICU Medical, San Clemente, CA
Katie Frate, BSN, RN, VA-BC
St. Joseph's Children's Hospital, Tampa, FL
Robert Helm, MD
Portsmouth Regional Hospital, Portsmouth, NH
Chris W. Jungkans, BSN, BS, RN, VA-BC, CPUI
Advocate Health, WI
Swapna Kakani, MPH
Swapna Kakani Consulting, LLC, Huntsville, AL
Sean Lau, MBA, BSN, RN, VA-BC
Stanford Health care, Palo Alto, CA
Karen Lindell, DNP, RN
Moore Regional Hospital and FirstHealth of the Carolinas, Pinehurst, NC
Kristen McNiff Landrum, MPH
KM Healthcare Consulting, Wilmington, NC
Karen A. McQuillan, MS, RN, CNS-BC, CCRN, CNRN, TCRN, FAAN
American Association of Critical-Care Nurses, Aliso Viejo, CA
R Adams Cowley Shock Trauma Center, University of Maryland Medical Center, Baltimore, MD
DJ Shannon, MPH, CIC, VA-BC, FAPIC
IU Health Adult Academic Health Center, Indianapolis, IN
Indiana University Richard M. Fairbanks School of Public Health, Indianapolis, IN
Lorelle Wuerz, PhD, MSN, RN, VA-BC, NEA-BC
NewYork-Presbyterian Hospital, New York, NY
Stephanie Pitts, DNP, RN, CPN, VA-BC, NEA-BC
B. Braun Medical Inc. Bethlehem, PA

Highlights

- The United States purchases an estimated 350 million PIVCs annually.
- PIVC insertion is the most frequently performed invasive procedure in healthcare.
- There is multidisciplinary and multi-organizational collaboration.
- PIVC insertion and maintenance is underappreciated in U.S. healthcare.
- There is a fundamental lack of awareness regarding associated risks.
- Patients knowingly and unknowingly accept substandard care.

Correspondence regarding this article should be addressed to jthompson@avainfo.org
https://doi.org/10.2309/JAVA-D-24-00011
Copyright © 2024 Association for Vascular Access. All rights reserved.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

Abstract

Background: The insertion of a peripheral intravenous catheter (PIVC) is the most commonly performed invasive procedure in healthcare. Despite its frequency in placement in hospitalized patients, PIVCs are generally perceived as being safe; however, the prevalence of failure ranges from 35%-50%. Additionally, complications are common and often deemed "acceptable" by clinicians. Healthcare provider and clinician foundational knowledge and competency is lacking nationally. Considering the mere volume of PIVCs placed, the failure and complication rates, the human impact is significant.

Methods: The Association for Vascular Access (AVA) has led a collaborative effort with representatives from the Infusion Nurses Society (INS), the American Association of Critical Care Nurses (AACN), ECRI, and content experts representing nursing vascular access, infusion therapy, infection prevention, critical care, pediatrics, healthcare leadership, a physician, and a patient representative. Our aim is to provide concise guidance that will enhance and standardize practices related to peripheral intravenous catheters (PIVC). By consolidating current standards of practice into a comprehensive document, our framework seeks to advance the quality of care and improve patient safety.

Results: This document has undergone meticulous scrutiny to ensure its quality; including incorporation of current standards, methodology for consensus from the expert panel, and input received from public comments.

Conclusions: We anticipate that this work will have a significant impact on healthcare professionals, policymakers, and, most importantly, patients' experiences by the promotion of consistent, high-quality treatment, safety, and comfort for patients receiving a PIVC.

Endorsing Organizations

- Alliance for Vascular Access Teaching and Research (AVATAR)
- American Academy of Emergency Nurse Practitioners (AAENP)
- American Association of Critical-Care Nurses (AACN)
- American Association of Nurse Anesthesiology (AANA)
- Association for Professionals in Infection Control and Epidemiology (APIC)
- Association for Safe Aseptic Practice (ASAP)
- Association for Vascular Access (AVA)
  - Beyond Acute Care Special Interest Group (BACSIG)
  - Canadian Vascular Access Association (CVAA)
- ECRI
- Emergency Nurses Association (ENA)
- Infusion Nurses Society (INS)
- International Nosocomial Infection Control Consortium (INICC)
- Pediatric and Neonatal Special Interest Group (PediNeoSIG)
- Society for Healthcare Epidemiology of America (SHEA)
- Society of Nurse Scientists, Innovators, Entrepreneurs & Leaders (SONSIEL)

Introduction

The Significance of Peripheral Intravenous Catheters

In the landscape of modern healthcare, peripheral intravenous catheter (PIVC) insertion is a cornerstone procedure, critical for the administration of therapies, medications, and fluids to a wide array of patients in a variety of settings. Annually, the U.S. alone purchases an estimated 350 million PIVCs, making it the most frequently performed invasive procedure in healthcare.[1] Its prevalence is underscored by Helm et al., who highlighted that 60%-90% of hospitalized patients in the U.S. require a PIVC during their care and experience PIVC failure rates ranging from 35%-50%.[2] This high failure rate has been persistent, as shown by Cooke et al., who reported even higher global rates of 33%-69% PIVC failures before treatment completion.[3]

Despite its commonality, PIVC practice variability leads to a range of complications such as infiltration, infection, and patient discomfort. Reports such as that by Zingg et al. corroborate a troubling global prevalence of PIVC failure, marked at 35% to 50%.[4] The Australian Commission on Safety and Quality in Health Care further amplifies this concern with indications of complication rates up to 70%.[5,6] The consistency in these findings is echoed in a systematic review by Marsh et al., which noted that at least one-third of PIVCs inserted globally fail before the completion of the intended therapy.[7] Such complications are not just statistical concerns; they represent a grave risk to patient welfare and highlight the urgency for improved insertion and care practices.

Scope and Implications for Healthcare Professionals

Inspired by the Australian Commission on Safety and Quality in Health Care's publication "Management of Peripheral Intravenous Catheters: Clinical Care Standard," in 2023, the Association for Vascular Access (AVA) led a collaboration with representatives from the Infusion Nurses Society (INS), the American Association of Critical-Care Nurses (AACN), ECRI, and content experts.[6] AVA initiated the collaboration seeking to provide clinical guidance to improve and standardize PIVC practices. First, by integrating currently published standards of practice into a singular, comprehensive document, this framework aims to advance the quality of care and enhance patient safety. Second, this work was further informed by the collective interdisciplinary guidance of key stakeholders in healthcare, vascular access, and infusion therapy. Third, this work

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

was vetted through public comment. We anticipate this document will impact healthcare professionals and policymakers and, most importantly, will significantly improve patient experiences by promoting consistent high-quality treatment, safety, and comfort.

Methods

Representatives from AVA, INS, AACN, and ECRI collaborated to convene 15 experts in vascular access and infection prevention, including registered nurses, epidemiologists, researchers, critical care specialists, nurse leaders, professional development specialists, a medical doctor and a patient representative. All experts completed conflict of interest disclosures.

Approach

We used a modified RAND/UCLA Appropriateness Method for development of the best practice statements.[8] This method has been widely used to reach agreement about the real-world application of evidence in healthcare. A project methodologist with consensus expertise defined the process, created the rating forms, calculated scoring, reported the ratings, and facilitated the in-person meeting. Informed by our focus on real-world implementation of these recommendations, we developed rating scales for both impact on patient outcomes and impact on health system resources. A standard RAND/UCLA 9-point scale was used, with the scale for outcome ratings defined as *1 = no impact; 5 = uncertain; 9 = high impact*, and the scale for the resource ratings defined as *1 = no resource needs; 5 = uncertain; 9 = high resource needs*. Outcome ratings were prioritized for the consensus process, with resource ratings providing implementation context. We defined scoring a priori, with an "uncertain" score to be assigned if a recommendation statement had a median score in the 4-6 range and "disagreement" to be assigned if individual ratings for a recommendation statement fell in both the 1-3 category and the 7-9 category.

Best Practice Statement Development

The drafting team reviewed the literature for published guidelines, standards of practice, and key evidence. They drafted an initial set of recommendations, organized into clinically and operationally meaningful groupings. The drafting team did not participate in the ratings or consensus process described below.

The panel, consisting of 13 experts were oriented in a virtual meeting. Panelists then conducted independent ratings of the draft recommendations using an online form. The project methodologist scored the first round of ratings using the scoring method previously described to indicate median scores, uncertainty, and disagreement. Summary results were sent via email to all panelists.

Panel members met for a one-day meeting facilitated by the methodologist. During the meeting, panelists discussed the recommendations, focusing on those with ratings reflecting uncertainty and disagreement, and proposed refinements. After the meeting, the revised recommendations were integrated into the second rating form. Panelists re-rated each recommendation in an online survey. The methodologist rescored the second ratings. Final recommendations were those that achieved a median score of 7-9 in the second rating.

A brief description of the project and the recommendations were posted for public comment in February 2024. Communications were distributed from supporting organizations and contributors through email, social media, and other digital campaigns. At the close of the public comment period, all submitted comments were reviewed for relevancy and inclusion into the final recommendations and manuscript. The expert panel convened to conduct review and revisions based on public comments. The expert panel then completed a final round of voting, indicating whether a recommendation should be maintained or removed for the final statement. A simple majority was used for scoring.

Results

At the completion of the second round of ratings, 14 categories with 81 recommendations were finalized for public comment. During the public comment period, we received responses from 92 respondents with 476 substantive comments. After revisions based on public comment, the panelists voted on 16 categories with 122 recommendations. The final 16 categories and 123 recommendations are presented below.

Themes from Public Comment

There were 476 substantive comments received during the open public comment period. Of these, many demonstrated positive reception for the recommendations. There were several themes that presented through the remaining comments, which were reviewed for adoption within the recommendations where appropriate or for revision of the recommendations for clarification. One theme that emerged was the need for enhanced awareness of the psychological, behavioral, and emotional needs of patients. Another theme that emerged was the need to strengthen the focus on diversity, equity, and inclusion in the recommendations. Another theme illustrated the need to improve the practices for assessing patients for difficult intravenous access. Some public comments reiterated recommendations that already existed within the document. The drafters were grateful for the public's interest in these recommendations, their detailed analysis, and the comments received.

Definitions

The panelists adopted or established the following definitions for the recommendations:

- Aseptic non-touch technique (ANTT®) – "A specific and comprehensively defined type of aseptic technique with a unique theory-practice framework based on an original concept of Key-Part and Key-Site Protection; achieved by integrating Standard Precautions such as hand hygiene and personal protective equipment with appropriate aseptic field management, non-touch technique, and sterilized supplies. It is designed for all invasive clinical procedures and management of invasive medical devices. In the

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

context of infusion therapy, this includes vascular access device (VAD) insertion and management and infusion administration. ANTT can be successfully implemented as a standalone initiative or as an integral part of a clinical care bundle."[9,10]

- Clinician – An inclusive term to describe clinicians who insert and/or maintain PIVCs, including but not limited to medical providers, nurses, respiratory therapists, independent licensed providers, and paramedics (consistent with state law) (expert panel definition).
- Difficult IV access (DIVA) – Patients identified as DIVA are those who have experienced multiple unsuccessful attempts to insert a catheter. This can be acute due to sudden illness or chronic. Characteristics of DIVA include, but are not limited to, patient characteristics, extremes of age (prematurity and older adults), gender (female), and vein characteristics (limited visibility and palpability).[10]
- Healthcare organization – An inclusive term to describe hospitals or other healthcare facilities, such as long-term acute care facilities or free-standing emergency rooms. (expert panel definition).
- Non-peripherally compatible- Infusates that are not appropriate for administration through a peripheral vein; based on duration and/or infusate composition.[11]
- Peripherally compatible – Infusates that are appropriate for administration through a peripheral vein; based on duration and/or infusate composition.[11]
- Peripheral intravenous catheter (PIVC) – is a catheter inserted into and resides in veins of the periphery.[10]
- Vascular visualization technology – Technology that allows for the location and identification of blood vessels used to guide device insertion in an attempt to increase PIVC insertion success. Common technologies used for the placement of PIVCs include ultrasound, near infrared technology (nIR), and transillumination.[10]
- Vessel health and preservation (VHP) – VHP is a model applied to vascular access and the administration of intravenous medications and treatment that structures evidence-based practices within four quadrants of medical care: assessment/selection, insertion, management, and evaluation of vascular access devices.[12]

Standards of Care for Peripheral Intravenous Catheters

Assess Intravenous Access Needs

1. Assess intravenous access needs to ensure that a PIVC is the most appropriate vascular access device (VAD). The clinician assesses patients requiring the administration of intravenous medication, fluid, or blood products to identify the most appropriate route of administration for their clinical needs. Assessment includes but is not limited to prescribed therapy, anticipated duration of therapy, infusate characteristics, vascular characteristics, patient's age, comorbidities, history of infusion therapy, preference for VAD type and location, and ability and resources available to insert and care for the device.[10]
   a) The clinician inserting the PIVC educates and involves the patient (and/or patient's caregiver) in the decision-making process for selecting the most appropriate vascular access device(s).[10,13]
   b) The ordering provider and care team incorporates vessel health and preservation strategies when planning for vascular access.[10,13,14]
   c) At minimum, the clinician overseeing the care of the patient conducts a daily PIVC needs assessment.[10,13–16]
   d) If a central vascular access device (CVAD) is the most appropriate VAD, clinicians must not use PIVCs to avoid CVAD placement.[10,13–15]
      i) A PIVC should not be inserted as a central line-associated bloodstream infection (CLABSI) prevention strategy when CVAD access is indicated.[10]
      ii) Consider situations in which insertion of a CVAD is planned, but the patient will benefit from immediate life-saving treatment through a PIVC. Replace PIVC with a CVAD as soon as possible.[10]

Educate, Inform, and Collaborate with Patients and Caregivers

2. A patient (and/or caregiver) is involved and empowered in care delivery by receiving information and education about the need for the device, the procedure, insertion, management, signs and symptoms of complications, risk of infection, and removal.[10,17]
   a) Healthcare organizations and clinicians provide patients (and/or caregivers) with information about PIVCs, including potential complications and self-monitoringtechniques.[10,17]
   b) Healthcare organizations and clinicians take responsibility for educating patients in the self-advocacy of PIVC care (e.g., patients/family advocating for disinfection of access ports and hand hygiene by healthcare team).[10,17]
   c) Healthcare organizations and clinicians empower and support a patient's request for site of choice and for the use of visualization technology in an attempt to reduce unsuccessful PIVC insertion attempts. (expert panel consensus)

Clinician Education and Competency

3. Ensure the competency level (knowledge, skills, and performance) of healthcare clinicians inserting and managing PIVCs. Clinicians who insert and manage PIVCs are trained and determined to be competent in current evidence-based practices for vessel health and preservation and preventing device-related complications, relevant to their scope of practice.

   Insertion by a clinician working toward competency is supervised by a clinician who is trained and assessed as competent.[10,15,18]
   a) Educational facilities or institutions training clinicians who will be responsible for PIVC insertion and/or management must provide foundational education on the purpose of PIVCs, indications, insertion,

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

complications, and complication reduction strategies.[10,15,18–21]

b) Healthcare organizations must provide standardized, comprehensive education prior to a clinician starting PIVC insertion and/or management at that organization, including an established process for validating knowledge, skills, and performance.[10,15,18–21]

c) Healthcare organizations must provide standardized, comprehensive continuing education to all clinicians who insert and manage PIVCs, including an established process for validating sustained (and ongoing) knowledge, skills, and performance.[10,15,18–21]

d) At minimum, training provided by the healthcare organization must cover PIVC device and site selection, patient comfort measures, ANTT, proper catheter insertion, use and removal, dressing application, device securement, monitoring to ensure patient and clinician safety, and complication identification and management.[15,19–21]

Ensure Safety

4. Ensure the safety of clinicians and patients with PIVC insertion and management. The insertion and ongoing management of a PIVC poses a risk to the clinician and patient.[10,18]

a) Healthcare organizations train clinicians caring for patients with a PIVC on proper hand hygiene, standard precautions, bloodborne pathogens, and sharps safety upon onboarding and annually.[10,15,18]

b) Healthcare organizations monitor clinicians' compliance to PIVC-related policies and procedures.[10]

c) Clinicians must wear gloves upon insertion of a PIVC and when changing a dressing.[10,15,18]

d) Clinicians must use ANTT during PIVC insertion, care and removal.

i) If site becomes contaminated by re-palpation or touch after disinfection, skin antisepsis must be reperformed.[9,10,15,18]

e) Healthcare organizations must provide safety-engineered PIVCs with preference given to passive safety devices.[10,22–31]

f) Healthcare organizations must have an established process to monitor compliance with PIVC skin antisepsis upon onboarding and with ongoing competency evaluations.[10,15]

g) Healthcare organizations use PIVC processes that avoid needle sticks and exposure to infusates, blood and bloodborne pathogens during insertion and care.[10,32]

h) Disposable items associated with PIVC insertion should be single patient use only.[33]

i) Healthcare organizations ensure that the chosen method for disinfection is applied consistently when accessing needleless connectors on all peripheral VADs as this is a critical element for reduction of intraluminal contamination and subsequent bloodstream infection (BSI). (expert panel consensus)

Choose the Right Insertion Site and Device

5. Choose the appropriate insertion site and catheter in collaboration with the patient/caregiver. Clinicians must employ vessel health and preservation (VHP) standards when assessing for PIVC cannulation. Components of a comprehensive assessment include type and duration of therapy, infusate characteristics, DIVA history, infusion therapy history, insertion site, skin integrity and vessel health, and the patient's age, diagnosis, decision-making capacity, and comorbidities/contraindications. Most appropriate site selection occurs collaboratively with the patient/primary caregiver and the attending healthcare team.[10,34]

a) Clinicians inserting PIVCs use upper extremity sites in adult patients, when clinically appropriate.[10,35]

i) Clinicians inserting PIVCs give preference to vessels of the forearm unless clinically inappropriate (e.g., for chronic kidney disease).[10]

b) Clinicians inserting PIVCs use all appropriate sites in pediatric patients, including lower extremity in non-ambulating patients, upper extremity in ambulating patients, or the scalp in neonates.[10]

c) Clinicians avoid suboptimal PIVC sites such as areas of flexion, injury, infection, lymphedema, lymph node dissection, fistulas, fractures, impaired skin integrity, or locations of planned procedures.[10,14,36]

i) For PIVCs inserted in areas of flexion, use joint stabilization to reduce the risk of complications. Joint stabilization must not obscure the PIVC insertion site or obstruct the infusion or vascular pathway.[10]

ii) PIVCs should not be inserted on the trunk of the body (e.g., chest, breast).[10]

d) Clinicians insert the least invasive VAD with an appropriate gauge and length for the vein size, smallest outer diameter and fewest number of lumens required for the prescribed therapy.[10,14]

e) Clinicians should be trained to prospectively identify DIVA patients and plan to gain vascular access in a manner that limits the risk of failed attempts.[37]

f) PIVC site selection should optimize a patient's ability to move to perform activities of daily living, including the use of mobility aides or durable medical equipment (expert panel consensus).

Pain Reduction and Comfort Strategies

6. Apply appropriate pain reduction strategies. Clinicians identify and apply appropriate pain reduction strategies for PIVC insertion and removal for all patient populations in collaboration with the patient and/or caregiver(s).[10,38,39]

a) Clinicians inserting PIVCs should offer, at a minimum, non-pharmacologic pain interventions (e.g., vibration, distraction, holistic measures) in non-emergent PIVC insertions.[10,38,39]

i) For neonates or infants, consider the use of sucrose/glucose, non-nutritive sucking, and comfort positioning.[10,40]

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

ii) For pediatric patients, comfort positioning can help children feel more secure during PIVC insertion. This involves positioning the child in the lap of or next to their parent, or in an alternative way that is comfortable and calming, while also providing access to the area of the PIVC insertion.[40,41]

b) For neonatal and pediatric patients, child life specialists should be offered as support in preparing children and their families for the procedure, during the procedure, and throughout care with the PIVC.[10,38,39]

c) Clinicians inserting PIVCs should offer and discuss pharmacologic pain reduction strategies with patients when clinically appropriate.[10,38,39,42–44]

d) Healthcare organizations apply standardized pain assessment protocols to PIVC insertion documentation.[10,38,39]

e) Clinicians should consider pain reduction strategies for PIVC dressing change and device removal (e.g., vibration, use of adhesive remover).[10]

Maximize First Insertion Success

7. Maximize first insertion success through patient assessment (including patient history and site knowledge/ preference), vessel identification (e.g, palpation and visualization) and the use of vascular visualization technology. All patients are assessed for difficult IV access (DIVA) prior to the PIVC insertion attempt. The clinician documents DIVA status.[10]
   a) Healthcare organizations train every clinician responsible for PIVC insertion on the use of DIVA assessments and the need to escalate insertion (e.g., to more skilled clinicians and corporate the use of organization-approved vascular visualization technology) to minimize unsuccessful insertion attempts.[10,45]
   b) Healthcare organizations acknowledge and incorporate health equity strategies into PIVC insertion policies and procedures and include this in clinician training.[10,45]
   c) Clinicians inserting PIVCs should employ vascular visualization technology to increase first-attempt insertion success of the most appropriate, least invasive VAD; thereby minimizing the need to escalate to an unnecessary, more invasive device and reducing insertion-related complications.[10,45,46]
      i) Healthcare organizations develop policies and procedures for the use of vascular visualization technology.[10]
      ii) Healthcare organizations develop policies and procedures for ultrasoundguided PIVC insertion practices including ANTT and disinfection of equipment after use.[10]
      iii) Clinicians inserting PIVCs in neonates should consider visible light devices that provide transillumination of peripheral veins.[10]
      iv) Clinicians should consider the use of near infrared (nIR) light technology to support PIVC insertion in children and adults with DIVA.[10]
      v) Clinicians with training in the use of ultrasound-guided PIVC insertion should consider ultrasound guidance to assess the vessel size, depth, anatomical structures, identify anomalies and guide insertion.[10]
   d) Clinicians inserting PIVCs should be trained and demonstrate competency in the use of facility-approved vascular visualization technology. Technology should be considered to improve first-stick success and to prevent vessel depletion.[10,45,46]
   e) Healthcare organizations establish clear policy and procedures for escalation when there are failed PIVC attempts or no visible or palpable veins, including a pathway of escalation (expert panel consensus).
   f) Consider the use of technologies and techniques to improve vessel dilation prior to PIVC insertion (e.g., warm compresses/heat, tourniquet[10]) (expert panel consensus).

Insert and Secure

8. Clinicians employ ANTT during insertion and ensure that the PIVC is stabilized.[9,10,13,47–49]
   a) Clinicians employ ANTT when inserting, caring for, maintaining, and removing a PIVC as a critical aspect of infection prevention.[10,13,15,18,50]
   b) Clinicians inserting PIVCs must perform skin antisepsis at the intended PIVC insertion site (per the manufacturer's recommendations).[10,15]
      i) Use an alcohol-based chlorhexidine solution as a first-line antiseptic solution for PIVC site care; if sensitive to chlorhexidine, use povidone iodine preferably with alcohol.[10,18]
   c) If a PIVC is inserted in suboptimal, non-aseptic conditions, it is removed as soon as possible.[10,15,18]
      i) If peripheral access is still indicated, remove and insert a new catheter as soon as possible, within 24-48 hours.[10]
   d) Clinicians secure the PIVC and apply a sterile dressing upon successful PIVC insertion and with routine dressing changes to avoid accidental dislodgement.[10,13,15,18,47–52]
   e) Clinicians inserting and managing PIVCs should implement a post-insertion care bundle and use techniques and devices that afford enhanced catheter stabilization and securement.
      i) Clinicians should consider the use of tissue adhesive and skin barrier film to improve dressing adherence and prevent dressing disruption and device dislodgement.[10,53,54]
      ii) Consider patient preferences for adhesives and skin barrier (expert panel consensus).
   f) Healthcare organizations develop policies and procedures regarding the use of tissue adhesives, skin barrier films, and securement devices to minimize dressing disruption, catheter movement, and accidental dislodgement.[10]

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

g) Healthcare organizations develop policies and procedures that provide guidelines for the appropriate timing and technique for securement device replacement that align with manufacturers' recommendations.10

h) Healthcare organizations consider the potential benefit of chlorhexidine-containing dressings.[10,15,48]

i) Clinicians assess for allergies to chlorhexidine and do not use chlorhexidine-containing dressings on patients with a known history of allergy or hypersensitivity reaction.[10,15,48]

Routine Use and Post-Insertion Care

9. Clinicians must routinely inspect the insertion site and assess the functionality of PIVCs for signs of complications and catheter dysfunction to prevent treatment interruptions.[10,13,16,18]

a) Clinicians confirm patency and assess blood return of PIVCs prior to each infusion and medication administration to prevent potential complications, and document assessment results.[10,13,16,55]

i) If unable to confirm blood return from the PIVC, consider alternative assessments including lack of resistance to flushing, ongoing clinical response to infusing medication, site evaluation, and patient symptom report.[10]

ii) If using the PIVC for vesicant administration, plan to transition the infusion to a more appropriate VAD or CVAD when clinically possible. Peripheral administration of antineoplastic vesicants is contraindicated in the absence of blood return.[10]

iii) For patients receiving antineoplastic vesicants through a PIVC, assess and verify blood return every 2 to 5 mL for IV push, every 5 minutes during an infusion, and upon completion. Remain with the patient during the entire short-term infusion.[10]

b) Change transparent semipermeable membrane dressings at least every 7 days (except neonatal patients) or immediately if dressing integrity is disrupted.[10]

c) Change gauze dressings every 2 days or earlier if dressing integrity is disrupted.[10]

d) Healthcare organizations must have policies and procedures that describe the steps of standardized flushing and locking practices.[10]

e) Clinicians must flush PIVCs after each infusion to clear the infusate from the catheter lumen to reduce the risk of incompatible medications interacting causing intraluminal precipitate.[10,13,16,55]

f) Clinicians must clamp the PIVC extension set after the completion of the final flush to decrease the risk of intraluminal occlusion and, depending on the solution used, to reduce catheter-associated blood stream infections (CABSI).[10,13]

g) For adult patients in the acute care setting, clinicians must inspect PIVC sites at a minimum of every 4 hours and every 1-2 hours in critically ill and sedated patients.[10,13,15]

h) For neonatal and pediatric patients, clinicians must inspect PIVC sites at a minimum of every 1 hour during an infusion.[10,13,15]

i) Outside of the acute care setting, clinicians must inspect PIVC sites at routine intervals based on the patient's treatment plan.[10,13,15]

j) Clinicians must perform additional PIVC site assessments when a patient expresses concern regarding pain, discomfort, redness, and/or swelling.[10,13,15]

k) Clinicians must perform hand hygiene before and after any interaction with the patient or PIVC catheter including the dressing.[10,15,18]

l) Healthcare organizations develop policies and procedures to promote effective cleaning and disinfection of PIVC access points for all vascular access devices including PIVCs.

m) Clinicians disinfect needleless connectors according to facility policy/protocol.[10]

n) Consider the use of a validated tool for the assessment process during care and maintenance.[56]

o) Patients and caregivers are educated on assessing their PIVC site with each infusion or at least once per day and reporting concerns to clinicians. (expert panel consensus)

Ongoing Need

10. Review the ongoing need for the PIVC. Clinicians routinely evaluate and document the need for the PIVC.[10]

a) Clinicians must perform a daily evaluation for the ongoing need of the PIVC in acute inpatient settings and during regular assessment visits in other settings, such as the home, outpatient facility, or skilled nursing facility.[10,57]

b) Healthcare teams review a patient's vascular access needs as part of a comprehensive, interdisciplinary evaluation to ensure effective communication and appropriate care planning.[10]

c) Healthcare teams communicate with the patient and/or caregiver, when possible, as part of the care planning process to ensure that a PIVC meets their needs as part of a comprehensive evaluation of their condition and treatment requirements.[10]

PIVC Removal

11. Clinicians anticipate potential risks and take appropriate steps when removing dressings and securement devices.[10]

a) Clinicians notify the provider if the PIVC is not used for 24 hours or more and remove PIVCs when they are no longer required for the plan of care.[10,57]

b) Clinicians use ANTT principles while removing a catheter.[10]

c) Clinicians apply direct pressure to the venipuncture site after PIVC removal to obtain hemostasis. The site is covered with a dressing after hemostasis has been achieved.[10]

d) Upon PIVC removal, clinicians assess and notify the healthcare team of signs and symptoms of suspected

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

complications (e.g., compromised integrity of the catheter, phlebitis, infiltration, extravasation, nerve injury, and signs of infection).[10,15,57]

e) If the patient remains in the healthcare facility following PIVC removal, clinicians observe the insertion site for 48 hours after the PIVC has been removed for signs and symptoms of complications (e.g., pain, redness and swelling).[10]

f) Clinicians educate the patient and/or caregiver on signs and symptoms to report to their healthcare providers after PIVC removal.[10,15]

g) Consider the use of adhesive remover when removing the PIVC dressing.[10]

Documentation

12. Clinicians must document PIVC insertion, management, removal, routine assessments of the insertion site, and every unsuccessful attempt (including the site).[10]
    a) Clinicians must label the PIVC dressing, according to organizational policy.[10]
    b) Clinicians must document routine care, assessments, patient response, and complications of a PIVC while it is indwelling.[10]
    c) Clinicians must report all PIVC-related adverse events (an undesirable clinical outcome, including but not limited to infiltration, extravasation, dislodgement, nerve injury, infection, and phlebitis) into their organization's event reporting system.[10]

Remove and Replace Only if Needed

13. Healthcare organizations have policies and procedures for the removal and replacement of PIVCs. This includes (1) a mechanism for documentation of the removal of PIVCs, including the removal reason, and (2) a mechanism for the documentation of the replacement of PIVCs, including the replacement reason. Competencies, policies, and procedures must address proper removal technique and proper replacement technique.[10]
    a) Clinicians only insert a PIVC when there is a clinical justification for intravenous therapy or an anticipated need for emergency PIVC access (expert panel consensus).
    b) Clinicians must remove a PIVC when it is no longer clinically indicated for patient care, at the first sign of malfunction, patient report of pain or other clinical symptom, or in the presence of a local or systemic complication.[10,15,57]
    c) PIVCs should be changed/replaced when clinically indicated rather than at defined intervals for clinical teams that have adopted optimized PIVC insertion techniques and care practices. This includes at minimum proper site selection, site preparation, insertion, management, outcome monitoring, staff competencies, and documentation.[10,16]
        i) Effective removal when clinically indicated is predicated on the following:
            1) Accurate and consistent VAD assessment based on patient and infusate risk.[10]
            2) Adherence to ANTT principles.[10]
            3) Early recognition and management of complications.[10]
    d) If healthcare organizations have not met the optimized PIVC insertion techniques and care practices described in 13c, then PIVCs at that organization should be replaced at specific intervals (expert panel consensus).

PIVC Quality Management

14. Conduct routine quality assessments of PIVC insertion and management to optimize organizational care standards and outcomes. Healthcare organizations collect data and evaluate the quality of PIVC care delivery within their organization.[10,15,58,59]
    a) Healthcare organizations must establish systems to monitor clinician adherence to policies and procedures related to PIVC insertion, management, and removal, and use the monitoring data in quality improvement initiatives.[10]
    b) Healthcare organizations conduct periodic audits of PIVC-related process measures using a combination of approaches including direct observation combined with available medical records documentation. Examples may include, but are not limited to, site preparation, site selection, insertion technique, first-stick success, dressing disruption, and facility-specific bundle compliance.[10,15,58,59]
    c) Healthcare organizations conduct periodic audits of PIVC-related outcome measures using a combination of approaches including direct observation combined with available medical records and event reporting documentation to provide a more robust overview. Examples may include, but are not limited to, phlebitis, infiltration/extravasation, occlusion, infection, and dislodgement.[10,15,58,59]
    d) Healthcare organizations evaluate the potential contribution of PIVC insertion and management on development of bacteremia events within the facility surveillance scope.[10,15]
    e) Healthcare organizations have patient-centered PIVC quality improvement initiatives and have meaningful engagement of all stakeholders including patient and caregiver advocates with active learning strategies to promote sustainable change.[10,15,58,59]

Psychological and Cultural Safety

15. Maintain the psychological and cultural safety of patients during IV therapy to support patient safety.
    a) Psychological safety creates an atmosphere of trust, respect, and mutual support and involves recognizing, acknowledging, and addressing the emotional needs of everyone involved in the healthcare process.[60]
    b) Cultural competence in healthcare refers to raising awareness in providing care to patients with diverse

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

values, beliefs, and behaviors and individualizing care delivery to meet the patients' unique social, cultural and linguistic needs. Patient safety events can result from the failure to address culture, language, and health literacy and can include unexpected PIVC outcomes and healthcare-associated infections.[61]

Health Equity and Social Determinants of Health

16. Improved education, research and awareness of the impact on PIVC insertion and care related to health inequities, social determinants of health, skin tone, and comorbidities are needed.[45]
    a) Healthcare organizations should consider analyzing quality and safety data to identify disparities related to PIVCs (e.g., first-attempt success, dwell time), develop an action plan, and inform key stakeholders about progress to improve healthcare equity.[45,62,63]

Discussion

The insertion of a PIVC is the most commonly performed invasive procedure in healthcare, yet its significance is underappreciated. Clinicians are commonly heard saying "it's just a peripheral," which further diminishes its importance. These devices are generally perceived as being safe, but patients are being harmed unnecessarily. There is a fundamental lack of awareness regarding associated risks. This is often because of clinicians' lack of knowledge, skill, and competency validation. Patients knowingly and unknowingly accept substandard care. With high failure and complication rates combined with the mere volume of PIVCs inserted, the human impact is incredibly significant.

The impact on patient outcomes can be significant, with multiple insertion attempts leading to increased discomfort, delays in treatment, heightened risk of complications such as site infection, bacteremia, vascular injury, and ultimately, diminished patient satisfaction with the overall healthcare experience. Despite published evidence-based standards of practice, the insertion, use, and care of PIVCs is often substandard with inconsistencies between policy and practice. Through education and training, skill acquisition, competency validation, and technology, we have the capability to make meaningful improvements for patients who require a PIVC for infusion therapies. The statements within this document offer guidance for clinicians and organizations, spanning from the insertion of the PIVC to its eventual removal.

Upon reflection of predicated guidance documents by Zingg et al. and the Australian Commission on Safety and Quality in Health Care, it becomes apparent that there are several notable differences despite many similarities.[4,6] Zingg et al. suggests inserting the PIVC in the "hand/wrist over forearm" is a contradiction to this expert panel and the INS 2024 Infusion Therapy Standards of Practice, which show preference to the vessels of the forearm.[4,10] Similar to the Australian Commission on Safety and Quality in Health Care, this committee ensured prioritization of a patient-centered approach in the entire document.[6] Although the authors of these previous PIVC best-practice documents did not specifically cite a pain management statement, our panel of experts agreed on the significance of incorporating pain management strategies as a standard practice. While both documents demonstrate a focus on PIVCs within their countries (Europe, Australia), this work provides insight for future international collaborations.

Conclusion

The statements derived by this panel can be used as a catalyst for policy change, a single source of truth that aligns with the most current evidence available at the time of publication. We aim to enhance awareness of optimal PIVC practices through this expert panel consensus work, ultimately leading to improved patient outcomes. Subsequent work would include evaluation of the needs of the global community with considerations of product, practice, and technologies available worldwide. Future opportunities of establishing a worldwide evidence-based standardization on PIVC insertion and care presents a promising opportunity to standardize practices, improve patient outcomes, enhance healthcare efficiency, and promote better utilization of resources across different healthcare settings globally.

Disclosures

Judy Thompson is employed by the Association for Vascular Access. Marlene M. Steinheiser is employed by the Infusion Nurses Society. J. Blake Hotchkiss is employed by Maine Health. James Davis is employed by ECRI. Michelle DeVries is employed by ICU Medical, is a Board member with the Association for Vascular Access and recent history as a Consultant and/or on the Speaker's Bureau for Baxter, Becton Dickinson, B. Braun Medical Inc, Eloquest, Ethicon, ICU Medical, Nexus Medical, Kurin, Teleflex, and 3M. Katie Frate is employed by BayCare and St. Joseph's Children's Hospital, is the Chair Advisor for the Association for Vascular Access' PediNeo Special Interest Group, is a Neonatal/Pediatric Consultant for The Clinician Exchange and is a Consultant for B. Braun Medical Inc. Robert Helm is employed by Portsmouth Regional Hospital and is Founder of OneIV Solutions, LLC. Chris Jungkans is employed by Advocate Health. Swapna Kakani is the Owner of Swapna Kakani Consulting, LLC, Consultant and/or speaker for Takeda Pharmaceuticals, Ironwood Pharmaceuticals, and B. Braun Medical Inc. Sean Lau is employed by Stanford Health Care, is a key opinion leader for Becton Dickinson, a consultant for Eloquest Healthcare and is the CEO/President of SJC Vascular Access. Karen Lindell is employed by Moore Regional Hospital and FirstHealth of the Carolinas. Kristen McNiff Landrum is the Owner of KM Healthcare Consulting and is a Consultant for Polsinelli. Karen McQuillan is affiliated with the American Association of Critical-Care Nurses. DJ Shannon is employed by IU Health Adult Academic Health Center and IU Indianapolis Fairbanks School of Public Health, is on the Speaker's Bureau for ICU Medical and Teleflex and is on the Board of Directors for APIC Indiana. Lorelle Wuerz is employed by New York Presbyterian Hospital and is a Speaker/Advisor for Baxter Inc. Stephanie Pitts is employed by B. Braun Medical Inc.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

This project was funded by the AVA Foundation through the generous support of B. Braun Medical Inc. in the form of an unrestricted grant.

Disclaimer

Consensus statements are developed by expert panels and/or professional organizations to provide recommendations based on the collective expertise and available evidence at the time of their publication. While consensus statements aim to provide guidance for clinical practice, it is important to note that they do not replace individual clinical judgment or consideration of specific patient circumstances.

The information provided in consensus statements is intended for general informational purposes only and should not be considered as a substitute for expert clinical advice, diagnosis, or treatment. Clinicians should exercise their professional judgment when applying consensus statements to individual patient cases, considering factors such as patient preferences, unique circumstances, available resources, and local regulations or laws.

It is essential to understand that consensus statements are not legally binding documents. They do not establish a standard of care that must be followed in all circumstances. Consensus statements may become outdated as new evidence emerges or medical practices evolve. It is essential for healthcare professionals to stay updated with current research and guidelines relevant to their specialty area.

While efforts are made to ensure the accuracy and reliability of consensus statements, no warranty or guarantee is given regarding their completeness, accuracy, reliability, suitability, or applicability. The use of any information contained in a consensus statement is solely at the discretion and responsibility of the healthcare provider.

For specific medical advice or concerns related to an individual patient's care, it is recommended that healthcare professionals consult with appropriate specialists and refer to relevant consensus statements specific to their region or institution.

Recommendations specify the level of confidence that the recommendation reflects the net effect of a given course of action. The use of words like "must," "must not," "should," and "should not" indicates that a course of action is recommended or not recommended for either most or many patients, but there is latitude for the treating clinician to select other courses of action in individual cases. In all cases, the selected course of action should be considered by the treating clinician in the context of treating the individual patient. Use of the information is voluntary. AVA and partnering organizations do not endorse, devices, services, or therapies used to diagnose, treat, monitor, or manage vascular access care. Any use of a brand or trade name is for identification purposes only. AVA and partnering organizations provide this information on an "as is" basis and make no warranty, express or implied, regarding the information. AVA and partnering organizations assume no responsibility for any injury or damage to persons or property arising out of or related to any use of this information, or for any errors or omissions.

Stephanie Pitts – the opinions expressed herein are my own and do not reflect the views of B. Braun Medical Inc., B. Braun of North America or any other related company.

References

1. iData Research I. U.S. Vascular Access Device and Accessories Market – 2023. https://idataresearch.com/product/vascular-access-devices-market-united-states/. Accessed March 7, 2023.
2. Helm RE, Kalausner JD, Klemperer JD, Flint LM, Huang E. Accepted but unacceptable: peripheral IV catheter failure. *J Infusion Nurs*. 2015;38:189–203. doi:10.1097/NAN.0000000000000100.
3. Cooke M, Ullman AJ, Ray-Barruel G, Wallis M, Corley A, Rickard CM. Not "just" an intravenous line: consumer perspectives on peripheral intravenous cannulation (PIVC). An international cross-sectional survey of 25 countries. *PLOS One*. 2018;13:e0193436. doi:10.1371/journal.pone.0193436.
4. Zingg W, Barton A, Bitmead J, et al. Best practice in the use of peripheral venous catheters: a scoping review and expert consensus. *Infect Prev Pract*. 2023;5(2). doi:10.1016/j.infpip.2023.100271.
5. Keogh S, Mathew S. Peripheral intravenous catheters: a review of guidelines and research. Sydney: 2019.
6. Australian Commission on Safety and Quality in Health Care. Management of Peripheral Intravenous Catheters Clinical Care Standard. Sydney: 2021.
7. Marsh N, Larsen EN, Ullman AJ, et al. Peripheral intravenous catheter infection and failure: a systematic review and meta-analysis. *Int J Nurs Studies*. 2024;151. doi:10.1016/j.ijnurstu.2023.104673.
8. Fitch K, Bernstein SJ, Aguilar MD, et al. The RAND/UCLA Appropriateness Method User's Manual. Rand Corporation; 2001.
9. Association for Safe Aseptic Practice (ASAP). ANTT Clinical Practice Framework. 2024.Available at: https://www.antt.org/antt-practice-framework.html.
10. Nickel B, Gorski L, Kleidon T, et al. Infusion therapy standards of practice. *J Infusion Nurs*. 2024;47(Suppl1):S1–S285. doi: 10.1097/NAN.0000000000000532.
11. Chopra V, Flanders SA, Saint S, et al. The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): Results From a Multispecialty Panel Using the RAND/UCLA Appropriateness Method. *Ann Intern Med*. 2015;163(6 Suppl):S1–S40. doi:10.7326/M15-0744.
12. Moureau N. The VHP Model. In: Moureau N, ed. Vessel Health and Preservation: The Right Approach to Vascular Access. Springer Open; 2019:3–8.
13. Porritt K. Evidence Summary. Peripheral Intravenous Catheter (PIVC): General Care and Catheter Lumen Patency. *The JBI EBP Database*. 2021;JBI-ES-22-5:1–3.
14. Alexandrou E, Carr P, Clare S, et al. Vessel health and preservation: the right approach for vascular access. Springer Open; 2019.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

15. O'Grady NP, Alexander M, Burns LA, et al. Guidelines for the Prevention of Intravascular Catheter-related Infections. Centers for Disease Control and Prevention, 2011. https://www.cdc.gov/infectioncontrol/pdf/guidelines/bsi-guidelines-H.pdf.
16. Webster JO. Clinically-indicated replacement versus routine replacement of peripheral venous catheters. *Cochrane Database Syst Rev.* 2019(1). doi:10.1002/14651858.CD007798.pub5.
17. Hotchkiss JB, Thompson J. A critical appraisal of variability in informed consent for vascular access procedures. *J Assoc Vasc Access*. 2021;26(3):19–24. doi:10.2309/JAVA-D-21-00007.
18. World Health Organization. Guidelines for the prevention of bloodstream infections and other infections associated with the use of intravascular catheters: Part I: Peripheral catheters. 2024. https://iris.who.int/handle/10665/376722.
19. Hassanein SM, Tantawi HR, Sadek BN, Hendy A, Awad HA. Impact of structured simulation-based and on-job training program on nurses' competency in pediatric peripheral intravenous cannulation: children's hospital experience. *Nurse Educ Today*. 2021;98:104776. doi:10.1016/j.nedt.2021.104776.
20. Valdez F. Evidence Summary. Peripheral Intravenous Catheter (PIVC) Care: Education and Training of Staff. *The JBI EBP Database*. 2022(JBI-ES-21-4):1–3.
21. Engstrom Å, Forsberg A. Peripheral intravenous catheter difficulty – A clinical survey of registered nurse and critical care nurse performance. *J Clin Nurs*. 2019;28(34):686–694. doi: 10.1111/jocn.14668.
22. Ballout RA, Diab B, Harb AC, Tarabay R, Khamassi S, Akl EA. Use of safety-engineered devices by healthcare workers for intravenous and/or phlebotomy procedures in healthcare settings: a systematic review and meta-analysis. *BMC Health Serv Res.* 2016;16:458. doi: 10.1186/s12913016-1705-y.
23. Aziz AM. Do training and needle-safety devices prevent needlestick injuries? A systematised review of the literature. *Br J Nurs* 2018;27(16):944–952. doi:10.12968/bjon.2018.27.16.944.
24. Jackson AP, Almerol LA, Campbell J, Hamilton L. Needlestick injuries: the role of safety engineered devices in prevention. *Br J Nurs*, 2020;29(14):S22-S30. doi:10.12968/bjon.2020.29.14.S22.
25. Ottino MC, Argentero A, Argentero PA, Garzaro G, Zotti CM. Needlestick prevention devices: data from hospital surveillance in Piedmont, Italy - comprehensive analysis on needlestick injuries between healthcare workers after the introduction of safety devices. *BMJ Open.* 2019;9(11). doi:10.1136/bmjopen-2019-030576.
26. Grimmond T. UK safety-engineered device use: changes since the 2013 sharps regulations. *Occup Med (Lond).* 2019;69(5):352–358. doi:10.1093/occmed/kqz087.
27. Grimmond T. Safety engineered device usage and activation in six western US hospitals. *J Assoc Occup Hlth Prof.* 2018;38(4):14–18.
28. Dulon M, Stranzinger J, Wendeler D, Nienhaus A. Causes of needlestick and sharps injuries when using devices with and without safety features. *Int J Environ Res Public Health*. 2020;17(23):8721. doi:10.3390/ijerph17238721.
29. Perry J, Jagger J, Parker G, Phillips EK, Gomaa A. Disposal of sharps medical waste in the United States: impact of recommendations and regulations, 1987-2007. *Am J Infect Control*. 2012;40(4):354–358. doi:10.1016/j.ajic.2011.04.328.
30. Reddy VK, Lavoie MC, Verbeek JH, Pahwa M. Devices for preventing percutaneous exposure injuries caused by needles in healthcare personnel. *Cochrane Database Syst Rev.* 2017;2017(11). doi:10.1002/14651858.CD009740.pub3.
31. Tosini W, Ciotti C, Goyer F, et al. Needlestick injury rates according to different types of safety engineered devices: results of a French multicenter study. *Infect Control Hosp Epidemiol.* 2010;31(4):402–407. doi:10.1086/651301.
32. The National Institute of Occupational Safety and Health. Bloodborne Infectious Diseases:HIV/AIDS, Hepatitis B, Hepatitis C. Centers for Disease Control and Prevention. https://www.cdc.gov/niosh/topics/bbp/default.html.
33. Johnson L, Nutt A, Piatek D, Reese SM, Rindels J, Schommer K. Strategies to Mitigate Cross Contamination of Non-critical Medical Devices. Arlington, VA: 2021. https://apic.org/wpcontent/uploads/2021/10/IssueBrief_NonCritical_Medical_Devices_Final.pdf.
34. Ullman AJ, Mihala G, O'Leary K, et al. Skin complications associated with vascular access devices: a secondary analysis of 13 studies involving 10,859 devices. *Int J Nurs Stud*. 2019;91:6–13. doi:10.1016/j.ijnurstu.2018.10.006.
35. Porritt K. Peripheral Intravenous Catheter (PIVC) Care: Insertion. *The JBI EBP Database.* 2021;JBIES-2996-4:1–2.
36. Sanft T, Day A, Ansbaugh S, et al. NCCN Guidelines® Insights: Survivorship, Version 1.2023. *J Natl Compr Cancer Netw*. 2023;21(8):792–803. doi:10.6004/jnccn.2023.0041.
37. Bell JA, Campos C, Moureau N. Validation and reliability of the Comprehensive Difficult IV Access Scoring Tool. *Int J Nurs Health Care Res*. 2023;6:1414. doi:10.29011/2688-9501.101414.
38. Romito B, Jewell J, Jackson M, et al. Child life services. *Pediatrics*. 2021;147(1). doi:10.1542/peds.2020-040261.
39. Welyczko N. Peripheral intravenous cannulation: reducing pain and local complications. *Br J Nurs*. 2020;29(8):S12–S19. doi:10.12968/bjon.2020.29.8.S12
40. Child Life On Call. Comfort Positions: A Guide for Parents and Healthcare Professionals. Meg Foundation; 2023.
41. Children's Hospital of Philadelphia. Comfort Positioning During Procedures. https://www.chop.edu/centers-programs/child-life-education-and-creative-arts-therapy/prepare-your-child-visit-doctor/comfort-positioning-during-procedures. Accessed July 10, 2017.
42. Griffith RJ, Jordan V, Herd D, Reed PW, Dalziel SR. Vapocoolants (cold spray) for pain treatment during intravenous cannulation. *Cochrane Database Syst Rev*. 2016(4). doi:10.1002/14651858.CD009484.pub2.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.

43. Farion KJ, Splinter KL, Newhook K, Gaboury I, Splinter WM. The effect of vapocoolant spray on pain due to intravenous cannulation in children: a randomized controlled trial. *Can Med Assoc J*. 2008;179(1):31–36. doi:10.1503/cmaj.070874.
44. Zhu Y, Peng X, Wang S, et al. Vapocoolant spray versus placebo spray/no treatment for reducing pain from intravenous cannulation: a meta-analysis of randomized controlled trials. *Am J Emerg Med*. 2018:2085–2092.
45. Shokoohi H, Loesche MA, Duggan NM, et al. Difficult intravenous access as an independent predictor of delayed care and prolonged length of stay in the emergency department. *J Am Coll Emerg Phys Open*. 2020;1(6):1660–1668. doi:10.1002/emp2.12222.
46. Tada M, Yamada N, Matsumoto T, Takeda C, Furukawa TA, Watanabe N. Ultrasound guidance versus landmark method for peripheral venous cannulation in adults. *Cochrane Database Syst Rev*. 2022;12(12):CD013434. doi:10.1002/14651858.CD013434.pub2.
47. Blanco-Mavillard I, De Pedro-Gómez JE, Rodríguez-Calero MÁ, et al. Multimodal intervention for preventing peripheral intravenous catheter failure in adults (PREBACP): a multicentre, cluster randomised, controlled trial. *Lancet Haematol*. 2021;8(9):e637-e647. doi:10.1016/s2352-3026(21)00206-4.
48. Porritt K. Peripheral intravenous catheter (PIVC) care: dressings and catheter securement. *The JBI EBP Database*. 2023;JBI-ES-1203-6:1–3.
49. Marsh N, Webster J, Mihala G, Rickard CM. Devices and dressings to secure peripheral venous catheters to prevent complications. *Cochrane Database Syst Rev.* 2015;2015(6). doi:10.1002/14651858.cd011070.pub2.
50. Ray-Barruel G, Xu H, Marsh N, Cooke M, Rickard CM. Effectiveness of insertion and maintenance bundles in preventing peripheral intravenous catheter-related complications and bloodstream infection in hospital patients: a systematic review. *Infect Dis Health*. 2019;24(3):152168. doi:10.1016/j.idh.2019.03.001.
51. Corley A, Ullman AJ, Mihala G, Ray-Barruel G, Alexandrou E, Rickard CM. Peripheral intravenous catheter dressing and securement practice is associated with site complications and suboptimal dressing integrity: a secondary analysis of 40,637 catheters. *Int J Nurs Studies*. 2019;100:103409. doi:10.1016/j.ijnurstu.2019.103409.
52. Marsh N, Webster J, Mihala G, Rickard CM. Devices and dressings to secure peripheral venous catheters: a Cochrane systematic review and meta-analysis. *Int J Nurs Studies*. 2017;67:12–19. doi:10.1016/j.ijnurstu.2016.11.007.
53. DeVries M, Sarbenoff J, Scott N, Wickert M, Hayes LM. Improving vascular access dressing integrity in the acute care setting: a quality improvement project. *J Wound Ost Cont Nurs*. 2021;48(5):383–388. doi:10.1097/WON.0000000000000787.
54. Ryder M, Duley C. Evaluation of compatibility of a gum mastic liquid adhesive and liquid adhesive remover with an alcoholic chlorhexidine gluconate skin preparation. *J Infusion Nurs*. 2017;40(4):245–252. doi:10.1097/nan.0000000000000230.
55. Hosseini SJ, Eidy F, Kianmehr M, et al. Comparing the effects of pulsatile and continuous flushing on time and type of peripheral intravenous catheters patency: a randomized clinical trial. *J Caring Sci*. 2021;10(2):84–88. doi:10.34172/jcs.2021.016.
56. Ray-Barruel G, Chopra V, Fulbrook P, et al. The impact of a structured assessment and decision tool (I-DECIDED®) on improving care of peripheral intravenous catheters: a multicenter, interrupted time-series study. *Int J Nurs Studies*. 2023;148. doi:10.1016/j.ijnurstu.2023.104604.
57. Porritt K. Evidence Summary. Peripheral Intravenous Catheter (PIVC) Care: Removal and Replacement. *The JBI EBP Database*. 2022;JBI-ES-3965-5:1–2.
58. Martin LA, Mate K. IHI Innovation System. Boston, MA: Institute for Healthcare Improvement; 2018. https://www.ihi.org/sites/default/files/2023-10/IHIInnovationSystem-WhitePaper.pdf.
59. AMA. Building Your Quality Improvment Team. American Medical Association, 2018. https://www.ama-assn.org/system/files/2019-01/building-quality-improvement-team.pdf.
60. Fukami T. Shared decision making with psychological safety. *Lancet*. 2023;401(10383):11531154. doi:10.1016/s0140-6736(23)00344-6.
61. Brach C, Hall KK, Fitall E. Cultural Competence and Patient Safety. Agency for Healthcare Research and Quality. https://psnet.ahrq.gov/perspective/cultural-competence-and-patientsafety.
62. The Joint Commission. National Patient Safety Goal to Improve Health Care Equity. R3 Report. 2022. https://www.jointcommission.org/-/media/tjc/documents/standards/r3reports/r3_npsg-16.pdf?db=web&hash=F4FA36C38D4D4146D38956F0392272DE&hash=F4FA36C38D4D4146D38 956F0392272DE.
63. Wiseman KM, Berbert L, DeGrazia M, Pilcher J, Forbes PW, Poyner Reed M. A retrospective look at peripheral intravenous catheter (pivc) dwell times in pediatric population. *J Assoc Vasc Access*. 2024;29(1):43–45. doi:10.2309/JAVA-D-23-00025.

Downloaded from https://prime-pdf-watermark.prime-prod.pubfactory.com/ at 2025-05-06 via Open Access.