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POSITION PAPER

Ultrasound Guided Peripheral Arterial Catheter Insertion by Qualified Vascular Access Specialists or Other Applicable Healthcare Clinicians

Protect the Patient • Educate the Clinician • Save the Line

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Introduction / Summary

The history of arterial catheter insertion and pressure monitoring dates back to the early 1950s. Critically ill patients requiring serial blood sampling and real-time pressure monitoring for continuous assessment for treatment of hypertension or hypotension benefit from invasive hemodynamic monitoring. Continuous monitoring is more precise than currently available non-invasive monitoring systems. Rapid physiologic changes of the critically ill patient demand frequent titration of drugs that exceed the capability of noninvasive intermittent blood pressure devices. Over the last 60 years, technological advances have improved catheter design and insertion techniques which reduce insertion-related complications and improve first-stick success. In addition, recent guidelines for the use of ultrasound, site selection, use, care, maintenance, and techniques for sterile catheter insertion have been established to further minimize risks to patients.

The use of visualization technology, including ultrasound, has become the standard of practice for vascular access device insertions.^{1,2} When selecting the insertion site and assessing collateral circulation prior to arterial catheter insertion, ultrasound is an efficient visual aid. This tool reduces insertion attempts, reduces complications, and minimizes risk to the patient. Clinicians must consider artery size, catheter size, and collateral circulation prior to catheter insertion.^{1,2}

Direct real-time visualization during the procedure provides the ability to differentiate between veins and arteries and to identify associated structures. Ultrasound also allows the inserter to recognize potentially problematic anatomical issues as well as venous and arterial abnormalities. This technology enables direct visualization of venous and arterial structures, nerves, bone, and other tissue at the bedside through the use of a hand-held probe connected to a small ultrasound unit via a cable. Identification of vein size, patency, and location of arteries prior to needle access increases placement success for the inserter.³



Background / Problem

Approximately 8 million peripheral arterial catheters (PACs) are placed in the United States each year.⁴ PACs represent a potential source of bloodstream infection (BSI) as they provide a direct indwelling, frequently accessed pathway between the skin and the bloodstream.^{5,6} Intravascular catheter infections increase morbidity, length of stay, and hospital cost.^{6,7} Traditionally, a blind palpation insertion approach had been used for arterial catheter insertion. This insertion technique may increase the number of insertion attempts and does not allow for appropriate vessel assessment or exit site management considerations prior to device insertion.

PAC insertion is a common practice in the critical care areas. Real-time ultrasound guided insertion has improved first attempt success, patient satisfaction, and safety, as well as reducing complications.⁸⁻¹⁵ Technology allows for greater assessment of vessel health status, location of nerves and consideration for optimal exit site management when inserting arterial catheters.⁹⁻¹⁵ Peripheral arterial catheter insertion, like other peripheral type catheters, does benefit from the use of ultrasound to reduce insertion related risks.^{8,10-15}

The Association for Vascular Access (AVA) recommendations:

Position

It is the position of the Association for Vascular Access that a properly qualified vascular access specialist or other healthcare clinician may insert peripheral arterial catheters with the use of real-time ultrasound. The Association for Vascular Access supports:

- An expanded scope of practice for vascular access specialists and other healthcare clinicians who are qualified to perform advanced vascular access procedures. This includes insertion of peripheral arterial catheters.
- Approved hospital policy and procedure which includes the discipline, procedure, education and minimum requirements. Policies are also to include the insertion procedures applicable to the insertion site, device utilized, and patient/procedure selection criteria.
- Minimum competency requirements, including a detailed, documented training process and preceptorship for each insertion site being practiced.
- Utilization of a detailed training plan, which includes ongoing competency assessment, a minimum number of demonstrated successful insertions, and procedures for device monitoring and troubleshooting.



- The vascular access specialist, or other healthcare clinicians, must meet the education and clinical practice requirements by the designated professional board within their state of practice.
- Establishing a data collection process to ensure quality and outcome metrics which align with organizational goals. Such data should be used for ongoing competency and assessment of organizational processes and to implement additional changes based on quantitative analysis.

Practice Recommendations

Given the variability of facilities, personnel, organizational capabilities, and practices, AVA recommends the following as minimum qualifications for a vascular access specialist or other healthcare clinicians to perform ultrasound guided peripheral arterial cannulation to include ^{2,3,4}:

1. Comprehensive knowledge of peripheral arterial anatomy of the arm, chest, and groin.
2. Verified competency in ultrasound imaging for peripheral arterial access procedures.
3. Established competency in insertion techniques to include Seldinger, direct puncture, and integrated wire use.
4. Established competency for the technical skills specific to cannulation of the radial, brachial, axillary and femoral artery.
5. Competency in sterile field awareness and maintaining maximal barrier precautions.
6. Verified competency in the aseptic assembly and priming of the transducer setup and monitor connection.
7. Comprehensive knowledge in device troubleshooting to optimize peripheral arterial cannulation (PAC) performance once instituted.
8. Comprehensive knowledge of complications associated with peripheral arterial cannulation (PAC) and clinical management processes.
9. Approved policy and procedure in place that supports such practice(s).
10. Recommend certification by the Vascular Access Certification Corporation (VACC).

Summary:

Vascular access specialists and other qualified healthcare clinicians play a critical role in procedural standardization. This standardization includes the use of ultrasound technologies to



reduce patient harm and improve patient outcomes. Due to the potential risks related to arterial catheterization, care, and the use of ultrasound in this invasive procedure should be performed by individuals with outlined competency, knowledge, and skill.

Conclusion:

Vascular access specialists and other applicable qualified healthcare clinicians, with clearly documented competency and local institutional approval, should be utilized for peripheral arterial catheter insertion with the use of ultrasound technology (where applicable). This achieves safer insertion practices, improved care and maintenance through site optimization, standardized education, and device removal, including consultation on the management of related complications in collaboration with other healthcare professionals. These teams or individuals must establish and maintain a standardized data collection process to ensure quality and outcome metrics that align with organizational goals.

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About the authors: Timothy R Spencer is a Vascular Access Specialist for almost 30 years and is currently the Director for Global Vascular Access, LLC. His clinical background and qualifications are in Intensive Care Nursing, Vascular Ultrasound, and Advanced Clinical Nutrition. Tim was the Clinical Nurse Consultant of the Central Venous Access and Parenteral Nutrition Service at the Liverpool Hospital, Australia, which he established and led from 1996–2014 (21 years). He has been instrumental in progressing the scope of advanced vascular access practices for clinicians globally, including contributions in clinical research and evidence, the promotion of patient safety, and best practices. He is fully trained in vascular ultrasound and facilitates the progressive role of ultrasound-guided vascular access procedures. He is a member of 3 editorial boards; JVA, JAVA, Vascular Access, as well as a reviewer for JIN, Scientific Reports (Springer Nature) and The Journal of Hospital Medicine. His PhD dissertation is in catheter-related thrombosis in cancer patients. Global Vascular Access, LLC also provides consultancy services for Teleflex Inc., FUJIFILM Sonosite and Interrad Medical Inc.

Amy Bardin-Spencer is a Vascular Access Specialist with over 20 years of critical care and ultrasound-guided device insertion experience. Through her career, Amy has been on vascular access teams inserting and educating on vascular devices which include peripheral arterial catheters, peripheral and central venous catheters, acute hemodialysis catheter insertion, and IABP catheter monitoring. Amy believes that all patients deserve access to the right line using a “no blind stick” approach when vascular access is required. She has been instrumental in progressing the scope of vascular access practices for all clinician types which include team development and the promotion of patient safety and best practices. Today, Amy shares her knowledge and passion with clinicians around the world as an international speaker and by developing vascular access curriculum and overseeing vascular access simulation training courses for physicians and non-physician clinicians. Her EdD dissertation is in vascular access specialist teams and their impact on hospital acquired conditions. Amy is a full time employee of Teleflex Incorporated.

Both Tim (2019) and Amy (2016) are recipients of the Herbst Award for Excellence in Vascular Access from the Association for Vascular Access.



Disclaimer: This document is meant to serve as a basis for evidence-based decision making. Nothing contained within this position paper should take the place of following a medical devices approved instructions for use provided by the manufacturer.

The Association for Vascular Access (AVA) was founded in 1985 to promote the emerging vascular access specialty. Today, AVA stands at the forefront of protecting and saving lives via establishing best practices and promoting patient advocacy. AVA's multidisciplinary membership advances research, provides professional and public education to shape practice and enhance patient outcomes, and partners with the device manufacturing community to bring about evidence-based innovations in vascular access. To learn more or join, visit www.joinAVAnow.com.

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