A Vascular Access Team's Journey to Central Venous Catheter and Arterial Line Placement

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Abstract

Background: *The frequency with which vascular access specialists (VASs) are placing peripherally inserted central catheters (PICCS) has allowed for the improvement and expansion of the skill set by using advanced insertion techniques such as the modified Seldinger technique and ultrasound for real-time imaging. The use of real-time imaging has decreased complications such as arterial puncture and has improved success rates. Due to this positive influence on patient outcomes, many VASs are moving to the placement of central venous catheters (CVC).*

Method: *We describe the service improvement process of expanding a vascular access team (VAT) practice to include the placement of CVCs and arterial lines in a large community hospital in Illinois. We also outline the history of vascular access and the journey of a VAT.*

Results: *By following a methodic approach toward implementation of practice expansion, our VAT has gone from solely placing PICCS to the placement of CVCs in the internal jugular, axillary/subclavian, and femoral veins and to the placement of arterial lines.*

Conclusions: *VASs have the capacity to positively influence patient safety and outcomes even further by placing CVCs, rather than simply staying with the current scope of practice by placing intravenous lines, midlines, and PICCs. Patient outcomes will improve as VASs move to the placement of CVCs, and the costs associated with potential complications will improve also. Moving to the placement of CVCs is vital to the specialty of vascular access and will continue the breadth and depth of service provided by VASs.*

Introduction

Infusion therapy and vascular access have seen tremendous growth during the past few centuries. It was in 1654 when "the first animal to animal transfusion using a silver tube inserted into the artery of the donor and a cannula of bone inserted into the vein of the recipient was done."[1] It was not until 1832 when Latta was credited with saving the lives of 8 out of 25 patients with cholera, whom he treated with intravenous (IV) saline using a small silver tube attached to a syringe containing a hypotonic solution of sodium, chloride, and bicarbonate.[1] In 1960, central venous catheters (CVCs) began being inserted peripherally in the upper and lower extremity veins for central venous pressure monitoring in critically ill patients.[1]

Vascular access specialists (VASs) have been placing peripherally inserted central catheters (PICCs) for more than 30 years.[2] During the initial stages of this new procedure, PICCs were placed in the antecubital fossa using the peel-away or breakaway method. Goodwin described the method of modified Seldinger technique (MST) placement in 1989.[3] The nurses who placed these devices at the bedside, using the MST technique and ultrasound guidance for real-time imaging, began to demonstrate better patient outcomes

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and success rates.[4] In 2004, the US Food and Drug Administration approved the first power injectable, computed tomography-rated PICC.[5] The evolution of products and techniques has vastly decreased complications associated with the placement of PICCs and has improved patient outcomes and satisfaction.

VASs who have embraced the technology and recommended techniques to improve outcomes for the placement of PICCs have shown great success. Now, in the past 5 years, VASs have begun to implement these same strategies to begin to expand the scope of practice to the placement of arterial lines in the radial artery and CVCs in the internal jugular, axillary/subclavian, and femoral veins. This movement can be seen as a natural progression for the specialty of vascular access. There was a time when physicians placed peripheral IVs as well as PICCs. These procedures have been successfully delegated to nurses for more than 30 years, as should the placement of CVCs. Vascular access thought leaders were faced with criticism for their vision that included the placement of PICCs and peripheral IVs. That criticism may continue today regarding the placement of CVCs and arterial lines by VASs. VASs who demonstrate good clinical judgment, a high success rate, and low malposition rate (compared with national averages), should strongly consider moving their practice to the placement of CVCs. The use of MST and real-time imaging 100% of the time for CVC and arterial line placement will help expand the breadth of the specialty and improve patient outcomes compared with current practice. Many times patients are provided a CVC with a blind stick and landmark technique, which subjects them to unnecessary pain, additional needle sticks, increased complications, and a great deal of frustration with their health care provider. The value of VASs will be realized by these patients who need vascular access and this will further solidify the value of VASs, as the movement to the placement of PICCs at the bedside did for the specialty.

There are more than 5 million CVCs placed annually in the United States.[6] The number of critically ill patients is increasing each year. The need for CVCs will also increase, and therefore, CVC-related complications could be significant. Data from the American Society of Anesthesiologists Closed Claims database indicate that CVC-related complications are associated with a 47% mortality rate.[7] Multiple studies have shown that the use of ultrasound reduces complications, and the use of ultrasound reduces the number of attempts required to place CVCs.[7] The National Institute of Clinical Excellence has recommended the use of ultrasound for CVC placement.[8] Some physician specialties have had a mixed response to this recommendation, whereas VASs have embraced the use of ultrasound and its benefits fully. VASs have seen the improvements associated with using MST and ultrasound for PICC placement. Also, VASs believe that using MST and ultrasound for CVC and arterial line placement will help reduce mortality rates, delays in treatment, infection rates, malpositions, and the costs associated with repeated attempts and increased length of stay. To keep patient benefits at the forefront of care, VASs can actually train physicians on these techniques to advance their skills, as well. Many health care settings are moving to nurse-led models of CVC and arterial line placement to deliver high-quality health care and reduce health care costs.[9]

Background

The journey to expand the scope of practice for the vascular access team (VAT) at 1 community hospital in Illinois is deeply entrenched in the passion and commitment of the VAT members themselves. For example, the vascular access coordinator's (VAC) first nursing position in the neonatal intensive care unit (NICU) at a leading children's hospital in Chicago, involved working with neonates—some of the most fragile patients. This NICU experience laid groundwork of assessment, vein preservation, collaboration, education, and surveillance. After leaving the NICU to work on an adult PICC team at a major university hospital in Chicago, the VAC was mentored by a highly skilled preceptor who would personally challenge her to always ask herself 1 simple question: "Based on what?" This question challenged the VAC to consider the evidence and current standards when assessing patients, making decisions, or participating in discussions about vascular access. These early foundational experiences shaped the VAC's passion to expand the scope of practice and drive her to achieve top of license practice. However, once the VAC moved to a position of team leader at her current large community hospital, the nursing leadership was key in allowing the vision to flourish. Executive leadership cultivated the personal and professional growth that encouraged the VAC and her team to challenge the status quo and become leaders at their medical center. The VAC's growth included obtaining certificates, advanced education, and expanding the scope of practice at the medical center and in the vascular access field. However, 1 of the most critical elements to the team members evolving as leaders was the support and inspiration they received from executive management, who believe that every nurse at their community hospital is a leader—regardless of title.

Along with leadership support, we believe that the ability to expand the scope of practice to CVC and arterial line placement requires developing strong relationships with the multidisciplinary team and collaboration throughout the organization. Collegial rapport with hospital leadership and physicians takes time to establish. The physicians who supported and valued vascular access as a specialty included many from our institution's Intensive Care Unit, Interventional Radiology Department, Emergency Department, Nephrology Department, and Infectious Disease Department. It was their confidence in the VATs knowledge and skill level that allowed practice expansion at this community hospital. The foundation of the program was the collaborative relationships and support of the physicians throughout the organization. Collaboration is essential in successfully achieving positive outcomes for current vascular access devices, but collaboration is even more important when looking to expand vascular access practices to the placement of CVCs and arterial lines. As VASs, we possess the knowledge of infusion standards and national recommendations and can weigh risks vs benefits to address the needs of our patient population. Having this knowledge base