

4 secrets of implementing a successful ultrasound-guided vascular access program with nurse leadership

Written by Judy Padula, MSN, RN and Matthew Ostroff, ARNP | September 05, 2017

Vascular access is the most commonly performed invasive procedure in medicine, with 200 million peripheral intravenous (PIV) catheters placed annually in U.S. hospitals to administer fluids, lifesaving medications, nutrients and blood products.¹

Although speed and a high success rate are particularly crucial for optimal care of critically ill or unstable patients, obtaining PIV access is difficult in about 35% of patients who present to the emergency department (ED), particularly if traditional landmark or palpitation methods are used, according to a recent meta-analysis.²

To achieve a “one-stick standard,” the American College of Emergency Physicians (ACEP) recommends procedural ultrasound, performed at the bedside, to facilitate placement of PIV and central venous catheters (CVCs). Among the benefits of this technique ACEP cited in a 2016 policy statement are “improved patient safety, decreased procedural attempts and decreased time to perform many procedures in patients whom the technique would otherwise be difficult.”³

Savings of \$3.5 Million with Ultrasound-Guided Vascular Access

This article offers an overview of the authors’ experiences in implementing a system-wide ultrasound-guided vascular access program at St. Joseph’s Healthcare System in New Jersey under nurse leadership. Launched in February, 2014, the program has achieved the following outcomes in its first three years:

- Striking improvements in the safety and quality of care for patients ranging from 2-pound premature infants to adults weighing up to 500 pounds.
- Cost savings of \$3.5 million, using a 6-person team of nurses trained in vascular access and ultrasound machines at the bedside.
- A 96.4% first-pass success rate for PIV placement, including difficult-access patients.
- Increased patient satisfaction across our healthcare system, comprised of St. Joseph’s Regional Medical Center and St. Joseph’s Children’s Hospital (651 adult and pediatric beds) in Paterson, NJ; St. Joseph’s Wayne Hospital (229 beds); St. Vincent’s Healthcare and Rehab Center (151 beds), in Cedar Grove, NJ, and our more than 30 outpatient facilities.

How did we attain these results? Here are four secrets of implementing a successful ultrasound-guided vascular access program.

Secret #1: Avoid risky central lines with ultrasound-guided PIV. Like many hospitals across the U.S., our center has seen a sharp rise in patients with problematic PIV access due to such factors as chronic illness, chemotherapy, obesity and IV drug abuse. Without ultrasound guidance, such patients--sometimes called “difficult sticks”--often end up with central lines, because clinicians find it impossible to obtain PIV access.

However, CVCs can have enormous risks, including central line-associated bloodstream infections (CLABSIs) and the accidental puncture and collapse of the patient’s lung (iatrogenic pneumothorax). Both of these dangerous complications are targeted by Medicare’s Hospital Acquired Conditions (HAC) Reduction Program, which penalizes the 25% of hospitals with the highest rates of these and other preventable medical errors 1% of their annual reimbursements, across all diagnosis-related groups. In fiscal year (FY) 2016, 758 hospitals were docked an estimated \$364 million in penalties.⁴

Thanks to our ultrasound-guided vascular access program, our healthcare system has a bloodstream infection rate well below the national benchmark--and for many patients, zero vascular complications of any kind.

Secret #2: Use ultrasound as a visual GPS to locate the safest, most cost-effective catheter site. Before the advent of our vascular access program, patients with problematic PIV access often received peripherally inserted central lines (PICCs), which typically take 40 to 45 minutes to perform, at a cost of \$280 for supplies alone at our center. Real-time ultrasound visualization, however, enables practitioners to map the patients’ blood vessels, access their patency and identify the best catheter site. As result, PIV access in patients with problematic vasculature is nearly four times more likely to be successful if ultrasound guidance is used, compared to traditional techniques, according to the meta-analysis cited above.

Implementing this technique system-wide at our center has reduced the need for central lines by 40%, even in challenging cases. For example, we recently treated a woman who was pregnant with triplets who had been hospitalized for a month of treatment to reduce risk for premature labor. Although her physician initially thought a PICC line would necessary, these can be problematic for pregnant women. Using ultrasound guidance, we were able to map her veins and identify a safe location for PIV access for the patient, who later delivered healthy triplets.

PIV lines take 5 to 10 minutes to place, at supply cost of \$25 to \$30. This simple--but important--change in catheter site many of our patients has resulted in cost savings of nearly \$1 million to date at our healthcare system. The vascular access program also saved St. Joseph's more than \$2.5 million by reducing referrals to interventional radiology for PICCs--freeing up these specialists to focus on more complex procedures with higher reimbursement rates--and shortening length of stay in our ED.

Secret #3: Recognize the vital role nurse leadership can play in implementing a successful vascular access program. Studies show impressive benefits of nurse-lead ultrasound-guided vascular access programs, particularly for patients with problematic vasculature. In what is believed to be the first such program, in 2004, nurses at a level 1 trauma center in Georgia were trained to use ultrasound to access deep peripheral veins. Of 258 patients identified as difficult sticks before this technique was used, 80% were rated as "hard" and none as "very easy." With ultrasound guidance, the nurses reported in a 2006 survey that only 11% of these patients remained "hard" and 42% were "very easy," with an overall success rate of 85% to 89%.⁵

A recent study at Texas Health Harris Methodist Hospital⁶ found that after launching a registered nurse-led ultrasound-guided vascular access program, CVC and PICC placements due to problematic PIV access decreased by 74%, with annual savings of \$200,000. Other investigators have reported PIV success rates of up to 100%⁷ with ultrasound guidance, while fewer jabs and faster care have also been shown to significantly increase patient satisfaction.⁸

Secret #4: Build on the program's successes. Our program began at our Paterson, NJ hospital with the hiring of one vascular access specialist, who initially handled PICC line placements and PIV cases in which there had been three failed attempts with traditional methods. However, the ease at which the specialist was able to achieve vascular access with ultrasound guidance, even in difficult cases, resulted in such a surge of demand that our program grew to include six specialists, all of whom are nurses. In June, 2017, we expanded the program to be system-wide. Key ideas that have contributed to the success of our program include the following:

- **Accelerating lifesaving care:** Until vascular access is achieved, many common therapies cannot be initiated, nor can ED patients be transferred to other departments, such as surgery, the cardiac catheterization lab, or the critical care unit, for additional treatments they urgently need.

- **Highlighting the value of ultrasound guidance to colleagues.** Use of this imaging modality is now the standard of care throughout our system, so all patients receive the same top-quality care no matter which department administers their treatment.

- **Identifying unmet nets.** Initially our vascular access specialists only worked with adult patients, but we quickly

discovered a major role for their services in pediatric care. After chronically ill children learn that their PIV lines can usually be placed on the first try if ultrasound guidance is used, versus multiple painful jabs without it, they've started asking for our vascular access specialists as soon as they arrive at the hospital for treatment.

- **Valuing the nurse/physician partnership.** Our vascular team recently worked closely with our geneticists to treat a newborn with a usually fatal metabolic condition. During one-year of pioneering treatment that included administration of IV medications every two weeks, along with drawing 10 vials of blood for lab tests, we were able to achieve a 100% first-pass PIV success rate with ultrasound guidance. Not only did the baby's veins remain open, without a need to escalate to more invasive devices, but she is making medical history by developing normally, without any of the usual life-threatening complications of her disorder.

As nurses providing hands-on care to patients ranging from the frail elderly to the tiniest preemies, these success stories are what fuel our passion for spreading the word about the many benefits of ultrasound guidance. It is our hope that sharing our experiences will inspire other healthcare professionals to join the growing movement towards the one-stick standard and adopt the ideal technology to achieve it: ultrasound machines at the bedside to help clinicians provide safer, more compassionate care.

Author bios: Judy Padula, MSN, RN is Vice President, Patient Services and Chief Nursing Officer of St. Joseph's Healthcare System in Paterson, NJ. Matthew Ostroff, ARNP is a vascular access specialist at St. Joseph's.

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