Ultrasound-Guided Peripheral Intravenous Access (UGPIV)

Innovative Technology Addresses Clinical Risks and Economic Challenges of UGPIV

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EXECUTIVE SUMMARY Insertion of a peripheral intravenous (PIV) device is the most commonly performed invasive medical procedure for administration of treatment in acute care today. Due to a variety of factors, clinicians are increasingly relying on ultrasound guidance to achieve successful PIV insertion in patients with difficult vascular access.

While UGPIV can improve patient options for receiving prescribed treatments, certain challenges still need to be addressed. The use of ultrasound probes and gels pose a risk of contamination, which can lead to negative clinical outcomes such as catheter-related blood stream infections. To limit infection transmission, facilities must invest in supplies such as probe covers, single-use gel or sterile gel packets, and disinfecting wipes to clean gel from skin. While necessary for patient safety, these items add to the cost of UGPIV—a procedure for which there is currently little to no reimbursement.

This paper highlights a novel technology that incorporates both barrier and securement, and eliminates the need for sterile gel. The UltraDrape™ was developed to address the current challenges clinicians face with UGPIV insertions, leading to a more efficient, cost-effective procedure while also improving patient safety.

INTRODUCTION

Peripheral intravenous catheters, used for the delivery of medications, fluids, blood products and nutritional supplements, are the most commonly used intravenous device in hospitalized patients. It is estimated that more than 70 percent of patients in acute care hospitals require intravenous access and a PIV catheter; in fact, approximately 330 million are sold in the United States and 2 billion are sold worldwide each year.[1,2]

As the population ages and more treatment with IV therapy is required, it is expected the number of patients requiring PIV catheters will increase. Aging veins, combined with repeated cannulations and more irritating medications, can make it increasingly difficult to achieve IV access. In addition, many other factors can complicate the process of establishing PIV access, including obesity, IV drug use, and chronic conditions such as diabetes, cancer and sickle cell disease.[3]

Some researchers estimate nearly 60 percent of patients are considered to have difficult intravenous access.[4] This trend has led to a rise in ultrasound-guided PIV insertions (UGPIV) and improvement in PIV placement success compared to the standard blind technique.[5] According to the American Institute of Ultrasound in Medicine (AIUM), ultrasound guidance for PIV access can be an invaluable technique for patients who are difficult or impossible to access.[6] UGPIV has been shown to improve IV success rates, decrease the number of percutaneous punctures and decrease the time required to achieve intravenous access.[5,7]

While the overall risks associated with any PIV insertion are relatively low, complications such as catheter-related bloodstream infections (CRBSIs) can occur. These can range from minor localized infections to life-threatening sepsis.[3] An aseptic no-touch insertion technique is the first line of defense to ensure patient safety and minimize infections.

Changing practice standards have resulted in longer dwell time for PIV catheters, rather than scheduled rotation every 72-96 hours. Newer guidance calls for a clinically indicated replacement strategy, where catheters are only replaced in the event of complications or when treatment is complete.[8,9] Thus, these longer dwell times put an even greater emphasis on proper aseptic no-touch insertion techniques in order to minimize the potential for initial contamination and infection.

For UGPIV, the cost of current infection control methods, including sterile ultrasound transmission gel and probe covers, can easily surpass the relatively low to nonexistent reimbursement for the procedure. This has clinicians and administrators searching for a more efficient, cost-effective method that also maintains a solid aseptic technique to reinforce patient safety.

UGPIV HELPS OVERCOME "DIFFICULT ACCESS"

Establishing PIV access in increasingly older and sicker patients can be challenging for even the most skilled clinicians. Initially adopted by many emergency departments, UGPIV can be used in a variety of care settings to help clinicians overcome difficult vascular access.

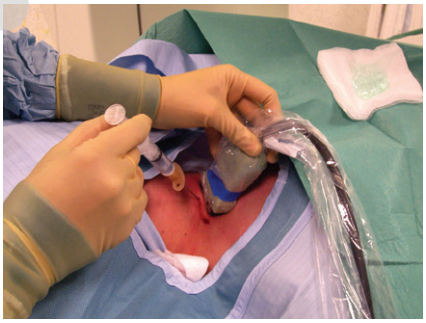
> ***"[Given]... lack of reimbursable charges for some procedures, healthcare providers must use the best techniques and technologies available to eliminate unnecessary use of supplies and staff time. USGPIV enhances visualization of potential IV access sites and helps prevent delays that arise from consulting specialized clinicians."***
>
> Phillip Stone, staff nurse in ED at Duke University Hospital

Traditionally, when PIV access cannot be obtained, a patient receives either a central venous access device (CVAD) or an external jugular catheter, both of which are associated with more serious and much higher rates of complications when compared to PIVs. In many cases, UGPIV is a logical alternative to more invasive vascular access procedures because it avoids more significant complications.[10]

Patient satisfaction also improves when fewer failed insertion attempts are made and central line procedures are avoided. In one study, for example, patients identified as having difficult intravenous access had much higher patient satisfaction scores when ultrasound was used to achieve PIV access.[11]

Using ultrasound not only improves patient outcomes but can also save time and money. Although UGPIV may take longer than traditional IV insertion, it's often faster than multiple failed venipuncture attempts. The most labor-intensive activity in IV therapy is the initial placement of the catheter, which averages 10-20 minutes for healthy patients, but may take much longer in patients with difficult intravenous access. Multiple attempts to successfully place a PIV catheter affect a facility's bottom line by increasing costs for both staff and supplies.[3]

RISK OF CONTAMINATION WITH ULTRASOUND



Despite the widely accepted benefits, UGPIV insertions are not without risks. Research shows both ultrasound probes and gels are frequently contaminated with bacteria, posing a serious risk of transmission between the ultrasound equipment and patients.[12,13]

Proper cleaning of the ultrasound transducer between patients takes considerable time when done correctly, which can significantly increase the length of the procedure.[6] However, research showing high levels of bacterial contamination of probes and gels highlight the need for more effective cleaning methods.

In one study, environmental organisms were found in 65 percent of samples taken from ultrasound equipment, while nearly 8 percent of samples included microorganisms that commonly cause infection.[14] Another study reported a transducer contamination rate of 17.5% following baseline cleaning methods.[15] This contamination includes the potentially life-threatening Staphylococcus aureus, which can frequently transfer from patient skin to the ultrasound equipment. According to Ohara et al., 60 percent of samples that tested positive for Staphylococcus aureus were methicillin-resistant (MRSA).[16]

To prevent infection transmission from the ultrasound equipment to the patient, a number of precautions are taken by clinicians before and after use. The Association for Vascular Access (AVA) and other organizations recommend using transducer/probe covers for assessment (non-sterile) and insertion (sterile) when contact with blood is expected. The guidance further indicates the use of single-use sterile gel packets for UGPIV procedures to reduce the potential for contamination. In addition to chemical disinfection to reduce the spread of pathogens, barrier methods may include ultrasound probe covers or transparent film dressings (e.g., Tegaderm) applied to the transducer (though film dressings are not

recommended by AVA transducer disinfection guidelines).[17] While the cost of protection with covers and single-use sterile gel packets (compared to non-sterile gel) can be significant, these measures are essential to minimize patient risk from contamination.

Additionally, the use of ultrasound transmission gel presents several challenges. Cleaning the gel from the patient's skin at the injection site before and after the insertion is necessary, yet time-consuming. Excess gel left at or near the access site poses the additional risk of accidental injection into a vein during insertion. Inadequate removal of the gel leads to dressing failure, requiring more frequent dressing changes—which in turn increases staff time and supply costs.[18] Dressings are the first line of defense against infection and research indicates contamination rates increase with frequent dressing changes.[19]

Importance of Maintaining Aseptic No-Touch Technique

There is a risk of contamination with ultrasound-guided peripheral catheter insertion, related to the use of gel and potentially longer procedure time.[25] An aseptic no-touch insertion technique helps prevent the spread of pathogens that cause infection, but its effectiveness is diminished if proper protocols are not followed. According to one study, following the standards for both ultrasound probe and gel hygiene was one of the key criteria for competency in UGPIV insertion.[26]

Both the American Institute of Ultrasound in Medicine (AIUM) and the Infusion Nursing Society recommend the use of sterile ultrasound gel and a sterile probe cover or transparent dressing for UGPIV insertions. In addition, the site should be cleaned with an antiseptic agent and clean gloves should be used (though maximum sterile barrier precautions are not required for PIV access).

UltraDrape is considered a commercially manufactured sterile product for the purpose of transducer/probe sheathing and patient protection from contamination. The product does not replace the need to complete transducer/probe disinfection before and after the procedure consistent with the ultrasound manufacturer's recommended processes for disinfection.

ECONOMICS OF UGPIV – COSTS AND PREVENTION OF NEGATIVE OUTCOMES WITH CVADS

Despite improved outcomes and high patient satisfaction, facilities utilizing ultrasound-guidance for PIV insertion currently face several economic challenges. The economic impact of UGPIV is best measured by both the actual cost of performing the procedure, as well as the prevention of potential negative outcomes that can affect patient safety.

The cost associated with a UGPIV insertion is approximately $45.[10] However, placement of peripheral IV catheters is not currently reimbursed by Medicare, which underscores the need to keep costs associated with UGPIV low. In a web-based review of supplies, the cost of sterile probe covers (recommended for both assessment and insertion) range from $4 to $10, single-use sterile ultrasound gel packets cost between $0.85 and $1.20, and adhesive films cost between $0.76 and $3.15 each.

An even greater cost is associated with negative outcomes that interfere with patient safety. It is estimated more than 500,000 preventable CRBSIs occur in the United States each year related to CVADs that may be placed because clinicians are unable to gain peripheral access.[20] For each episode of infection, hospitalization is prolonged by 7-14 days, and cost of additional treatment can range from $3,000 to over $50,000 per event.[3] CRBSIs also are part of a larger healthcare challenge. Nearly 10 percent of hospitalized patients in the United States acquire a healthcare-associated infection (HAI) as a result of poor aseptic techniques, adding $4.5 billion in additional annual healthcare costs and taking the lives of approximately 90,000 hospitalized patients.[21] Successful use of UGPIV will reduce the need for CVADs in many cases, thus avoiding these more serious outcomes.[22,23]

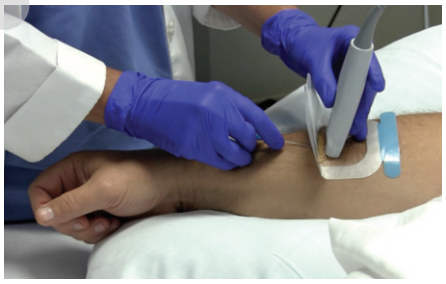
In addition to putting patient safety at risk, negative outcomes such as CRBSIs can have an impact on a hospital's reimbursement. Under the Hospital-Acquired Condition Program, data on hospital-acquired conditions, such as infection, are collected by Medicare and hospitals are scored based on their performance. Lower performing facilities, i.e. those with higher rates of complications, can see their Medicare reimbursement reduced by one percent. Therefore, hospitals have an economic incentive to find ways to reduce complications such as catheter-related bloodstream infections.

A NOVEL APPROACH: REDUCING COST AND CONTAMINATION WITH ULTRADRAPE

A unique securement and dressing technology has been developed to address the clinical risks and economic challenges of UGPIV insertion. That technology, called UltraDrape™, is a sterile dressing designed for use during UGPIV procedures that acts as both a barrier and securement method. UltraDrape's design addresses many of the current challenges clinicians face with UGPIV insertions.

A study of 10 patients showed the use of UltraDrape enabled easy and quick ultrasound-guided blood sampling with a 100% success rate while keeping the disinfected puncture area clean and dry. In all 22 cannulations performed in the study, UltraDrape restricted the gel and transducer to the adhesive unsterile part of the drape, ensuring a gel-free venipuncture area.[24]

With UltraDrape, the ultrasound gel is applied to a removable film layer to enable target vessel identification (using ultrasound guidance) while keeping the puncture area dry and free from gel. The bifurcated design prevents gel from reaching the IV site, providing a barrier between the unsterile sonographic site and the sterile gel-free puncture site. The top layer where the gel is applied is discarded after use, eliminating the time-consuming post-IV clean up. It also avoids the prospect of securement failure as a result of inadequate gel removal.



At a cost of approximately $2.50 per dressing, the use of UltraDrape offers a significant cost savings by eliminating the need for sterile gels, probe covers and/or adhesive films. Since UltraDrape is both a barrier and securement dressing, additional securement dressings are not needed. By enabling a "no-touch" aseptic UGPIV procedure, it may reduce contamination at the insertion site without impeding visualization or sacrificing workflow.

New AVA Guidelines: UltraDrape Answers Call for Innovation

Despite the widespread adoption of ultrasound-guidance for vascular access procedures, there are conflicting guidelines regarding the level of disinfection an ultrasound probe must undergo between patients and procedures. Unfortunately, this has led to confusion and inconsistent infection control practices.

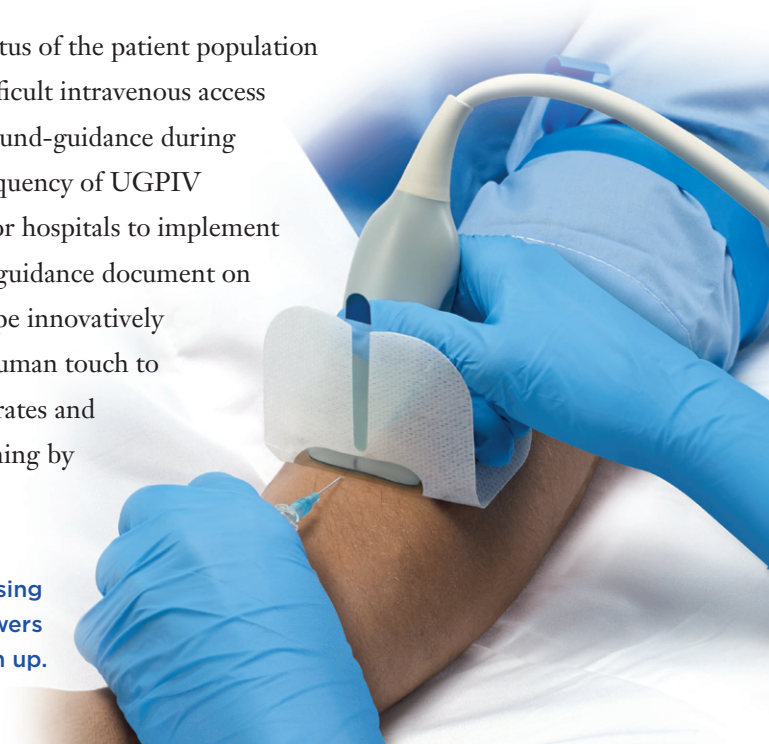
In an attempt to standardize disinfection practices, AVA recently published a guidance document, *Transducer Disinfection for Assessment and Insertion of Peripheral and Central Catheters for Vascular Access Teams and Clinicians*.

Among other recommendations, the authors encourage the development of clinical products incorporating infection prevention and control, as well as patient safety, as key elements of the product's design.

UltraDrape, the first sterile barrier and securement dressing made for ultrasound-guided PIV insertions, answers this call for product innovation. Its design reduces contamination at the insertion site by enabling a "no-touch" aseptic procedure. Use of this unique dressing is a cost-effective, efficient step clinicians can take to implement better infection control practices during UGPIV procedures.

CONCLUSION

The changing health status of the patient population and the growing number of patients with difficult intravenous access will continue to increase the need for ultrasound-guidance during peripheral IV catheter placement. As the frequency of UGPIV procedures increases, so does the necessity for hospitals to implement technologies that limit costs, as listed in the guidance document on transducer disinfection from AVA. UltraDrape innovatively combines state-of-the-art technology with human touch to improve patient outcomes, reduce infection rates and make it easier for clinicians to do the right thing by ensuring a higher degree of patient safety.



UltraDrape is a unique sterile barrier and securement dressing that enables a "no-touch" aseptic UGPIV insertion, which lowers the risk of infection and eliminates post-procedure clean up.

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