Ultrasound Guided Peripheral IV Insertion

Course ID: 1023  -  Credit Hours: 3

Author(s)
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Disclosures
none

Audience
Registered Nurse.

Accreditation
KLA Education Services LLC is accredited by the State of California Board of Registered Nursing, Provider # CEP16145

Course Objectives
Upon completion of this course participants will:
1. be able to describe human peripheral venous anatomy
2. be familiar with the basics of high frequency-low depth ultrasound equipment
3. be able to describe the vein/catheter selection process
4. be able to demonstrate technique for cannulating a vessel using ultrasound
5. be able to list 3 common pitfalls of learning this technique
6. be able to list 3 potential complications of peripheral IV insertions

This course will serve as the didactic portion of training. Precepting should be obtained by an experienced colleague per facility policy.
Precision & Solution for the Hidden Veins

You should develop accurate proprioception with practice.

In preparing for a successful ultrasound guided PIV start, there are several considerations to be made. These include: facility policy, ultrasound equipment, vessel and catheter selection, site preparation, technique for probe, insertion & threading, potential pitfalls & complications to avoid, and appropriate documentation.
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  – be able to list 3 common pitfalls of learning this technique
  – be able to list 3 potential complications of peripheral IV insertions
Introduction

• Using ultrasound to insert peripheral intravenous catheters (PIVs) has been a common practice for years, however this skill is scarce and usually self taught for nurses not part of peripherally inserted central catheter (PICC) teams.
• Lack of structured training and available ultrasound equipment has kept this desirable technique to among a few Registered Nurses (RNs) per facility.
• However, this is changing. Ultrasound equipment is getting smaller, less expensive and becoming more readily available.
• Introducing this skill into the hands of more nursing department will positively influence patient outcomes, reducing delay of care and peripheral iv insertion attempts.
The Need: Common Difficult Stick Causes¹

- Diabetes
- Cancer
- Cardiovascular conditions
- End stage renal disease
- COPD
- Aging population
- Pediatric population
- Mastectomy
- Stroke
- Contractures
- Smoking
- Inactivity
- Major surgery
- Hematomas

- Obesity increasing
- Hemophilia
- Rheumatoid arthritis
- Drug abuse
- Crohns, ulcerative colitis, irritable bowel syndrome
- Dark pigmentation difficult to visualize vascular
- Hypotensive
- Multiple injuries
- History of multiple venous cannulations
- Immunodeficiency
- Long periods of bedrest
- Peripheral venous disease

¹ Hadaway: InfraRed Imaging Systems 2005 pg 1; Dychter: Journal of Infusion Nursing 2012 pg 86
Example Program Content

As with any nursing procedure, a well written policy and competency is essential. Monitoring outcomes is also advised as this will alert the facility to any problems where additional training may be necessary and can also serve as an annual competency log. All of this program content (policy, competency, and outcomes log) is available upon request via email and attached as appendices. The author also suggests leaning on your vendors for assistance as they often support the sale of their products with the appropriate example documents.

Example documents attached as appendices A, B, C

Fig 1. Images by Kevin Arnold, RN, BSN. kev1999@gmail.com
Example Ultrasound Equipment

Although prices are coming down, portable ultrasound can be an expensive piece of equipment. Take care of it by always cleaning before and after use. Also using a sign-in/sign-out log book is helpful when others may be borrowing the equipment.

Tip: Wrap the cord around your arm helping prevent the probe from sliding off the bed when finished accessing the vessel.

Fig. 1 http://englishmotion.com.br/qtmove/includes/site-rite-vision-i2.jpg
Fig. 2 http://www.bardaccess.com/assets/images/products/ultrasound/siterite6_unit_hero.jpg
Fig. 3 http://65.36.201.165/instrumentpics/sonositeLook.jpg
Ultrasound Technology

- Ultrasound has a high frequency >20KHz, outside the range of human hearing.
- Interacts with tissues as it propagates and returns.
- Reflections from blood are weak compared with those from solid tissues.

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Ultrasound Equipment (tips)

- Always plug in power adapter
- Battery life is unpredictable
- Utilize a sign-in / sign-out log book
- Clean before and after use
- Please take careful care in handling equipment
- Very expensive... $5,000 - $25,000
- Replacement probe... $2,500+
- Do not drop it :)

Always plug in power adapter
Battery life is unpredictable
Utilize a sign-in / sign-out log book
Clean before and after use
Please take careful care in handling equipment
Very expensive... $5,000 - $25,000
Replacement probe... $2,500+
Do not drop it :)
Ultrasound Equipment (tips)

- Avoid tilting the probe\(^1\)
- Fig 1 “a” will produce the cleanest image

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Fig 1. http://vrassoc.com/Page24_Figure2.gif
Ultrasound – Maximize Your Image

• Depth
  – The lumen should be large enough to be easily seen on the ultrasound screen.¹

• Optional settings typically available
  – gain, focus, etc

• Fluid filled vessels should appear (anechoic) black, void of echoes ²

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¹ Goldstein, Israeli Journal of Emergency Medicine, 2006, pg 50

Vessel Selection: Vein Anatomy

Fig 1. http://images.tutorvista.com/content/transportation/illustration-of-normal-vein.jpeg
Fig 2. http://www.daviddarling.info/images/vein.jpg
Vessel Selection: Arm Vein Anatomy

![Arm Veins Diagram](http://vascularultrasound.net/wp-content/uploads/2010/08/armveins2-copy.jpg)
Vessel Selection: Arm Vein Anatomy
Vessel Selection: Ultrasound View

Vessel Selection: Ultrasound View


Nerve Bundle
## Vessel Selection: Typical Vein Sizes & Flow Rates\(^1\)

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Diameter (mm)</th>
<th>Blood Flow (ml/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cephalic</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Basilic</td>
<td>8</td>
<td>150 - 200</td>
</tr>
<tr>
<td>Axillary</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Subclavian</td>
<td>6-19</td>
<td></td>
</tr>
<tr>
<td>Superior Vena Cava</td>
<td>20 to 30</td>
<td>2000 - 2500</td>
</tr>
</tbody>
</table>

Vessel Selection: “Rule of Thumb”

- Be patient
- Look for sites that will have the best possible success
- Use warm packs if extremities are cold to touch
- Avoid areas of flexion\(^1\)
- Use good judgment
- Evaluate and avoid sticking nerve bundles

Start where the vessels are known to be located in the antecubital area. Looking in a known location will help with gaining a familiarity of vessel appearance. Then scanning these vessels down the arm to a more appropriate site for a PIV is recommended. Scanning quickly takes a little practice and will become easy when coordination is developed. Another tip is to make deep depressions with the probe while moving side to side, as the vessels will "wink" at you making them easier to discern from their surroundings.

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1. Policies and Procedures for Infusion Nursing, 4\(^{th}\) ed. INS. P 58
Vessel Selection: “Rule of Thumb”

- Assess entire arm
- Start distal and work up\(^1\)
  - Ulnar, Radial, Cephalic

- Then... upper arm superficial
  - Cephalic

- Avoid upper arm and forearm in patients with Chronic Kidney Disease\(^1\)
  - Basilic, Brachial

Depth of the vein is important and the author cannot say this enough, "too deep of a vessel or a catheter that's too short may cause adverse outcomes." Ideally, vessels selected will be in the 0.5 cm to 1.25 cm range when using a catheter at least 1.75 in (4.5 cm).

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1. Policies and Procedures for Infusion Nursing, 4\(^{th}\) ed. INS. Pg 58,59.
Vessel Selection: Vein vs Artery

The next step is differentiating vein from artery. Simple depression of the vessels by the probe will discover vein from artery. Veins will stay collapsed and arteries will pulsate, forcing their way open. Exceptions do exist of course. Some patients with very low blood pressures may not have enough arterial pressure to "pulsate" against the force of the probe. The best solution in that situation is to simply slowly let up the probe applying partial pressure until you see the pulsation begin.

• Depress vessels to differentiate veins from arteries
• Vein will stay depressed.
• Arteries will “pulsate”
• Vein depth discussed later...

Fig 1. http://www.nysora.com/files/uploaded/techniques/ultrasound-guided_techniques/ultrasound-assisted_nerve_blocks/image6b_big.jpg

1. Meer, Medscape, 2011, pg 5
2. Goldstein, Israeli Journal of Emergency Medicine, 2006, pg 50

Fig 1. http://www.nysora.com/files/uploaded/techniques/ultrasound-guided_techniques/ultrasound-assisted_nerve_blocks/image6b_big.jpg
Selecting the Catheter

• Key Point 1 - While no industry standard exists on this, the author recommends the catheter length should be adequate to ensure that at least **one-half** of the catheter will reside in the vessel. This involves consideration of the angle of insertion and vein depth.

• Key Point 2 - The catheter should be easy to thread using only one hand, as the user’s other hand will be unavailable holding the probe.

• Key Point 3 - Catheter size (gauge) selection should reflect size of available vessel and types of therapy to minimize complication. Use the smallest diameter catheter needed in the largest available vein.¹

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¹. Policies and Procedures for Infusion Nursing, 4th ed. INS. Pg 56
Selecting the Catheter

• Example of typical catheter used for ultrasound guided PIV insertions
  – 1.75 in | 45 mm (or longer)
  – 20 gauge
  – This will require adding tubing

• One handed insertion and threading should be possible with your choice of catheter
Vein Depth | Stick Angle | Catheter Length

Take notice of the catheter length needed to reach the vein (hypotenuse of the triangle). This can vary greatly depending on the angle of insertion chosen. Keeping this angle in a range of 45 to 65 degrees will also help prevent two problems:

- Using a stick angle too small (close to the skin) will use up way too much of the catheter before reaching the vein, resulting in insufficient length of catheter left to dwell in the vein.

- Using a stick angle too steep (close to the probe) can often result in the catheter kinking at the hub as it is secured to the skin.
Vein Depth | Stick Angle | Catheter Length

The author advises to stick at an approximate angle of 45 degrees or a little steeper. The use of a needle guide can also be a great tool to achieve a very accurate insertion technique.

This point not only prevents the aforementioned problems, but also makes seeing the tip of your needle much easier.

"Steeper is easier. Steeper is easier."

Fig 1. Created by Kevin Arnold, RN, BSN. kev1999@gmail.com
Vein Depth | Stick Angle | Catheter Length

- This chart represents the catheter lengths needed just to reach the vein.
- The length to reach the vein should not be more than one-half of your catheter length.
- Red = Areas of caution when using a 1.75in (4.5cm) catheter

<table>
<thead>
<tr>
<th>Vein Depth (cm)</th>
<th>30°</th>
<th>45°</th>
<th>75°</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 cm</td>
<td>1.0</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>1.0 cm</td>
<td>2.0</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td>1.5 cm</td>
<td>3.0</td>
<td>2.1</td>
<td>1.6</td>
</tr>
<tr>
<td>2.0 cm</td>
<td>4.0</td>
<td>2.8</td>
<td>2.1</td>
</tr>
<tr>
<td>2.5 cm</td>
<td>5.0</td>
<td>3.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Catheter Length = Vein Depth / [Sin(Stick Angle x (Pi()/180))]
Site Preparation

- Trace vein with probe to find a straight section of the vein \(^1\)
- Mark endpoints to visualize vein path \(^2\)
- Mark endpoints to visualize vein path and insertion area \(^1\)

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1. Goldstein, Israeli Journal of Emergency Medicine, 2006, pg 50
Fig. 1 Image created by Kevin Arnold, RN, BSN. kev1999@gmail.com
Fig. 2 Image created by Kevin Arnold, RN, BSN. kev1999@gmail.com
Site Preparation

• Follow your facility protocol
• When using chorhexidine, friction is important, scrub the selected site about three inches in diameter for 30 sec and allow to dry\(^1\)  NOTE: Do not blot or wipe on site to speed drying.
• Aseptic vs sterile technique is inconsistent in the literature. Minimizing contact of the needle with gel is intuitive but may difficult for novice users.\(^2\)
• Apply sterile gel to the probe or above selected insertion site \(^3\)
• Alternate techniques: covers, gel caps, etc.

1. ChloraPrep One-Step FREPP Applicator, CareFusion, 2010
2. Goldstein, Ultrasound-Guided Peripheral Venous Access, 2006 pg 49
Technique

- Clasp probe with a “C” grip close to the skin... holding the probe far from the end will allow too much movement\(^1\)


Fig 1. Image created by Kevin Arnold, RN, BSN. kev1999@gmail.com

Gripping with a “C” allows use of your pinky finger and/or butt of you hand to stabilize your hand against patient arm.
Technique

• Stabilize your hand holding probe with one finger or wrist against patient’s arm.
• For users that place the machine on the same side of the bed, it is recommended to wrap the ultrasound cord around arm to prevent dropping probe.
• Keep ultrasound perpendicular to skin for a better image \(^1\)
• Use on-screen guide to align center. \(^2\)

2. Goldstein, Israeli Journal of Emergency Medicine, 2006, pg 50

Fig 1. Image created by Kevin Arnold, RN, BSN. kev1999@gmail.com

Not real insertions. No gloves were worn in images taken for demonstration only purposes.
Technique

• AGAIN: Consider the concept of catheter length vs. angle of insertion. It is important to balance the two.

• Veins with a diameter of at least 0.4cm and a depth no greater than 1.5cm should yield better success.¹

• Sticks will be easier with a higher angle of insertion, but this must be balanced with the catheter’s ability to bend.

• Avoid kinking the catheter.

¹ Meer, Ultrasonography Assisted Peripheral Line Placement, 2011, pg 6
Technique

• Center the vessel on the ultrasound probe\(^1\)
• Use on-screen guide to measure depth of vein and direction. Each dot = \(\frac{1}{2}\) cm (on most machines).

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Technique

- Threading: In general it is easier to visualize your needle if you stick in the 45 (to 65) degrees range from the skin.¹ Then lower your angle to thread the catheter.²

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¹ Meer, Ultrasonography Assisted Peripheral Line Placement, 2011, pg 7

Fig. 1 Image created by Kevin Arnold, RN, kev1999@gmail.com
Fig. 2 Image created by Kevin Arnold, RN, BSN. kev1999@gmail.com

Not real insertions. No gloves were worn in images taken for demonstration only purposes.
Technique

• Scan probe to view needle tip by moving probe to and from insertion site. ¹

• You may inadvertently stick through both sides of vein wall. If so, you may see and feel the vein wall “pop” into place when retracting the needle out of the deeper side of the vein wall.

• You should have excellent blood flow when tip is in the middle of the vein. ¹

• After visualizing tip of needle in center of vein, it is okay to lessen the angle of the needle as you begin to thread the catheter.

¹ Meer, Ultrasonography Assisted Peripheral Line Placement, 2011, pg 7
Technique

• Needle entering and visible in vein
Technique

• Side View (Horizontal Plane)

Fig 1. http://www.bluephantom.com/product_thumbs/t_brachial_vein_ultrasound_needle_insertion_model.jpg
Documentation

• Follow facility protocol

• Typical: Document IV site location and preparation, gauge of catheter, number of attempts, and type of dressing in the medical record.

• Use of ultrasound for guidance should be included in note.
Potential Complications\textsuperscript{1}

- Arterial puncture
- Adjacent nerve irritation
- Infection
- Infiltration
- Potential UE DVT
- Injury to vessel preventing arteriovenous fistulas sites for renal patients

\textsuperscript{1} Goldstein, Ultrasound-Guided Peripheral Venous Access, 2006 pg 51
Common Pitfalls

- Beware of threading in the “sidewall” of the vein.
- It is common to get some blood return after threading through part of the sidewall. It is very important to visualize the needle tip in the center of the vein opening.

Fig 1: http://www.daviddarling.info/images/vein.jpg
Common Pitfalls

My needle is under the skin but I can’t see the tip?
- Make sure the needle is directly underneath the face of the transducer
- Move the transducer closer to the site of skin entry.
- You may be too deep. Look for movement below vein

I buried my needle and I still can’t reach the vein?
- Retract and advance at a steeper angle, but make sure to allow sufficient catheter length left for in the vein. Infiltration is likely if catheter is too short.

1. Goldstein, Ultrasound-Guided Peripheral Venous Access, 2006 pg 51-52
Summary Tips

• Keep your **eyes on the screen**...not the insertion area.
• **Stick steeper**...45 degrees is steeper than usual.
• **Don’t hover** over patient with needle...just stick quickly through skin and then use the screen to guide the needle into the vein.
• Use your **wrist/finger to stabilize** your probe hand...free handing the probe will allow too much movement.
• **Use a “C” grip** to hold the probe.
• Use minimal amount of gel. Too much gel creates a mess and difficulty.
• Avoid extreme steep angles as this may kink the catheter while securing to the skin.
Student/Patient Outcomes

• Barton and Danneck Average Stick Rate
  – Traditional palpation method
  – Mean num of IV attempts 2.18 \(^1\)
  – Poor patient satisfaction

• Hard Stick average
  – ???

• Ultrasound PIV insertion using ultrasound
  – My experience... as good as 1.10 = approx 90%
  – Multiple studies report similar outcomes

Typical Learning Curve

Average Sticks by New Ultrasound Users Post Check Off Insertions

Data generalized from speaker’s teaching experience of typical outcomes.
Student/Patient Outcomes

Using ultrasound to place PIVs is becoming more prevalent beyond just the expert PICC nurse. It's pretty easy to see by those who have done it how implementing this new skill can lower the number of insertions per patient, save costs associated with those insertions, and reduce risks for infection and other adverse outcomes associated with repetitive vein trauma. Equipment is becoming more affordable, leaving facilities little reason not to pursue this superior practice.

Congratulations on completing the initial training towards improving your practice!
References

• BD Insyte Autogaurd IFU, http://www.bd.com/infusion/pdfs/d13348-4d.pdf, page 1
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• Myers K., Clough A: Making Sense of Vascular Ultrasound – A Hands on Guide; 2004,Odder Arnold, United Kingdom, pg 1-341.
• Policies and Procedures for Infusion Nursing: Infusion Nurses Society, 4th Ed. 2011, pg 1-162
• Ryder MA; Peripheral Access Options, Surgical Oncology Clinics of North America; 4(3) pp 395-427
Appendix A: Example Policy

ULTRASOUND GUIDED PIV INSERTIONS & BLOOD DRAWS

INDICATIONS FOR USE:

a. Patients with difficult venous access may be candidates for US guided starts.
b. May utilize US for placement by health care workers with appropriate training.

PRECAUTIONS & KEY POINTS:

1. The deeper veins generally utilized for US guided starts are associated with a greater risk of complication from infiltration due to later recognition of infiltration and proximity of nerves and arteries.
2. The upper Brachial and Basilic veins may be considered if no other options are available.
3. Special consideration needs to be given to catheter selection based on the depth of the chosen target vessel. At least ½ of catheter length should reside in the vessel in final position.
4. Vein diameter should be 3x’s catheter diameter (with no tourniquet applied).
5. Local anesthetic may be utilized for US guided starts.
6. Special care must be taken to avoid possible infection during the procedure.

SECTION I: DIRECTIONS

1. Gather Equipment:
   a. Portable US machine and gel.
   b. IV supplies as per PIV protocol.
   c. Appropriate IV safety catheter for selected target vessel.
   d. Sterile US gel.
   e. 2X2 gauze.
   f. Local Anesthetic (optional).

2. Preparation for Insertion:
   a. Prepare as per standard PIV procedure.
   b. Position US machine for clear view with patients arm in comfortable position.
   c. Open additional supplies; 2X2’s, sterile gel.
   d. Draw up local anesthetic in labeled syringe and attach 25-30g needle (optional).

3. Site Selection:
   a. Don PPE.
   b. Apply non-Latex tourniquet snugly on upper arm.
   c. Assess extremity for possible sites.
      (1) Consider range of motion/restricted movement in selecting sites. Avoid joints (wrist/elbow) if possible.
      (2) Consider purpose and duration of therapy. (e.g. phlebogenic solutions/drugs) Using non-sterile US gel, explore forearm for suitable target vessels. If no suitable veins are located, check other arm before proceeding to upper arm.
      (3) If upper arm presents the only suitable vessels. Cephalic vein is best, followed by Basilic.
   d. Vein diameter should be 3x’s catheter diameter (with no tourniquet applied)
   e. Depress veins with U/S to differentiate veins from arteries. Veins will stay depressed. Arteries will “pulsate” due to pressure forcing blood through depression.

NOTE: Patients with low BP may not pulsate when depressed.
f. When appropriate target is selected, release tourniquet.
g. If no appropriate target vessel is identified discuss consideration of other type of access for the patient with the PICC RN and/or physician.

4. **Catheter Selection:**
   a. Consider purpose and duration of therapy i.e. volume vs. multiple intermittent meds and/or isotonic fluids vs. phlebogenic drugs/solutions.
   b. Catheter size selection should reflect size of available vessel and type of therapy to minimize/prevent complications and maintain adequate access.
      NOTE: Phlebogenic drugs are best given through a small catheter in the largest available vessel.
   c. Catheter length should be adequate to ensure that ½ of the catheter will reside in the lumen of the vessel. Be sure to take the angle of approach into consideration when determining vessel depth (scale available on US screen).

5. **Site Preparation:**
   a. Using friction and approved skin antisepsis scrub the selected site about 3 inches in diameter for 30 sec and allow to dry.
      NOTE: Do not blot or wipe on site to speed drying.
   b. Reapply tourniquet.
   c. Prep surface of transducer using Chloraprep sponge (once prepped, do not allow probe to contact non-prepped areas.)
   d. Apply a small amount of sterile gel above selected insertion site
   e. Visualize vein with transducer and administer local anesthetic as per protocol

6. **Venipuncture/Insertion of Catheter/Blood Draw:**
   a. Reapply tourniquet.
   b. Maintain sterility of catheter and integrity of prepared site during venipuncture. NOTE: Do not touch the site with your fingers once it has been prepped.
   c. Using center mark of transducer aligned with vessel as guide, advance catheter into target vessel while watching/guiding tip progress with US. Adjust probe as needed, but do not overrun insertion site.
   d. Once a blood return is visualized, lower angle of catheter and slide catheter off stylet into vessel to hub of catheter. Activate safety device. If blood draw, use appropriate device in place of catheter.
   e. Set aside transducer, and release tourniquet.
   f. Apply enough pressure above the end of the catheter to occlude it momentarily while attaching the extension set. Ensure good blood return. Slowly flush with NS, observing for swelling, then close clamp on the connector.
   g. Wipe gel from around catheter using sterile 2X2’s.
   h. Apply transparent dressing to cover insertion site and catheter hub.
   i. Apply tape as needed to secure catheter/tubing. Do not place any tape under the dressing.
   j. Write the date, type and gauge of catheter on the transparent dressing with a felt marker.

7. **Documentation:**
   a. Document IV site location and preparation, gauge of catheter, number of attempts, type of dressing, and numbing agent, in the medical record. Use of Ultrasound for guidance should be included in note.

**PATIENT EDUCATION:**

Instruct patient this is an advanced way to see their veins. Pain of insertion is comparable to a regular PIV insertion. Anesthetic is available, but its sting is usually worse than the IV needle.
CLEANING PROCEDURES:

The ultrasound system probes should be cleaned between patient uses. To clean the ultrasound system/probe, 1. Turn off the system. 2. Dampen a nonabrasive cloth with warm water or rubbing alcohol. 3. Gently wipe the dampened cloth over exterior surfaces.

REFERENCES:

3. http://vrassoc.com/Page24_Figure2.gif
5. http://www.ispub.com/ispub/ijms/volume_2_number_2_62/a_needle_guide_device_is_better_than_a_free_hand_technique_for_ultrasound_guided_cannulation_of_the_internal_jugular_vein_results_from_a_simulation_study/guide-fig3.jpg
12. Created by Kevin Arnold, PICC RN, BSN, kev1999@gmail.com
13. Created by Kevin Arnold, PICC RN, BSN, kev1999@gmail.com
Competency Statement: The purpose of this competency validation is to ensure that healthcare workers trained for Ultrasound Guided peripheral IV placement and blood draws will be able to carry out their skills safely and proficiently to provide vascular access devices to patients with poor venous access.

<table>
<thead>
<tr>
<th>KEY</th>
<th>HOW STANDARDS ARE MET:</th>
<th>LEVELS OF EXPERIENCE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1. Little or no experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Some experience (may require practice/assistance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Competent and can perform independently</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Competent, performs independently and able to assess competency of others</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>HOW MET</th>
<th>INITIALS</th>
<th>STANDARDS</th>
</tr>
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1. GATHERING OF EQUIPMENT
   a) Portable Ultrasound (US) machine and gel.
   b) IV supplies as per peripheral IV protocol.
   c) Appropriate IV safety catheter.
   d) Sterile US gel.
   e) 2X2 gauze.
   f) Local Anesthetic (optional).

2. PREPARATION FOR INSERTION
   a) Educated patient about procedure.
   b) Prepared as per standard PIV procedure.
   c) Positioned US machine for clear view with patient’s arm in comfortable position.
   d) Opened additional supplies; 2X2’s, sterile gel.
   e) Drew up local anesthetic in labeled syringe and attach 25-30g needle (optional).

3. SITE SELECTION
   a) Donned PPE.
   b) Applied non-Latex tourniquet snugly on upper arm.
   c) Assessed extremity for possible sites.
   d) Considered range of motion/restricted movement in selecting sites. Avoid joints (wrist/elbow) if possible.
   e) Depressed veins with probe to differentiate vessels.
   f) Release tourniquet.

4. CATHETER SELECTION
   a) Considered purpose and duration of therapy i.e. volume vs. multiple intermittent meds and/or isotonic fluids vs. phlebogenic drugs/solutions.
   b) Ensured catheter length adequate that ⅔ of the catheter will reside in the lumen of the vessel. Considered the angle of approach when determining vessel depth.
### 5. SITE PREPARATION

- **a)** Used friction and approved skin antisepsis scrub the selected site about 3 inches in Diameter for 30 sec and allowed to dry.
- **b)** Reapplied tourniquet.
- **c)** Prepared surface of transducer using chloraprep sponge (once prepped, did not allow probe to contact non-prepped areas.)
- **d)** Applied a small amount of sterile gel above selected insertion site
- **e)** Visualized vein with transducer and administered local anesthetic as per protocol (optional).

### 6. VENIPUNCTURE/INSERTION OF CATHETER:

- **a.** Removed cover of safety catheter and inspect catheter condition.
- **b.** Maintained sterility of catheter and integrity of prepared site during venipuncture.
- **c.** Used center mark of transducer aligned with vessel as guide, advanced catheter into target vessel while watching/guiding tip progress with US. Adjusted probe as needed, but did not overrun insertion site.
- **d.** Once a blood return was visualized, lowered angle of catheter and slid catheter off stylet into vessel to hub of catheter. If blood draw, used appropriate device.
- **e.** Activated safety device.
- **f.** Set aside transducer, and released tourniquet.
- **g.** Applied enough pressure above the end of the catheter to occlude it momentarily while attaching the extension set.
- **h.** Ensured good blood return.
- **i.** Slowly flushed with NS, observing for swelling, then close clamp on the connector.
- **j.** Wiped gel from around catheter using sterile 2X2’s.
- **k.** Applied transparent dressing to cover insertion site and catheter hub.
- **l.** Applied tape as needed to secure catheter/tubing.
- **m.** Wrote the date, type and gauge of catheter on the transparent dressing with a felt marker.

### 7. DOCUMENTATION

- **a.** Documented IV site location and preparation, gauge of catheter, number of attempts, type of dressing, and numbing agent, in the medical record. Use of Ultrasound for guidance was included in note.

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1\(^{st}\) successful stick  \(\quad\) 2\(^{nd}\) successful stick \(\quad\) 3\(^{rd}\) successful stick

Trainee Signature: ________________________________ Date: ______________

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