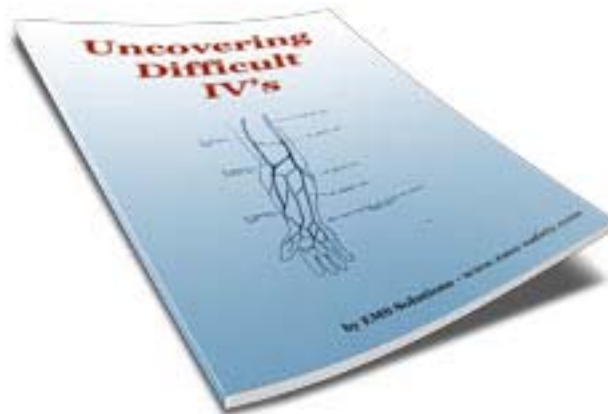




# EMS Solutions

*Presents*

## Uncovering Difficult IV's



**NOTICE:** You DO NOT Have the Right to Reprint or Resell this Publication.

© **Copyright EMS Solutions ALL RIGHTS RESERVED.** You may give this publication away, offer it on your website or share it with your peers so long as no part is changed or altered.

**DISCLAIMER AND/OR LEGAL NOTICES:**

The information presented herein represents the views of the author as of the date of publication. Because of the rate with which conditions change, the author reserves the right to alter and update this information based on the new conditions. The publication is for informational purposes only. While every attempt has been made to verify the information provided in this publication, neither the author nor its affiliates/partners assume any responsibility for errors, inaccuracies or omissions. Any slights of people or organizations are unintentional. If advice concerning medical, legal or related matters is needed, the services of a fully qualified professional should be sought. You should be aware of any laws/practices or local policies which govern emergency care or other pre hospital care practices in your country and state. Any reference to any person or business whether living or dead is purely coincidental.

# The Basic Equipment

## Hardware

### 1- What is an intravenous?

Let's have a look:

#### The bag



Looks like normal saline. Ok new grads, what's "normal" about normal saline? What does "isotonic" mean? What other commonly used IV fluid is isotonic?

This stuff that's "clear as crystal" is commonly referred to as "crystalloid".

**Sterile!** The entire IV setup has to be **EXTREMELY** sterile: the bag, the tubing, the connectors, the catheter, the dressing...

#### The tubing



The whole fluid path from the spike to the needle is sterile.

#### The spike



This one's vented – you use this kind with bottle mixes; it lets air get into the bottle, so the fluid can come out, while with bag mixes, the bag just collapses closed.

### The drip chamber



A little hard to see, but the one on the left is “macro” drip, or fifteen drops per cc, and the one on the right is “mini” - 60 drops per cc. We never regulate constant infusions by eye anymore – most everything goes on an infusion pump nowadays.

But for a rapid IV volume bolus of something (**not** meds) – normal saline, Ringer’s lactate, whatever, we still use gravity. Which one of these are you going to reach for? In other words, which one is going to run more rapidly?

### Roller clamps



We only use gravity tubing in two situations nowadays: for rapid IV bolus infusions, and for blood. For boluses, the roller clamp has two positions: “all the way open”, and “closed”.

### The ports



This is where things get plugged into the line. Are you running, say, normal saline at 30 cc’s per hour? And you want to plug in the patient’s dose of IV Lidocaine? This is where you go...

### What are needle-less connectors all about?



It’s been a LONG time since we used needled connectors, but it’s worth mentioning, I guess. Needles, or “sharps”, as we call them, are generally considered a Bad Thing. This doesn’t mean we don’t use them all the time for various things – we draw up meds with them, we give subcutaneous and intramuscular injections with them. People were getting hepatitis from patients, I think there were a few cases of HIV... so the word went out: the fewer needles, the better. And non-needle connection systems were created.

### The connection to the catheter – what are Luer connectors?



The tubing actually screws onto the yellow end shown – except sometimes it's blue, or green, or pink, or whatever, usually depending on the catheter size. But the screw technology is pretty uniform, all under the name of Luer connectors.



These syringes have female luer connections at the ends.

The catheter hub of the IV, the hubs of injection needles, the connector hubs at the ends of IV tubing – they all use **the same size and type of connector**, which was probably what developing the Luer standard was all about.

### The dressing



We like to be able to see the site, so we put a clear tegaderm over it.

# Intravenous Access

Intravenous lines are initiated for a variety of reasons:

- acutely expand intravascular volume
- to correct an underlying imbalance in fluids or electrolytes
- to compensate for an ongoing problem that is affecting either fluid or electrolytes
- administer medications

Two solutions are used for acute volume expansion (isotonic): Normal Saline (0.9%) and Lactated Ringer's Solution. Normal Saline is salt water at a concentration that is isotonic with the blood. Ringer's Lactate is similar, but has small amounts of potassium. In addition, it provides lactate which is metabolized by the liver to bicarbonate and helps buffer the blood if acidosis is present. Note that these two solutions do not contain any glucose. This is because bolus infusion of these solutions would drive blood glucose (and plasma osmolarity) up too quickly.

## Starting An Intravenous Line

Before starting the IV, accumulate all necessary supplies:

- Alcohol wipes
- Tourniquet
- Angio catheter
- IV tubing (filled with normal saline, making sure there are no large air bubbles)
- Tape
- Gauze
- Gloves

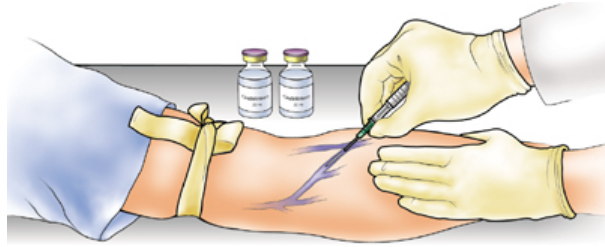
## Preparing the arm

Apply a tourniquet high on the upper arm. Now start the search for suitable distended subcutaneous veins. Often the antecubital fossa is chosen because there is a large antecubital vein easily accessible there. Have the patient squeeze their hand to make a fist several times in order to maximize venous engorgement. If you cannot see any veins popping up from the distention caused by the tourniquet, you can sometimes feel them by palpating the arm. If after a meticulous search no veins are found then release the tourniquet from above the elbow and place it around the forearm and search in the distal forearm, wrist and hand. If still no suitable veins are found, then you will have to move to the other arm. Be careful to stay away from arteries which are pulsatile.

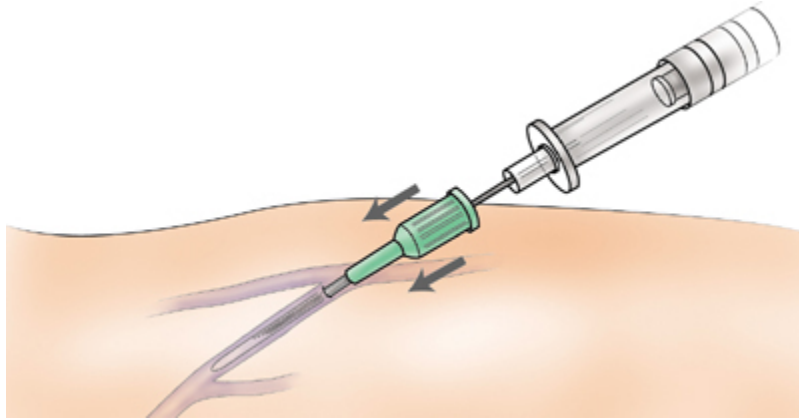
Once a suitable vein is found, it is necessary to clean and disinfect this area with alcohol.

## Puncture Vein

Use one hand to apply counter tension against the skin, while inserting the needle. As the angio catheter enters the vein look for the dark red flashback of blood at the angio catheter hub indicating that the angio catheter is in the vein.



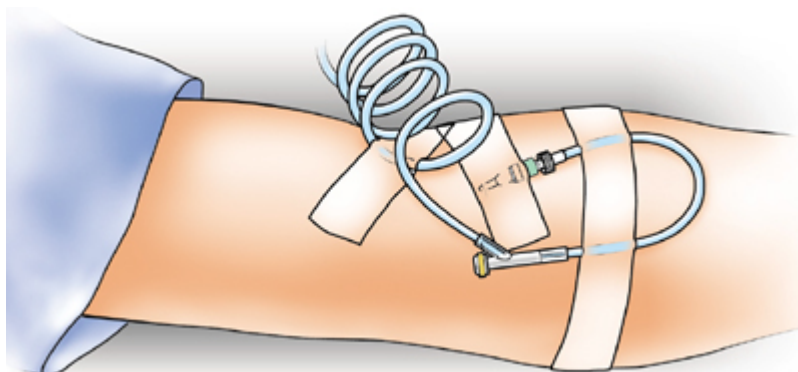
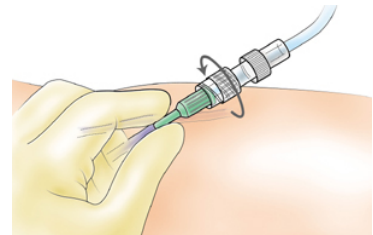
If this first pass is unsuccessful in entering the vein and there is no flashback then slowly withdraw the angio catheter, without pulling all the way out, and carefully watch for the flashback to occur. If you are still not within the vein, then advance it again in a 2<sup>nd</sup> attempt to enter the vein while withdrawing always stop before pulling all the way out to avoid repeating the painful initial skin puncture.



## Release Tourniquet

Once the angio catheter is advanced in the vein up to the hub, release the tourniquet, apply gentle pressure over the vein to collapse it, so that blood will not pour out of the angio catheter when the stylet (needle) is removed. Once you remove the stylet (needle) place it in a sharps container.

**Attachment and Locking of Tubing** Attach the male end of the tubing to the female hub of the angio catheter. Lock the IV tubing to the angio catheter by advancing and rotating it. Quickly test the IV with a small injection of saline to make sure it is working properly. The saline should flush easily. Tape the IV in place.



# Intravenous Access Tips

**INSERTION SITE:** Choosing an appropriate access site is an important consideration. The ideal vein to access should be situated on the distal part of the arm, but proximal to previous attempt. Avoid sites near joints, veins that are inflamed and, in adults, veins of the feet.

**SIZE OF CATHETER:** Choosing the correct size of catheter to be inserted will vary depending upon the patient and their requirements (both actual and potential future needs). The smallest catheter suitable for the patients need should be inserted. As a general rule large gauge catheters (16-14g) should be used for rapid transfusion/infusion. Smaller catheters (22-20g) can be used for situations requiring slower drug/solution delivery.

**HEMATOMA PREVENTION:** As a result of repeated venipuncture, hematoma's often contribute to the reduced choice of suitable veins to access. Upon removal of a catheter, hematoma prevention is encouraged by the application of digital pressure to the puncture site for at least three minutes.

**VEIN ROLL-** Superficial veins may roll therefore it is important to maintain skin tension throughout the insertion procedure.

**LYMPHOEDEMA** – Some patients for example who have undergone mastectomy, axillary dissection and radiotherapy (to the lymphnode areas) may be at risk of developing lymphoedema following any form of venous access on the affected site. At risk patients should have their unaffected arm utilized for venous access i.e. mastectomy patients.

How do I know if my patient's IV is working properly?

Well... there are certain basics: for one, the catheter is supposed to be in the vein. How can you tell if the catheter is in the vein?

Couple of tricks:

if you're running the patient's IV fluids through a gravity line, open the roller clamp, unhook the bag from the hook, or the pole, or whatever else it's hanging from, and lower it down below the level of the bed. What should you see backing up in the line?

Another way to do the same thing without unhooking things: crimp the IV tubing with your fingers. Now with the other hand, squeeze the tubing below the crimp, and release. Get a blood return?

Third trick – sometimes you just can't get a blood return. This doesn't mean the IV's no good, but it can be hard to tell. Try this: hang your gravity bag up so you can see the drops falling in the drip chamber. Now compress that patient's arm a couple of inches up above where the IV catheter should end. Did the dripping stop? What does that mean? What if it didn't?

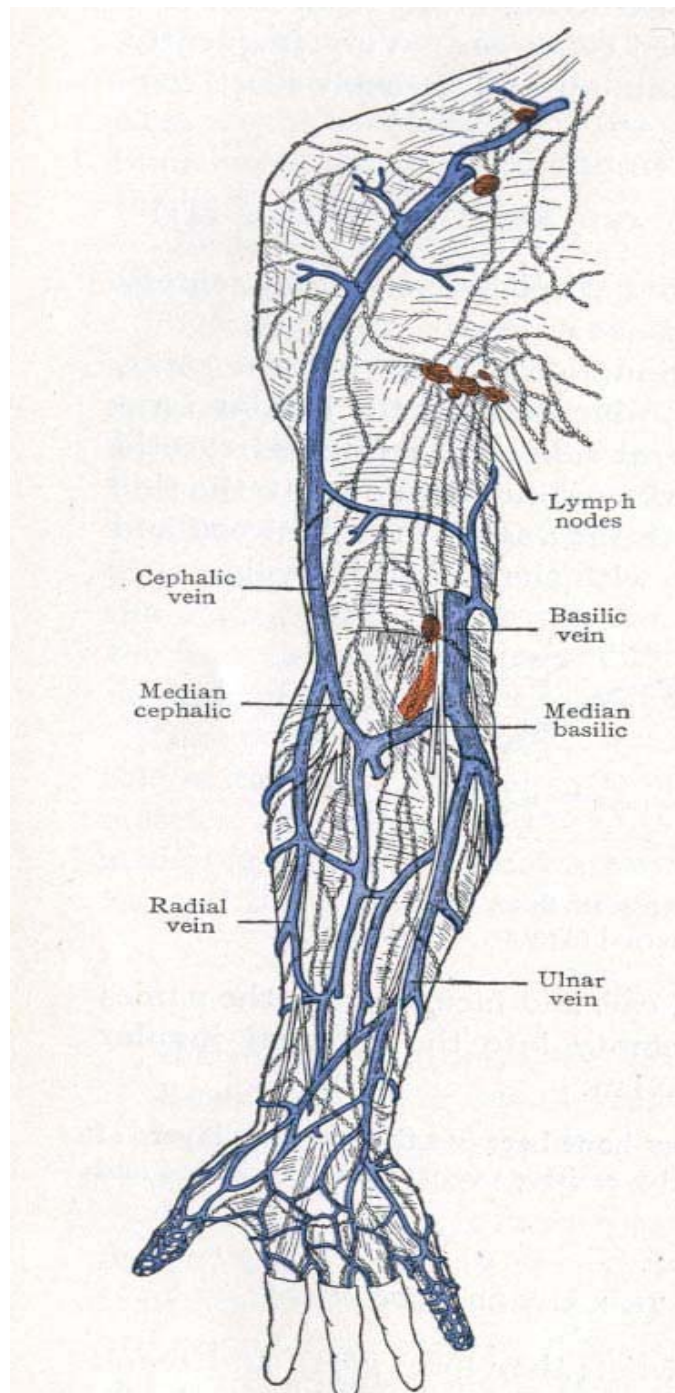


## Problems

What does “infiltration” mean?

Sometimes the tip of the catheter pokes its way out of the vein into the surrounding tissue, and what’s going through the catheter goes into the tissue spaces instead of the vein where it was supposed to be. If the fluid is something isotonic, like normal saline or D5W, then this is usually not a big deal, and once you recognize the problem and stop the infusion, the fluid is rapidly absorbed by the tissues and the swelling goes away.

## KNOW YOUR ANATOMY FOR EASY VEIN LOCATION



## Tips From The Street

We would like to thank each of the contributors for their tips on IV access.

The following are tips from <http://enw.org/IVStarts.htm>

Can't see a vein?: Trust your fingers even more than your eyes when trying to find a suitable vein.

What is this I feel?: A tendon may seem like the vein for which you are hoping, but palpating it through a range of motion may prove that it is not.

"Hardened" Veins?: If the vessel is hard, or scarred, try for another. Occasionally, one can, however, get through a scar to a usable portion of vein. There is a risk of fraying or kinking the cannula, however.

Difficult Advance?: Mild obstructions, tortuosity of the vessel, vessel fragility, and frictional resistance can often be overcome by "twirling" the catheter hub, imparting a rotatory motion, as it is advanced to help glide over some points of hang-up. This will require a free and gentle hand or a trusted assistant. Some "safety" cannulae with sheathing devices are more awkward with which to do this than older styles.

Moving With the Moving Target: When dealing with limb motion, or motion from the mobile environment (ambulance, air or watercraft, etc.), lock the arm in extension and block flexion at the elbow. It may be necessary to tuck the distal part of the limb under one's own humerus or axilla to control motion. Maintain braced contact positions of one's hands on the patient's limbs, be aware of and "get in the rhythm of the motion" of the vehicle or patient, and perform venipuncture.

Gravity & Position: Hang the patient's arm down as low as possible, to employ gravity to assist in the venous filling. Raise the gurney sufficiently high that you can work in good light without hurting your back. If the intended site is distal, kneel or seat yourself so that you can work closely and steadily. For lower-extremity IV's, one may need to dangle the limb over the side of the bed to encourage dependent filling of vessels. If the patient is hypovolemic or in shock, one may need to tilt the bed head-down in Trendelenburg's Position to permit access, or to fill neck-veins for access and minimize air embolism. If the patient is on the floor or the bed cannot be tilted, or the need is extreme, a helper may raise and hold the patient's legs as high as possible to achieve the same effect.

---

### Mike Welsh NREMT-P

If the veins roll, pull the skin taut on either side of the vein instead of distal to the iv insertion site. This holds the vein still and the skin taut to ease iv insertion.

If I have a hard time finding veins, or am not sure which way the vein runs, I will either look away from the patient or close my eyes and palpate the area. This allows me to concentrate on feeling for the vein instead of looking for the vein.

I will also periodically start an iv with my non-dominant hand. This way if I am in a position where I can't get my dominant hand in position to start the IV, I am comfortable using my non-dominant hand.

I think in my first ten attempts during hospital clinicals I hit one! They even sent me home on one shift because they wouldn't let me try any more.

I asked for help, begged for criticism. But the feeling seemed to be “you can either do it or you can't.”

The only advice I got really was, “Quite being so timid, just stick it!” But I couldn't see how being more 'brute force' and less precise was going to resolve my problems. (It turned out I was mistaken)

On my first shift on the ambulance I was nervous as a one legged man in an ass kicking contest. The whole time my preceptor was yelling at me, and I couldn't hit anything! Finally I just got fed up, she was telling me what an idiot I was for taking so long (in different words, but that's an accurate paraphrase) so I just got a general feel for the vein and rammed the cath. And got flash! Taped it down and was good to go.

I thanked the God of fools and small children for a miracle, yet tried the same approach on my next IV. Get a general feel for the vein, and go for it without thinking very much, flash! I think in my next forty IVs I missed one and had to re-stick two or three. And several of the successes were on very heavy people where the anatomy was deep and the very mobile (to say the least).

Anyway, my point is that for some reason I seemed to just keep getting in my own way. Some part of my little pea brain seems to know how to do this if I just don't over think it. I'm now confident with every start. Maybe this will work for you, maybe not...I just thought I'd throw it out there.

Also, I spent a shift in endoscopy. My pharmacology instructor suggested it as the patients all do a cleansing the night before so tend to be a bit dehydrated. The theory being they are a little harder to stick, but you're surrounded by nurses that successfully stick them day in and day out. It was a great experience and very helpful.

I'll bet you'll find it will “just come together” all of a sudden. That seems to be a common thread to the 'learning' stories.

I've found that it's easier for me to press a little harder, feel for the "divot" (A little concave, that I believe is the bottom of the vein instead of the top), and then back the pressure of to get a feel for the 'quality' of the vein.

It doesn't seem to require such a gentle touch at first, as when pressing harder you can feel yourself 'stumble' across the veins, and then back the pressure off to decide if it has the qualities you like before committing to it.

Again, I must state that this makes my technique sound much more elegant than it really is. I get a general idea of location, and then go for it. Normally the above steps are applied with heavier patients, or sticks that I have a low level of confidence for success.

From the start I made the whole process much more difficult that it needed to be..

**Dwayne Womack**

---

IVs can be really tough when you are first starting. Don't sweat it if you are missing a bunch, because we all do when we are new to the procedure.

It may sound silly, but I honestly feel like self confidence is one of the most important components of getting an IV. Personally, when I don't think I am going to get a line- I often don't, regardless of anatomy. When I feel good about my IV sticks, when I know I'm going to get this line - surprise surprise - I do. Try to keep your head up. Be positive. Don't get upset if you miss a line, because we all do.

As far as practical advice, try a few different techniques on your next few sticks:

1) Try not going for the vein right away as you stick. Get your catheter under the skin first, and then go at the vein from the side. This helps with those "rolling" veins quite a bit, and to be honest I use this technique in the ambulance a lot because the needle is easier to control once it is under the skin. Start your stick a half inch or so distal to where you see the vein, then go right up towards it.

2) Try the other way: "stabbing the vein" directly with the needle as you enter the skin. This works especially well for deeper veins where you can't feel too well but can see the color of it. Try to be as exact as you can, and move slowly, because these deeper veins are harder to judge as far as depth, so your "X axis," as I like to put it, needs to be dead on.

3) Remember to keep moving the needle forward a little bit even after you see the flash. Keep in mind that the needle tip is longer than the end of the catheter, and you get flash before the catheter is actually in the vein. If you try to advance at this point, it will feel like you've hit a valve even though you haven't. Don't be afraid to keep going with the needle within the vein until you are able to feed the catheter to the hub.

4) If you need to use a tiny needle - #22 or #24 - remember to move really slowly. The bore of the needle at this size is really really tiny, and it will take longer than normal for flash to show up in the chamber once you have entered the vein. Make very small motions and have patience.

5) Don't worry too much about the patient's pain. I know this sounds like bad "patient-care" advice, but it is better that you just get the line (even after fishing a little) than have to stick them again. Apologize to your patients and thank them for being patient, but don't let your worry about their pain hinder your ability to get the line. Just get it.

Anyways, hope that helps. The key to all of this really is just to practice practice practice. I don't think I was really proficient at IVs until after my first 100 or 150 sticks. I know that is a lot, but it really did take that long before I felt confident about getting the line on just about every patient. ..And these days, when I do miss, it doesn't bother me that much because I know that the patient was a tough stick. No big deal.

**Fiznat – [emtcity.com](http://emtcity.com)**

---

If you get into the situation where you know its gonna blow (especially elderly and diabetics) skip the tourn---That is something I have known for almost 20 years and it hasn't failed yet---

**tinman694**

---

While you're performing the sticks feel for the "pop" once you enter the vein. I found that when I was first starting with IV's, that I would actually feel the "pop" of the needle entering the vein. I find myself now not focusing on the flash chamber at all until I feel that flash. Just like you've been told on here, just find your vein and perform the stick, the more you do it the more you'll get the feel for the little things you may not notice right away.

**Eddie Parnell - Paramedic Field Training Officer**  
**Florence County EMS, Florence SC**

---

I precept student and new medics all the time. IV's are a skill that everyone is very timid with in the beginning. Why? Glad you asked. Patients are normally awake and can feel the stick. We're aggressive w/ intubations because the patient is gorked and don't realize what we're doing. Every patient is different with regards to IV's. What I've seen a lot of people do is "go by the book". IIRC, it says to start at a 45 degree angle. That works great of IV dummy arms. Hit the hole the other guy left you and you're in and the "vein" is always the same depth. Attempt the IV at a shallower angle. Say 15-20 degrees. That will help to eliminate going the through the back of the vein. You have to be more aggressive with the 35 year old chain-smoking truck driver because his skin will be thicker and tougher than the 85 year old grandma. Everyone has their "trick" for hitting IV's. Find yours. It's as simple as that.

### **Buckeye Doc**

---

One of the most common problems and solutions that I see is that a lot of people are never taught to correctly use their sense of touch. The basic training in IV technique seems to usually focus on visualising your vein, then going for it, without first using your fingers to get the lay of the land. Developing your ability to use your tactile senses to evaluate your stick sites is probably the most positive thing one can do to improve his skills. Veins that look good don't always feel good, and vice versa. Don't let visualisation give you a false sense of confidence, because it frequently will. Always make palpation your primary decision maker.

Of course, like anything, that takes a lot of practice to make it come together for you. You're going to have to take some risks at a time when you are looking for a sure thing. It's a tough thing to make yourself do. But for the next while, ignore your first instinct. Feel around for veins that are not so obvious, but have good size, and a nice, spongy firmness. Sometimes you may not actually see them at all, but don't worry about it. Locate them. Visualise their path, then go for it. I think you will see your success rate rise, because those veins are generally more stable (less roll) and less delicate than their superficial counterparts.

As for the "pop", I never really thought about the frequency with which it occurs. I'd venture a rough, non-scientific guess at me sensing a distinct "pop" much less than half of the time. I'm betting it is much more common with the larger gauge catheters than those 18 gauge and smaller. Regardless, I don't see a lot of value in the sign. If you are in when you feel the pop, you're going to get a flash at the same time anyhow. If you are not in, then you aren't. And, of course, there are plenty of other things that you can hit to cause a pop, so it would be unwise to quit digging just because you thought you felt a pop.

I think the two biggest tips I am known for are to learn to go by feel, and not sight, and to not psych yourself out. The headwork is ninety-percent of success. A few other tips:

1. If you are just learning, avoid taking the easy shots. Once you find a vein, forget about it and go find another, less obvious one. If you always take the easy shots, the hard shots stay hard. Get used to them.
2. Check your tourniquet. Keep it only 4-6 inches proximal to your site. Don't put it up on the bicep if you are shooting for forearm or hand veins. Not too loose, and if you're using a BP cuff, not too tight.
3. Don't get too aggressive while trying to raise the vein. Slapping it too hard will cause vasoconstriction. Just tap it lightly.
4. If you have hot packs, they do work wonders to raise a vein.

5. Choosing your vein by feel instead of sight allows you to better judge its depth and thickness, so you know when to expect a flash, and how deep to go.
6. If you can feel a vein, but not see it at all, you have to develop your ability to visualise the path of the vein without actually seeing it. Palpate the vein for a distance of a couple of inches so you can visualise that path, because remember, once you clean it off, you can't go palpating again (unless you have a fresh sterile glove on). If you have povidone-iodine solution available, you can use it to paint the vein path while swabbing the site. That will give you a target to shoot for.
7. To prevent rolling, stabilise the vein with skin traction distal to the site.
8. Don't be tentative in your venipuncture. Once you start inserting the needle, go straight on through to where the vein is. Don't slowly advance, waiting for a pop, stop, then start slowly advancing again, on and off. Go for it! Veins are smart. If you give them too much warning that you are coming, they will run!
9. Don't stop advancing the needle when you see the flash. Keep going just a hair to assure that the catheter tip is well inside the vein. If you start threading the catheter too soon, you'll probably blow the vein.
10. If you get a flash, advance, and then lose the flash, you may have gone through the back of the vein. But many times, you can still salvage it by simply backing up a little until the bevel is back in the vein, and the flash returns. Then you can thread as normal and start the IV. You'll still want to maintain some pressure at the puncture site for a few minutes to make sure the posterior puncture clots off okay.
11. Even though they tell you to start at the hand and work your way up, keep in mind the purpose of your IV. If the purpose is for volume replacement, you need to start with something bigger than the dorsal veins of the hands. They're too small and too fragile. Same goes for thick, caustic solutions like D50 or promethazine. NEVER give D50 in a hand vein. Your patient will hate you for it.
12. The cephalic vein bifurcates on the lateral wrist, just superior to the thumb. Whether you can see it or not, it is ALWAYS there. Stop and look at it on yourself. Visualise and memorise the location of that bifurcation. When all else fails, and you have nothing to go on, and you MUST have an IV, shoot blindly for that "Y". So long as you have spent a lot of time looking for this on every patient you see, you will soon become very good at knowing where it is and, in a pinch, hitting it when no other veins exist.

**Rob Davis, RN, EMT-P, BSc**

---

**The website below has pretest, flashcards and more to enhance your knowledge of IV therapy in pre hospital setting.**

<http://www.ivprehospital.com/>

**Just a few pictures of common IV supplies. Note the different catheter types. Be familiar with the ones your agency uses.**



**Needleless spring loaded. By pressing the white button tab after advancing, the needle retracts into the plastic barrel.**



**This needleless catheter will lock into the barrel once the catheter is advanced using the small ridge on top of the catheter.**



**These are the older style catheters that will still have the needle exposed after advancing. Be careful and place in sharps container immediately.**

I hope you found this short report useful. For more EMS Tips and free downloads visit



<http://ems-safety.com>

Also – become a member of our brand new members only website



<http://TheEMSProfessional.com>