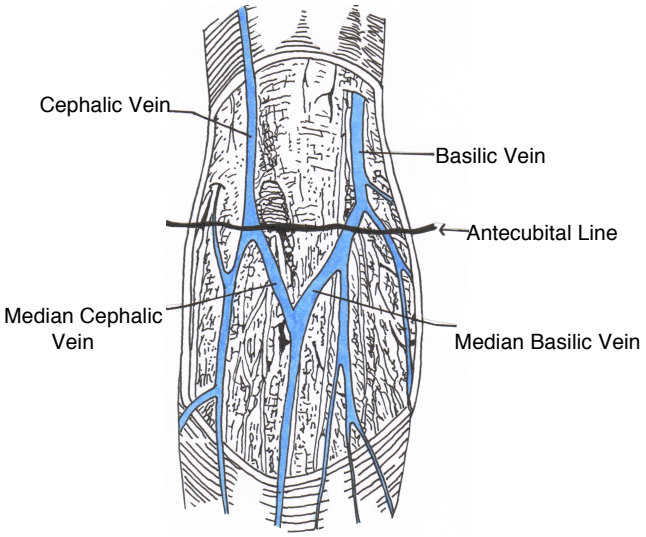
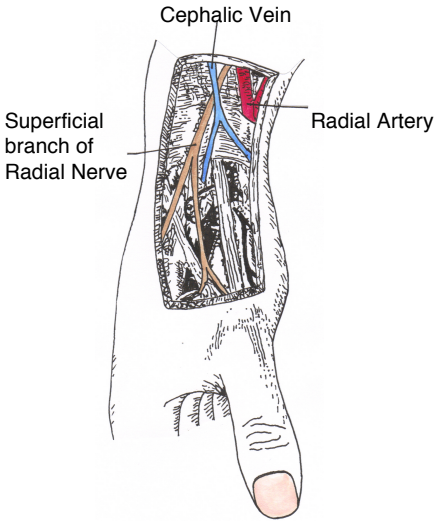
Vein Access Technologies
presents

The Science Behind the Skill of Vein Access for the Phlebotomist

The Anatomy, Physiology, and Physics of the Blood Draw





By
M. Gail Stotler, Vein Access Technologist / B.S.N., R.N. /
Biology / Anatomy / Physiology / Physics / Chemistry / Math

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Illustrations By
M. Gail Stotler and Tami Tite

Published by
M. Gail Stotler, B.S.N., R.N. / Vein Access Technologist
Vein Access Technologies, a division of
The Nurses' Station, P.C.
#2 Terminal Drive, Suite 1
East Alton, Illinois 62024
618-259-7781
www.veinaccesstechnologies.com

ISBN: 0-9723656-1-3

About the Author

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This book IS different from all of the other books written on this subject, and that's because I am different from all of the other authors who have written on this subject. It is this **difference** that makes this book "**THE BOOK"** on vein access.

Exactly what is this **difference**?

Unlike most of the other authors who have written about vein access, I was pre-med before I did anything else. Here is a synopsis of my academic and experiential background -

1. A Bachelor's Degree in **Biology**, with a minor in **Chemistry** and all of the accompanying course work (i.e. **physics**, advanced mathematics, genetics, cellular biology, microbiology . . .), and

2. One year of graduate (**cadaver**) **Anatomy** at St. Louis University's School of Medicine and the accompanying course work (i.e. pathology, **neuroanatomy** . . .), and

3. Graduate hours in **Biology**, and

4. A Bachelor's Degree in **Nursing** from St. Louis University's School of Nursing, and

   (And it was while sitting in these nursing classes that I realized that nursing students are taught very LITTLE basic science information . . . they have NO cadaver anatomy, no physics, very little chemistry, minimal math, and skill instruction at the most minimal level.)

5. Graduate hours in nursing (i.e. graduate **physiology**, and didactic nursing classes. . .).

One of the things that I discovered on this academic journey was "what" these other levels of health care professionals were missing in their education. ***Each discipline teaches to their own level of science with respect to their field.*** And the lack of information is then perpetuated - continued on and on and on.

This is NOT a criticism – it is an observation.

Check out the academic course work of the other authors' (NOT TITLES) that came with their degrees.

Because I have experienced education in four different dimensions -

- *the **science world** with the Biology/Chemistry*
- *the **medical world** with graduate cadaver anatomy – a more advanced cadaver anatomy than even medical students are exposed to – really!*
- *the **allied health world** with the Nursing degree*
- *the **graduate/research world** with an emphasis on research and critical analysis of the facts and findings*

and I have a very diverse (clinical) work experience -

- *cardiovascular technologist (2D / M Mode echos, Treadmill Stress Testing, Basic Electrocardiography, 24 Hour Holter Monitoring and scan analysis, and Venous Doppler testing of the lower extremities)*
- *pulmonary function testing and function analysis*
- *EEG technician*
- *general skeletal radiology as an x-ray tech*
- *established and ran a diagnostic (medical center) laboratory*
- *established and ran a medical center based radiology department for general skeletal and chest exams, IV pyelograms, nuclear scans (i.e. bone and cardiac)*
- *transcription in cardiology, internal medicine, radiology, pathology and*

medical records (to include all other disciplines) – resulting in a very advanced terminology education and understanding – that's why the word phlebotomy makes me crazy

- *pathology technician*
- *etc.*

and a teaching background in a classroom and clinical setting -

- *I am an Illinois Department of Public Health certified CNA instructor and evaluator and have taught this program extensively.*
- *I have taught vein access (phlebotomy), as a self-owned corporate entity for the last 18 years, along with basic electrocardiography, injections (ID, SQ, IM, and IV), vital signs, ICD-9 and CPT coding, insurance claims filing, etc.*
- *medical seminar presentations*

I was able to see the medical profession in its totality. Other authors don't know the global medical picture as I know it. They were narrowly taught and trained in their specific area, and then they narrowly worked in their specific area. One "phlebotomy" book's author even flat out contradicts Gray's Anatomy in his one sentence description of the vein.

That's why I know all of this science information, and they don't. That's why they can't write about this. They don't know the level of anatomy, physiology, physics, and chemistry that I know.

That's why all of the other books out there are MISSING INFORMATION.
And maybe that's why they focus on the extemporaneous information and not on the anatomy, physiology, physics, chemistry, and math of the vein access procedure.

That's what's special about me and this book.

Critics might say that "with all of that academia, she was 'apparently' confused about what she wanted to do, and that she is just a *jack of all trades and a master of none*." Well, I wasn't confused. When I didn't get into medical school, I did what came next, and next after that, and next after that. And in the end, God knew what He was doing with me after all – He gave me this global knowledge of the sciences and medicine, and gave me the ability to apply this information to the clinical skills. This was no mistake at all.

Acknowledgments

The credit for this book and its content belong totally to God. God gave me all of the experiences (academic, clinical, and life) and the abilities (to think and to write) that it took to create this book.

I want to recognize the contribution that Kathleen M. Spooner made to this book. She is a phenomenal medical secretary and editor, who is extremely bright, with an innate intelligence about this field of medicine and a GREAT thinker. She critiques, corrects, comments, and brings a final touch to the content and to the diagrams that tie up the loose ends and makes it all flow. She read it from a secretarial and from a consumer perspective that challenged the process and forced the extraordinary detail that made this book the finished product that it is. She, too, thinks that this is revolutionary material, and that it will change the way that vein access is done from this point forward, and improve this procedure for everyone.

And, I want to sincerely thank my sister, Sherryl, and my niece, Kadie, for their unending and unconditional support and love. They have listened daily to this phlebotomy story of mine for the last 7 years. Kadie, when she was only 7 years old, sat in on her first phlebotomy class; and captured the skill of the tourniquet with one demonstration. She has yet to do her first stick, because she is only 13, but that is the only part she has not yet accomplished. And **I** will be her first stick!

And one more thing - there is a lot of repetition in this book, and that is on purpose. Please read this material with that in mind.

Table of Contents

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Foreword

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Phlebotomy: It's just a skill.

The first thing you need to know is that phlebotomy is considered just a skill in all states of the United States except California.

In November, 2004, California became the
first state to "State Certify" phlebotomists.

Therefore, there are no other states with regulations in the teaching of this skill. Programs, then, can be of any design, any length, any content, and any cost.

Since there is no state regulation for the training and no state certification (except California), you will usually be given a "Certificate of Completion" upon successful completion of a phlebotomy training program.

Employers look for this "indicator" of formal training. It is not a requirement for you or for the employer that you have this formal training. "On the job training" still exists for this skill, and in many facilities is still the method of choice. However, training an employee is a costly thing and many employers prefer that you come already trained.

One last thing you may want to know – these "Certificates of Completion", usually, can be used in any state in the United States to seek employment as a phlebotomist. In fact, California, according to their written state regulations, will entertain acceptance and "grandfather status" of your certificate if, after review of your course work and/or work experience as a phlebotomist, your application meets with their approval.

The only other kind of certification that exists is through the laboratory industry - through the American Society of Clinical Pathologists (ASCP). But, their rules say that you must have 2000 working hours as a phlebotomist BEFORE you can sit for their exam. (So obviously, you have to draw blood without "certification" for one full-time work year to take their test.)

You must evaluate the training programs individually and determine which is right for you.

Introduction

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This written description about phlebotomy is different from anything else that has been previously written -

- ✓ Different in actual scientific content.
- ✓ Different in the focus.
- ✓ Different in the amount of information.

This manual is **all** about the skill of phlebotomy. It is entirely focused on the actual blood draw. This book meets and exceeds the current standards of care for vein access. Add this information to the current writings that are out there, and, you will have combined **this** detailed skill information with the rest of the lab and medical information that the other books have described in great detail.

This description and instruction is based on scientific fact. Start with *Gray's Anatomy*, *Guyton's Physiology,* and *College Physics* by Miller. Within these science texts are the basic facts about the human body and the laws of nature. It is entirely up to us to apply this information to the clinical skills.

And, by the way, the word phlebotomy does not mean draw blood.

Phleb- means vein, and -otomy means incision. Phlebotomy means to "cut a vein with a scalpel". Look it up in a medical dictionary and check it out. The descriptor "draw blood" came to be associated with the word phlebotomy, but the true definition of the word, phlebotomy, means something all together different from what you and I do to the vein.

It's time we clearly define every aspect of this skill. Phlebotomy is a vein access procedure, and all vein access procedures –

- ➢ Blood Draws (phlebotomy)

- Blood Collection (blood donation, cells or plasma)
- Infusion of fluids/medications (nursing)
- Infusion of diagnostic contrast (radiology)

consists of two parts –

- **Part 1 - Locating a Healthy Vein**
- **Part 2 - Accessing That Vein With a Needle**

The vein site selection and the working position of the needle in the vein will vary depending upon the mission of the procedure, but the method for locating a healthy vein and accessing that vein are the same for all vein access procedures.

So, let's begin . . .

PART ONE

LOCATING A HEALTHY VEIN

Anatomy of the Arm and Wrist for Vein Site Selection

****

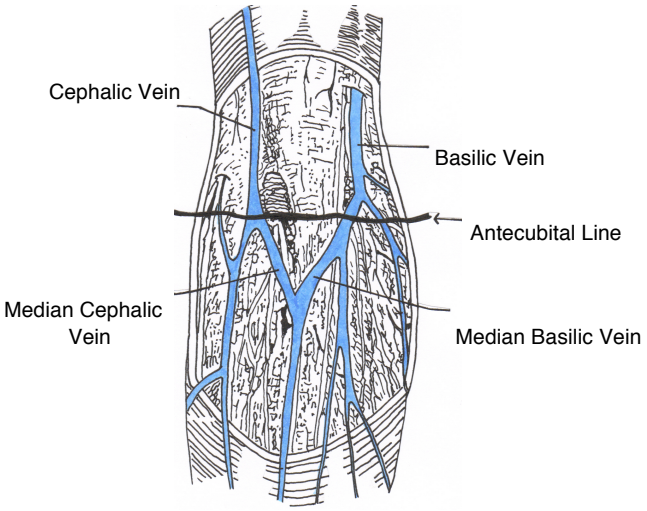
Let's identify the veins that you will be accessing for blood draws -

In the **antecubital region**, the veins most often stuck are the median basilic, first, and the median cephalic, second.

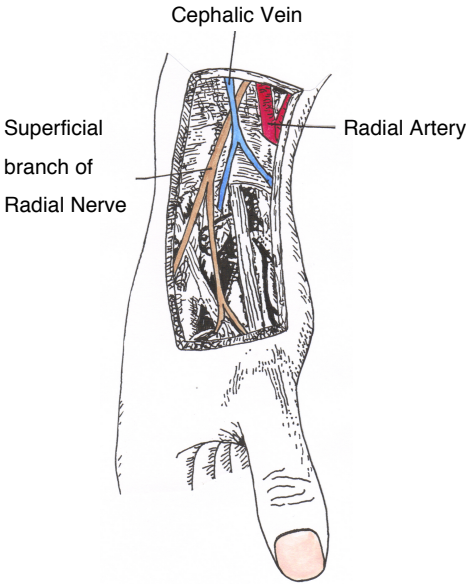
Now, <u>any</u> of these veins CAN be stuck - **if** they meet the criteria for "healthy", which you will soon learn about.

The hand is **palm up** for an antecubital draw, with a natural bend in the arm at the elbow.

Right Arm



Right Wrist

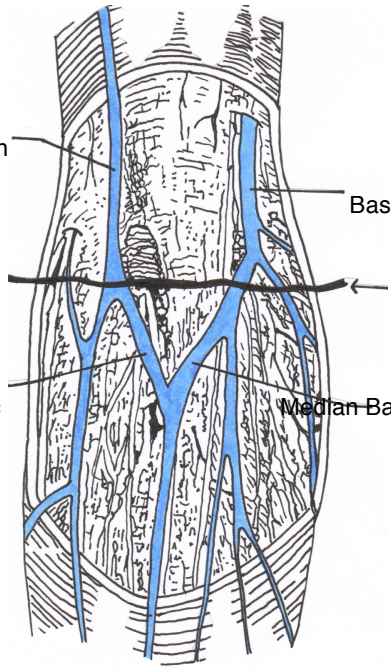


In the **wrist region**, the vein that <u>should be stuck</u> is the cephalic vein, located on the shaft of the wrist (and, technically, it should be the more superior segment of this vein).

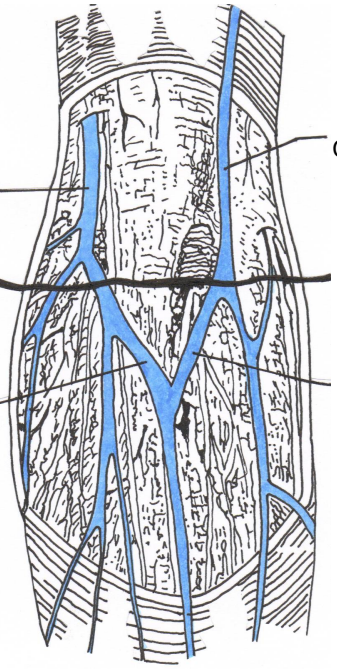
The hand is in the <u>handshake</u> position for a wrist draw, with the hand off the table and in <u>alignment</u> with the arm.

Antecubital Region

Right Arm



Left Arm



Antecubital Region

1. The antecubital site in the right or left arm is where 99.99999….% of your blood draws will occur. The veins in this region are easy to locate, easy to access with a needle, and usually are the healthiest veins for venipuncture. So, the antecubital region is the **first choice** for blood draws.

Look at the diagrams of the antecubital region. When you study these diagrams and want to apply this information, place the arm on a table at a height that allows for a natural bend in the arm and place the hand palm up. Be sure that you are comparing the right arm to the right arm diagram and the left arm to the left arm diagram.

Note: Keep in mind, that although the anatomy is usually taught starting at the "top" and moving "down", the venous blood is traveling from the fingers towards the heart.

2. There are a lot of veins in this antecubital region, but we are going to focus only on four: the **cephalic** vein, the **median cephalic** vein, the **basilic** vein, and the **median basilic** vein (nicknamed the cubital vein, after the antecubital region).

Any of the antecubital veins CAN be stuck - **if** they meet the criteria for "healthy", which you will soon learn about. However, the **median basilic** (first choice) and the **median cephalic** (second choice) are the two most frequently stuck veins in blood draw. This is because they are usually the largest veins, and are in an anatomical position for easy access with the needle. (This means that, typically, the region palpated is most often just immediately below the antecubital line. The next most often palpated region is on the antecubital line. If the vein(s) are not palpable in these two specific regions – and remember to palpate BOTH arms – then expand the region.)

Take your highlighter and highlight the names – Cephalic Vein, Median Cephalic Vein, Basilic Vein, Median Basilic Vein. Starting with the cephalic vein, follow it down until it bifurcates (branches). At this point, follow the median Cephalic into the inferior (lower) antecubital region. Next, locate the basilic vein and follow it until it reaches the antecubital line where it also bifurcates, then follow the median basilic vein into the inferior antecubital region.

One more time, the median basilic vein and the median cephalic vein, in that order, are the most frequently stuck veins for phlebotomy. Other veins can be stuck if they are firm enough, large enough, and accessible.

Wrist Region

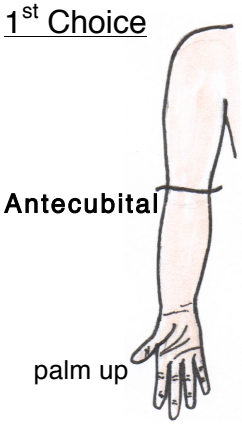
1. So, now let's look at the wrist diagram. The vein in the diagram is colored blue and is the continuation of the **cephalic** vein from the antecubital region. In the wrist region, the cephalic vein is the vein that should be stuck.

2. Notice that the hand is in the handshake position, and the vein is then on the shaft of the wrist. This is important to notice because when you do antecubital draws, the hand is in the palm up position. But, since the wrist portion of the cephalic vein is on the shaft of the wrist, the hand must be placed in the handshake position in order to locate and access the vein.

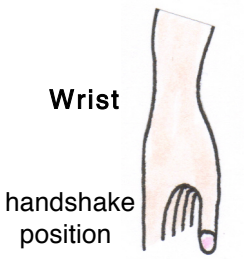
Note: The wrist veins on the palmar or dorsal aspect of the wrist should NEVER BE STUCK, because they will not tolerate the stick.

So, back to the original statement – 99.99999….% of your blood draws occur in the antecubital region. But if for whatever reason, you cannot locate an antecubital vein, you will move down to the wrist.

1st Choice



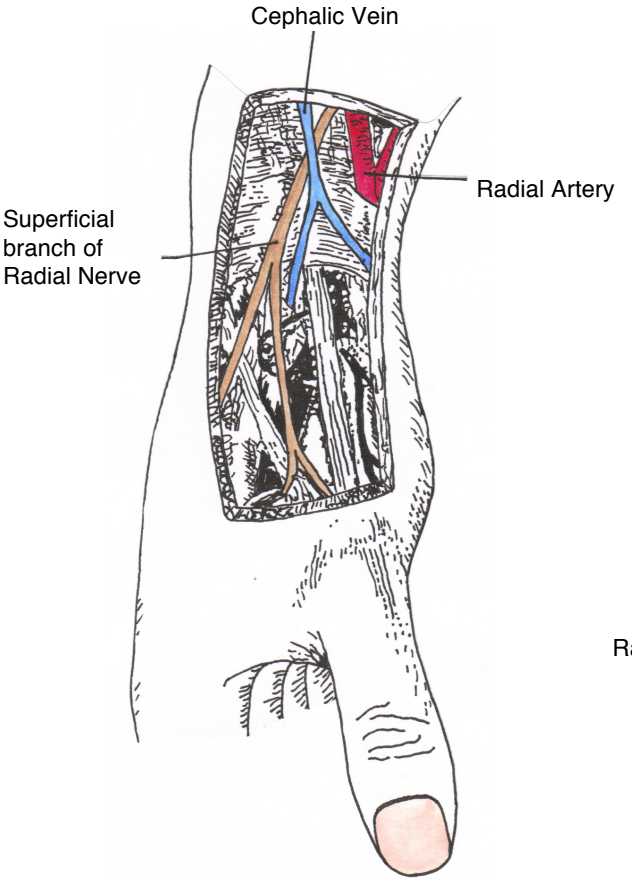
2nd Choice



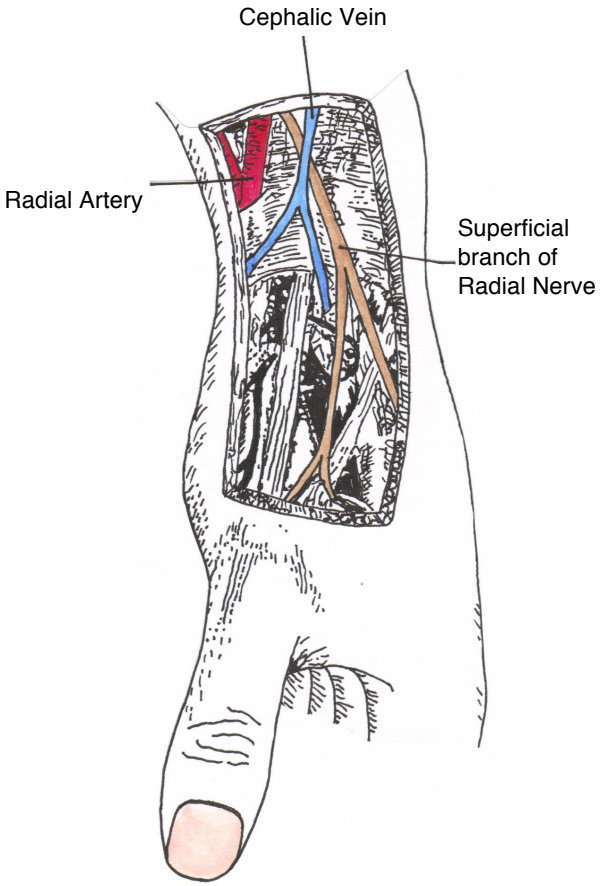
I am going to mention it here. That old adage "start low and then move up" is NOT correct! Not even in IV therapies!

Wrist Region

Right Wrist



Left Wrist



Diagrams based on *Review of Gross Anatomy*
Ben Pansky, Ph.D., M.D., 6th Edition

Dr. Gray (of *Gray's Anatomy*) dissected many cadavers to be able to describe, define, and draw these diagrams for us, as many other anatomists after him. What he and the other anatomists also discovered is that not all humans match these diagrams exactly. During my cadaver anatomy program, I learned that about 50% of the humans have anatomy just like the diagrams, but the other 50% have a variation of it. THEY HAVE THE VEINS, they're just not in that exact spot.

So, you can't trust a diagram to locate a vein for you - or you will "miss" 50% of the time.

That was never the mission of the anatomy diagram in the first place. It was never meant to be a map overlay that you place on a patient's arm to know where the vein is at. The diagrams (merely) demonstrate that the human body consists of these structures and in this manner (with the usual Bell curve distribution of variation in location).

Do we need to know the name of the vein to stick it? NO. But the more you know about what you are doing the more confident you will (should) be; and the more confident you are, the more competent you will (should) be.

Do we need to know the diagram to locate the vein? NO. But the diagram should convince you that if a patient has an intact arm (i.e. arm, forearm, wrist and hand), then that arm has these veins, and it teaches you where to expect to locate these veins and, consequently, builds your confidence.

But, remember, we can't trust a diagram to locate the veins for us.

So, if we are not using a diagram to locate a vein, how are we going to locate veins?

And, no, we're NOT going to LOOK for one either!
(There are some inherent problems with this approach as well).

We are going to use, and trust, our

Sense of Touch

to locate a healthy vein.

The Sense of Touch
and
Locating a Healthy Vein

****

Now that we know where we can expect to find the veins most often accessed for phlebotomy, let's learn how to use our sense of touch to locate a healthy vein. After all, you can't stick (or shouldn't) until you know the location of the vein and if that vein will tolerate the stick. **This** is the part of vein access that is least described in the current literature.

There are 5 steps to locating a **healthy** vein –

1. **PALPATE** – feel for the vein.

2. **USE YOUR DOMINANT HAND INDEX FINGER TO PALPATE** – the hand that sticks is the hand that palpates.

3. **"FEEL" FOR A LONG, SKINNY WATER BALLOON** – feel for the bounce, the shape, and the size.

4. **PALPATE WITH ALCOHOL** - alcohol insures a "clear touch signal to the brain.

5. **GRADE THE VEIN** – assess for firmness, size, direction, and depth.

Each of these 5 steps will be described in detail, and you will be given step-by-step instructions for utilizing this method.

1. Palpate

Palpate for a vein using your sense of touch. You're going to **feel** for a vein.

DO NOT LOOK for one! WHY?

Because there are 3 inherent problems when using your sense of sight to locate a vein.

1. You can't always see a vein.
2. You "can't judge a book by its cover".
3. Not all veins are created equal (≠).

1. You can't always see a vein. The veins that we are accessing for phlebotomy are Superficial Veins. Superficial Veins can be found at one of three levels in the human arm.

- **shallow or surface sitting** - These veins can easily be seen (the blue of the vein) and very easily felt, but are found only in a small portion of the population (10%).

- **average depth** - You can't see the "blue' of the vein, but many times you can see the "impression" of the vein, and it can also be easily felt. This represents the majority of the human superficial (blood draw) veins (about 80%).

- **deep in the subcutaneous tissue** - You can't see the "blue" of the vein, and you can't see the impression of the vein, BUT you can still feel it. These veins are also found only in a small portion of the population (about 10%). (These percentages are (Bell curve) approximates.)

Superficial Veins vs. Deep Veins

And by the way, we are always dealing with Superficial Veins, NOT Deep Veins. There are two types of venous systems in the body: Deep and Superficial. Deep Veins (with a capital "D") run with arteries and are very "deep" in the extremity, protected by nature. You will never try to access a Deep Vein. The "deep" superficial vein described above is with a little "d", and these are found on or near the surface of the extremity.

Why don't we ever access Deep veins? Because, if you cause a vein injury in a Deep vein, and this injury results in a thrombus formation (blood clot), this clot **can** travel to the lungs and **can**

instantly kill the patient (DVT - Deep Vein Thrombosis).

A clot formation (thrombus) in a deep vein (a Superficial vein) will not travel to the lungs and will not result in a DVT.

Since only about 10% of the population has palpable, healthy veins that are VISIBLE to the naked eye, trusting your sight to locate a vein is not a very good idea, and we can't trust that anatomical diagram to locate the vein, remember?

That means that 90% of the superficial healthy veins that we are going to access are **NOT** visible.

So, **FEEL (palpate)** for a vein; don't LOOK for one.

.

And even if you could see a vein, you don't know anything else about it. Because . . .

2. You "can't judge a book by its cover". You've heard that expression before. It means that you must read the book. Right? The same is true of the vein. You can't judge a vein by its cover (appearance) either. You must "read" the vein.

How do you read something you cannot see? *How does a blind man read?* By "feel". That's right, **palpate**!

Using your sense of touch you are going to **FEEL** for a vein and then **FEEL** the vein. And, literally, 100% of the time you will be able to locate a vein and be able to determine all of the other specifics that you need to know about that vein before you stick it.

Why do we need to know specifics about the vein we want to stick? Because . . .

3. Not all veins are created equal (≠). What's not equal about the veins? The thickness of the vein wall. Think about the veins that "blow" as soon as they're stuck, causing a huge hematoma. Why do some veins hold, tolerating the procedure, and some don't? Because not all veins are created equal, and not all veins were meant to be stuck. It's anatomy!

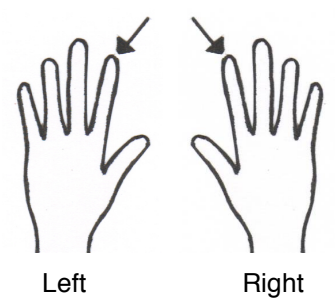
A successful vein access has everything to do with the integrity of the vein wall. The wall of the vein must be thick enough to tolerate the stick and hold, and the wall must be healthy, with its elasticity intact. If the vein wall is too thin to begin with (and made even thinner yet by placing the tourniquet on too tight), or if the vein is varicosed, this can result in the vein wall rupturing with the needle stick.

The only way to know about the integrity and health of the vein is to **feel** it. What are we feeling for? **Firmness**, **size**, **direction,** and **depth**. All of these criteria will determine if we stick that vessel or not. And, you can't SEE these things; you can only FEEL these things. These four criteria will be described in detail under Grade the Vein.

So, palpate for a vein, don't look for one. After you have located the vein, then you can LOOK.... to stick it

2. Use Your Dominant Hand Index Finger to Palpate

Now that we know we need to **PALPATE** for a vein, how do we do that? **Use your dominant hand index finger.**



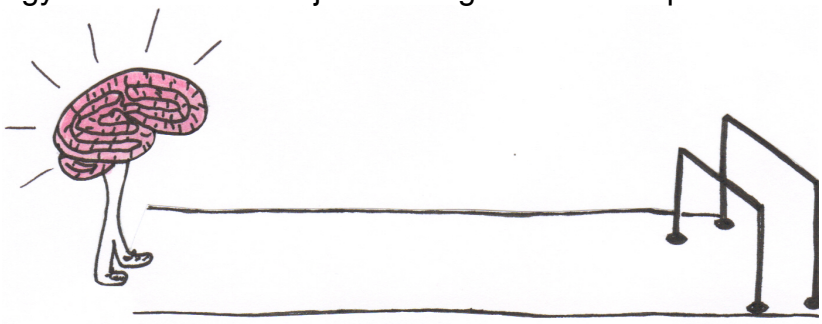
For the best **sensitivity**, **specificity** and **accuracy**, use the palmar pad of your dominant hand index finger to locate the vein. It is extremely important that the hand that "sticks" is the hand that palpates!

Think about it: if you were going to pretend to shoot a target, which finger do you point with? That's right. Your dominant hand index finger. It's neuroanatomy and neurophysiology – It's a Brain Thing!

And, when you are palpating with that index finger, **lift the rest of the arm and your hand up off the table**, because every part of that arm or hand that is touching a surface while you are palpating will be sending a touch signal to the brain as well, and will compete with the touch signal from the pad of your index finger. Again, this is neuroanatomy.

Imagine this: Your brain is getting a touch signal from all of the surfaces from your hand and your arm, and the brain now has to filter out the extra touch signals and focus on the one signal from the pad of your finger.

Why make the brain do those gymnastics? Send just the signal from the pad of the index finger, and not the rest.



3. Feel for a Long, Skinny Water Balloon

Now that we know which hand and which finger to use, what are we "feeling" for? We are **feeling for a long, skinny water balloon**.

Long, skinny water balloon

Close your eyes, if you have to. Feel the bounce.
You must focus on your sense of touch.

The vein feels like a long, skinny water balloon. No other structure in the human body feels like a water balloon - not even the artery! Can you now imagine how easy it's going to be to feel for a vein when you now understand that you'll be feeling for a structure that feels like a water balloon? Yeah! It's that easy!

Place a long, skinny water balloon on the table (or imagine it), and place the pad of your dominant hand index finger on the water balloon. Depress it. (DON'T POKE IT!) Feel the water's rebound bounce?

You must adjust the force of the pressure that you are applying when depressing, because -

- If you press too soft, you can't feel the fluid bounce.
- If you press too hard, you press right through it, and you will feel the table (if this were a vein in an arm, you would feel whatever is on the other side of the vein - i.e. tendon, muscle, bone).
- If you press just right (like Goldie Locks), you'll feel the fluid bounce or rebound of the water in the balloon (or the blood in the vein).

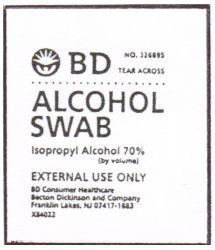
Technically speaking, when the applied external pressure matches the internal pressure of the water in that balloon (or the pressure of the blood in the vein – venous blood pressure), you will be able to feel the fluid bounce or rebound. So, since humans are not static, they are dynamic (constantly changing), you must adjust the pressure that you are applying until you can feel that bounce.

Hint: Start soft and increase your pressure from there.

Imagine - water balloons in the arm and feeling for those water balloons.

4. Palpate <u>With</u> Alcohol

There's one more thing that can improve your sense of touch, making it even better than it already is! **Alcohol.** (70% Isopropyl Alcohol)



That's right, leave the area **<u>wet</u>** with alcohol and now palpate.

Alcohol is going to improve your sense of touch!

First, let's describe what happens when you palpate dry-

When you move dry skin across dry skin, you create friction. (Friction is physics.) Anytime you move one surface across another surface you create friction.

Friction creates grab and drag. This gives the sensation that the surface you are moving across is rough. The dry skin on your finger feels like it is "catching or sticking" to the dry skin on the arm.

Friction is the equivalent of "noise" to the brain. So, your brain can't get a <u>clear</u> touch signal because of the interference of the "noise" or friction. Your brain now has to filter out the noise.....that's a lot of unnecessary work for the brain and makes it much more difficult to locate the vein.

Analogy: Think of the static on your car radio when the station isn't fully tuned in. Now, imagine your favorite song on the radio. Your brain knows the song frontwards and backwards, but it's not "tuned in" all the way, there is static..... your brain says, **"TUNE IT IN, or turn it off!!!** The brain doesn't like noise,
especially when you're trying to discern and be specific. The same is true when feeling for a vein.

The friction that palpating dry creates is as irritating and interfering to the brain as that radio static. So, how do we get rid of friction noise?

Alcohol - 70% Isopropyl Alcohol to be exact.

Alcohol prevents friction

Now, let's describe what happens when you palpate with alcohol -

> When the area is wet with alcohol, your finger now glides across the area - no grab or drag. All of a sudden, the structures in the arm seem very noticeable. It feels like the vein got bigger, but it didn't. Your sense of touch got better. Or, more accurately stated, the brain is now getting a clear touch signal - **NO NOISE** - and that is what makes it seem like your vein got bigger.

When you palpate with 70% Isopropyl Alcohol, the touch signal describing the vein to your brain does not have to compete with the noise signal from the friction.

Note: The traditional alcohol wipes are useless for this new use of palpating wet. There's enough alcohol in the traditional pad to clean the area, but not enough alcohol to leave the area wet. So, carefully select an alcohol wipe that is loaded with alcohol, or use a cotton ball saturated with alcohol.

And, by the way, even if you use an entirely different agent to prep the site for the venipuncture, use alcohol to palpate with, to locate the vein.

Let's try this. Let's perform the alcohol "test", and remember **DO NOT LOOK !**

FEEL!!!

First, let's do the test dry.

1. Palpate dry - glide your finger across an antecubital line.
   - First, notice the grab and drag?
   - Second, notice any "rope-like" structures?
   - Third, notice any water balloon bounce to that "rope-like" structure?

Now, wet the area with alcohol. Make sure it's **70% isopropyl alcohol.**

2. Palpate wet - glide your finger across the same antecubital line.
   - Do you notice any grab or drag? NO. It glides!
   - Is that "rope-like" structure more noticeable? YES. Does it feel

bigger, more specific, more discernible, and more described?

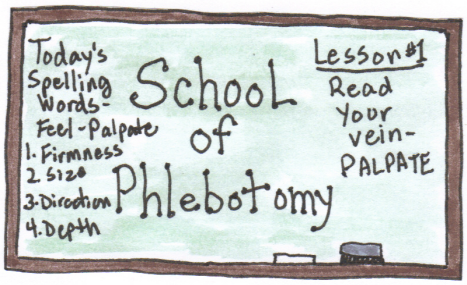
- Notice the water balloon bounce better?

5. Grade the Vein

Remember "not all veins all created equal", so we need to grade the vein on four very important characteristics –

Firmness, **size**, **direction,** and **depth**.

Veins vary in these characteristics from patient to patient, and from site to site on the same patient.



Firmness (0-10) - The firmness criteria is the most important. This criterion must be met and be met first. In fact, the size, direction, and depth does not matter if we cannot satisfy the firmness criteria. And this is why....

Firmness is a direct correlation to the vein wall thickness. Vein wall thickness varies throughout the body. As veins get closer to the heart, they get bigger, and the walls get thicker. (Think of a hand vein compared to the inferior vena cava.)

The thicker the wall of the vein, the better the vein wall will tolerate a needle stick. The thinner the wall of the vein, the more likely it will be that the vein wall will rupture upon insertion of the needle. We grade the firmness of the vein on a scale of 0-10, with 10 being the firmest.

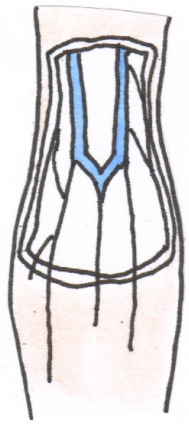
Analogy: Let's compare the vein wall thickness this way. Get a non-sterile latex glove. Feel the thickness of one wall of that glove. Pretty thin! Stretch that portion of glove over your finger, thinning it even more. What will happen to it if you stick that stretched, thinned wall with a needle? Rupture? Yep!!!!!

HAND: The vein wall in a hand vein is about as thin as the glove wall. And, when you apply a tourniquet too tight, you

distend the vein which will stretch the wall even thinner (like the glove). You all know what happens, so frequently, with those hand veins . . . . quoting a phrase commonly heard, “blew that vein”, and now you have a huge hematoma. (Hand veins usually score 0-2.

WRIST: As we move UP the arm, the next stop is the wrist. Blood draws usually go a little bit better here. That’s because the vein wall is starting to get thicker. But again, feel the vein for firmness and grade it (0-10). If the firmness of the bounce is less than a 5 (<5) on your firmness scale, do not stick that segment - it won’t hold either. Palpate a little further UP (like one inch) until it feels firmer (scoring between a 5-10 on the scale), and stick it there. (Superior wrist veins usually score 5-7)

Analogy: Get a tourniquet (a real one, not a cut piece of surgical tubing). Feel the thickness of the tourniquet? Now stretch it over your finger. Still thick! Right? You can even stick that tourniquet with a 16 gauge Red Cross needle, and it will still hold. It will NOT rupture!



ANTECUBITAL: As we move UP the arm, the next stop is the antecubital region. The vein wall of a healthy median cephalic or healthy median basilic vein is as thick and as resilient as the tourniquet. (Typically, a healthy antecubital vein scores 7-10.)

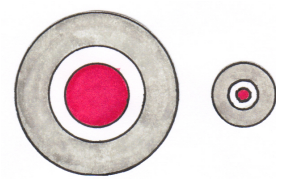
Don’t assume that just because it is antecubital, the vein will score a 7-10. It must be “healthy” to score a 7-10. Varicose veins can occur anywhere. (A varicose vein is a vein that is unnaturally and permanently distended.) So, palpate and grade before you make your selection.

Remember, we are feeling for the **firmness** of the bounce when you depress the vein. We are grading on a scale from 0-10, with 10 being the firmest. If your vein scores less than 5 on the firmness scale, DO NOT STICK IT. That thin vein wall will most likely not tolerate the stick.

So, if the vein FIRMNESS has a - Score 5-10 - Stick it.
Score <5 - Do Not stick it.

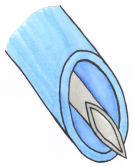
Size - The size of the vein is important because, obviously, the larger the "target", the easier it will be to hit. Think of target shooting. Which target would you rather shoot?

That's right. The larger one! Same way with a vein. Pick the largest, firmest vein.



And, there's one more aspect to consider when sizing up your vein. The size (gauge) of the needle that you are placing in that lumen (the space within the vein) cannot occupy the entire canal. If it does, blood won't be able to flow around it and/or the powerful vacuum of the tube can suck the wall of the blood vessel into the bevel of the needle, corking it off.

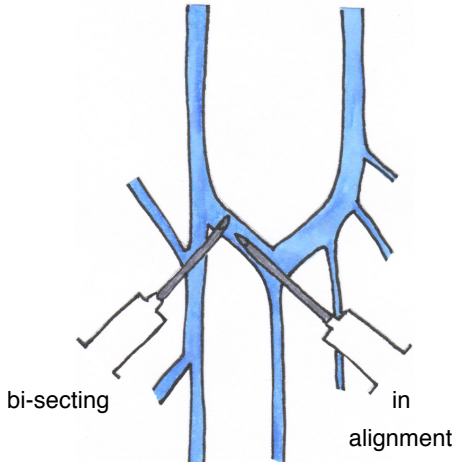
Ideally, you should select the best vein first, and then select the needle.



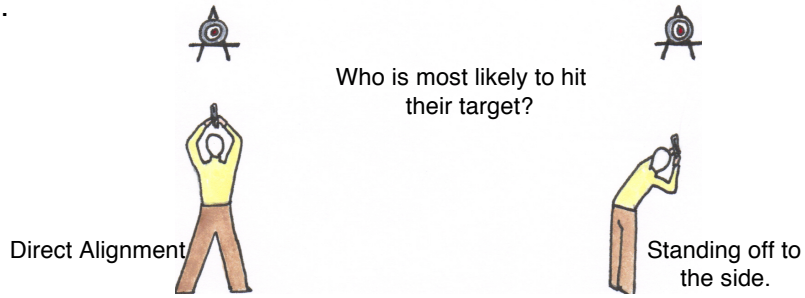
Direction - What direction is the vein running, and why is this important to know? It's important for two reasons -

First, you need a certain amount of the vein to work with. The bevel of the needle is a certain length, depending on the gauge. If you enter the vein in a bisecting direction, you may not have enough luminal width to accommodate this length.

You want the needle to enter the vein in the same direction that the vein is running to accommodate the complete insertion and positioning of the bevel and a minimal amount of the shaft of the needle.



Second, just like target shooting, you will be more accurate with the entry of the needle and, therefore, more successful with your draw if you have lined up with or directly behind your target.



So, determine the direction the vein is running by palpating up and down and all around the site. Once you have determined the direction, get positioned directly in alignment with that vein and balance on both feet. Now you are ready for a controlled, accurate, and swift entry into the vein.

Depth: Remember, we are dealing with Superficial Veins, and superficial veins can be found at approximately three different levels -

- **shallow** superficial vein - is surface sitting and is easily palpable and visible (you can see the "blue" of the vein).

- **average** depth superficial vein - is just a little bit deeper in the subcutaneous tissue and are easily palpable, but is not necessarily visible. You may see the "impression" of a vein on the surface of the arm, but you cannot see the "blue"

- **deep** superficial vein - NOT to be confused with DEEP Veins – is deeper yet in the subcutaneous tissue. It is more difficult to locate and is not visible at all. This vein cannot be located by gliding across the region. You must depress the tissue methodically and in small increments as you work your way across the region, until you feel that characteristic "water balloon" fluid bounce. These veins have a less pronounced bounce.

Hint: When palpating a deep superficial vein - to insure that you indeed are feeling a deep vein – bounce on the vein and then step off to one side or the other of the vein, and bounce. You will feel that that tissue is very flat, almost hard (so to speak). Now come back to the vein and bounce again. There should be a very noticeable bounce now because you gave your brain a new reference for comparison. (This will be explained in detail in another lesson.)

Determining the depth of the vein is important for two reasons -

1. Because you can expect to locate veins at any of these levels, you will have to adjust the pressure you apply in your palpation, and adjust your expectations of where you will feel these veins.

2. Also, the angle of entry of the needle will be determined by the depth of the vein.
   - shallow veins - approximately 45° angle of entry
   - average depth veins - approximately 45° angle of entry
   - deep superficial veins - approximately 60-75° angle of entry

Adjusting the angle of entry allows for the least amount of needle to be inserted into the tissue which reduces the risk of injury to underlying tissues, and reduces the amount of fear that the patient can experience from the visual (scared to death if it appears you have buried the whole needle in their arm).

So, to insure a successful stick - getting blood on the first stick, with no discomfort to the patient, and without injury to the tissues -

I emphasize, **GRADE THE VEIN** before you stick.

1. Firmness (0-10), requiring a score of 5-10 to stick.
   This reflects thickness of the vein wall and its integrity.

2. Size - Think of target shooting and the size of the needle.

3. Direction - Line up behind your target, and more vein to work with.

4. Depth – Shallow, average, and deep superficial veins with an accommodating angle of needle entry (45°, 45°, 60°).

Summary

Use these 5 steps –

1. PALPATE – feel for a vein.

2. USE YOUR DOMINANT HAND INDEX FINGER TO PALPATE – The hand that sticks is the hand that palpates.

3. "FEEL FOR A LONG, SKINNY WATER BALLOON – Feel for the fluid rebound bounce, the shape, and the size.

4. PALPATE WITH ALCOHOL – Alcohol provides a "clear" touch signal to the brain.

5. GRADE THE VEIN – Assess for firmness, size, direction, and depth.

.....and you will be able to locate a healthy vein 100% of the time and get blood on the first stick 99.999…% of the time (life's not perfect). But this means that maybe only one out of 300, 400, or better, might get stuck twice. Think about how many repeat sticks occur with the old method.

How much more fun will phlebotomy be, for both you and the patient, with this new technique?

Now you need to know some detail about the vein itself. After all, it is the structure that you are about to put a needle into, and this information will make locating, dilating and grading that vein even easier.

Anatomy and Physiology of the Vein

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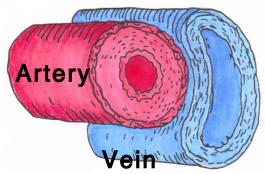
This information about veins IS in *Gray's Anatomy* and *Guyton's Physiology* (as well as other A&P texts used at the graduate or medical school levels). This information is just **not** in the nursing, lab, phlebotomy, or x-ray program texts, but is equally important to these groups.

Here's a diagram of a vein. The vein is sitting next to an artery for comparison. And, here's a picture of a long skinny water balloon (imagine it with just enough water in it without distending or stretching it). We are going to compare the vein to the water balloon. The vein is just like the water balloon in many ways. The artery is not.



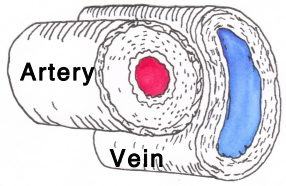
Long, skinny water balloon

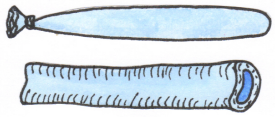
1. The **lumen** is the space within an artery or a vein. Compare the lumen size of the artery to that of the vein. The lumen of the artery (red) is very small compared to the lumen of the vein (blue), which is very large. There's a physiological reason for this, but, at this point, just appreciate that there is a difference, and that due to the volume of

blood in the large lumen of that vein, you will be able to feel the "water balloon" bounce very easily.

Imagine the vein, and imagine the water balloon; imagine the fluid bounce.

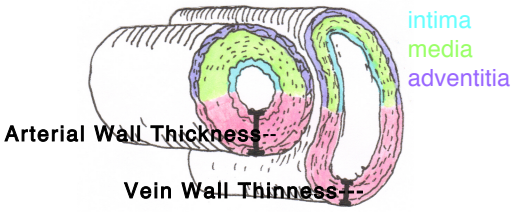
Compare the lumen sizes. The vein is very different from the artery. But, the vein is very similar to the water balloon.





2. Compare the **thin** vein wall to the **thick** arterial wall. This wall thickness has to do with the amount of blood pressure (mm Hg) that these walls have to hold or contain. We will come back to this concept, but for now, just notice the difference between the **vein wall thinness** and the **arterial wall thickness**.

Note: **All** blood vessel walls have **3 layers** of tissue (intima, media, adventitia). The media (middle layer) is composed of MUSCLE fibers. This has a function, too.

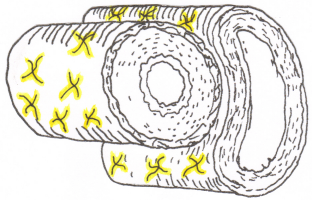


Compare the thin vein wall to the thick arterial wall. These wall thickness differences serve more than one purpose

Artery blood pressure = 80-120 mm Hg
Vein blood pressure = 10-20 mm Hg

3. The walls of all blood vessels are **innervated**. This means they have nerve endings just like your skin! And, just like your skin, these nerves endings respond to stimuli (i.e. hot, cold, touch, and pain) in a specific and predictable manner. These stimuli cause either vaso**constriction** or vaso**dilatation**.

Hot (heat) dilates. **Touch** (gentle) dilates.
Cold constricts. **Pain** constricts.



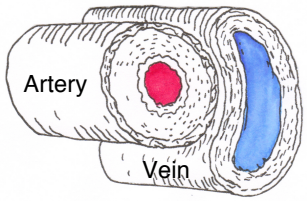
The walls of all blood vessels are innervated. The nerve endings tell the muscle in the wall of this vein to either contract (constrict) or relax (dilate).

What does <u>this</u> anatomy and physiology of the vein have to do with phlebotomy? **EVERYTHING !!!!!!!!**

Anatomy and Physiology of the Vein as Related to the Blood Draw

****

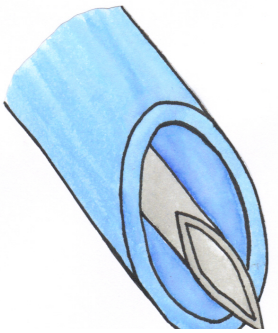
LUMEN - The huge **<u>lumen</u>** of this vein accommodates a lot of blood. That means that the amount of bounce to that vein will be very easy to feel. Again, think about the water balloon and the bounce sensation when you press on it. This is exactly what a human vein will feel like. The amount of bounce sensation you feel will vary as you compare an infant vein to a toddler vein, to an adolescent vein, to an adult vein because of the difference in size.



Long, skinny water balloon

Here's one more factor you need to take into consideration with the lumen size of the vein. As mentioned previously, you are going to be placing a certain size needle into that lumen, and that needle will occupy a certain amount of that inner space. Can you visualize this? Look at the diagram below.

You must have enough space left in the



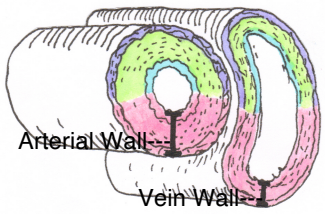
lumen of the vein for blood to flow around the needle, allowing for continued circulation of blood.

Hint: Select the appropriate gauge needle for the size of vein you have selected for your blood draw. Remember, you can't tell the size of the blood vessel by looking at it, but you can tell the size by palpating (feeling) it. So, **palpate** for a vein. When you have felt and determined the size of the vein, then you can select the appropriate size needle.

VEIN WALL - You now know that the vein wall is thinner than the arterial wall. But the thinness of the vein wall varies throughout the body, also. (Remember? We just described this under grading the vein for firmness.) As veins get closer to the heart, the vein gets bigger, and the walls get thicker! Right?

While most of you have never seen human veins on an anatomical level (cadaver dissection), you can conjure up the image of small and large veins in the body and conjure up the image that smaller veins have thinner walls and larger veins have thicker walls.

This anatomical fact is so important because the thicker the wall, the better the wall will tolerate a needle stick!

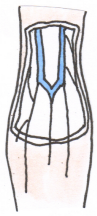


Again, keep in mind the water balloon.

Think of the wall of a balloon. What will happen to that wall when a needle penetrates it? If it's too thin, it will rupture. If it's thick enough, it will hold. **(How does a water balloon wall get too thin? Over distend it!)**

Nature designed the vein to distend to a certain size. Exceed that limit, and you can damage the wall temporarily or permanently (varicose vein). When you cause the vein wall to thin beyond what is natural for it, and when the needle penetrates it, the vein wall will rupture which will result in a hematoma or the squirting of blood from your phlebotomy site.

Recall, one more time, that we are going to access antecubital veins first, and wrist veins as a second choice (and hand veins NEVER).



ANTECUBITAL - The vein wall of a (healthy) median cephalic or (healthy) median basilic vein in the antecubital region is as thick as the tourniquet and as resilient. Typically, a healthy antecubital vein scores 7-10.

WRIST - The vein wall is thinner here (we are more distal from the heart). The more superior segment of this vein wall is thicker than the more inferior segment of this same vein. It is extremely important that in this region you carefully grade the vein wall for thickness (firmness) and select the segment that is scores greater than 5.

HAND - The veins in the hand are the most distal (furthest away from the heart), and therefore, have very thin walls. The wall in a hand vein is about as thin as the glove wall, and they usually do not tolerate a needle stick and frequently rupture. That is why I recommend that you never stick a hand vein. (Hand veins usually score 0-2.)

Remember, **grade the vein** for the firmness of the bounce. The **firmness** of the bounce is the key to determining the thickness or thinness of the vein wall. Grade the firmness on a scale from 0-10, with 10 being the best.

You can't **see** thickness, so don't **LOOK.**

Palpate (feel) the vein.
What are we feeling for? **Firmness.**

We have to pick that segment of the vein where the wall is **thick enough** to tolerate the stick and the withdrawal of the blood. How?

PALPATE TO GRADE - Here are some helpful exercises to aid in performing this assessment by comparing the antecubital veins, to the wrist veins, to the hand veins.

1. Pick an ideal body weight male arm.
2. **DO NOT** apply a tourniquet.
3. Visibly identify an antecubital vein, a wrist vein, and a hand vein that you intend to palpate (feel).
4. Wet all three sites with alcohol and leave them wet.
5. Feel all three veins by bouncing on them, one right after another - antecubital, then wrist, then hand. DO NOT grade them – just feel the bounce.

Did you notice the difference in the **firmness** of the bounce? If yes, proceed. If no, do it again. Notice the difference in the firmness of the bounce.

Now, let's **grade the firmness** of these veins. Start with the antecubital vein, then compare and score the other veins against the bounce of the antecubital vein.

6. **Feel** the **firmness** of the bounce of the antecubital vein, and automatically give it a score of 9 or 10. Score _____

Now **feel** (palpate) the wrist vein and bounce on it. Compared to the firmness of the bounce of the antecubital vein, what score would you give this wrist vein? Score _____

Hint: In the wrist area, palpate high on the wrist and low on the wrist and compare the scores assigned. You should discover that the lower wrist segment is very weak, scoring usually about a 4 on your firmness scale. <u>One inch</u> higher on that same wrist and that same vein should score about a 5-7. (Remember, the vein wall gets thicker as we go UP.)

8. Now **feel** (palpate) the hand vein and bounce on it. Can you even feel a "fluid bounce"? If no, score it a "0". If yes, compare it to the wrist vein and/or to the antecubital vein and score it. What score is this bounce? Score _____

Hint: If you feel the hard bone behind the vein, you have palpated too hard - lighten up and feel for the fluid rebound bounce.

Remember, the score must be between a **5-10** on your **firmness** scale to stick the vein.

- If it is **(<) less than 5 - DO NOT STICK** IT!
  The wall is too thin and will not tolerate the stick.

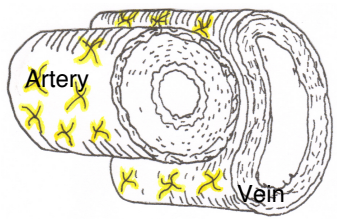
- If it is **between 5-10 - YOU CAN STICK** IT!
  The closer you get to a 10, the better. This

reflects a thicker vein wall.

If the wall of the blood vessel is too thin, the vein wall will not tolerate the stick, and the vein will rupture. Now you have a hematoma.

But, there's a bit more that you need to know about the vein that will make your job of locating it and grading it even easier!

INNERVATION - Your vein wall has nerve endings, remember? These nerve endings respond to external stimuli like hot, cold, touch and pain.



Nerve endings stimulate the muscle in the wall of the vein to either constrict or dilate.

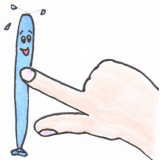
Hot (heat) - causes **dilatation**. Think of a whirlpool or sauna. What does that warmth

do to a normal human being? Relax you? Yep! Heat relaxes the muscle layers in the vein wall and allows the relaxation and stretching of that wall, and the filling of that vein with blood.

Cold - causes **constriction**. Think of jumping into a pool of ice water. What does that

kind of cold do for you? Does it make you want to relax and stay in the water? Or does it make you want to <u>withdraw</u> from the water? Yep, withdraw!

Touch (gentle) - causes **dilatation**. Think of a back massage. Do you say "give me



more", relaxing and giving into it, or do you say "give me less" and pull way? If you are normal (and not all people are), the response is to relax and open up, dilate. (We will discuss neurovascular anomalies later which will explain normal vs. abnormal with regards to touch. There is a small segment of the

population who have neurovascular anomalies and these people do **not** like to be touched, and neither do their veins.)

Pain - causes **constriction**. Think of someone slapping your face. Does your face

lean in and say "give me more"? NO! Your face immediately withdraws (constricts). And, **the vein has the same reaction when you smack it!** If you smack or flick the vein, you cause it to **VASOCONSTRICT**! Is that what you wanted?

FRIGHT/FLIGHT SYNDROME

Now, I can tell you the **Fright/Flight Syndrome** story as related to the vein.

Imagine the arm and its vein . . . . attached to a person with a brain. . . .

- *The brain is in charge.*

- *The brain watches as the phlebotomist slaps or smacks the vein.*

- *The nerve endings in the vein wall scream - sending a message to the brain that says - "I've been hurt, BAD!" (This is **fright**.)*

- *The brain's job is to keep the body alive, and the brain responds. It does this by sending a message back to that same screaming nerve ending and tells the muscle in the vein wall to **constrict**, squeezing all the blood away from that site. This is because the brain wants to bring all the blood to the vital organs to keep the body alive. (It thinks it's going to die.)*

*At this point, there is **no blood in that vein** !!!*

*Sticking the vein now will get you **nothing**, literally!*

- *This segment of hurt vein will remain constricted until the danger (fear) has passed (i.e. you quit smacking it, or while you go get someone else to stick it), or the muscle in the vein fatigues.*

- *When the danger has passed, the brain looks around and says, "We're not dead yet, let's get out of here!" (This is **flight**.)*

- *The brain then sends a message to the vein's nerve endings to tell the muscle in the vein wall to relax and **dilate**. This allows the vein to super fill, so that the patient can fly (so to speak).*

- *Now there is a lot of blood in that segment of vein.*

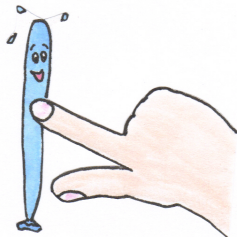
So, if you're going to smack the vein, you must wait for it to go through that entire process of **vasoCONSTRICTION** . . . and then (later) . . . **vasoDILATATION**. Here's a better suggestion. **MASSAGE** the vein. Remember what gentle touch does to the nerve ending?

Hint: DO NOT slap or smack the vein. Instead, **MASSAGE THE VEIN**. Gentle touch sends a signal to the brain, and the brain sends a signal back to the vein saying "this feels good, relax". The muscle in the vein wall relaxes, and dilatation allows for more blood to fill that vein.

THIS IS THE IMPORTANT PART OF THIS ARTICLE.
(Gentle) TOUCH DILATES THE VEIN!

Your job of locating that vein is much easier because of the nerve endings in the vein wall telling the muscle layers of the vein wall to relax, allowing for a natural stretch of the wall and allowing for more blood to fill the vein.

How do you massage the vein? The same way you locate it. **Palpate it.** That's right. Not only do you palpate **for** a vein, you must palpate **the vein**. Palpation is a gentle, relaxing massage.



Note: Did you know that "gliding" is called effleurage in massage therapy? Did you know that "pressing" is called petrissage in massage therapy? So, **palpation is massage.**

The process of palpating for the vein starts the dilatation process, and once you have located the vein, palpating **the vein** will further dilate it. Let's try it.

PALPATE TO DILATE - Follow the instructions below, and let's prove (or disprove) that this new technique really works. Read through these steps entirely before you begin.

1. Pick an obvious surface sitting antecubital vein (not yours)
.
2. Clean the antecubital region with alcohol and leave the area WET. (Alcohol enhances your sense of touch.)

3. Place the pad of your dominant hand index finger over one segment of that vein and stay put.

4. Remaining on that spot, and without lifting your finger off the skin, begin to depress and feel the return. Continue this maneuver.

5. Tune into your sense of touch (close your eyes if you need to), and feel the change in the vein – **it should be dilating and filling, feeling fuller, bigger, and firmer**.

Now, let's take this information and technique and apply it to the veins that you cannot see. Pick an arm where the veins are NOT visible. Palpate all the regions of the extremity where you typically draw blood. Are you better able to locate the veins now?

And always remember, for those veins you can see, just because you can see blue doesn't mean it's a good vein, **FEEL** it. If you can feel a water balloon bounce, and it's firm, you can stick the blue vein that you can see. But if you can't feel a firm wall with a fluid bounce, don't stick it (even if you can see it) because it won't hold.

Proper attention to these details can mean the difference between a single stick event and a multiple stick event. Utilizing this information and this touch technique will minimize immensely the amount of time you spend locating the vein. And, when you add grading the vein to this, the odds get even better for a successful blood draw on the first stick! Isn't that the mission for everyone involved - the patient, the phlebotomist, and the institution?

Let's Palpate to Locate, Dilate, and Grade the Veins

****
****

Get an arm (not yours), and let's practice what we have learned so far - palpate, locate, dilate, and grade the vein.

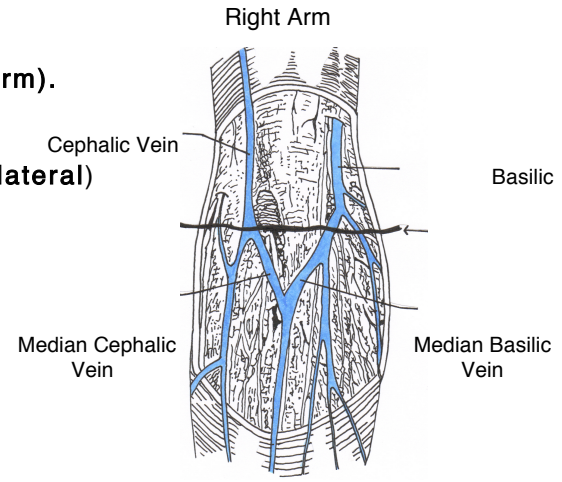
Antecubital Region

1. Place the arm on a table at a height that allows for a natural bend in the arm, and place the hand palm up. This insures that the inferior antecubital region is UP. DO NOT straighten the arm. Straightening the arm tightens the tissues of the antecubital region engaging muscles and tendons, causing all of the tissues to be "hard" and not pliable, and this will prevent you from feeling the fluid bounce of the blood in the vein. *(Technicians were taught to straighten the arm to increase the visibility of the "blue" in the vein – because they LOOK for a vein. And, we have already discussed this and decided that LOOKing for a vein will not work well.)*

2. Identify the anatomical boundaries of the antecubital region. Remember, phlebotomy is considered a "surgical" procedure (otomy means surgery), and like any surgical

procedure, you must clean the ''football size field" to do the microscopic cut (or, in this case, the microscopic stick). It's all about killing microorganisms over a large enough field, preventing pathogens from entering our venipuncture site and giving organisms outside the field a long distance to travel before they reach our venipuncture site.

- ✓ **Identify the antecubital line (the bend in the arm).**
- ✓ **Clean the area: 1 1/2 inches above the line**
  1 1/2 inches below the line
  from side to side (medial to lateral)
- ✓ **Encompass the entire anterior surface of the antecubital region.**



3. Using 70% Isopropyl Alcohol, clean the region as described above and leave the area WET. Using the palmar surface of your dominant hand index finger, **glide** slightly below the antecubital line first, feeling for any rope-like structures (the veins). If you feel one, bounce on it. If it feels like a water balloon, it's the vein.

If you can't feel a vein by gliding (because the deep superficial vein is too deep in the tissue to feel with surface gliding), then start at one side or the other of the antecubital region and begin to depress, methodically and in small increments, as you move across the antecubital region. When you feel the water balloon bounce, you have located a vein.

4. Continue to palpate **it** - to dilate it.

5. Remember, not all veins are created equal! So, now we must grade the vein on those four criteria - **firmness, size, direction,** and **depth**.

6. Tune into your sense of touch (close your eyes if you need to), and feel the change in the vein - it should be dilating and filling, feeling fuller, bigger, and firmer.

Note: Obviously, there are other tissues in the arm that you can feel besides the vein, like muscle and tendon.

Muscle - feels like a firm mushroom. Imagine a huge portabella mushroom sitting

on your kitchen counter top. Press on it. It feels firm and spongy - that's (relaxed) muscle.

Tendon - feels like a guitar string. Imagine the largest guitar string on a guitar, in your arm - that's a tendon.

Can you now imagine from the descriptions just given, the different palpation sensations that you will experience when palpating these tissues? Try it. Again, get an arm (not yours) and palpate a muscle and palpate a tendon.

That's how easy it is to locate a healthy vein in the antecubital region. As mentioned previously, 99.999...% of your blood draws will occur in the left or right antecubital region.

But, if you can't locate an antecubital vein, for whatever reason, then you will move down to the wrist.

Wrist Region

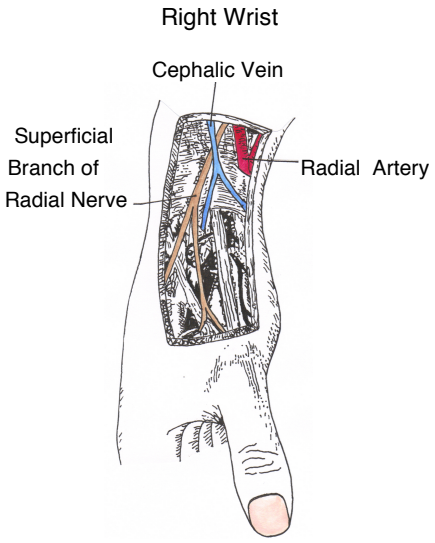
1. Place the arm on a table at a height that allows for a natural bend in the arm, but this time the hand must be in the handshake position. Because the patient's hand can get in the way of your "approach" to the vein, **move the patient's hand off the table and place it in alignment with the arm**. DO NOT OVER EXTEND the hand. This tightens the skin (causing a more painful stick) and flattens the vein, all of which can adversely affect the draw.

2. Using 70% Isopropyl Alcohol, clean the distal shaft of the wrist leaving the area WET. Using the palmar surface of your dominant hand index finger, glide over the area feeling for any rope-like structures (the veins). If you feel one, bounce on it. If it feels like a water balloon, it's a vein. Continue to palpate it and dilate it.

3. Grade the vein, especially for **firmness**. It is critical that you palpate and grade the vein for firmness **here** because the thickness of the wall changes very quickly in this segment of the vein – one inch can make a huge difference. Remember that the wall of the wrist vein gets thicker as you move proximally, closer towards the heart.

4. Now that you have located a healthy vein, clean the area using 70% Isopropyl Alcohol as described below.

- ✓ **Locate a healthy wrist vein.**
- ✓ **Identify where you will stick.**
- ✓ **Clean a 2 inch circumference around the vein site.**



In fact, this is a good time to mention that when you go to palpate both extremities (both antecubitals and/or both wrists), moving from one side of the patient to the other, expect that the patient might become a little concerned. The patient may even be thinking, "Oh no, this person doesn't know what they are doing!" Reassure them - explain what you are doing (palpating, locating, and dilating) - so you get blood on the first stick. They will immediately be cooperative, giving you both extremities and encouraging you to **take your time**, because they only want to be stuck once, too.

Note: Some patients will even think that this method of locating a vein is neat, and might even want to feel their own "water balloon", already thinking about future blood draws and how they can help locate the vein for the phlebotomist who doesn't know where their vein is at . . .

The antecubital and wrist veins are not the only veins that can be accessed for blood draw. Any vein that meets the **firmness**, **size**, **direction,** and **depth** criteria can be accessed. (Example: If your patient does not have arms, you must access veins somewhere else - i.e. ankles.)

So, **take your time**, and **palpate** **both extremities** before you select. Remember, **palpating dilates** the veins. And, again, I emphasize **grade the vein** for **firmness, size, direction,** and **depth**.

This new technique and new use for palpation, and the method for grading the vein have not been previously described, and it makes a "neural world" of difference in the skill of locating a vein.

And THIS information on vein anatomy and physiology just described to you (to my knowledge) has not been described in your texts. (If such a book exists, let me know. They will be given proper credit.)

The art of palpation has been around forever, and the use of palpation in locating veins is mentioned in the literature and in the training programs, but it is not focused upon. The health care industry still heavily relies upon LOOKING for a vein. This sight technique does not work well. Right?

So, now you have all of the scientific facts that you need to palpate, locate, dilate, and grade the vein. Review the summary, and then we'll move on to the tools.

SUMMARY

Part 1 - Locating a Healthy Vein

****

1. PALPATE - **Palpate** for a vein, using your sense of touch.

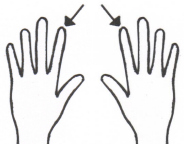
DO NOT LOOK for one,

because –

- You can't always see a vein.
- You can't judge a book by its cover.
- Not all veins are created equal (≠).

So, use your sense of touch to **"FEEL"** for a vein.

2. DOMINANT HAND INDEX FINGER TO PALPATE - Use your **dominant hand index finger** to palpate for a vein.



Use the palmar pad to **"feel".**

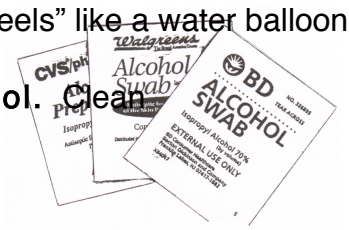
It's a brain thing! Neuroanatomy says that the connection between your brain and your dominant hand index finger is more specific and more sensitive (therefore more accurate) than your non-dominant. It is extremely important that the hand that "sticks" is the hand that palpates!

3. "FEEL" FOR A LONG, SKINNY WATER BALLOON - You are **"feeling" for a long, skinny water balloon**.

- "feel" the bounce
- "feel" the shape
- "feel" the size

Imagine palpating for water balloons in the arm! No other structure in the human body "feels" like a water balloon.

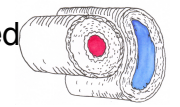
4. PALPATE WITH ALCOHOL - **Palpate with Alcohol.** Clean the area with 70% Isopropyl Alcohol and leave it wet.

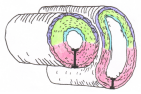


Palpating dry creates friction. Friction causes grab and drag as you move your skin across your patient's skin, and friction is the equivalent of "noise" to the brain. The brain cannot get a clear touch signal. **Alcohol** prevents friction, and now the brain gets a **clear touch signal**!

5. VEIN ANATOMY AND PHYSIOLOGY - **Vein Anatomy and Physiology** is important to phlebotomy.

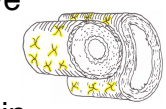
- The **lumen** of the vein is very large compared to the lumen of the artery.





- The **vein wall** is very **thin** compared to the very thick artery wall. (The vein is "floppy" by nature).

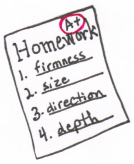
- All blood vessels walls are **innervated**. Nerve endings stimulate the muscle that is found in the walls of the blood vessels. These **nerve endings respond** to hot, cold, touch, and pain by either **constricting** or **dilating** the blood vessel. **Gentle Touch dilates the vein.**



6. GRADE THE VEIN - **Grade the vein** before you stick. Remember, not all veins are created equal? Some will tolerate a needle stick, some won't. What's different? The thickness of the vein wall.

Before you pick to stick, grade the vein for –

- **FIRMNESS (0-10) - Must be 5-10.**
- **SIZE** - The bigger the better (target).
- **DIRECTION** - Determine what direction the vein is running, and line up with your target.
- **DEPTH** – Correct angle of entry of the needle.

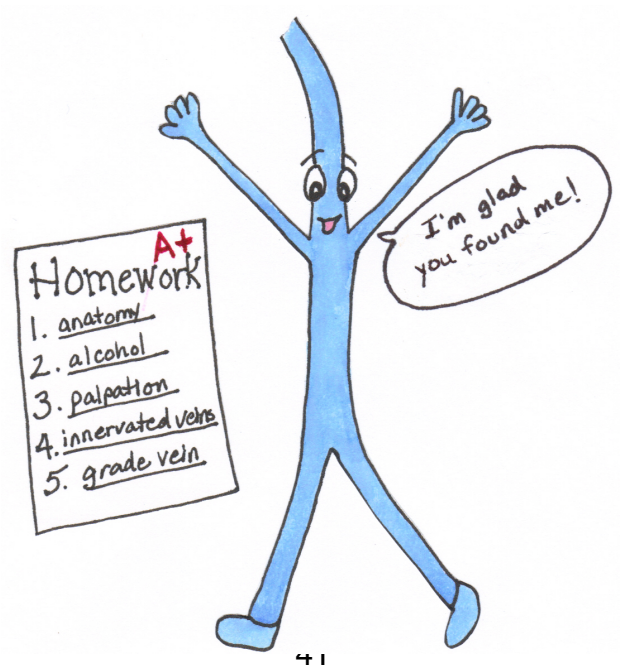


7. VEIN SITE SELECTION - Proper **vein site selection** for a successful blood draw.

FIRST CHOICE – ANTECUBITAL - The antecubital site in the right or left arm is where 99.999...% of blood draws occur.

SECOND CHOICE – WRIST - Second only if you can't locate a healthy antecubital vein. **Select the proximal segment, not the distal segment.**

Hand NEVER - The veins walls are too thin. X



YOU NOW HAVE 5 NEW TOOLS FOR LOCATING A HEALTHY VEIN.

1. **Anatomy** - You know from the diagrams where to expect to “feel” the veins and the confidence of knowing that the veins do exist - *Gray’s Anatomy* says so.

2. **Alcohol** - Alcohol removes friction, making is exceptionally easy to “feel” these veins by improving your sense of touch.

3. **Palpation** – You use your sense of touch, locating a healthy vein 100% of the time.

4. **Innervated Vein Walls** - The blood vessel walls have nerve endings that stimulate the muscle layers to relax, allowing the wall to stretch, dilate, and fill with blood.

5. **Grading the vein** - Pick the best vein for the procedure, one that will tolerate the stick and make it easy for you to be successful.

PART TWO

ACCESSING THE VEIN

Accessing the Vein with the Tools

****

Now let's learn about the blood draw tools and how to use them proficiently and safely.

The Tools

1) Gloves
2) Tourniquet
3) Alcohol Wipes
4) Band Aid
5) Adapter
6) Needle
7) Tube

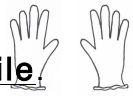
The importance of this section is strictly to make you aware of the inventors' intended use and method of these tools in the process of drawing blood. While on the surface this appears to be a rather "obvious" statement, the facts are that most health care professionals don't use these tools correctly.

The success in blood draw is in the "detail", and these tools have a lot of detail – detail that has not necessarily been thoroughly described in the already existing literature. At the very least, even if this information has been read, it is rarely implemented.

So, let's describe these tools in detail, describe the mission of each as intended by their respective inventor, realize the effectiveness of these tools when used correctly, and MOST IMPORTANTLY, the safety and "safeness" of this skill when the tools are used correctly.

1. Gloves

There are two types of gloves in the health care field: **Sterile** and **Non-Sterile**.



STERILE gloves – protect the patient from germs.

NON-STERILE gloves – protect the worker from germs.

Did you catch that HUGE difference in mission and purpose?

In the vein access of phlebotomy, we wear NON-STERILE gloves. And there are some things that you need to know about the non-sterile glove – to prevent infections through that venipuncture.

Sterile vs. Non-sterile

1. What does NON mean? **NOT**!
   So, really we have - Sterile vs. **NOT**-sterile

2. In terms of **germs,**
   what do we have? - NO germs vs. **HAS** germs

3. Let's assign terms clean and dirty
   based on germs. No germs = CLEAN Has germs = **DIRTY**

I know, I know . . . these applications of the words clean and dirty are not how the health care industry defines them. Medically speaking, these words "sterile", "clean", "dirty", and "non-sterile" have their own definition.

Sterile = guaranteed NO germs.
Clean = not sterile, but coming out of a box or package that is not dirty, therefore, not soiled, not used.
Dirty = implies soiled, and/or used, and/or visibly dirty.
Non-sterile = **not** sterile, has some germs(?), but clean…..until used….then soiled!

I can see how confusing all of this can be. So, let's clarify it, re-define it, and globally agree on one understanding of it because NOT-STERILE gloves are touching the needle insertion site every day.

First off, non means NOT. So . . . . **Non-sterile means NOT sterile**.

That's how I want to begin this chapter because there is a huge misconception out there about non-sterile gloves. . Some health care workers and nearly all patients think that non-sterile gloves are without germs and/or that the patient's are protected from germs because GLOVES are worn, and this couldn't be further from the truth – *this is only true if the GLOVES worn are* ***STERILE*** *gloves!*

We are wearing **NON-STERILE** gloves, **NOT STERILE** gloves.

Now that you realize that the non-sterile glove can be a source of infection for your patient let's describe the true mission of the non-sterile glove.

The little scientist who invented the glove meant it for one purpose with regards to the phlebotomy. That purpose is to protect the phlebotomist from the patient's blood. That is its only mission!

Gloves protect us from the patient's blood. That's it!
Keep this statement in mind as we continue describing the glove.

The non-sterile glove wasn't meant to **protect the patient** from us. *That's the role of the sterile glove.*

The reason this is so important to emphasize is because you see health care providers TOUCH the vein access SITE, right before they stick it, with that NOT sterile glove.

And we wonder how infections occur!

Don't touch the site right before you stick it with that DIRTY glove. If you have problems remembering where the vein is at, then "landmark" it.

The next important consideration for the use of that glove is PALPATION. You know, locating the vein by palpating for it.

Can you palpate with a glove on? Or more accurately stated, can you **feel** to the same degree of accuracy with a glove on as without a glove? **NO**. The fact is that you cannot feel as accurately with a glove on your finger as you can without a glove. This is neuroanatomy and neurophysiology. It's a brain thing! A glove is a barrier between your sense of touch and the object you are feeling.

So, you must palpate without a glove, and when the patient voices his/her concern over your dirty finger touching their arm, inform the patient that the same alcohol that is

cleaning their skin so that you can stick a needle through it, is also cleaning your finger! That's right. Your finger will be just as sterile as their skin.

The patient usually recognizes the logic and truth of this and concedes, but then asks, "why not wear the glove and sterilize it?" Now you can educate them about the palpation process and the need to "feel" for a vein, that you (the healthcare worker) cannot **FEEL** the vein with the glove on (not very well anyway, and definitely not well enough).

In fact, some workers who have already been palpating (dry) for a vein realize they cannot "feel" with the glove on, so they tear a hole in the glove to expose the pad of the palpating finger. What's wrong with this?

- The little scientist who invented the glove would have a heart attack if he saw them intentionally breach the integrity of that glove . . . (not to mention OSHA).
- The health care worker obviously doesn't understand the purpose of the glove – to protect him/her from any of the patient's blood.
- And when the patient discovers you purposefully put a hole in that glove, trust just went out the window

Don't breach the integrity of the glove; don't tear a hole in it!

And, here is another frequently occurring situation already just briefly mentioned. Right before the phlebotomist inserts the needle into the vein, he/she reaches up with their other gloved index finger to feel the vein *one more time,* right before they stick, touching the very site that they intend to insert the needle **through** and **into** the blood stream!!! Was that a clean glove? **NO!** It was a **NOT-sterile** glove. It was a glove that had touched non-sterile tools (i.e. the tourniquet, the bed side table, the needle package, the patient, etc.) potentially picking up whatever germs were lurking about. How dangerous is that? How often do you see that happen?

So, the **patient** ISN'T necessarily safe just because **we** are wearing gloves. You must **THINK** while you are wearing gloves, and

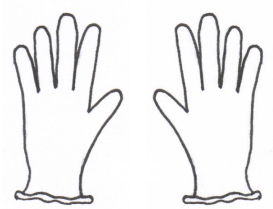
- Use them correctly – NO holes, and
- Don't touch the site right before you stick. (In fact, palpate wet without a glove, locate the vein, and landmark it!)

Let's see – the patient isn't necessarily safe because we are wearing gloves, so is the phlebotomist safe? Not if the phlebotomist purposefully tore a hole in the glove. And, there's one more real hazard – **THE NEEDLE**. Will a glove protect you from the needle? **NO!** The needle can easily penetrate the glove. So, the only way you are safe is if you bring your brain and **THINK** about what you are doing with that needle.

My concern is this – if everyone thinks they are safe just because a glove is worn, then we have created a false sense of security and safety in one of the highest risk environments.

SUMMARY

Gloves have a purpose, but a limited one – Gloves are to protect you, the phlebotomist, from the patient's blood. That's it! No other purpose! And remember, they are **NOT** sterile.



Think that the NOT-sterile glove is dirty. **Think** that you do not want to touch the sterile needle or the sterile site with a NOT-sterile glove. **Think** what can happen if you do.

GLOVES DO NOT PROTECT THE PATIENT FROM INFECTION.

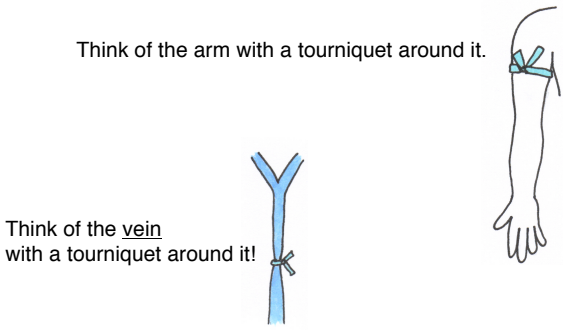
GLOVES DO NOT PROTECT THE PHLEBOTOMIST FROM THE NEEDLE.

GLOVES ONLY PROTECT YOU FROM BLOOD!
This is their only purpose.

2. Tourniquet

The Tourniquet Should Be **SNUG**, Not Tight!

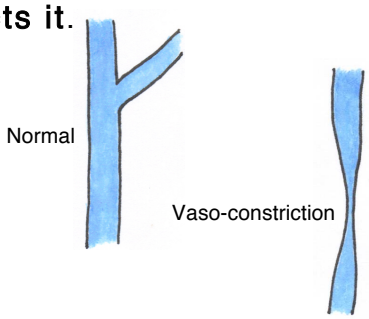
I know, everyone puts that tourniquet on tight – **so . . . tight**, that the patient is uncomfortable (the same uncomfortable as when the BP cuff is pumped way up). There is a misguided perception that the tourniquet must be tight, so I am going to give you the scientific documentation for why the tourniquet should be **snug**, not tight, and tell you about the potential injuries that a "too tight tourniquet" can cause.



As you read this section, recall the anatomy of the vein from Part 1 - **vein walls have nerve endings**. Also remember that the arm consists of skin, subcutaneous tissue, muscle, (Deep) veins, nerves, arteries, bones, and tendons. So, when you place a tourniquet around an arm, you are placing a tourniquet around all of these tissues, and these tissues can be affected by that tourniquet as well.

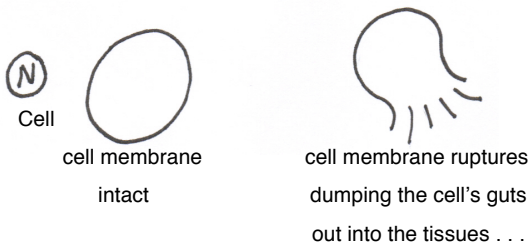
Here are **6 good reasons** why the tourniquet should be **SNUG**, not tight.

1. Pain does what to the vein? **Vasoconstricts it**. So, if the tourniquet is on so tight that it is causing pain, then the patient's neuro system (the brain) is going to respond to this. The vein wants to constrict. If it can, it will. If it can't, because the vein is already engorged with blood, the brain will remain in conflict.



This is not what we wanted! Don't cause pain! **Snug**, not tight!

2. Pain is an indicator of tissue injury. Injured tissues release chemicals, which according to the phlebotomy literature, can end up immediately in the blood stream, and potentially affect some of the very levels we are about to test the blood for.



That's why some programs teach the phlebotomist to release the tourniquet as soon as they see blood in the first tube drawn, because their tourniquet is on **so tight** that is causing tissue injury. (Tissues: skin, subcutaneous, muscle, tendon, nerve, artery, vein, lymphatics, etc.)

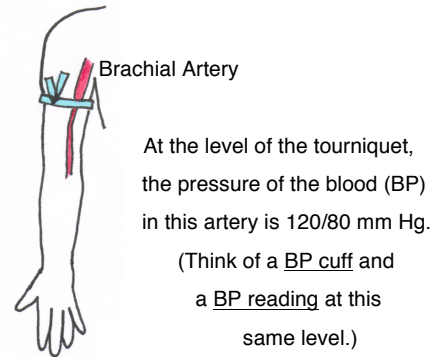
Another tissue injury never mentioned is a Volkmann's contracture which is a tendon injury caused by a tourniquet that is applied too tight. We'll talk more about this injury at the end of this section under proper placement of the tourniquet on the arm.

A snug tourniquet will not cause injury. **Snug**, not tight!

3. We need arterial blood to make venous blood. Right?

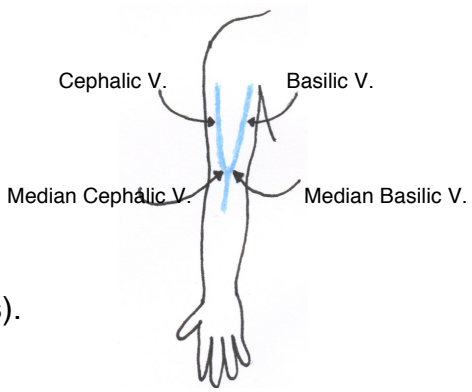
The pressure of the blood in the artery (or the "BP") is 120/80 mm Hg, on the average.

Think! If your tourniquet is on **as tight as** a BP cuff, or tighter then you have stopped the flow of arterial blood to the lower part of the arm. Right?
That's not a good thing.



We need arterial blood to make venous blood. **Snug**, not tight!

4. What's the pressure of the blood in the vein at the <u>same point</u> of tourniquet placement on the arm? The venous blood pressure is approximately 10-20 mm Hg! (See Guyton's Physiology)



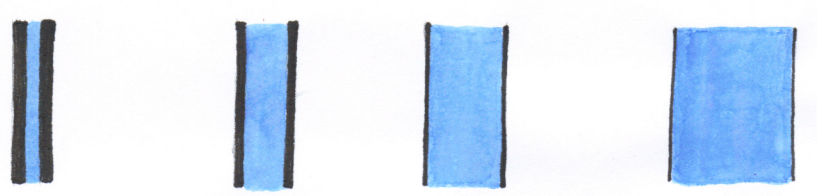
Remember, we are dealing with **Superficial Veins**. (Not DEEP Veins).

Think! What would a BP cuff **feel** like if it were pumped up to only 10-20 mm Hg? **SNUG!**

If you apply more external pressure to the vein than 10-20 mm Hg, you can cause the following problems for the vein.

a) Applying pressure greater than 10-20 mm Hg will actually **<u>stop</u>** the flow (or the return) of venous blood <u>at the point of the tourniquet</u>, and the vein <u>distal</u> to that point of pressure will continue to fill and dilate . . .

The vein gets bigger, and bigger, and bigger . . . **<u>over distended</u>**!

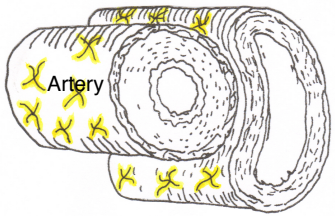


normal wall thinner wall thinner yet extremely thin wall

What's in the wall of all blood vessels?

Nerve endings!!!

What does a ***<u>stretched</u>*** nerve ending feel like?



Painful !!!

And what does pain do to the vein?

The vein wants to **constrict**. Vein

But you have it over dilated – imagine the "**conflict**" . . .

And, how cruel would it be to stick a needle into an already screaming nerve ending?

Snug, not tight!

b) Every structure in life, natural or man-made, has limits, including the vein wall. This means that there is a limit to how much you can stretch the vein wall before you injure it or alter it – temporarily or permanently.

This over distended blood vessel now has extremely thin walls. What would happen to the wall of an over distended water balloon if you stuck it with a needle? Rupture!!!

The same thing can happen to the vein . . .
Now you need your gloves because you probably have a bloody mess . . .
Or now you have a huge hematoma and an unhappy patient, and
If you can't get blood from this site, you're not happy either . . .

Or, when the wall reaches a state of super thinning (right before it ruptures), the vein wall can get so thin it starts leaking serum (the liquid part of blood) into the tissues of the arm. This **leakage** is called an **extravasate** in the science world, an **infiltrate** in the IV world, and **edema** in the med/surg world. (This is described in more detail later on.)

Normally, the lymphatic system picks up this fluid and puts it back into the vascular system. Normally! But it still is not a healthy thing to do to the vein wall.

Or, you can cause a permanent loss of elasticity of the vein wall by over distending it. Can you recall what the walls of the balloon look like after you have removed the air from the balloon? All stretched out! The same happens to the vein. This over distention of the vein wall can cause a permanent loss of elasticity of the vein wall. This loss of elasticity is called a varicosity. The vein is varicosed, or it is more commonly known as a "varicose vein". Varicose veins can occur anywhere in the body not just in legs.

Grade that vein on your firmness scale from 0-10, and you will now have a "0-2".

Thank goodness you have only injured a segment of vein, not the entire length of the vein. But, injuring even a segment is not necessary or desirable.

Do not over distend the vein with a tight tourniquet. **Snug**, not tight!

5. There are two vein systems in the body – Superficial veins and Deep Veins. What type of veins are we accessing for blood draws?

   Superficial Veins.

   We are locating, dilating, and accessing **Superficial** veins. So, when you think of applying the tourniquet, think of applying that tourniquet superficially, on the surface . . .

   Superficial
   Surface
   Snug, not tight!

6. How does blood get into the tube? What's unique about the tube?

   Tubes are vacuumed! That's right. Tubes suck blood. You don't have to build up the blood pressure in the vein to force blood into the tube.

   Apply the tourniquet **snug**, not tight!

SUMMARY

A tourniquet **helps** dilate the vein. You know from "Locating a Healthy Vein" that palpating a vein naturally dilates it. A tourniquet artificially dilates it. There is a huge difference. A tourniquet can be more harmful than helpful if it is on too tight. A tourniquet works best when it is **SNUG**, not tight.

Use a Tourniquet as a Tourniquet!

Having said all of that . . . one more thing you need to know and do –

Always use a scientifically designed tourniquet as a tourniquet.
Do NOT use a cut piece of surgical tubing.

Surgical tubing is thinner in consistency than the tourniquet and because it is a tube, it rolls on itself, making a very thin "rubber band" type structure around the arm. AND, because it has a thinner consistency than a true tourniquet, you have to stretch it "more" to make it effective . . . and a tightly stretched rubber band around the arm is painful. And, you know what pain does to the vein, the tissue, and the patient. Not Good!

If the guy who made surgical tubing meant for you to use it as a tourniquet, the box would have read "Surgical Tubing/Tourniquet – Cut a Piece"! It doesn't.

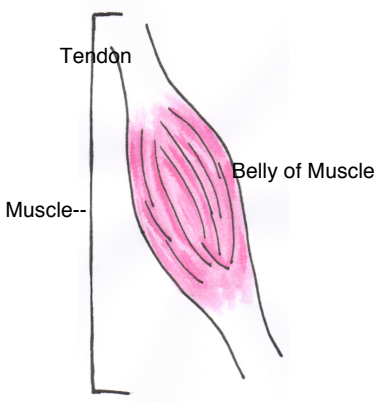
Use a tourniquet as a tourniquet!

Proper Placement of the Tourniquet on the Arm

Next question. Where should the tourniquet be placed on the arm? It should be placed halfway between the shoulder and the antecubital line, at the belly of the biceps muscle. Not all humans are the same size, so halfway will properly place the tourniquet every time.

Why does it specifically need to be over the belly of the muscle? Let's look at the anatomy of the biceps and triceps muscle to understand this reasoning.

A muscle has an origin, a belly, and an insertion (a beginning, middle, and end). The origin and insertion are made up of tendons. Larger tendons are innervated with nerve endings! (Think of your patellar tendon {knee} – when the doctor whacks it for a reflex!)



So, placing the tourniquet too high, or too low,

on this muscle will place the tourniquet right over the tendinous area – which is not comfortable and can actually be harmful.

Tendon

Note: There is an actual injury that can be caused by applying a tourniquet too tight over a tendon – a "Volkmann's Contracture".

However, the belly of the biceps is all muscle – very soft, supple, and pliable, and when the tourniquet is placed here it is **comfortable** and **safe**.

So you can't place the tourniquet 3-4 inches above the antecubital line on every patient because this will not be at the belly of the biceps on every patient.

Instructions for proper placement of tourniquet: Look objectively at your patient's arm and place the tourniquet halfway between the shoulder and the antecubital line (at the belly of the biceps muscle) **AND** remember . . . **SNUG, not tight**.

Do we really need a tourniquet to draw blood? NO!

We located and dilated the vein by palpation, and the tube is vacuumed - it sucks blood in all by itself. Neither activity requires the use of the tourniquet to accomplish them. But, show up with a tourniquet. It's what the patient expects to see, and it can help. But apply it **snug**, not tight!

When You Cannot Use a Tourniquet

When **can't** you use a tourniquet? When there has been axillary lymph node removal.

Patients who have had a mastectomy or other surgery with axillary lymph node removal have been instructed to "never allow anyone to touch that arm!". No blood pressures, no IVs, and no blood draws! And this is not a totally accurate instruction.

A more correct and accurate instruction is that no one should apply a **blood pressure cuff** or a **tourniquet** to the arm where the axillary lymph nodes have been removed. Why? Because the patient doesn't have a **working lymphatic system** now.

The lymphatic system **fights infection** and **removes excess extravascular fluids**.

For example, if the patient without axillary lymph nodes gets a bee sting in that arm and the area swells, that arm cannot get rid of the swelling (extravascular fluid). The lymphatic system would normally "suck the fluid up" and put it back into the vascular system. But this arm doesn't have a working lymphatic system.

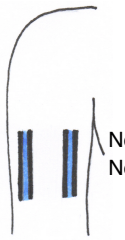
There are no lymph nodes in that arm to **fight infection** or to remove **extra**vascular fluid (swelling).

Well, what does all of this have to do with a tourniquet and blood draw?

Let's describe in detail what can happen to an arm, a vein, and its vascular fluids when a "too tight tourniquet" or a BP cuff is applied, whether the arm has its lymph nodes or not.

Note: Blood is made up of **serum** (the liquid part of blood - clear yellow) and **cells** (the solid part of blood - red). Cells can't leak through the wall, they're too big, but serum can.

1. These are normal veins in an arm.
   Notice how thick the walls of the veins are.



Normal veins in arm.
Note the thick walls.

2. Someone comes along and applies a "too tight tourniquet" or a BP cuff. These two things cause an **artificial dilatation** of the vein *(vs. the natural dilatation of palpation)*.

too tight
tourniquet = BP cuff
"tourniquet effect"

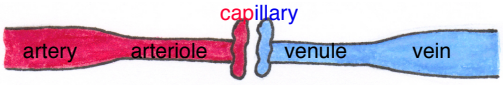
This results in an over distention of the vessel with blood and an extreme thinning of the blood vessel wall - think of the overfilled water balloon - the walls thin!

Veins dilate, and the vein walls thin.

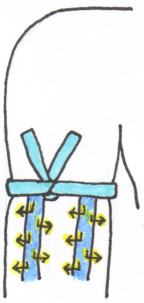
resulting in an "artificial dilatation" of the vein

This thinning occurs at three levels:

a) the venous part of the capillary bed,
b) the venule, and
c) the vein



3. This thinning results in the leaking of serum (the liquid part of blood) across the vessel wall and into the tissue of the arm - this is called **extravascular fluid**, or an
*extravasate
extravasate, or an **infiltrate**, or **edema.**
*infiltrate
The person without lymph nodes can't get rid of this interstitial fluid. They have to take their swollen arm to a physical therapist or a massage therapist who then <u>milks</u> the fluid through the <u>tissue</u> of the arm, up and into the chest area where there are lymph nodes that can pick up that fluid and place it back into the vascular system.



This leakage is called an:

The too thin walls leak SERUM into tissue

*edema = swelling

No lymph nodes means no way to get rid of "swelling".

So, when providing care to the patient <u>without</u> axillary lymph nodes:

- You CANNOT place a BP cuff on that arm because it will cause vein and tissue injury as described above.
- So, you CANNOT take a BP reading.

- You CANNOT place a tourniquet on that arm because this will also cause the type of vein and tissue injury described above.

But, you CAN draw blood.

They still have veins and arteries, they just don't have lymph nodes.

Here are the rules:

1. Definitely do not touch their site with a **NOT-sterile** glove.
   They cannot fight infection.

2. And **DO NOT** use a tourniquet.

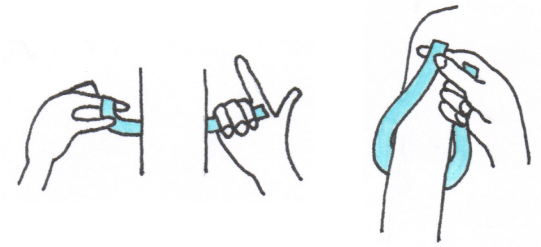
3. Palpate WET for a vein using 70% Isopropyl Alcohol.
   Continue to palpate the vein to dilate it.
   Clean your site with alcohol or the approved cleansing agent of your facility.
   Insert the needle into the vein.
   Draw the blood.
   Apply the proper amount of pressure for the proper amount of time.
   Dress the site after the draw.

Step by Step Instructions for Applying a Tourniquet

If applying the tourniquet goes well, the patient doesn't give it a thought. But if it doesn't go well because the tourniquet comes loose, or you have to apply it 2 or 3 times, or you pinch them, or it's too tight and hurts..... then the patient starts to WORRY! So, do it right.

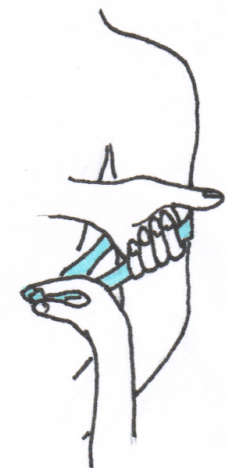
1. Make a gun with your dominant hand and place the tourniquet in the three fingers. While securely holding the tourniquet with the three fingers, practice pinching the gun fingers together.

2. Drop the tourniquet under the arm, and with the support hand pull it up, and grab the other end, at the tip, with the gun fingers.



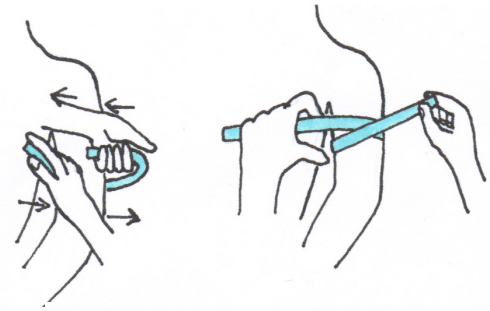
3. Gently pull the tourniquet out and towards you.

4. With the support hand (non-dominant hand) reach out in front of the tourniquet (vs. behind) and grab the piece that is in the last 3 fingers of the dominant hand. Make sure that only the four fingers of your support hand are wrapped around that piece (with the thumb free and pointing to the floor).

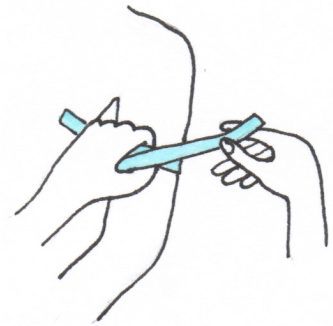


5. Now, turn loose (let go) of the piece of tourniquet that is in the last three fingers of your dominant hand.

6. At this point, both hands are holding only one piece of tourniquet, and your arms are crossed (so to speak). Uncross your arms or take these two pieces past each other, completely.

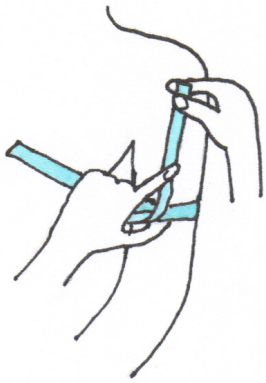


7. Take the support hand thumb and flip it back and under the two pieces of tourniquet where they cross each other, and rest the support thumb on the patient's arm and leave it there.



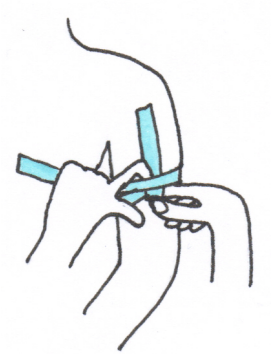
8. Take the piece of tourniquet that is in the dominant hand and move it forward towards the patient's shoulder and stay put.

9. Next, wiggle the support hand index finger free and place it on the outstretched piece of tourniquet being held by the dominant hand.

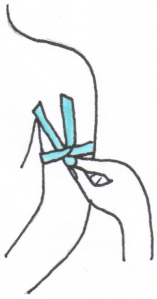


10. Make the support hand index finger pin the outstretched tourniquet to the support thumb and, in one continuous movement, barely tuck the tourniquet under with the support index finger and stay put.

11. The dominant hand can turn loose of the piece of tourniquet that was stretched towards the patient's shoulder and can now hold the tuck, pinching the support index finger and the tourniquet that is stretched over it and stay put.



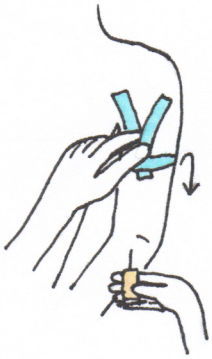
12. While the dominant hand holds or pinches the tuck, you can remove your support hand index finger, and allow the tourniquet to sit down on itself.



How to release this tourniquet, at the end of the blood draw,

KEEPING YOUR EYES ON THE NEEDLE (because your dominant hand still has a needle in the patient's arm) -

Reach up with the support hand and with the index finger and thumb, and getting as close to the tuck as you can get (or at the very least the bottom piece), pinch the two strands of tucked tourniquet, and gently roll the tourniquet towards the needle until the tourniquet releases. Then immediately let the tourniquet go.



DON'T TRY TO PUT THE TOURNIQUET "AWAY".

The tourniquet is not important. The needle in the patient's arm is important!

Grabbing the end piece of the tourniquet piece, and yanking on it to release it, creates a LOT of MOVEMENT - you move, the patient's arm moves, and THERE'S STILL A NEEDLE IN THAT ARM!!!!!

The **gentle release** of the tourniquet will insure that there is no movement of the patient's arm and no movement of the needle that remains in their arm.

Like the rest of the entire blood draw process.... **ALWAYS BE GENTLE!**

Practice applying the tourniquet as instructed, and remember - **SNUG**, not tight.

PRACTICE

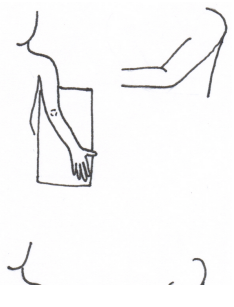
Now that you have the instructions on the tourniquet, let's take time to apply this tourniquet to an arm, and while we're at it, let's get some 70% isopropyl alcohol and practice palpating to locate, dilate, and grade some veins at the same time. (You can practice this tourniquet application by yourself by placing it on your thigh. It goes on your thigh the exact same way it goes on an arm.)

Place the arm on the table with a natural bend in the arm.

The natural bend vs. straight.

First, place a patient at the table in such a manner that the arm has a natural bend in it. (See the diagram.) Now, press across the antecubital region with your palpating finger and FEEL how supple and pliable the tissues are.

Now straighten the arm (raise the arm or raise the table). Now press across that same region with your palpating finger. Do you FEEL how hard the tissues are in that region? In fact, can you FEEL the water



Place the antecubital region facing up, and this can be achieved by placing the hand palm up. Apply the tourniquet at the belly of the biceps muscle - **snug**, not tight.

We are going to grade these veins for firmness of the bounce, and we are going to score them on a scale from 0-10, with 10 being the most firm.

First, wet all three sites: the antecubital region, the wrist (remember to place the hand in the handshake position), and the dorsum of the hand. Now, LOOK at the veins. When you **LOOK** at these sites, there appear to be some "good looking" veins at all three sites. But don't trust SIGHT! **PALPATE!!!!!!**

We are going to do a global comparison first. The mission is to make you instantly aware of how different the firmness of the bounce is in the veins in these three areas.

- So, start with the antecubital vein and feel the bounce, firm
- and then move quickly to the wrist vein, and feel the bounce, less firm
- and then move quickly to the hand vein and notice.....no bounce

Now let's start over, and grade the firmness of each vein on the scale from 0-10.

Antecubital vein - usually between a 7-10 on the firmness scale.

Wrist vein - palpate at least a 2 inch segment
the more proximal the vein, the more firm, usually a 5-7
the more distal the vein, the less the firmness, usually a 4

Hand vein - usually between a 0-2 (younger than age 25 may be 2-4)

Firmness, as stated previously, is a direct correlation to the thickness of the vein wall.

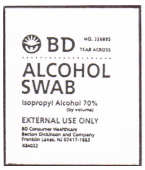
Now, don't confuse firmness with "hard". You must be able to feel the rebound bounce of the vein. Hard is a different thing altogether, and you can make the vein feel "hard" by over distending it. Try it.

Crank down on that tourniquet. A "too tight tourniquet" can make a vein feel very hard. and especially if, while the tourniquet is on tight, you have the patient "milk their hand" which will further engorge the vein.

3. Alcohol Wipe (70% Isopropyl Alcohol)

You now know that the alcohol wipe has two important functions:

1. for sterilizing the site and your finger, removing all microorganisms (in particular, pathogens) from the area, and
2. for palpating.



To my knowledge, there is no other chemical out there that palpates the same as 70% isopropyl alcohol.

Note: Water does not remove friction. Think about it. When they instruct on self breast exam or testicular exam, they have you palpate with **soap** and water. Right? Because water by itself still permits friction, creating grab and drag, and you cannot glide and feel as you need to.

The latest trend in prepping a site for vein access involves using a substance called Chlorhexidine Gluconate and 70% isopropyl alcohol. This substance has an oily base to it, and it, also, will not allow for easy palpation. The oil does not remove the friction, and, therefore, your touch signal is "clouded" with a film of oil.

So, if they insist that you use this new prepping agent, that's okay. Locate the vein with alcohol **FIRST**, and then you can prep your vein site with the agent of their choice.

Another thing to consider is the quality of the alcohol wipe. The hospital wipe will clean a site, it just won't leave it **wet** because the wipe itself is not saturated with enough alcohol to leave it wet. Also, the hospital alcohol wipe is made of a thin sheet of fiberfill material that **glides on itself**.

My advice is to buy a thicker, wetter alcohol wipe. (BD, Walgreen's and CVS make a wipe that is a thick pad of cotton and is saturated - check it out. There are probably others, too.) Use one of these.

Note: Alcohol comes in different strengths.

90% Isopropyl Alcohol	**70% Isopropyl Alcohol**
10% water	30% water
used in a surgical setting	will remain on the site a little longer
because of rapid evaporation	allowing for the time that it takes to palpate

There is also a cheaper version of alcohol, **50% Isopropyl Alcohol**, which then is 50% water. Not only will this not work as a palpating tool because it won't prevent friction the same, but it won't kill the organisms as effectively either. Evaporation must occur for the sterilization process to occur, so if the area is still wet with water this can't happen. Fortunately, this 50% alcohol is not sold to the medical profession - but it is sold to households throughout America. (Check your cabinet.)

And one more piece of interesting information - You know those alcohol based hand sanitizers that are common and frequently used in place of hand washing? Do you know what strength of alcohol they are made of?

64% Isopropyl Alcohol

Yep. They are less in percent of alcohol than the wipes. So if you have any concerns at all about using your bare finger and alcohol to palpate with, let this remove all doubt for you here and now. The 70% alcohol that you palpate WITH is higher in alcohol content than the hand sanitizers that you use.

4. Band Aid

The band aid is applied at the end of the procedure to protect the site from infection - the venipuncture site is now a portal of entry for pathogenic microorganisms and

must be protected.

Contraindications to band aid use: ALLERGY to tape products (the adhesive).

For those patients who are allergic to tape products, this little tool can cause a huge injury and a huge problem.

You, the phlebotomist, may not be allergic to tape, and this concept of a tape allergy may not even enter into your brain. But if the patient is allergic to tape, it's an important concept to them.

I teach my students to ask the patient the question "Are you allergic to tape?" right before they apply the band aid. Why is it necessary to even ask the question?

Some patients are in a "stupor" as you draw their blood. Can you recall that look? Fear takes them to another dimension, and they won't "think" to tell you about their allergy. Asking this question "Are you allergic?" brings those that are allergic instantly out of that stupor. So, "wake the patient up" with that question.

Allergies to tape can be mild, moderate, or severe.

Mild Allergy - When the band aid is applied, the site begins to itch. The patient removes the band aid and the skin underneath is red and irritated. This will heal rather quickly and, usually, without problems. No big deal.

Moderate Allergy - Now more of a concern . . . the skin is more irritated, and there may even have mild swelling but still manageable. No big deal.

Severe Allergy - The instant the band aid is applied, there is **instant** blister formation. No matter how quickly the patient responds, as they pull the band aid off, the blistered skin comes off with it !!!!! Now the patient has the equivalent of a chemical "burn". That is what this adhesive does to allergic tissue, it burns it.

Think about this "burn" injury that was just inflicted upon the patient:

- If the patient is healthy, it will take 7-10 days to heal that burn.
- If the patient is DIABETIC, it will take 3 weeks, OR LONGER, to heal that burn, and that's if the site doesn't become infected –

because diabetes delays the healing process and increases the risk of infection. **Think about that !!!!!**

Don't give your patient a whole new problem.

What can you use if they are allergic to tape products? A dry cotton ball and gauze cling.

Note: Coban is a popular tool of use these days. But some patients are even allergic to Coban - so be careful.

Applying the Band Aid

It sounds silly to think that I should even want to describe this simple procedure, but we all know that nearly everyone who applies the band aid touches the sterile gauze pad when handling this tool. So, yes, I need to mention this and a few more things about the band aid.

Definitely, DO NOT touch the sterile gauze pad of the band aid. **It** is sterile, and if you touch it, it will no longer be sterile.

This is a big deal because we have just created a portal of entry for pathogens to enter the system (albeit a small entry if your inserted the needle bevel up). But, nevertheless, an "opening".

The new band aids with antibiotic ointment already on the pad are a phenomenal idea !!!

Try this little maneuver for getting the tabs to pull away from the band aid itself, without the possibility of contaminating the sterile pad.

1. Take the band aid out of the wrapper.

2. With the gauze pad side facing up, hold the ends of the band aid between an index finger (on the top) and a thumb (underneath) close to the pad but not on the pad area; now TWIST one direction and then the other quickly, until the plastic strips that are covering sterile gauze pad pop loose - the ends will lift up and off of the band aid all by themselves. Now the plastic strips will be easy to grab because they are not even close to the sterile gauze pad portion of the band aid.

3. Next, place the sterile gauze pad portion of the band aid directly over the site, and support the site by applying light pressure over the venipuncture site. While supporting the site carefully secure one end of the band aid to the arm by touching the adhesive part of the band aid to the skin and then the other 1.

DO NOT yank on the band aid to stretch it over the skin. Why?

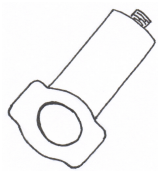
IT'S NOT NECESSARY! And because, if you are yanking on that band aid while applying it, pulling on the tissue of the arm,

you will disturb the clot,

and the potential for bleeding starts all over again. (We're not talking a hemorrhage.) But, bleeding is what causes bruising (see the article in this book on bruising), and it takes 1-3 minutes of applied pressure to form a clot.

Be thoughtful and be **gentle**.

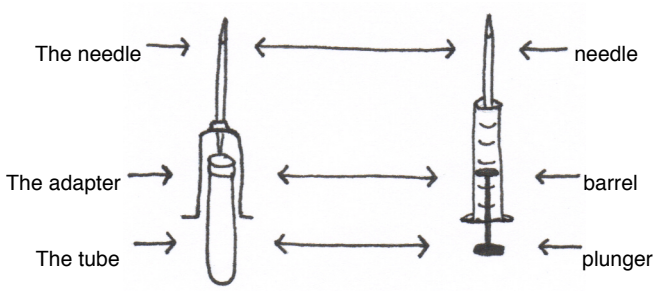
5. Adapter



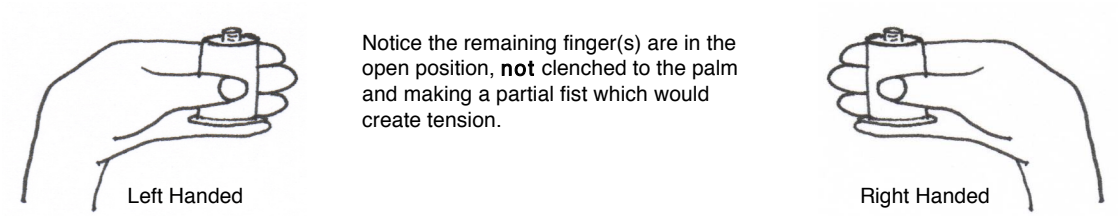
We **can't shove** tubes on and **yank** tubes off. There's a needle in a patient's arm that is attached to the entire process! So, the adapter was designed to eliminate shoving and yanking.

The adapter holds the needle and the tube and provides the means with which to properly insert the needle into the vein and properly insert the tube into the adapter **without moving the needle in the patient's arm.**

The needle, adapter, and tube function like a syringe. (Keep this syringe concept in mind as we describe the use of the adapter in detail.)



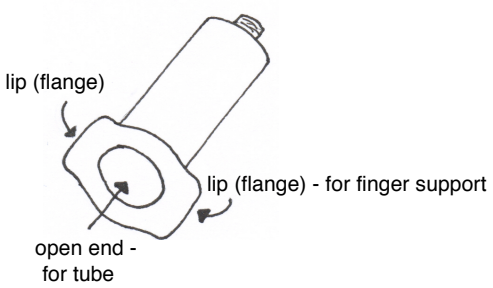
The adapter is held in the dominant hand, two to three fingers underneath and the thumb on top. The remaining fingers are in the open position.

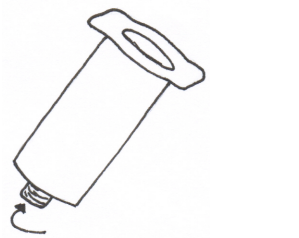


The dominant hand index finger must be one of the fingers underneath the adapter - it's a brain thing. For specificity, sensitivity, and accuracy you must include the dominant hand index finger. The index finger must remain on the body of the adapter, and must not protrude past the end of the adapter, approaching the needle. So, again, if the length of the adapter accommodates three of your fingers, use three - if the length of the adapter only accommodates two of your fingers, use two.

The thumb sits on top of the adapter, making the letter "T" with the adapter. This centers the thumb on the adapter, and allows room for placement of the non-dominant hand fingers behind each lip of the adapter when wedging the tube on and off. We'll describe this in more detail as we continue.

Notice the ends of the adapter. The needle screws into one end of the adapter, and keep in mind that this needle will be in a patient's arm. The other end of the adapter is open where the tube will be inserted, and this open end has two lips (or flanges) on the rim. You must use these two flanges to wedge the tube on and off.

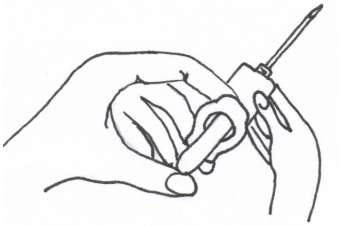




You can't push (or shove) a tube on! This will advance the needle further into the patient's arm! Ouch!!!!!!

WEDGING A TUBE ON

Remember the syringe concept. The tube, once in place in the well of the adapter, now makes a syringe with the needle. Right? This is called "wedging a tube on".

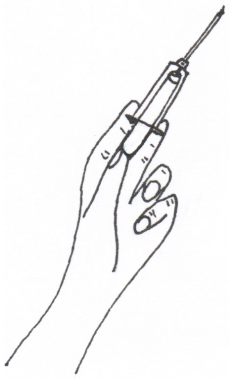


Place your non-dominant hand index and middle fingers behind the lips of the adapter. Place your non-dominant hand thumb on the end of the tube. And just as if this were a syringe, depress the plunger (tube) - wedging the tube on - resulting in **no** movement of the needle that is in the patient's arm. That's wedging a tube on!

Note: The bevel of the needle must remain in the up position, which means that which ever direction the lips of the adapter end up, you cannot rotate the adapter to accommodate your support hand. The support hand must move and accommodate, placing the fingers behind the lips appropriately.

HOW TO PROPERLY HOLD THE ADAPTER

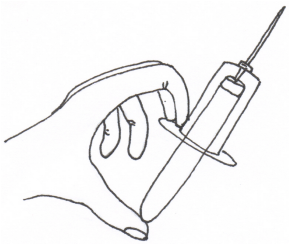
The scientists who designed this adapter specifically placed these two lips (flanges) on the adapter for that reason - as **leverage**, to be used to load tubes on and off without moving the needle in the patient's arm.



IMPORTANT

You must place **a** finger behind **each** lip.

NOT two fingers behind one lip!!!



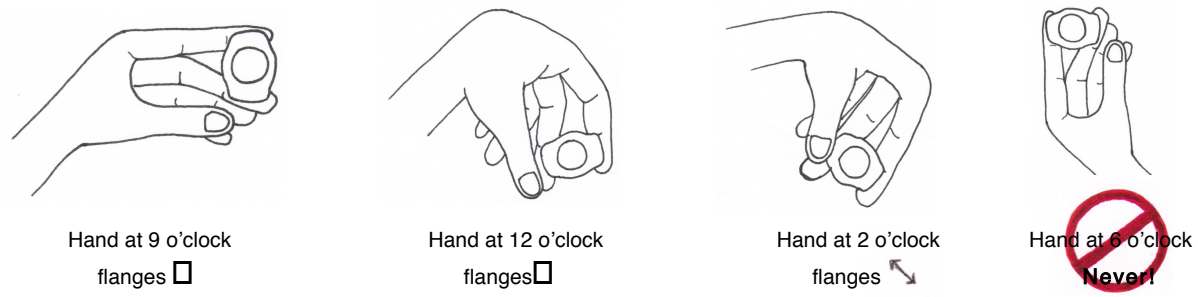
Correct **Incorrect**

The weight of the pull of the fingers must be evenly distributed over that adapter, or you will cause the entire adapter to pull to one side. And again, remember, there is a needle in a patient's arm attached to that adapter!

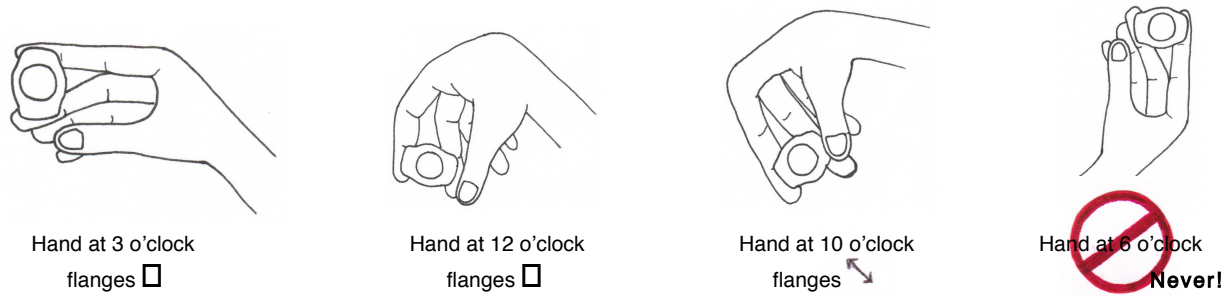
The Position of the Thumb with Respect to the Tube when Wedging a Tube On -The same rule applies to the thumb that you are placing over the end of the tube. Place the pad of the thumb, **NOT** the side of the thumb, directly over the end of the tube when you wedge the tube on. Imagine that syringe concept again – the thumb on a syringe is placed directly on the flat top of the plunger head. The same should occur with the tube when loading it onto the adapter. There is not enough power and not enough control when you use the side of the thumb. Try it!

The Position of the Thumb and Hand with Respect to the Adapter and Flanges when Wedging a Tube On - When using the thumb to wedge the tube onto the inner needle in the adapter, the thumb is most powerful if it is on top or to the side of the tube with respect to that tube. The thumb has little or no power if the thumb is in a position underneath the tube. See the diagram. (Another way to describe this is the hand (fingers and thumb) can be at a 9 o'clock, 12 o'clock, or 2 o'clock position, but **NOT** at a 6 o'clock position.) Try it!

Support Hand of Right Handed Phlebotomist



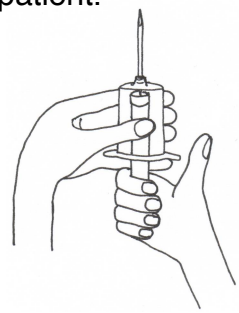
Support Hand of Left Handed Phlebotomist



Now, how do you get the tube off? You can't pull (or yank) it off! This will cause the needle to jerk (in and out motion) while it is still in the patient's arm! Ouch!!!!! You must wedge it off!

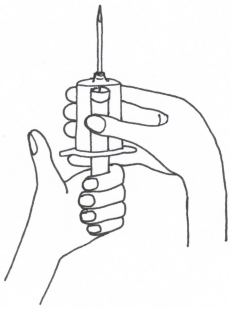
WEDGING A TUBE OFF

This is also easy. Again, using the adapter flanges and the tube itself, we will wedge the tube off of the inner needle and out of the adapter, without moving the needle that is in the patient.



The dominant hand stays where it's at and gently and securely holds the adapter with the attached needle in its blood draw position **in the patient's arm**.

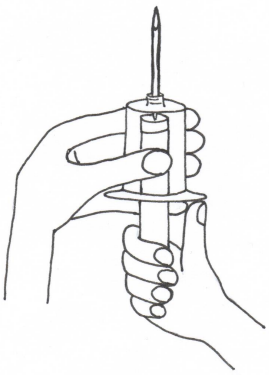
It is the **non-dominant hand** that wedges the tube off.



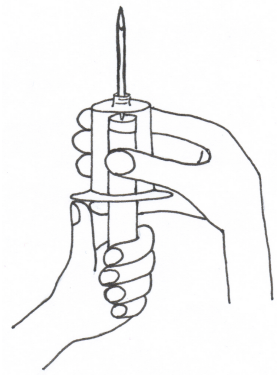
Left Handed Right Handed

Grasp the tube with only the fingers of the non-dominant hand. Do not include the thumb in this part.

Place the **tip** of your (non-dominant hand) thumb against the adapter. The thumb pushes against the adapter at the same time that the fingers are pulling the tube - wedging the tube off – again, resulting in **no** movement of the needle that is in the patient's arm. That's wedging a tube off!



Left Handed



Right Handed

Do not practice this wedging on and wedging off technique **while in a patient's arm**! This technique is learned and perfected long before you are in a patient's arm. Practice wedging these tubes on and off while the needle is inserted into a cloth chair.

The non-dominant hand loads and unloads tubes and does this out of practice and routine because your **brain** is focused on your **dominant hand**, the hand that has the needle in the arm. And that is where your brain and your dominant hand should stay - with the needle! It's a brain thing.

You will see many phlebotomist switching hands on that needle and adapter in the middle of the draw, in order to let their dominant hand load and unload the tube. This is not right.

What's important here? The NEEDLE!
So, which hand do you want to be in charge of the NEEDLE? The dominant hand.

It's a brain thing!

And believe me, if you were the patient, you wouldn't want that needle moving around in your arm as the phlebotomist switches hands!

To insure a successful draw, without injury to the vein, the patient, or the phlebotomist, hold the adapter and needle - start to finish - with your dominant hand, and hold it correctly -

- With three (or two) fingers underneath and the thumb on top.
- Make sure the thumb is centered on the adapter, making the letter "T".
- Do not change position on the adapter or switch hands on the adapter during the draw.
- Use the non-dominant hand and the flanges to wedge tubes on and off.

Consistency is critical to success. Athletes practice over, and over, and over again. Why? To perfect their skills and to be consistent. (Not so they don't have to think.) Try it, you'll like it. Try it both ways, correctly and incorrectly, to convince yourself that the method described above works the best.

6. Needle

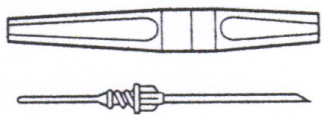
The most important fact you want to know about the needle is that the seal is still intact. Intact means sterile.

Got it? **I N T A C T** seal.

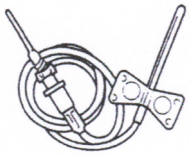
If the seal is intact, the needle is sterile. If the seal is broken, consider that needle **not sterile**. Don't ask 10 other people if they opened it, but didn't use it and put it back . . . Just immediately place that needle into a sharps container and get a new needle with the seal still intact.

Now that we have determined that you are dealing with a sterile needle, we can look more closely at the detail about the needle.

There are "regular" needle systems,
(Typically used on adolescents and adults.)

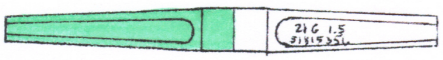


and the butterfly needle system.
(Reserved for toddlers and infants.)



The regular needle system has a short white cap and a longer colored cap. On every white cap are numbers that describe the size and length of the needle and the serial number for that lot.

21g 1.5 describes the needle size
31815356 are serial numbers



The first number (i.e. 21g) refers to the gauge of the needle. The "g" stands for "gauge", and the number tells you about the inner luminal size of the needle, or in other words, the size of the opening in the shaft of the needle (the barrel size). The "color" of the colored cap is specific to that needle gauge (i.e. green = 21g).

And, then, here's where it gets confusing;

The bigger the number, the smaller the lumen.
The smaller the number, the bigger the lumen.

Why did they do that?!
The electrical industry gauges wire the same way.
The weapons industry gauges bullets and barrels of guns the same way.
The golfing industry gauges clubs the same way.
There must be a good reason for this.

A 16 gauge needle is so big you can practically see down the shaft of it. The 21g and 22g are getting smaller and smaller yet, respectively. And, the 23g and 25g are so tiny that you can barely see the bevel opening.

Again, in the blood draw industry, the 21g and the 22g are typically used on adults and adolescents. The 23g and 25g butterflies are used on toddlers and infants.

The second number on the white cap following the gauge of the needle (i.e. 1.5) refers to the length of the needle, and it is measured in inches. Thank goodness this one makes sense!

1 = one inch needle	1.5 = 1 and 1/2 inch needle
1.25 = one and 1/4 inch needle	¾ = 3/4 inch needle

Needle length is a "personal choice" decision. The importance of picking one length and sticking with it (pardon the pun) is that you must KNOW your needle length. If you have to maneuver while in the arm, you must know the length of your needle in order to back the needle out to the bevel, without the bevel being "out" of the vein, before you reposition the needle.

LOADING THE NEEDLE INTO THE ADAPTER

At this point let's load the needle into the adapter. **Please read this thoroughly before you do it**, to fully appreciate the importance of the proper handling of the needle.

There are four steps to loading the needle into the adapter.

1. Check the **seal** to see that it is **INTACT**.
2. Twist the caps to break the seal.
3. Pull, and the white cap comes off automatically.
   (Remember – there is a needle inside the gray sleeve.)
4. Screw the needle into the adapter.

Did you catch that? Some things **twist**, some things **pull**, and some things **screw**.

So, let's review this because it is extremely important.

Seals **twist** to break. Caps **pull** off. Needles **screw** on.

Once the needle is loaded into the adapter, **NEVER** stand the adapter and needle UP; always lay the adapter and needle **DOWN**. This is safe. **SAFETY FIRST**, always.

Now we are ready to pick up the adapter and attached needle (the colored cap is still in place) from the table and work with it.

Always pick the adapter and needle up with your **DOMINANT HAND**.

It's a brain thing. You want the hand that the brain has precise control over holding the one tool that can hurt you, even if it is a sterile needle. Picking it up with the dominant hand from the start also avoids transferring the needle system from hand to hand.

Example: You will see a right handed phlebotomist -

a) pick the system up with the left hand,
b) pull the colored cap off with the right hand, and
c) then transfer the system back to the right hand for the stick.

This extra handling of the needle can result in injury to the phlebotomist and/or an incidental touch and contamination of the sterile needle . . .

So, with the adapter and attached needle properly placed in your dominant hand (review these instructions again if necessary), we are now ready to remove the colored cap.

It is this instructor's opinion that there is only one correct way to pull this cap off safely and without the potential for contaminating the needle with your NOT-sterile glove -

1. Holding the adapter correctly in the dominant hand, flip the hand over (from supination to pronation), resulting in the needle now pointing towards the non-dominant hand.

2. With the non-dominant hand fingers at the tip of the cap (not near the base of the cap) **PULL** the cap off. Lay the cap down. Flip the dominant hand back into the proper blood draw position.

You see phlebotomists take these caps off every which way . . .

1. The one handed method is where the phlebotomist uses the thumb to reach up and flip the colored cap off. The slow motion demonstration of this method shows hat the (NOT sterile) gloved thumb can actually touch the needle during this movement. Now the needle is no longer sterile and has been potentially contaminated with lethal pathogens.

2. Some phlebotomists use their mouth to remove the cap. This method involves placing the colored cap end of the needle in your (dirty) mouth and while the teeth and/or lips hang on to the cap the phlebotomist pulls the needle out. While you probably did not contaminate the needle, it LOOKS DISGUSTING! And you will probably never convince the patient that this method did not contaminate the needle - especially if that patient eventually ends up with a site infection or systemic infection after your draw.

3. While the needle is pointing to the patient, the phlebotomist reaches out in front and tries to pull the cap off, in a direction towards the patient. It can be done this way, however, frequently I visualize phlebotomists slightly twisting or turning the cap as they pull the cap off. It's not intentional. This twisting (or turning) occurs because of the awkward position that the support hand (non-dominant hand) is in when you go to pull the colored cap off. In any case, intentional twist or not, if any twisting occurs at all, you may have loosened the needle from the adapter. And, remember, needles screw on and unscrew off.

   The needle does not completely unscrew from the adapter which is too bad because then you would know that the needle was loose. No, the needle is just loosened, and will hold in place as you insert the needle into the patient's arm (because the pressure towards the needle holds it against the adapter and you don't realize that the needle is loose). But, when you load the tube into the adapter, the needle pops out, totally loose from the adapter. There you sit, the needle is in the patient's arm but the needle is no longer attached to your adapter. Uh oh!

4. The phlebotomist removes the colored cap by holding it at the base of the cap. If NOT-sterile gloved fingers are too close to the joint (where the cap meets the needle) when removing the cap, a loose glove may actually touch the needle without you even "feeling" it. (You could not feel it because – 1. Your sense of touch is impaired by the glove, and 2. If it is a loose piece of glove that is not touching you and your nerve ending, you would not be able to "feel" it). Touching the STERILE needle with

the NOT-STERILE glove results in a potential contamination of the needle with lethal pathogens, and therefore, a NOT STERILE needle.

All this constant talk about potential for infection. Forbes Magazine (June 19, 2006, pg. 62) has a very well written article about these very concerns. Read it, and then THINK about what I have been describing about non-sterile gloves and needles. And then draw your own conclusions.

So, when removing the colored cap from the needle, be sure that your gloved fingers do not in any way, shape, or form, touch that needle. And also be sure that you do not accidentally loosen the needle from the adapter.

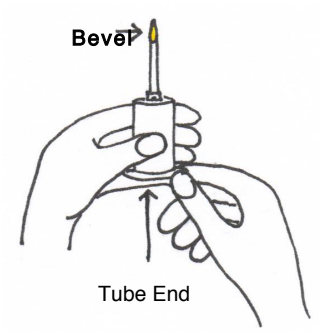
Now that we have the cap safely and appropriately off, and the adapter and attached needle in the correct position, we need to see if the bevel of the needle is in the **UP** position.

THE BEVEL

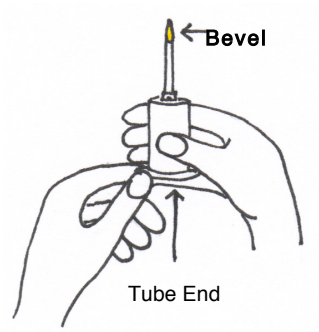
What is the bevel? It is the opening at the end of the needle.

To position this bevel up (as illustrated), hold the adapter and attached needle correctly with your dominant hand, and using your non-dominant hand rotate the adapter and attached needle from the tube end of the adapter - so as not to accidentally touch the needle with your NOT-sterile glove.

Left Handed



Right Handed



Why must the bevel be **UP**? To minimize the "pinch" felt by the patient, and to minimize the hole that the needle creates with its insertion and withdrawal through the skin and the vein wall.

With the bevel in the **UP** position (and the needle at the proper angle with the skin on insertion), it is the microscopic tip of that needle that penetrates and leads.

This means that -

- The patient will feel a pinch the size of the tip of that needle - microscopic! The rest of the tissue stretches to accommodate the increase in size of the needle as the remainder of the needle is inserted.

- The hole that is created on insertion and left behind upon withdrawal of that needle is microscopic - (the hole in the skin and the hole in the vein wall). These little holes will seal easily and quickly with a clot - resulting in no bleeding and, therefore, no bruising. (See the article on bruising.)

Now, let's describe the entry with the bevel **DOWN**.

First, LOOK at the bevel. See how large that opening is (this varies with the gauge of the needle). That is how big this whole event is going to be. Compare the microscopic tip to the huge bevel opening!!!!

As you insert the needle into human tissue with the bevel **DOWN** -

- You cut a hole the size of the bevel opening. Ouch!!!!! You went from a teeny tiny (microscopic) pinch to a huge PAIN.

- The hole that is created and left behind upon withdrawal is HUGE. This big hole will not seal easily or quickly with a clot, resulting in bleeding, and therefore, bruising. (See the article on bruising.) And again, remember that this huge hole is in the skin and in the vein wall.

Let's prove this. Place a folder down on the table for this demonstration. Draw two circles on it. Follow the diagrams below for right and left handed.

We are going to do two sticks into this folder, a stick in each circle. And, we are going to listen and feel as we do these sticks.

1. The first stick will be bevel **UP**.
2. The second stick will be bevel **DOWN**.

And, again, we are going to listen and feel as we do these sticks -

1. With the bevel **UP**, you will not hear or feel the stick.
2. With the bevel **DOWN**, you can **hear** and **feel** the stick.

Read this thoroughly before you begin, so that you can do all the steps in one continuous movement and be able to appreciate the difference.

1. Hold the adapter and attached needle correctly in your dominant hand.
2. Remove the cap (correctly).
3. Place the bevel in the **UP** position.
4. Place your support hand down. (See diagram.)
5. Place the tip of the needle to the folder in first circle.
6. Keeping the angle of the needle at 45°, listen and feel as you insert the tip into the folder. Stop as soon as you feel resistance.

Now back the needle out and prepare for insertion with the bevel **down**. (2nd circle)

7. Change the position of the bevel (correctly) to **DOWN**.
8. Place your support hand back down.
9. Place the needle to the folder in the second circle.
10. Keeping the needle at the same 45° angle, listen and feel as you insert the needle into the folder. Did you hear it?! Did you feel it?!

LOOK at the two sites.
Bevel **UP** - you can't even see where you stuck.
But bevel **DOWN** - reveals a huge tear!

If you were the patient, which experience would you want, bevel **UP** or **DOWN**?

Now let's talk about recapping this needle. In the real blood draw world you will most likely NEVER recap a needle (or shouldn't have to). You will dispose of the adapter and attached needle (needle down) into a sharps container.

But because we are going to practice with this needle over and over again, you need to know how to safely recap this needle, per OSHA standards and instructions.

1) With the adapter and needle remaining in the dominant hand,

2) Place the colored needle cap on the table with your support hand. (Let the colored cap lie on the table – do not hold it with the support hand.)

3) The dominant hand then introduces the tip of the needle into this cap. DO NOT try to scoop this cap UP.

4) With the tip of your needle safely in the cap, use your support hand to reseat the cap by holding the cap at its base (NOT from the tip of the cap). Stay put.

5) Continue to hold the needle end with your support hand and let the dominant hand unscrew the adapter from the needle.

   Not the other way around. DO NOT try to unscrew the needle from the adapter. You want your dominant hand to do the unscrewing. Your non-dominant hand doesn't do this function very well - it's a brain thing. (Try it.)

6) Once the needle is disconnected from the adapter, safely recap the white end by placing the white cap on the table with your dominant hand, and introduce the gray sleeve end into the white cap with your support hand. DO NOT scoop this cap up either. When the gray sleeve safely in the cap, use your dominant hand to reseat the cap by holding the cap at its base. And by the way, DO NOT transfer that needle from your support hand to your dominant hand to do the recap. Why? Because underneath that gray sleeve is another needle.

   Beneath the gray sleeve is the tube needle. It is the needle that the thick rubber top of the tube is inserted onto. This needle can be just as injurious and as deadly to you as the patient end of the needle. Just leave the needle in your support hand, and have your support hand introduce that gray sleeve covered needle end into the white cap. Use your dominant hand to reseat the white cap.

Thoughtfully practice this recapping over and over again till you are safe and skilled with this part of handling the needle.

(The butterfly needle, as mentioned in the beginning of this section, is reserved for pediatrics only and will be discussed in detail at a later time.)

7. Tube

As we discussed earlier, the blood is collected in tubes that are wedged on and wedged off the needle inside the adapter, and these tubes are vacuumed which means they suck the blood in.

The tubes are color coded, and specific color tubes are used for specific tests. The different colors indicate a certain chemical in that tube which will preserve the blood in a certain state so that the test can be run on it.

The speed at which a tube fills is dependent upon-

Number of ml(s) = amt. of vacuum
The gauge (size) of needle = size of the opening.
The bevel facing the canal = proper technique.

So, the 5 ml purple top tube fills at a certain speed with a 21g needle
vs.
the 5 ml purple top tube filling with a 22g needle

The smaller opening means slower filling. Keep this in mind if you are changing needle sizes from patient to patient. Experiment with this.

- Get out two needle systems - a 21g (green) and a 22g (black).
- Get out two 5 ml purple top tubes.
- Watch a purple top tube fill with a 21g, and then watch a purple top fill with a 22g, and notice which filled faster.

Pick up one tube of every color and find the "ml" amount on the label at the bottom. The new SST tube - the golden yellow top - is a 5 ml tube, the red top tube is 8.5 ml, and the light blue tube is 1.8 ml. Think back to when you filled your tubes with water using the same gauge needle but different colored tubes. You will recall that the speed at which the tubes filled varied from color to color. Here's why.

The amount of blood in ml(s) is equal to the amount of vacuum (the suck).
The tubes with more ml(s) have more vacuum.
The more ml(s), the harder the "suck", the faster the speed of the intake.

So, a 10 ml tube fills very powerfully in the beginning, and slows down as you get closer to full (or closer to 0 ml). And, the 1.8 ml tube fills very meekly - slow from the start.

Here's the concept: A powerful vacuum sucks hard and fast.
A weak vacuum sucks soft and slow.
The light blue top tube is the perfect example of a tube in evolution –

original tube	2nd generation	most recent tube
4.5 ml	2.7 ml	1.8 ml

The original tube with 4.5 ml of vacuum sucked hard and fast. So hard, in fact, that the first little RBCs that came into the tube came in so fast and so hard that they hit the wall and broke - HEMOLYSIS!

They wanted to fix this problem, and they figured out that the smaller quantity (smaller ml amount) came in softer and slower.

So, they created the next generation of light blue tubes - 2.7 ml tube. The blood did come in softer and slower, but hemolysis was still occurring, improved but still occurring. So, they recalculated and determined that the minimum amount they could "live with" and still get a good test result was 1.8 ml.

This 1.8 ml of vacuum very **softly**, **slowly,** and **gently** sucked RBCs in without breaking them. No hemolysis. Yea! They call this tube a "**SOFT DRAW TUBE**".

These soft draw tubes not only avoid hemolysis, but they also minimize the risk of "sucking the vein shut" with a too powerful vacuum.

Imagine using a 10 ml vacuum on a "frail, 90 year old, hypovolemic and varicosities everywhere" vein system. That powerful a vacuum could, conceivably, suck the vein shut. If ever there was a time to use that misused phrase "the vein collapsed", this would be the time. (But the vein didn't do it of its own volition - we sucked it shut.)

So, if you are in the middle of a draw and your tube stops filling before it is full, and you checked that the angle of your needle did not change (and, therefore, the bevel is still facing the canal), **DON'T** back out and start over.

Think. Which tube are you using? A high volume (ml) tube? If so, first try wedging the tube off (shutting off the vacuum), letting your vessel refill (if this was the problem), and then wedging the tube back on. If your tube starts filling again, then you will know that the vacuum in that tube was too powerful for your vessel and volume. It's okay. Just wedge the tube off and back on again (same tube – the vacuum is still there), until you have completely filled the tube.

Tubes are changing and are in evolution - the amount of blood (ml) is less, the thick rubber tops have a deeper recessed well, and the tube is taller, narrower and made of plastic instead of glass. These changes will lead to a huge improvement in the blood draw process as well as in the test outcomes.

More tube information will be given later in conjunction with the information on the laboratory requisition/tube detail and on butterfly needle systems.

Sharps Container

****

Although the sharps container is not a tool used to access the vein, it is a very important and necessary piece of equipment when doing blood draws.

The sharps container is used to dispose of **HAZARDOUS WASTE ONLY**!

What is hazardous waste? Any object that has bodily fluids on it.

- the needle
- the blood soaked wipe or cotton ball
- gloves – ONLY if they have blood or bodily fluids on them
- tourniquet – ONLY if there is blood on it

So, what DOESN'T go into a sharps container?

- gloves – if they do not have blood or other body fluids on them
- the band aid wrappers
- the tourniquet that does NOT have blood on it

- the needle caps
- the wrappers from a butterfly needle

The sharps container is, in and of itself, not cheap - **Don't fill them up with garbage.**
The disposal of that sharps container is not cheap - **Don't fill them up with garbage.**

How do we use the sharps container?

- The tip of the needle must be fully inserted past the lip of the container.

  You want the needle fully past the lip of the container so that there is no way you will accidentally drop that needle outside of the container when you let go.

- But, your fingers **CANNOT** be past the lip of the container.

  Your fingers cannot be past the lip of that container or you RISK getting stuck by a sharps (probably a needle) that could be sticking UP in that container.

As with all things regarding vein access, **THINK** while you are doing this function. It's a brain thing too, and requires your undivided attention while you are doing it – or you will get hurt.

Following the OSHA guidelines and instructions for using a sharps container is an absolute must – and it is the law!

I insist that the sharps container be **placed at your dominant side**. It can be on the floor or on the table if space permits. But, it absolutely must be –

- immediately at your dominant side, and
- on your dominant side

because running around with a potentially lethal needle is risky business.

If that sharps container is a distance from your blood draw station, you run the risk of injury in that distance. **MINIMIZE RISK** by placing that sharps container close.

Practice

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Take this information and skill instruction and practice.

Practice. Practice. Practice.

This skill is learned by practicing palpation and practicing with the tools;

NOT by practicing on a patient!

By the time you stick a patient, you will no longer be practicing.

Sticking a patient is “for real”!

Assignment:

1) **Practice the tourniquet** - on and off, on and off, over and over again.
   a) Practice on your leg, or b) Practice on a real arm.

2) **Palpate for veins AND palpate veins**, WET, using 70% isopropyl alcohol.
   (If you are practicing your tourniquet on an arm, get out the alcohol at the same time and palpate - ALL THREE SITES: antecubital, wrist, hand.)

3) **Practice drawing colored water or tea into new tubes and watch the speed at which the tube fills with liquid** as demonstrated in class and/or on the DVD. (Do not use soda because of the carbonation and do not use orange juice because of the pulp). Do this before you practice wedging tubes on and off. Remember, tubes are vacuumed! And they only “suck” once. If your needle tip is “in air” when you wedge the tube on, it will suck air. So, make sure your needle is fully submerged in liquid when you wedge your tube on, AND remember that the level of the liquid in your cup is dropping as your tube is sucking it up. The importance of this function is to watch the speed at which the tubes fill with liquid (and the meaning of this will be explained in a later lesson).

4) **Practice wedging the tubes on and off your adapter**. First, take the tubes you filled with liquid and empty them (pop the top off, pour out the liquid, and re-apply the top). Now, you can insert your needle (bevel up) into a cloth chair or cushion - so that you can watch the needle as you wedge your tubes on and off, making sure that you do not move the needle. Remember, the needle is in the patient’s arm! (Tubes were designed to be punctured once: therefore, the thick rubber tops wear out quickly and the tube will pop off your adapter all by itself after a few uses - this is cheating. When this happens, throw that tube away and get another one. You must wedge the tube off.)

What you have learned so far will be built upon in the following lessons. You must be skilled in each individual component before you can put the components into a process.

The Blood Draw Process

****

We will take the information on locating a healthy vein and the blood draw tools as discussed to this point and put it all into the blood draw process; a step by step instruction utilizing all of the information and techniques you have learned thus far.

After we have essentially memorized this step by step instruction, then we will perform a mock blood draw on a human arm to demonstrate how this blood draw process, step by step, really applies.

Start off by practicing these steps on your leg (thigh). It's okay. The tourniquet goes on your thigh the same way it goes on an arm. And we are pretending to locate a vein. The mission of this exercise is to perfect some of your skills with the tools and commit the step by step process to memory.

We memorize the blood draw process to insure SAFETY. You can reduce the risk of injury by being CONSISTENT with every blood draw. This consistency comes from practicing a routine.

We don't develop a routine so that we don't have to THINK,

We **THINK** every step of the way.

We develop a routine to be consistent: consistently safe and consistently skilled.

Practicing these steps this way will allow you to get very skilled with the tools and allows your brain to fully and completely memorize each step before you do a mock blood draw on a human arm.

This is the time that having an instructor directly observe, critique, and redirect your technique with on-the-spot correction of any flaws, is of the utmost importance.

To begin, have a seat, making sure that your knees are NOT underneath the table. You will need to place the tourniquet at the knee, and place the pretend insertion of the needle at the tourniquet allowing room for you to wedge tubes on and off the adapter.

The PRACTICE BLOOD DRAW PROCESS - Step by Step. . .

The following steps are a general overview of the blood draw process and are intended to be used for practice purposes at this point. When you have learned these steps, we will move on to the blood draw chair and do a mock draw.

1. Collect and count your tools.

2. Check the seal on the needle. (Pretend it's intact if you have been practicing with it.) Twist to break the seal, pull the white cap off, lay the white cap down, and load the adapter. Lay the adapter and attached needle down, and lay the tube next to it.

3. Apply the tourniquet.

4. Put the support hand glove on.

5. Pick up the alcohol wipe with the dominant hand (for this practice, do not open it). Pretend to clean your palpating finger first and then the antecubital region, AND then (pretend to) squeeze the alcohol wipe to leave the area wet with alcohol.

6. Your dominant hand index finger glides across the region pretending to palpate for a vein. Pretend you have located a vein - now dilate it, grade it, and landmark it. (Landmarking will be described in detail shortly.)

7. Put the dominant hand glove on.

8. With your dominant hand, pick up the adapter and needle, and holding it correctly, flip the hand over and pull the colored cap off. Lay the colored cap down.

9. Put your dominant hand back in the correct position and turn the bevel up.

10. Place the support thumb down. (Proper placement of the thumb will be described in detail shortly.)

11. Pretend to insert the needle into the vein.

12. Place the tube into the adapter and with proper technique wedge it on.

13. (Pretend the tube is full.) Release the tourniquet.

14. With proper technique, wedge the tube off.

15. Place the alcohol wipe over the insertion site, swiftly pull the needle out and immediately apply pressure.

16. Instruct the patient to apply pressure.

17. Safely recap the needle, unload it from the adapter and pretend to dispose of it (gray end down) into a Sharps container. (Remember, if this was a real blood draw, you would NOT recap the needle. You would dispose of the adapter and attached needle – needle down – into a Sharps container.)

18. Mix and label the tube (patient name, date and test) and rack it.

19. Ask the patient if they are allergic to band aids, and if not, apply the band aid.

20. Clean up your area.

To repeat this PRACTICE step-by-step process . . .

1. Safely recap the white end of your needle, so we can use it again.
2. Remove your gloves, inside out.

Now you can begin again.

Do not include these last two steps as part of the "routine", because these 2 steps WILL NEVER be part of the routine.

Do this routine (1-20) a few times and then let's add some information to each step.

The PRACTICE BLOOD DRAW PROCESS IN DETAIL - Step by Step . . .

We are now going to describe the practice steps again, but in great detail. You will learn the importance of each step and why the steps are sequenced the way that they are. This is the detail that you need know to insure safety and a successful blood draw.

1. Collect and count your tools.

   You always want to make sure that you have all the tools you are going to need for this draw. The time to discover you are missing something is before you start the draw, NOT while you are in the middle of the draw. There should be 7 tools (gloves count as one and tubes count as one.) Also, be sure to place the sharp's container immediately on your dominant side

2. Check the **seal** on the needle. (Pretend it is still intact if you have been practicing with it.) **Twist** to break the seal, then **pull** the white cap off and lay it down. Now load the adapter by **screwing** the needle into it. Lay it down and lay the tube next to it.

   Do not abandon your STERILE needle. If you load the needle and then have to leave the room, when you return you must dispose of that needle. You do not KNOW for certain what, if anything, might have happened to that needle while you were gone. To insure safety and to have complete knowledge that that needle is sterile, pitch the opened one and start over.

   Lay the loaded adapter down, going in the correct direction (needle pointing toward the patient. **Right handed** phlebotomists: Lay the tube to the left of the adapter, also going in the correct direction of the rubber top end pointing toward the patient. **Left handed** phlebotomists: Lay the tube to the right of adapter.

   The placement and direction of these tools are important because you do not want to spend a lot of time looking away from your intended stick site to locate these tools and/or reposition them for pick up.

   The loaded adapter is the first tool you will pick up when you are ready to draw blood. If you pick that needle up and have to turn it around or switch hands, it will result in the extra "handling" of the needle which will increase the risk of injury, contamination, and mishandling. Place the loaded adapter such that the dominant hand can easily pick it up. And, **do not** stand the adapter on its end - lay it down! As previously described in the tools section,

standing it up also increases the risk of injury.

3. Apply the tourniquet - snug, not tight!

Apply it as close to your knee joint as you can get it while still being on the thigh. You will need space between your pretend insertion site and your belly to load the tube on and off the adapter.

4. Put the support hand glove on. (That's your non-dominant hand).

Most employers instruct you to apply gloves at the very beginning of this blood draw process. (Remember, they think the gloves are "clean", and that the gloves will keep you, and the patient, safe.) But there are a couple of problems with this as previously described in the glove section.

- You can't **feel** with a glove on.
- Applying a tourniquet with gloves on is difficult. Try it! No matter how skilled you are, sometimes your gloves are going to get caught up in the tourniquet. You'll look more like Patch Adams than a skilled phlebotomist.

There's nothing wrong with "Patch Adams". In fact, if you are working with pediatrics you may even want that "Patch Adams" effect, to make the kids laugh. But adults probably won't find it funny at all. They may even find the "clownish" behavior perhaps concerning. If that draw doesn't go right, for whatever reason, they will remember one thing - "you clowned around throughout the whole draw...".

That's why I instruct you to apply your tourniquet <u>before</u> you apply either glove. And, remember, our tourniquet is SNUG, not tight, so we aren't causing any of the problems that those tightly applied tourniquets cause.

5. Using an unopened alcohol wipe. Pretend to clean your palpating finger and then the antecubital region with the alcohol wipe in your dominant hand, and pretend to leave the area **wet** <u>with alcohol</u>. Lay the wipe down.

The facilities that you may end up working for may use other agents to PREP the skin before a draw. That's okay. Still use the 70% isopropyl alcohol to LOCATE the vein, and then you can clean the site with their prep agent.

6. With your dominant index finger, glide across the wet antecubital area pretending to palpate for a vein. You will locate the vein, dilate it, grade it, and landmark it.

Glide first, pretending to feel for a "rope-like" structure. Remember, if there is no vein found with gliding, then you will begin to "press palpate" your way across the antecubital region feeling for that vein.

Pretend you have located a vein right on top of your leg, at the tourniquet. Now that you have located the vein, continue to palpate <u>it</u> to dilate it more. Next, grade the vein for firmness, size, direction, and depth, and landmark it. At this point, let's describe landmarking.

Landmarking

Recall that superficial veins come in three different depths -

- **shallow superficial veins** - visible as well as palpable. These veins sit so close to the surface that not only are they easily palpable, they are visible - you can see "blue".

- **average depth superficial veins** - palpable, but not necessarily visible. These veins sit a little deeper in the arm. They are very palpable, but they are not necessarily visible. You definitely CANNOT see blue. However, you may be able to see the impression of the vein on the surface of the arm - a sense that there is a "water balloon" sitting just beneath the surface.

- **deep superficial veins** - not easily palpated, and NOT visible. These veins sit very deep in the superficial tissue of the arm and cannot usually be palpated (felt) by the gliding technique. And, these veins are not visible AT ALL. These veins can only be palpated by "pressing" your way across the antecubital region.

Shallow veins can easily be seen, so you know where to stick. Average depth veins can usually be visually appreciated, so you know where to stick. But deep superficial veins usually do not give you a visible clue. So, you must now find a "clue", or create one, that will help you identify or landmark the spot beneath which the vein is located. Here are 4 ways to landmark.

1. Identify a dermal depression (microscopic dimple) on or near the vessel,

2. Identify a skin discoloration like a freckle on or near the vessel,

3. Create a fingernail mark directly over the vessel with the nail mark going in the same direction as the vessel.

4. Using a felt tip marker, place dots above and below the intended site of insertion, again in the same direction that the vein is running (**do not** insert a needle through a marker site).

You will develop your own "sense" of landmarking with experience.

7. Put the dominant hand glove on.

8. Pick up the adapter and needle with your dominant hand. Holding the adapter correctly, **pull** the colored cap off and lay it down.

9. Put your dominant hand with the needle and adapter back in the correct position.

Then position the bevel up.

Use the proper technique of turning this adapter from the tube end of the adapter, not the needle end, when positioning the bevel up.

10. Place the support hand down in proper position.

The support hand thumb is placed one inch down from the insertion point of your needle, going the same direction as the vein, and one inch over. **Do not apply pressure.** Just gently place it there in case it is needed.

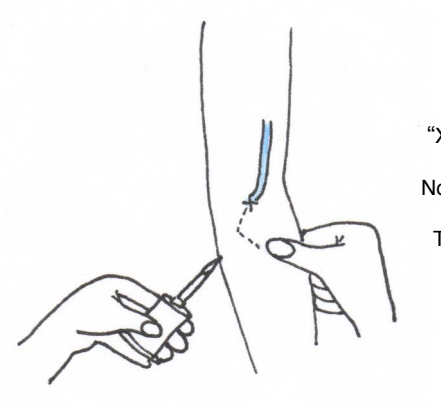
Let's describe the purpose of the support hand and its position in greater detail.

The Support Hand

The support hand is your NON-DOMINANT HAND, and it is going to "support" the nearby tissue while you are inserting the needle into the vein. The use of the support hand is described below, and technically speaking, it is actually the **thumb** that does the supporting.

To properly place the support thumb, tuck the four fingers to the patient's arm (not under the arm).

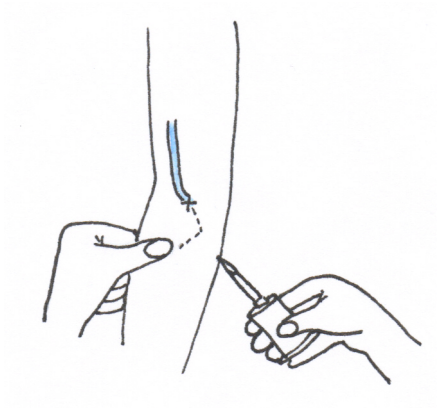
Once the four fingers are in place, and without leaning on them, bring the support thumb straight over and (barely) place it one inch down (same direction as vein) and one inch over from the intended insertion site.



"X" marks the insertion site.

Note the direction of the vein.

The broken line indicates one inch down, and one inch over.



Left Handed Phlebotomist

Place your right thumb (support thumb) one inch down and one inch to the **RIGHT** of the intended site of needle insertion.

Right Handed Phlebotomist

Place your left thumb (support thumb) one inch down and one inch to the **LEFT** of the intended site of needle insertion.

Just place your support thumb on the patient's arm, **barely** touching it.

DO NOT APPLY PRESSURE! **DO NOT PULL ON THE TISSUE!**

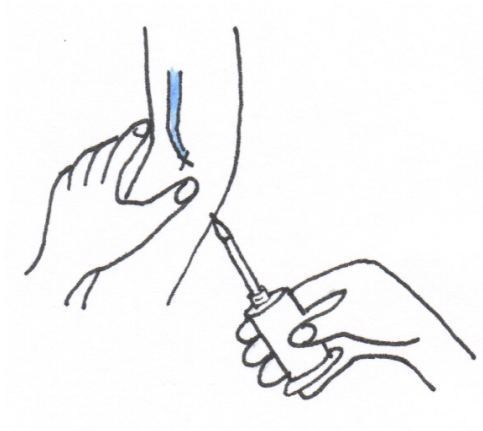
Just place your support thumb on the patient's arm, **barely** touching it.

The purpose of the support thumb is to support the tissue only and only if it is necessary. If the needle does not want to glide easily into and through the tissue of the arm (because it is dry, or leathery, or dehydrated. . .), then you will need to **press** straight down with that support thumb, anchoring the tissue as you now proceed to advance the needle in.

Don't confuse **this** instruction with a concept that should never be employed call "anchoring the vein".

#1 One way they teach you to anchor the vein is to place your thumb over the vein itself, just inferior to the site that you intend to stick. And they teach you to **pull** (down) on the tissue, "anchoring the vein" right before you stick the needle in it.

What's wrong with this picture?



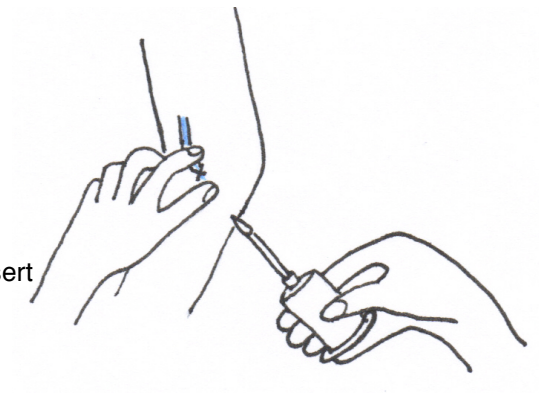
a) Stretching tissue stretches nerve endings. Stretched nerve endings cause pain signals to be sent to the brain. The patient immediately has an inherent sense of concern. Remember Fright and Flight Syndrome? Fear causes what?

b) If you introduce a sharp instrument into tissue while it is being tightly stretched, you will cause the tissue to tear. Albeit a tiny skin tear, it is still a tear and is not necessary. What is in skin? **NERVE ENDINGS!** That tear just caused more pain and more injury.

c) Once the needle is inserted, where is the needle with respect to that support thumb? The STERILE needle is either near or resting upon your NOT-sterile gloved thumb. This will contaminate your needle and set your patient up for an "acquired" infection - as organisms can march right down that needle and into the portal of entry you just created with your needle insertion.

#2 The second type of "anchoring the vein" commonly seen is when they have you place the support thumb on the vein beneath your intended insertion site and your support hand index finger on the vein above the site.

What's wrong with this picture?



The same thing that's wrong with the other one - only more exaggerated.

a) You will really tear the tissue as you insert the needle through that very tightly stretched skin.

b) Your index finger is in a great spot to get accidentally stuck!!!!

c) And, again, the gloved thumb can contaminate the needle.

#3 Finally, the third type of "anchoring the vein". There are some phlebotomist who place their support thumb basically where I have instructed you to place it - one inch down and one inch over. **BUT** instead of pressing straight down (when necessary), they will automatically, and on every draw, **PULL** the tissue to the side as they stick.

When you pull the tissue, **you pull the vein with it**, displacing the vein from its original position. There's an actual medical word to describe this DISPLACEMENT.

Phlebectopia.

It's true. It's in *Dorland's Medical Dictionary* 30th Edition, pg. 1423.

And when the phlebotomist puts the tube on and there's no blood in that tube, they look at the patient and, with disgust in their voice, they say "your vein rolled". Like it was the patient's fault! But it's not the patient's fault because **veins don't roll!**

In fact, there is no medical word for "rolling vein" in the medical dictionary. Why?

Because IT DOESN'T EXIST. **Veins don't roll!**

Veins Don't Roll

Anatomically and physiologically, it's not possible for a vein to "roll". Ask any anatomist and any physiologist.

Prove it to yourself by placing a long, skinny water balloon on the table. Have someone else place one finger at one end of the water balloon and another finger at the other end of the water balloon, and now place your finger on the water balloon and roll it.

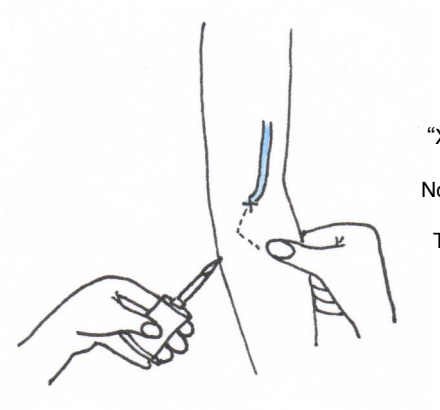
LOOK at it. The balloon twists on itself, doesn't it? Do you really think that this can happen to a vein? Did the water balloon roll and twist on itself all by itself? The answers are all NO! **Veins don't roll**

We, the phlebotomist, can displace the vein! When you pull the tissue to the side, you pull the vein with it, displacing it!

So, don't pull on the tissue. If you need to use the support thumb, press straight down, anchoring the tissue of the arm (not the vein).

Let's review. To properly place the support thumb, tuck the four fingers to the patient's arm (not under the arm).

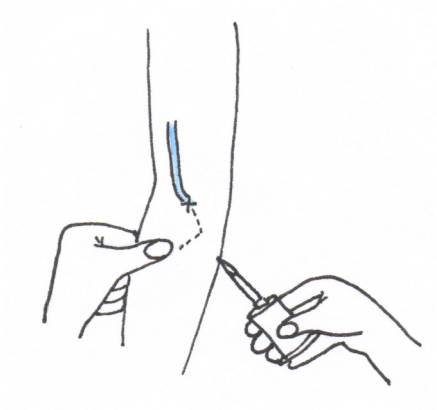
Once the four fingers are in place, and without leaning on them, bring the support thumb straight over and (barely) place it one inch down (same direction as vein) and one inch over from the intended insertion site.



"X" marks the insertion site.

Note the direction of the vein.

The broken line indicates one inch down, and one inch over.



Left Handed Phlebotomist

Place your right thumb (support thumb) one inch down and one inch to the **RIGHT** of the intended site of needle insertion.

Right Handed Phlebotomist

Place your left thumb (support thumb) one inch down and one inch to the **LEFT** of the intended site of needle insertion.

11. Pretend to insert the needle into the vein.

    Where on the vein do you insert the needle? At the lower end. Imagine you have palpated one inch of vessel length. Insert your needle at the lowest part of that segment so that you now have one inch of vein to work with and you know what direction it is going for that inch. If you insert high on that segment of vein, you will not know which direction the next inch of vein is going.

12. Using your peripheral vision, pick up the tube, and with the proper technique, wedge the tube onto the adapter

13. (Pretend the tube is full.) Release the tourniquet, and let it go.

    Do not put the tourniquet "away". The tourniquet is not important, the needle in the arm is.

    We release the tourniquet first, before removing the tube and before removing the needle. Why? BECAUSE we want the vein to return to its normal dimension to avoid

excessive bleeding when the needle has been removed.

Again, just release the tourniquet and forget it. **The needle is important!** The tourniquet is not.

14. With the proper technique, wedge the tube off.

15. Pick up the alcohol wipe and just place it over the insertion site.

DO NOT APPLY PRESSURE while the needle is in the arm, or you will cut the tissue as you remove the needle. Just place it there.

Then, in one continuous step, swiftly remove the needle, and then

immediately apply pressure.

Pressure is what stops the bleeding at the vein site and the skin site. If you do not apply pressure, the sites will continue to leak and/or bleed, and this will result in bruising. Bruising is not necessary or acceptable. At this point, let's discuss the bruise.

The Bruise

I have yet to meet a patient who said "Oh, I'm so glad I got that bruise." Have you ever had a patient tell you that? No. In fact, almost every patient complains about the bruise that was left behind after their procedure, as if they needed or wanted a reminder that's going to last for a few days, or a few weeks, until that bruise resolves.

The bruise can be avoided, and understanding how the bruise occurs in the first place, will tell you exactly how to avoid bruising.

According to *Dorland's Illustrated Medical Dictionary, 30th Edition*.

bruise (brooz) contusion. (pg 256)

contusion [L. contusio, from contundere to bruise] an injury of a part without a break in the skin and with a subcutaneous hemorrhage. Called also a bruise. (pg 414)

injury [L. injuria; in **not** + jus **right**] harm or hurt; usually applied to damage inflicted on the body by an external force. …. (pg 934)

(Did you catch the words "not right" in the above definition and "inflicted on the body by an external force"?)

hemorrhage (hemo + rrhage) the escape of blood from the vessels; bleeding. …. (pg 834)

We are the "external force", and we did something "not right" that caused bleeding that resulted in bruising.

You must be thinking, "Of course there will be bleeding from the vessel, I just put a hole in it with the needle in order to do the procedure. So therefore, bleeding is unavoidable". **WRONG!!!**

Do you recall your FIRST AID instructions regarding "bleeding"? Now, don't go off assuming that we're referring to a massive arterial bleed. A bleed can be little or big, venous or arterial.
So again, recall the FIRST AID instructions for stopping a bleed. **How do you stop "bleeding"?**

APPLY PRESSURE!

That's right, apply pressure. Applying pressure stops the bleeding, instantly! Applying pressure, ***until a clot can form***, results in no bruising.

How long must you apply pressure? Assuming normal clotting time for your patient, pressure must be applied for **1-3 minutes**; the time that it takes for clot formation to occur. This time, of course, will be longer if your patient is on blood thinners or has some other blood disorder that interferes with clotting time.

This explains why some patients end up with multiple bruises all over the hands, wrists, and arms. When the repeat multiple sticks were occurring for that single blood draw, pressure was NOT applied to each site after each stick. The sites (skin and vein) continued to "bleed" and this resulted in the bruising.

Well, bruises are **injuries**, and they can be **avoided**. You, and then your patient, must apply pressure to the site to stop the bleeding at both the skin level and the level of the vein, until clotting has occurred - before you move on to another next site.

How do you know for sure that enough time passed for the blood to clot? Observe the site. Lift the alcohol wipe up and count for 10 full seconds. If no blood rises to the skin surface, then it has clotted at the skin level and probably at the vein level, too.

DO NOT clean the site with that alcohol wipe to remove any smudge of blood left behind because this "cleaning" will move the tissue, tearing the clot apart, and the bleeding will start all over again.

Just leave the smudge of blood (if there is any), explain the "why" of it all to the patient, and leave the site alone.

Now you can apply the band aid, gently, so as not to disturb the clot.

16. At this point (before disposing of the needle), instruct the patient to apply pressure, for two reasons:

    a) It's a brain thing: **you can't do two things at once** (apply pressure and dispose of the needle - something will get cheated) so you ask the patient to apply pressure, because

    b) **It takes 1-3 minutes for blood to clot,** and you don't want to hold that potentially lethal needle for 1-3 minutes in mid air. So, ask the patient to apply pressure for these 1-3 minutes instead. Be sure that they understand the importance of **applying**

pressure.

- Holding the cotton ball is **NOT** applying pressure.
- Bending the arm is **NOT** applying pressure.
- Holding the cotton ball and raising the arm above the head is **NOT** applying pressure.

Applying pressure is **applying pressure**.

17. Safely recap the needle, unload it from the adapter and pretend to dispose of it (gray end down) into a sharps container. (Remember, if this was a real blood draw, you would NOT recap the needle. You would dispose of the adapter and attached needle – needle down – into a sharps container.)

    For practice purposes, lay the needle down (gray end still uncapped) on the table, and at the end of this practice blood draw process, we will come back to it and safely recap the gray end.

18. Mix and label the tubes with the patient's name, the date, and the test name. (The patient is still applying pressure to the site while you are doing this.)

    Medically and legally, tubes must be labeled in front of the patient. Avoid legal scrutiny and avoid error. (There is more to tubes than labeling, and mixing and other details will be described later.)

19. By now the site should be clotted – check that this is so, and then ask the patient, "are you allergic to band aids?"

    If the answer is NO, apply the band aid. If yes, apply a cotton ball at the site and wrap the area with cling.

20. Clean up your area.

The end of the practice Blood Draw Process, step-by-step.

To continue practicing, remove your gloves, safely recap the white end of the needle, and start the "blood draw process" over again.

Do these practice steps at least 7 times. And then, if you believe you've got it, verbalize the steps out loud while you execute each step, as if you were instructing someone else to do it. Have someone check your accuracy.

Once you have these steps down, we are now ready to take this blood draw process, step by step, to the blood draw table and perform a MOCK blood draw.

At this point, let's view the DVD that accompanied this book, and then practice your own mock draw. Have the on-site instructor critique your mock draw.

MOCK DRAW

Place the patient in the blood draw chair. Place their arm on the blood draw table in the proper position with that natural bend in the arm and the palm up.

Right Handed Phlebotomists:

- Place all of your blood draw tools on the left side of the patient's arm.
- Place your right hand on the patient's arm as if you had a needle in their arm.
- Spread the fingers of your left hand and place it over the tools on the left.

LOOK! Notice there is NOTHING to the right side of the patient's arm.
It's a brain thing!

Once the right hand inserts the needle into the patient's vein, your brain must stay focused on the needle. To accomplish this, you must keep all of your tools on the left hand side, or another way to state this is that NOTHING can be to the right of your right hand - this would mean that you have to cross over your right hand (with your left hand) to reach for tools. This act of crossing over your right hand causes two things to happen:

1) MOVEMENT - Your body executes a huge movement to reach over the right hand. Remember, there is a needle in the patient's arm, and any movement you cause will cause movement of the needle - OUCH!

2) As your left hand crosses over your right hand, your brain wants to go with the left hand (it now thinks that the left hand is the right hand, because it crossed mid brain). And if your brain (i.e. attention) is with the left hand, then who is in charge of the right hand with the needle in the patient's arm? No one! OUCH!

You can prove this for yourself. Place a tube on the right side of your patient's arm. Load your needle into your adapter, cap off, bevel up, support thumb down, and place your needle tip to a marked site on the arm. Just point the needle there and leave it - **DO NOT** stick them – just pretend you have inserted the needle into the vein. Now reach over with your left hand to get the tube - and stay put. From that position, look at your needle point - Did it move? I rest my case. Put all of your tools back to the "start" position.

Left Handed Phlebotomists:

- Place all of your blood draw tools on the right side of the patient's arm.
- Place your left hand on the patient's arm as if you had a needle in their arm.
- Spread the fingers of your right hand and place it over the tools on the right.

LOOK! Notice there is NOTHING to the left side of the patient's arm.
It's a Brain Thing!

Once the left hand inserts the needle into the patient's vein, your brain must stay focused on the needle. To accomplish this, you must keep all of your tools on the right hand side, or another way to state this is that NOTHING can be to the left of your left hand - this would mean that you have to cross over your left hand (with your right hand) to reach for tools. This act of crossing over your left hand causes two things to happen:

1) MOVEMENT - Your body executes a huge movement to reach over the left hand. Remember, there is a needle in the patient's arm and any movement you cause will cause movement of the needle - OUCH!

2) As your right hand crosses over your left hand, your brain wants to go with the right hand (it now thinks that the right hand is the left hand, because it crossed mid brain).And if your brain (i.e. attention) is with the right hand, then who is in charge of the left hand with the needle in the patient's arm? No one! OUCH!

   You can prove this for yourself. Place a tube on the left side of your patient's arm. Load your needle into your adapter, cap off, bevel up, support thumb down, and place your needle tip to a marked site on the

arm. Just point the needle there and leave it - **DO NOT** stick them – just pretend you have inserted the needle into the vein. Now reach over with your right hand to get the tube - and stay put. From that position, look at your needle point - Did it move? I rest my case. Put all of your tools back to the "start" position.

Let's do a mock draw.

1. Collect and count your tools, and place them on the correct side.
2. Check the seal on the needle; twist, pull the white cap off, and load the adapter.
3. Apply the tourniquet.
4. Apply the support hand glove.
5. Clean your palpating finger and the region with alcohol, and leave it WET.
6. Palpate for a vein: locate it, palpate it, dilate it, grade it, landmark it, line up with it.
7. Apply the dominant hand glove.
8. Pick up the adapter/needle, pull the colored cap off.
9. Position the needle bevel up.
10. Support thumb down.
11. Pretend to (swiftly) insert the needle into the vein. From here on out . . .

    KEEP YOUR EYES ON THE NEEDLE.
12. Using peripheral vision, pick up the tube, set it into the adapter and <u>wedge</u> the tube on.
13. When the tube has finished pretend filling, using peripheral vision, reach up and gently release the tourniquet, and let the tourniquet go.
14. Gently <u>wedge</u> the tube off.
15. Using peripheral vision, pick up the alcohol wipe, place it over the site, <u>swiftly</u> remove the needle, and <u>immediately</u> apply pressure.
16. Have the patient apply pressure.
17. Now you are free to safely recap the needle, unload it and pretend to dispose of it (gray end down) into the sharps container at your dominant side foot.
18. While the patient is applying pressure, mix, label, and rack the tubes.
19. Ask the patient if they are allergic to band aids or tape; if not, check for clotting and apply the band aid.

20. Clean up your area.

Repeat this over and over again. Practice on both arms of your patient. Turn them around and do the other arm - #1 for practice, #2 because both arms aren't the same, #3 to discover that you don't have to move all of your tools to the "other side" - they remain in their correct position, just the patient's position changes.

This mock blood draw truly reflects the real event almost in its entirety. You should **really** be palpating for a vein, locating the vein, palpating the vein to dilate it, grading the vein, determining the vein's direction and lining up with it, determining the vein's depth so you can start thinking about the angle of entry of the needle and where on the vein to insert the needle, and then running through the blood draw process as if you are really doing it. The only thing you **do not** do "for real" with the mock draw is stick the patient. We're not ready for this yet. There are a few more details that must be covered.

But this is the logic behind the mock draw. The skill part of the blood draw process remains consistent from draw to draw to draw . . . the technique for locating the vein and grading it, the use of the tools, and the order described are consistent **every time**. This "skill" part does not change.

The part that does change is the patient - and **every one** is different. In fact, remember that even both arms on the same patient are different. Just take the **facts** that you were taught about locating a vein, and **apply these facts** to each patient, to each arm, to each draw.

Maximize your success percentages by nailing the one thing that you do have control over - the blood draw process:

THE BLOOD DRAW PROCESS IS THE ONE CONSTANT.

PALPATING PROBLEMS

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As you continue to practice the mock blood draw on human arms, you are getting an opportunity to do a lot of palpation. And, you probably have come to discover that this part of the blood draw can occur quickly, which is usually the case, or it can take a while. The reality is that you will spend whatever amount of time it takes to locate that vein . . . because you can't stick if you don't know where to stick.

But sometimes, the palpation process can be a challenge. So, let's describe a few things here that might be helpful to you with your "real" blood draw experiences. I call these challenges "palpating problems".

If you are ever in a situation where you have palpated both antecubital regions and both wrists and still can't "feel" a vein, here are a few things to consider:

1. FEAR - Not your fear, but the patient's fear - fear of the blood draw. Remember the Fright and Flight Syndrome. Fear causes vasoconstriction, just like pain and just like cold. If a patient's fear is big enough, it may be able to cause vasoconstriction. Vasoconstricted veins cannot be palpated because there is no blood there (it's all in vital organs - remember?).

You now know from the Fright and Flight story that whenever nature vasoconstricts, it always vasodilates, later. But, if you would like to speed that process up a bit, give the patient something else to think about besides the blood draw. Ask them to think of their children or grandchildren, or their favorite vacation spot, or where they're headed when they leave us . . . anything that will take their mind off of the draw. This should result in the relaxing of their face muscles and the color returning to their face . . . and now you should be able to "feel" their veins.

2. HYPOVOLEMIA - (low volume). Someone told your patient to fast for their test. They told your patient, "nothing to eat or drink for 12 hours, including no water!" Boy, was that the wrong instruction. True - your patient cannot have anything with calories to eat or drink, **but your patient can have water.** In fact, your patient should have water.

Here's the explanation: The body has 5 quarts of blood. (Imagine a quart of oil.)

Now imagine 5 quarts of blood:

946 ml = 1 qt.

That's not a lot of blood, but that's all we need, and it's enough to "feel". But here's what happens when the patient is fasting and doesn't have water for 12 hours.

To maintain the 5 quarts of blood, we must drink approximately...

2500 ml(s) of fluid per day
(that's 5 little water bottles)

500 ml = 1 bottle

So, the patient who has been fasting and has not had their water (the night before the test, during the night and the morning before their test) is missing at least 1 bottle of water (500 ml), and, if they are normally good water drinkers, they may be missing as much as 2 bottles of water - that's a lot a fluid compared to the five quarts we previously described. We won't call them dehydrated, but we will call them HYPOVOLEMIC, low volume. Now we can't "feel" the fluid (blood) in their vein.

So, how do you fix this while they are sitting in your blood draw chair?

a) Give them water. How much? One of those little 500 cc water bottles would be just right. Have them drink it all.

b) And then, send them out to the waiting room for 15 minutes – not less than 15 and not more than 15 minutes. Why? It takes the gut about 15 minutes to absorb the water, placing that water in the blood stream

where you can now “feel” it.

If you wait longer than 15 minutes, the blood will filter through the kidneys, and the water will be extracted and put in their bladder - it won’t do you any good there . . . unless you want a urine specimen from them.

3. NICOTINE - Where do you find nicotine? In cigarettes! And what does your patient
have to have right before you stick them? A cigarette! (Their “last” cigarette, like you’re going to kill them!) And what does nicotine do to a blood vessel? It vasoconstricts it - just like pain, just like cold, and just like fear. It takes about 30 minutes for the affects of nicotine to wear off. So, confiscate their cigarettes, and then send the patient out to the waiting room for 30 minutes.

Here’s the good news: You will **rarely** not be able to “feel” a vein - **rarely**. But if you can’t “feel” a vein, assess the three things we just discussed – fear, hypovolemia, and nicotine - and make those corrections. This should fix your palpating problem.

If you still can’t “feel” a vein, you have to consider that your “feeler” isn’t working right that day. Maybe you slightly burned your finger the night before while cooking. or maybe it is swollen from too much hammering (microtrauma). In any case, if you can’t “feel” a vein, I advise that you do not attempt the stick, and get someone else to perform the blood draw. Always set yourself, and your patient, up for success.

PROBLEMS DURING THE BLOOD DRAW

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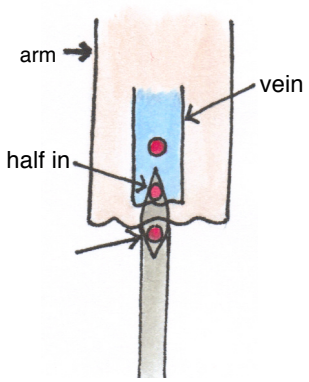
While we are discussing problems that may occur, let’s discuss some things you may see during a blood draw.

A) A bead of blood bubbles up at the bevel.



Here is an arm with a vein sitting very close to the surface (a shallow superficial vein), one that you can easily “feel” and that you can easily see.

As you are inserting the needle into this vein, at some point, the bevel will be half way in (the tissue) and half way out

half out

(still outside of the tissue) . . . because, the **length** of the bevel can be longer than the width of the dermis, the subcutaneous tissue, and the vein wall put together. At this point the bevel makes a conduit (a canal) that allows an opening between the blood in the vein and the outside, and blood can escape through that conduit. If you stop the insertion of the needle to watch this drop, you will now have a small pool of blood . . . so just keep on inserting.

This can occur if:

- You insert the needle too slowly, which allows time for this escape of blood to occur . . . how cruel would it be to **slowly** insert a needle through nerve endings?

  Nature is so smart. Insert **SWIFTLY**! This reduces the timely likelihood of blood being able to escape. And this swift insertion avoids pain. In fact, it results in only a "pinch", as previously described under the needle section.

- If the tourniquet is on too tight and overdistends (overfills) the vein with blood and creates a high pressure of blood within that vein, blood will forcibly escape from that site. A **SNUG** - not tight - tourniquet will keep the vein wall and its pressure normal and minimize this possibility of escape.

However, if with a SNUG tourniquet and a SWIFT insertion you still see a bead of blood, it's okay. You didn't necessarily do anything wrong. This can normally occur, and your alcohol wipe will absorb this drop of blood at the end.

There are only 2 swift movements in blood draw:

swiftly in with the needle,
and swiftly out.

Blood draw, as a whole, is a slow and thoughtful process. In fact, it only moves as fast as YOUR brain can safely, thoroughly, and proficiently take YOU through it. Therefore, FAST is not the mission. Safety, skill, and success are the mission.

And as previously mentioned, SAFETY is always first.

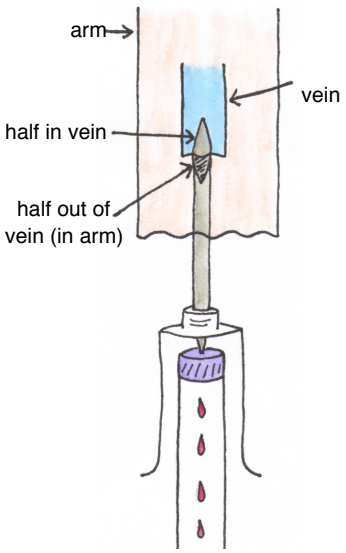
However, there are two steps in blood draw that must be SWIFT. The needle must be swiftly inserted and swiftly removed. There are nerve endings in the skin and blood vessel wall, and to move SLOWLY through nerve endings with a sharp instrument (the bevel of the needle) would be cruel.

So, by inserting swiftly, your needle should practically penetrate skin and vein wall simultaneously, and if your bevel was up and only the tip touching and leading as you inserted your needle, your patient will experience only a slight pinch or nothing at all. The same is true when removing the needle - swiftly out.

Swiftly in with the needle and swiftly out with the needle are the only swift movements in the blood draw process. Every other step is thoughtful and should take the time that it takes you to think it and then execute it skillfully. Thoughtful deliberation and execution as you perform the entire blood draw process in front of your patient and on your patient will demonstrate to that patient that you are skilled, professional, and trustworthy.

And these are exactly the qualities that all patients LOOK for and hope for in their health care providers.

B) Your tube is not filling as fast as you know it should.



This second diagram depicts an arm where the vein is deeper in the arm. You can't "see" it, but you can easily "feel" it, and you know where to stick. So, you insert your needle (swiftly).

You put your purple top tube on, but your tube is filling **slowly** - slower than you know that purple top should fill (for a 21g needle).

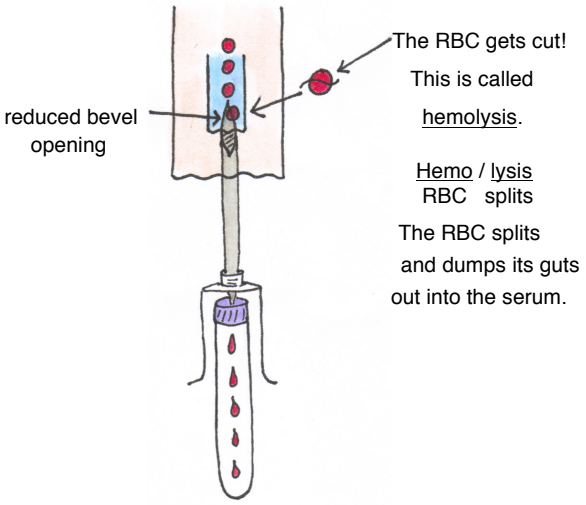
What has happened - and you can't see it because you can't see the bevel while it is fully in the arm - is that the bevel is only half way in the blood vessel, and the other

half of the bevel is out in the tissue of the arm. You have, in essence, reduce the bevel opening - it's no longer a 21g opening, but may be as small as a 23g opening. So, blood cannot be sucked in as quickly through that small opening - and the tube fills **slowly**.

Don't just sit there and watch it fill slowly. You must place your support thumb back down on the patient's arm and advance that needle in further, until you see that the tube is filling at the speed you know it should. Why?

Little red blood cells are a certain size (adult RBCs vs. infant RBCs), and the bevel opening must be a certain size to accommodate the passage of RBCs into the needle shaft without damaging them.

This reduced bevel opening can result in damage to the RBC as the cell gets caught between the needle's sharp bevel edge and the wall of the vein.

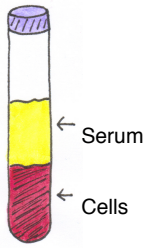


Recall that blood is made up of:

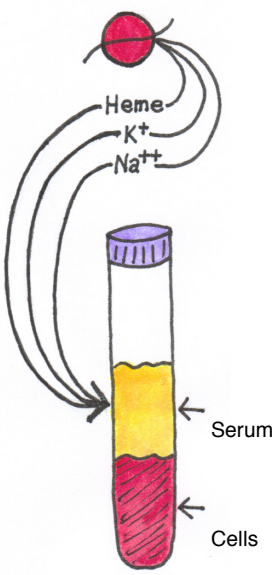
SERUM	and	**CELLS**
liquid part		solid part
clear yellow		red

Centrifuging Process

I need to describe the separation of serum and cells through the centrifuging process at this point because with most blood tests, we are analyzing the serum. To get to the serum, we place the tube of freshly drawn blood into the centrifuge, and this process of rapid spinning will cause the heavier part of blood, the CELLS, to go to the bottom of the tube, and the lighter part of blood, the SERUM, to remain on top. So, now we can clearly see the SERUM, and it should be a clear, yellow, slightly thick liquid. Should be.



But when the CELLS split and dump their guts out into the SERUM, the appearance of the SERUM changes. It is no longer clear yellow.



One of the elements in the guts of the RBC is **Heme**. Heme is "red" in color, and it is what gives the RBC its color.

When this heme ends up in the serum, the serum is no longer clear yellow. The serum now appears "bloody". (It looks like "bloody urine".)

When the lab technician sees "bloody" serum, they call that a **HEMOLYZED** specimen.

And do you know what they do with that tube of blood? They pitch it. And then, they tell you to go stick the patient again. Why? Because there are more elements in the guts of that RBC than just heme.

Also found within the little red blood cell (RBC) are elements such as -

Potassium (K^+), Sodium (Na^{++}), Chloride (Cl^-), etc., etc., etc.

These are all the very elements we normally test the serum for, but this HEMOLYZED specimen will now have elevated **(falsely elevated)** levels of . . . potassium, sodium, chloride, etc., etc., etc.

The doctor cannot make medical decisions based upon these false numbers. So, the blood is pitched into a sharps container, and you are sent back to draw another specimen.

So, if your tube is filling slower than you know it should, adjust that needle, immediately!

Note: This is why you were given instructions earlier to fill the different colored tubes with water, and to watch them as they fill, visualizing the speed at which the fluid entered the tube. **This filling speed is a predictable event, based upon the gauge of the needle and the tube you are using.** (Technically speaking, it is the volume amount in ml(s) reflecting the amount of vacuum specific to each color of tube that also controls the speed at which fluid enters the tube). Again, tube detail will be discussed shortly.

C) You are in the middle of a draw, getting blood, when all of a sudden your tube stops filling? (This is where they use "the vein collapsed" cliché.)

There are several explanations for what might have just occurred here (and the vein "collapsing" is not one of them), but I'm going to describe the one that is the likely culprit.

> You should be leaning out, down, and onto your dominant hand once you are in the vein with your needle so as to stabilize the dominant hand before you wedge a tube on.
>
> The most important part of that stabilization process is for the phlebotomist to straighten up and lean over the needle and onto that dominant hand – without a death grip on the adapter. When you do this maneuver, the needle remains stationary in the vein with the bevel at a 45º angle in the lumen of the vein, and the bevel faces only blood. So, when you put the tube on, the vacuum only sucks blood.
>
> If you are not leaning over and onto your dominant hand, then you are probably out there "hanging on" by a fingernail while you are wedging the tube on (and off). And unfortunately, if you are "hanging in mid air" then the tendency is to lower (the angle of) the needle. This now places your bevel facing the anterior wall of the vein and not facing the blood in the canal. So now when you put your tube on and the vacuum starts sucking, the possibility of sucking the vein wall into the bevel opening (corking it off) is great. If your vacuum is sucking the vein wall, you won't be getting any blood, and your tube stops filling. If this happens to you, don't back out and start over.

First, try leaning forward and pointing down with your needle. This may release the wall from the bevel.

If that doesn't work, then wedge the tube off of the inner needle (not completely out of the adapter) to stop the vacuum (the sucking), and the bevel will turn loose of the wall. Now that the bevel is free from the wall, point the needle down and wedge the tube back on. This should fix the problem.

> Analogy: Just like vacuuming at home when you accidentally suck up a sock, you could pull the sock out while the vacuum is still sucking, OR you could turn the vacuum off and release the sock. Which method will work better? I hope you said "turn the vacuum off"!)

One other problem that can occur by not leaning into that draw is the tendency to rock back, ever so slightly, but enough that your needle backs up with you - and that tiny distance can be the difference between being in the vein or out of the vein. Lean into your draw. That doesn't mean lean on the needle.

Absolutely DO NOT lean on the needle!

Lean into your draw means: lean over your needle (literally, your head should be positioned directly over the site of the needle insertion), and lean onto your hand, while the needle is lightly and gently being held by your fingers (NO death grip on the adapter).

Again, these are situations you might experience during a blood draw, but with this information you will be able correct them during the draw, avoiding the need for a second stick.

THE VEIN BLOCK (OR TISSUE FLAP)

****

Now I want to introduce a teaching tool that can be used to demonstrate some of the very Laws of Physics (nature) that you will experience with a human draw. This tool is called a vein block or a tissue flap. And, we want to make sure you have the right kind.

In the beginning, there existed a vein block where the veins were visible and visibly palpable. What do I mean by this? If you were to LOOK at this vein block, not only could you see the "blue" of the veins, but you could also SEE the raised impression where the veins actually sit in that block - in other words, visible bumps. Also, these original veins blocks were made of a very pliable material.

Later on, vein blocks started to change. They got "hard". The material they were made of was no longer pliable - it is just plain "hard". And, the veins were situated deeper in this block of hard material such that you could no longer SEE the impression of veins on the surface - in other words, the surface was now flat and smooth. However, these vein blocks pronounced the "blue" even more. People who use these blocks **LOOK** for veins - they **don't "feel"** for veins.

So, first and foremost, you must have a **palpable** vein block for this first demonstration. This means that the veins in that block must be **palpable** - not just visible. So, close your eyes, and if with your eyes closed you can "feel" the veins when gliding across the surface, then you have a palpable vein block.

Now that we have determined we have the correct vein block, we are ready for this demonstration. What are we demonstrating? How wonderful alcohol is as a palpating tool!

WITHOUT Alcohol

1. Glide across the tissue flap.
2. "Feel" the bumps where the veins are.
3. Notice the "grab and drag" of your finger as you move across the flap.
   At first it feels sticky - but tap it - it's not sticky.
   So, what is this "grab and drag" - FRICTION.

WITH Alcohol

1. Glide across the tissue flap. WOW!!!!!
2. "Feel" the veins now - they feel huge and very discernible.
3. No more "grab and drag"!

ISN'T ALCOHOL A WONDERFUL PALPATING TOOL?!!!!!!!

No matter what agent you clean your site with - before you stick it, you **must** locate the vein using **70% Isopropyl Alcohol!**
There are some other fun things you can do with this block that will extend your education on this skill of phlebotomy.

Think about this first. As the needle travels through human **tissue** (skin, subcutaneous tissue, and finally the vein wall), there is that "grab and drag" friction sensation on this needle - UNTIL - the needle "pops" through the vein wall and into **liquid** - at which point you immediately experience the sensation of a "give". **(This sensation can best be appreciated if you "swiftly" insert the needle.)**

As a solid mass (the needle) passes through another solid mass (the tissue),
FRICTION (grab and drag) is created,
until the solid mass (needle) enters into liquid (blood),
then you feel the "give" (no more friction).
This is Physics!

You can actually experience this same sensation with this vein block because the Laws of Physics apply to all structures, natural and man-made.

So, whether you have an original vein block or a later version, this demonstration will still work. The original vein block feels closer in magnitude of the "give" to a human, than the magnitude of the "give" with the hard vein block which is very pronounced. But, nevertheless, you can feel the "give".

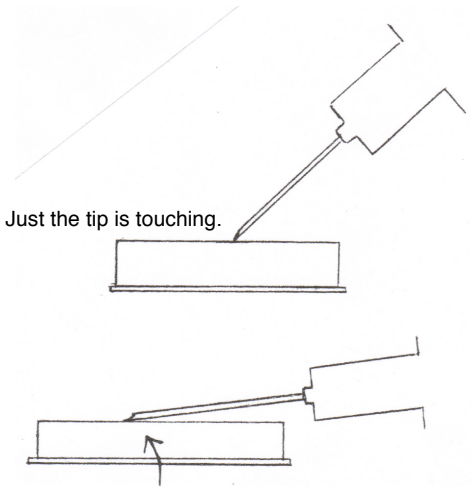
Instructions:

1. Load your adapter with your needle.
2. Cap off and bevel up.
3. Support thumb down on the vein block.

Before you do step 4 - read this:

When you go to insert the needle into the vein block, be sure that just the tip of the needle is touching the vein block.

If you drop the angle of the needle at all or lean on that needle at all, then more of the back surface of the needle will be touching the vein block. This will be creating more FRICTION grab and drag on the extra surface of the needle as it is inserted into the tissue.



a) This will cause more discomfort to the patient.
b) The entry of the needle will drag and feel "harder" and be slower.
c) You won't feel the "give" because of all the friction drag.
d) And, if all of this occurred because you leaned on the needle as you inserted it, you (and the patient) will see the needle actually bend!

4. With the needle at a 45º angle to the vein block, place the tip on the tissue flap and then swiftly insert the needle. Did you feel the "give"?

   If not, do it again. Do it a couple of times, correctly, to fully appreciate that sensation.

   Now, do it incorrectly - with more of the back of the needle touching the surface of your vein block and slightly leaning on the needle as you enter.
   (Just describing that sounds awful!)
   Could you feel the drag? Could you feel the "give"?

This demonstration should convince you of two things:

First, that a "give" can usually be experienced as your needle enters a vein. This little indicator also tells you when your bevel is in the lumen of the vein. If you pay attention for this "give" and stop the insertion of your needle (immediately) when you feel the "give", your bevel should be properly placed in the vein every time (given you have the right gauge needle for that particular sized vein). No "halfway in and halfway out" of the vein with that bevel.

> Insert the needle within 1/4 inch of the top end of the vein in your vein block and when you feel the "give", stop immediately. Support your needle in that position, and lift your vein block up. Now LOOK in the lumen of the vein and SEE where your bevel is positioned. It should be dead center, with the bevel facing the canal.

And second, never lean on that needle when you are inserting it into the patient's arm. Leaning (even slightly) will bend the needle, depress the patient's tissue, drag the needle as you enter the tissue (creating friction grab and drag), cause more discomfort to your patient with that insertion, and prevent you from feeling the "give".

Another fun thing you can experience with the palpable vein block is differentiating, by feel, the difference between the shallow superficial vein, the average depth superficial vein, and the deep superficial vein. Here's how:

1. Take a real tourniquet and fold it into thirds (3 pieces thick).

2. Place the folded tourniquet over one end of the vein pad.

3. Wet two areas with alcohol: where the tourniquet is and where it isn't.
4. To feel an example of a **shallow superficial vein**, glide over the part of the vein block where there is no tourniquet. It is very palpable and visible.

5. Next, to feel an example of an **average depth superficial vein**, glide over the part of the vein block that is covered by the tourniquet (in other words, glide over the tourniquet section). It is still palpable, but not visible.

6. Next, to feel an example of a **deep superficial vein** (you can't feel these by gliding), you must press (bounce) on the vein. The deep superficial vein has the same consistency or resiliency of bounce as the vein with the tourniquet over it. So,

    a) Bounce first on the large vein with the tourniquet over it. There is a "dull" bounce.
    b) Bounce on the large vein where there isn't a tourniquet. There is the "expected" bounce.

    The "dull" bounce is what a deep superficial vein bounce feels like. To convince your brain that it really is a water balloon bounce and you really are over a vein, give your brain a whole new reference for discerning that bounce. Here's how:

    Working strictly with the area that is covered by the tourniquet -

    - Palpate the vein (by bouncing) - a "dull" bounce, not pronounced.
    - Step off to one side or the other and palpate there - flat/hard.
    - Now come back to the vein and bounce - now the bounce is discernible.

    You gave your brain a new reference for comparison. This method for discerning a deep vein works the same in the human arm as well.

Blood draw is Ballet, not Riverdance!

The process of drawing blood should be a gentle one, from start to finish.

From the time your patient walks through the door -
And you acknowledge their name, off the requisition.
And you properly place them at your blood draw station.
And you determine the tubes you need from the requisition.
And you thoughtfully count your tools and place them in order
on your blood draw table, next to your patient's arm.
And as you begin the blood draw process, step by step -
gently loading that sterile needle into the adapter,
placing it next to your patient's arm, and placing
the tubes in the order of the draw next to the needle;
gently applying that tourniquet (snug, not tight);
gently applying that support hand glove;
gently cleaning the region, palpating, locating, dilating,
grading, and landmarking the vein;
gently applying the dominant hand glove, and thoughtfully
handling the needle, uncapping it, and checking the bevel;
gently placing the support thumb down.
And swiftly and gently inserting the needle into the vein;
gently wedging the tube on . . . (on an off for multiple tubes);
gently releasing the tourniquet while on the last tube;
gently wedging the last tube off.
And swiftly removing the needle and gently applying pressure.
As you then thoughtfully dispose of the needle and adapter.
And gently mix the tube(s) and thoughtfully label the tube(s).
And then thoughtfully check the site for clotting.
And patiently explain to the patient on how to avoid bleeding and bruising.
And then gently apply the band aid.

Be Thoughtful and Gentle.

Be kind to the vein and to the patient; and the vein and patient will be kind to you.

Practice! Practice! Practice! Practice!

Practice the “blood draw process, step by step” over, and over, and over again.

The step by step blood draw process and the palpation technique are the skills of phlebotomy. Practicing these skills at the table is where you get good at blood draw - NOT by practicing on patient. These skills are the part of blood draw that is CONSISTENT every time.

Practice these skills so you can minimize the risk of injury, perfect your skill, and maximize your success rate on first stick draws.

PRACTICE!! . . . . . .

PRACTICE!! . . . . . .

PRACTICE!! . . . . . .

Natural Stick Ability

****

Let's check your "**natural stick ability**". We are trying to mimic the exact same stance as in a real draw, so begin by standing in front of a waist high stack of chairs or kneel down in front of a chair. (Do not lean over to a seat cushion from a standing position.) Now we're going to stick the seat cushion of the chair.

Get your adapter and attached needle and let's do this.

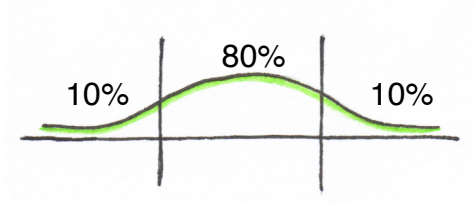
1. Cap off.
2. Bevel up.
3. Support thumb down.
4. Insert the needle into the chair (seat cushion).

Stop! And leave the needle exactly where it ends up.
Don't remove it, don't adjust it. Just remain right there!

I have each student do this, and I make some observations about the insertion as well as the final status of that needle in that chair.

Here's the story. Phlebotomists fall into one of three categories for stick technique. I separate them into the groups as they demonstrate their "natural" skill.

In statistics, there's an entity called a Bell Curve.



Phlebotomists follow this naturally occurring phenomenon, and their stick technique falls into one of these three groups.

Group #1 - 8 out of 10 students end up in the middle (average) group. When they look at their 1½ inch needle at the end of this stick, there is approximately 1 inch of needle still out and a ½ inch of needle in the chair. (Now the vein isn't ½ inch in the arm, it's because we are inserting that needle at an angle – right? The vein is approximately ¼ inch in.) Now, nobody told them to do that. Nowhere have I even discussed this aspect of phlebotomy yet. So, how did they know to insert the needle this far and stop? They didn't know. They just did what came "natural" to them.

Here's what's so fun! In 80% of all the patients they will stick, this is exactly where the vein will be located.

These 80% of patients also represent the "average", and to be exact, it is that "**average depth vein**" that we described under vein anatomy. (Recall that veins come in three depths: shallow superficial vein, average depth superficial vein, and deep superficial vein.) And as I told you then, the "**average depth veins**" represent about 80% of the palpable veins you will locate.

Isn't Nature smart? How fun that 80% of all phlebotomists will be sticking 80% of the blood draw population that has a vein at the exact spot where nature told them to stick that needle!

I didn't make this up. It's statistics, math, and the mathematic laws of nature.

Group #2 - 1 out of 10 students steps up and barely inserts the needle. When you look, you see approximately 1¼ inch or more of needle out. That means that they only inserted about ¼ inch of needle. Why? Because they're afraid, afraid they're going to hurt the patient. So their brain tells them "Don't go too far!" and "Go slow!".

Well, the good news is that these phlebotomists are so gentle that the patient won't even know that they've been stuck (not even a

pinch is felt). However, the bad news is that in those "80% patients" who have the average depth veins, this phlebotomist won't be in far enough. So, when they put their tube onto their adapter, they won't see blood. They will need to place their support thumb back down and continue to advance their needle in just a little bit further.

The patient population that has a **shallow superficial vein** will be just the right patient for this phlebotomist, but the **shallow superficial vein** only represents about 10% of the blood draw population.

This phlebotomist needs to focus on "the give" that is usually felt when the needle penetrates the vein wall and moves into blood. They will need to override their brain's natural instincts and instructions to go slow and shallow.

Group #3 - 1 out of 10 students step up to the chair and **(more than swiftly)** inserts and **buries** nearly the whole needle. This is scary! When you look at their needle, you see only a ¼ inch (of that 1½ inch needle) still out. They have buried 1¼ inch needle into that arm.

These people **really** need to focus on "the give" and override their brain's natural instincts to aggressively bury the needle. They are just as afraid as those in group 2, but these guys just want to "get it over with" and consequently insert too fast and too deep.

As with the other groups, there are a group of patients and veins that fit with this type of phlebotomist. They are the **deep superficial veins**. But keep in mind - these only represent about 10% of the vein population. Remember, most of our patient population has average depth veins and some have shallow depth veins. **And** what's on the other side of the vein in that arm? Muscle, tendons, nerves, arteries, DEEP veins, and bone. We don't even want to stick these structures!

With all types of phlebotomist and with all sticks, the phlebotomists should be focusing on feeling for "the give", not focusing on how much needle length is in or out of the arm, or trusting their natural instincts to stick.

The point of this section was to:

- Identify the three types of phlebotomist.
- Make students realize they should focus on the "give", regardless of their group and natural instincts.
- Realize that even if you are in one of the extreme (10%) groups, you can still be a skillful phlebotomist.

Now, look at your needle in your cushion. Which group do you fall into?

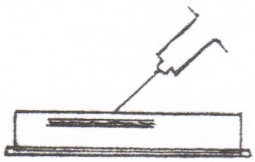
Needle Insertion and Positioning

****

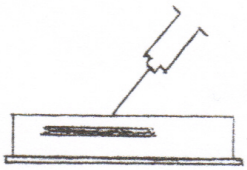
Angle of Entry of the Needle: Now that you are grasping the concept of shallow superficial veins, average depth superficial veins, and deep superficial veins, let's discuss the proper angle of entry of the needle for each type of vein.

Again, for those with natural instincts, you will automatically adjust the angle of the needle as you approach that vein for insertion based upon the depth of the vein. For those of you who have to "think" about it, here are the facts that will help you understand the concept.

shallow veins sit close to the surface. To reduce the friction grab and drag on the needle, it must be inserted at a 45° angle of entry.



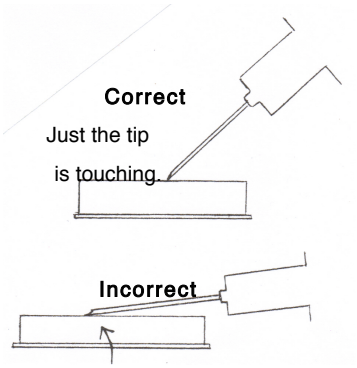
average depth veins sit a little deeper, but you will still need to approach at a 45° angle with the arm.



deep veins sit much deeper, and you will really need to steepen the angle of the needle to 65° to reach this one and to avoid having to use all one and one half inches of the needle.

By adjusting the angle of entry, you will minimize the amount (length) of needle that ends up in the arm (which is a good "thought" for the patient), and will maintain the bevel of your needle facing the canal - facing blood.

Do Not Lean on the Needle: As described before, when inserting the needle, you must make sure that it is just the tip of the needle that touches the skin and leads. If any other part of the needle, other than the tip, touches the skin of the patient, then the needle is not at the correct angle for entry.



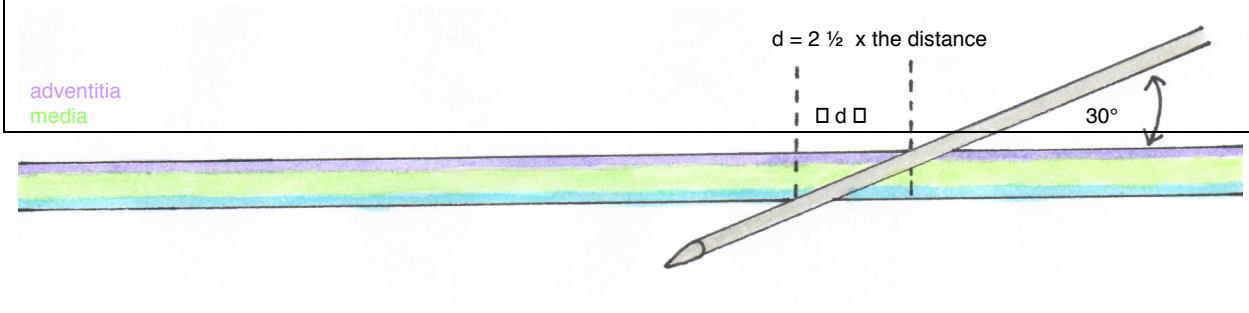
More than just the tip is touching.

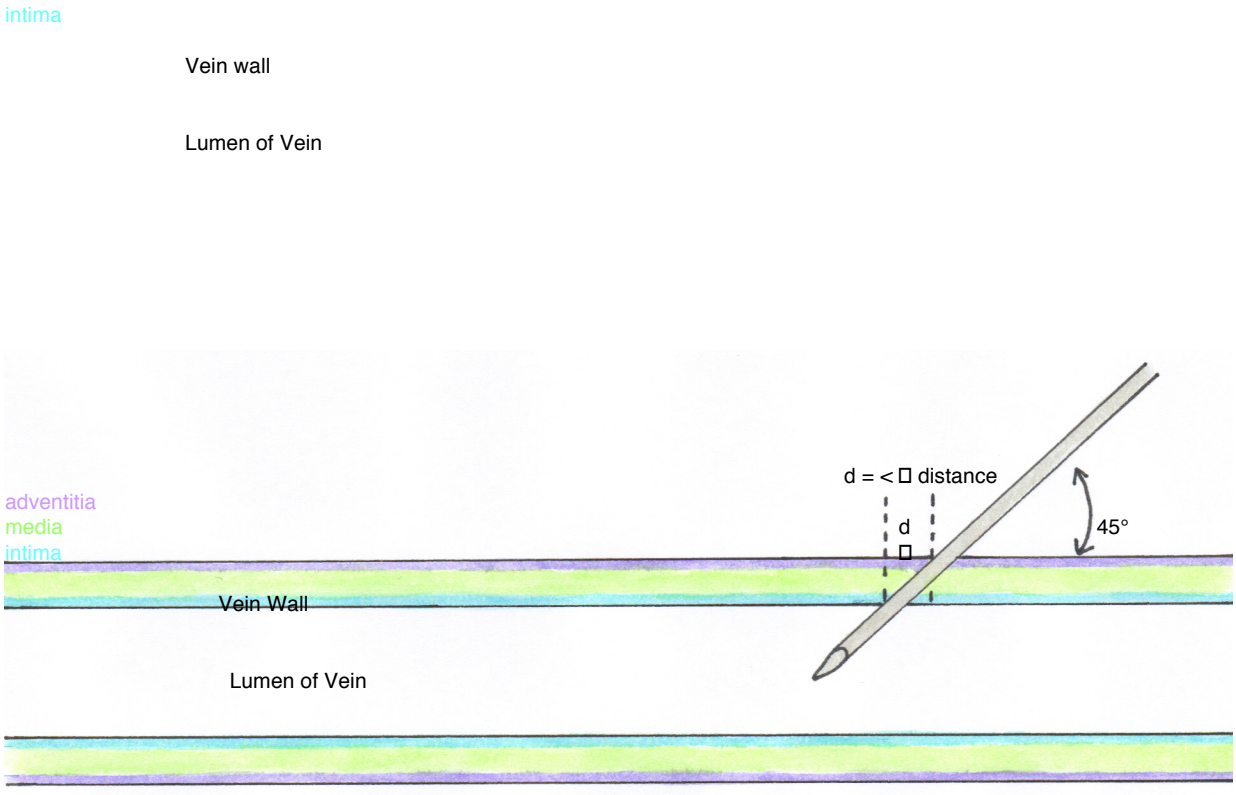
Leaning on the needle will –

- Bend the needle as it is inserted.
- Create more friction grab and drag as you enter the tissue, making it harder to insert the needle, and interfere with your ability to feel the "give" as you enter the vein.
- Actually depress the tissue of the arm.
- Result in a scooping insertion of the needle instead of a straight insertion.

All of the above will increase the discomfort for the patient.

A low angle of entry can be a problem for the vein wall. Entering through a vein wall at a low angle disturbs more vein wall tissue than if you more directly penetrate the wall (with a 45° of entry).





So, keep that needle at a 45° (or 65° if it is a deep superficial vein) angle of entry upon insertion and maintain that angle during the injection of contrast.

Hard, Over Distended Veins vs. Natural Dilated Veins: We've touched upon this when we discussed the "too tight tourniquet", but let's approach it from a different direction now.

Let's actually experience the varying degrees of vein distention. Take a human arm that has a good antecubital vein and palpate –

- First without a tourniquet,
- then with a snug tourniquet,
- then with a slightly tight tourniquet, and
- then with a very tight tourniquet.

Did you notice the difference in the vessel itself? It should have gone from very soft and pliable all the way to "hard".

If you lean on a "hard" over distended vein as you insert the needle, the chances of your needle slipping off to the side of that vein or displacing that vein (pushing vein off to the side) are great. Make sure the vein is supple and pliable.

Repositioning the Needle Once In the Arm: When changing the needle position and direction while in the patient's arm, you must back the needle up (or out, so to speak) to the level of the bevel without exposing the bevel opening to air or without ending up with the bevel opening in the dermis. From this position only can you re-direct the needle.

Using the tissue flap, insert your needle to the right of the vein. Make sure you are the usual ½ inch in with the needle. Now, from this needle position, try pointing the needle in the direction of the vein (to your left). Did you see all the "tissue" move? Did you feel how much resistance there was with that movement? This is exactly what it would be like for the patient.

Now, back that needle up (out) to the level of the bevel. Now point to the left and insert to the vein. Much easier! There is no tissue displacement, and there is no pain with this movement because the tip and bevel of the needle are all that is really moving within that subcutaneous tissue, and the skin is not pulled or stretched like it would be with movement from a deeply inserted needle. (Please view the DVD.)

The Laboratory Requisition and Tube Detail

****

Look at the laboratory requisition. You will find it in the back (last page) of your workbook. Tear it out and use it as we work our way through these next few pages. We will be working with the middle section of this requisition identified as **INDIVIDUAL TESTS**. The tests are listed alphabetically in this section.

Typically, your patient will present with a lab requisition with the top portion already filled out and with the tests circled that are to be done. But, let's pick our own to understand this requisition and learn how to determine which tests go in which tubes.

- In the first column on the left, find CBC Differential. Highlight it.
- What's in the circle next to it? "P". Highlight it.

Now look towards the bottom of your requisition for the guide box with the circles and letters.

- Find the "P". What does it say? Purple.

Wasn't that easy? Your test (CBC Differential) goes in a purple top tube. That's how simple this is.

Tubes are color coded. Specific color tubes are used for specific tests. The different colors indicate a particular chemical in that tube which is going to preserve the blood in a particular state so that the test can be run on it. Do you have to know the name of the chemical and what it does to blood to draw blood into that tube? NO. (The lab tech needs to know the name of that chemical and what it does to the blood.) All you want and need to know is which tube do I use for that test. Let's do a few more.

- Next, find Cholesterol. Highlight it.
- What's in the circle next to it? "S". Highlight it.

Go to the guide box.

- What does "S" stand for? Serum/SST. (I know - all the other letters in the circles stand for a color, except this SST tube.)

  The serum/ SST tube is a serum separator tube, and used to be "tiger striped" (red/black or red/gray, but now is a golden yellow. This tube has a chemical (clot activator) in it and an augur (gel). The important thing to know about this tube is that when centrifuged, it will permanently separate the serum from the cells because the test will be done on the serum part of the blood.

Here's a little history behind this SST tube:

The scientist who designed tubes took a plain tube (red top tube), filled it with blood, and centrifuged it. The cells went to the bottom because they were heavier. The serum sat on top because it was lighter.

Now, the scientist wanted to permanently separate the serum from the cells because it would be so much easier to work with this tube of blood if we didn't have to worry about remixing the serum and the cells. So, how did he permanently separate them?

The scientist decanted off the serum and weighed it. Then he decanted off the cells and weighed them. The serum was lighter, and the cells were heavier. Then he got an amount of augur (inert gel) that was a weight in between the serum weight and the cell weight.

So, when you spin the blood and the augur in a centrifuge -

- The cells goes to the bottom, they are the heaviest.
- The augur goes to the middle, it weighs less than the cells.
- And the serum sits on top, it is the lightest in weight.

Isn't that neat?

This augur (gel) permanently separates the serum from the cells. These two blood parts will never mix again.

And here are some old fashioned terms for this tube of blood -
S = SST = Serum Separator Tube = Serum = Serology = Chemistry

Electrolytes are referred to as chemistries.
Rheumatoid factor is referred to as a serology.
Pregnancy test is referred to as a serum.

I just wanted you to be aware of the old terminology because I'm sure some docs are still using it. What you need to know is that all of these tests use the same kind of tube (SST tube).

- Next test, Digoxin. Highlight it.
- What's in the circle? "R". Highlight it.

Go to the guide box.

- What does "R" stand for? RED.

Red represents the plain red top tube. This tube is plain (it has no additives and no augur). We will still centrifuge and separate this blood into serum and cells (and test the serum). But, the reason we need a PLAIN tube for this digoxin test is because digoxin is a CHEMICAL (a Prescription drug). We do not want this chemical mixing with and being distorted by the clot activator chemical in the SST tube, and we don't want to lose any of our digoxin in the augur as the blood is separated into serum and cells. So, all "drug" levels go in the PLAIN RED top tube.

- Next test, PT. Highlight it.
- What's in the circle? "B". Highlight it.

Go to the guide box.

- What does “B” stand for? Light Blue. Specifically “light blue”, because there is a “royal blue” tube in the lab world. So, they are very specific even about the shade of the color tube you are suppose to use.

Now the next three go quickly.

- Find Glucose Fasting. Highlight it.
- What’s in the circle? “S”. You’ve seen that before – SST.

- Next find Magnesium. Highlight it.
- What’s in the circle? “S”.

- Next find TSH (for Thyroid Stimulating Hormone). Highlight it.
- What’s in the circle? “S”.

How many “S” tests do we have ordered? 4 “S” tests. How many “S” tubes do we need? Only 1. With that old 10 ml SST tube, we could do at least 27 “S” tests. The laboratory machines today use only a micro-liter amount of serum for each test. A 10 ml tube produces a lot of serum, more than we need for just one or two tests.

The same is true if the doctor had ordered a PT and a PTT. You still only need one “light blue” top tube.

If the test you are about to collect blood for requires more than one tube, it will specifically state that on the requisition or in the Directory of Services (book). Now look for one more test.

- Find HLA:B27. (No it’s not a bomber - It is a blood test.)
  Search your requisition . . . . . It’s not there, is it?

That’s because it is a rarely ordered test. Only the most frequently or commonly ordered tests are listed on the requisition. So how do you determine which tube this test goes into?

- Find the lab manual called the **“Directory of Services”**.
  This directory lists every laboratory test, in alphabetical order.

- Find HLA:B27. Read the description.

Specimen: 10 ml whole blood (yellow top tube), must include race and diagnosis of patient on requisition; room temperature.
TAT: 3 days.

(yellow top tube) - that's all we need to know.

If you were the one filling out the requisition, you would need to add the race and diagnosis of the patient to the requisition. This information is used to track genetic drift. In other words, HLA:B27 is for ankylosing spondilitis and is peculiar to people of Mediterranean descent . . .

The last instruction about keeping the specimen at room temperature is information that the lab tech needs to know and follow, again to preserve that blood in a particular state so that the test can be accurately done on it – refrigerating this specimen could alter the test.

Finally, TAT stands for "turn around time". This is the amount of time it will take to produce the test result - in this case, 3 days.

These odd ball tests are handwritten in the section marked "other tests" which is in the right hand bottom corner of your requisition. So write HLA:B27 in this section and next to it, draw a circle and place a "Y" in it for yellow.

Now, write your name at the top of the requisition where the patient name goes. Turn it over and lay it down. Now, pick it up and pretend it was the patient who just handed it to you, and proceed as if you were about to draw blood on this patient.

1. Look at the name so that you can properly greet the patient (by their name).

2. Don't bother to read all of the names of the tests - you just need to know which tubes you need . . . start down the requisition list and see –

P - You need a purple top.
S - You need a SST.
R - You need a red top.
S - You already have one of those.
S - You already have one of those.
B - You need a light blue top.
S - You already have one of those.
HLA:B27 - You look it up and determine you need a yellow top tube.

Now you are ready to take your patient, the requisition, and the tubes to the blood draw table.

You situate your patient and their arm on the table and place the adapter and attached needle next to their arm. Then you must place the tubes next to the needle in a specific color order, called the **order of the draw**.

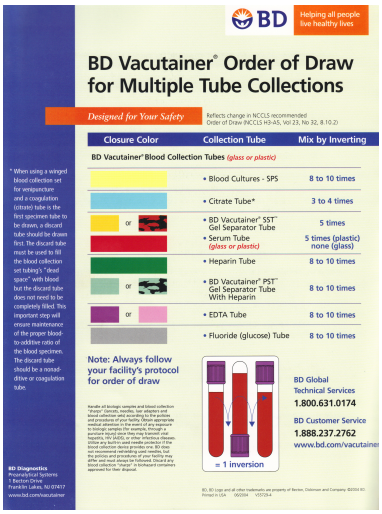
ORDER OF THE DRAW

Tubes must be drawn in a specific color order, and here's why. When you wedge the tube on, the chemical that is in that tube ends up "bathing" the part of the needle that inserts into the tube, and drawing blood into the tube is not enough to "clean" that needle of chemical residue. This then means that the chemical residue left behind by that first tube may interfere with the chemical that is in the next tube that you are about to wedge on. This interference may alter the chemical in this second tube to the degree that it doesn't preserve the blood in the second tube the way that it was designed.

Well, they have figured out that the chemical in the yellow tube won't bother the chemical in the light blue tube - so you can draw the yellow first and then the light blue tube. And, the chemical in the light blue tube won't disturb the SST clot activator chemical, etc., etc., etc.

There is an Order of Draw Guide that you will have with you at all times so you can easily follow the instructions for the correct order of the draw. (Always follow your facility's protocol for order of draw.)

The guide tells us which tubes **can** be next to each other. But which tubes **cannot** be next to each other? The guide doesn't tell us this. So you will need to ask your lab supervisor.


BD Helping all people live healthy lives

BD Vacutainer® Order of Draw for Multiple Tube Collections

Designed for Your Safety

Reflects change in NCCLS recommended Order of Draw (NCCLS H3-A5, Vol 23, No 32, 8.10.2)

Closure Color	Collection Tube	Mix by Inverting
BD Vacutainer® Blood Collection Tubes *(glass or plastic)*		
	• Blood Cultures - SPS	8 to 10 times
	• Citrate Tube*	3 to 4 times
or	• BD Vacutainer® SST™ Gel Separator Tube	5 times
	• Serum Tube *(glass or plastic)*	5 times (plastic) none (glass)
	• Heparin Tube	8 to 10 times
or	• BD Vacutainer® PST™ Gel Separator Tube With Heparin	8 to 10 times
or	• EDTA Tube	8 to 10 times
	• Fluoride (glucose) Tube	8 to 10 times

* When using a winged blood collection set for venipuncture and a coagulation (citrate) tube is the first specimen tube to be drawn, a discard tube should be drawn first. The discard tube must be used to fill the blood collection set tubing's "dead space" with blood but the discard tube does not need to be completely filled. This important step will ensure maintenance of the proper blood-to additive ratio of the blood specimen. The discard tube should be a waxed-drive or coagulation tube.

Note: Always follow your facility's protocol for order of draw

Handle all biology samples and blood collection "sharps" (lancets, needles, luer adapters and blood collection sets) according to the policies and procedures of your facility. Pay particular medical attention in the event of any exposure to biologic samples (for example, through a needle stick, cut, splash to the eyes, nose or mouth, hepatitis, HIV, SARS, or other infectious disease. Utilize any built-in used needle protector if the blood collection set is equipped with one. We do not recommend extending used needles, but the policies and procedures of your facility may allow for the use of a "sharps" holder for the blood collection "sharps" in discharge-resistant containers approved for their disposal.

≈ 1 inversion

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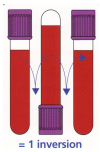
Example: If you are drawing a yellow top and a green top, we know that yellow will come first. But, can green come next, or do we need a discard tube in between the yellow and green tubes?

If you should end up with a requisition requesting only two tests, and these two tubes cannot be next to each other, then you will take a "plain" red top tube and put it in between the other two tubes. This "plain" red top has no additives, so this tube will serve to "clean" your needle in between the two tubes to be drawn. At the end of your draw, just discard the plain red top tube into the Sharps container.

MIXING THE TUBES

Once you have finished the draw and properly disposed of the needle, you must mix these tubes of blood thoroughly with the chemical inside the tube - **before** you label the tubes.

Drawing blood into the tube will not "MIX" it enough.
The tube must be inverted. **Inverted GENTLY**!



Why can't we just shake the tube to mix the blood with the chemical? Remember the little red blood cell and how fragile it is? Remember Hemolysis? Shaking will break the cells, and then you have hemolysis.

Think of shake 'n bake, only shake n' BREAK.
If you shake them, you break them!
And then you have to stick your patient again!

Also, these tubes are **inverted** a specific number of times according to the color of the tube. Why? First, because of the way the chemical preserves the blood, and second, because of the fragile nature of the RBC - too much mixing can have a negative effect (hemolysis, breaking of the RBCs). The number of times the tubes need to be inverted is also on your Order of Draw Guide.

Now, because these chemicals need to be thoroughly mixed with the blood as soon as possible, we must **mix before we label the tubes.**

However, do NOT try to mix these tubes **while** drawing blood into other tubes,
It's a brain thing. You can focus on the needle in your patient's arm, OR you can
focus on inverting and counting. The correct answer is focus on the needle.

But, because this mixing needs to occur as soon as possible to appropriately preserve the blood in each tube, mix them simultaneously. To mix each tube individually can be time consuming, especially if you've drawn quite a few tubes, and time is of the essence when mixing the blood with the chemical. So, invert them at the same time. How? See the following schedule.

To expedite this mixing, pick up all of the tubes at the same time, and begin inverting and counting –

Down and Up is 1
Down and Up is 2
Down and Up is 3
Down and Up is 4 - rack the light blue top tube
Down and Up is 5 - rack the red and SST tubes
Down and Up is 6
Down and Up is 7
Down and Up is 8 - rack the purple and yellow top tubes

Now that you have thoroughly and gently mixed the blood with the chemicals, it is time to label the tubes. Refer to your requisition once again and begin -

First test marked - purple: pick up the purple top tube and label
- name of patient
- name of test – CBC Differential
- date of test

Next test marked - SST: pick up the SST tube and label
- name of patient
- name of test - Cholesterol, Glucose (FBS), Magnesium, TSH
- date of test

Next test marked - red: pick up the red top tube and label
- name of patient
- name of test - Digoxin
- date of test

Next marked - light blue: pick up the light blue top tube and label
- name of patient
- name of test – PT
- date of test

Last marked – yellow: pick up the yellow top tube and label
- name of patient
- name of test – HLA:B27
- date of test

Rack all of the tubes and return them to the lab. Be sure that you rack the tubes (standing them up), and do NOT lay them down. The serum and cells need to start the separation process before they are centrifuged (in most cases).

CENTRIFUGE

As we touched on earlier, a centrifuge is the machine that spins the tubes at a high speed causing the heavier red blood cells to go to the bottom of the tube and the lighter serum to go to the top.

1. A centrifuge has an even number of buckets (tube holders). Whether it is a 4 tube or a 24 tube centrifuge, there is always an even number of buckets because – just like a washing machine - **it must be balanced.**

   Whatever you put on one side, you must put something directly across from it. A washing machine out of balance not only makes a heck of a racket, it WALKS! You don't want your centrifuge to walk, right off the counter and onto the floor with all of your tubes of blood!

2. Not only must the machine be balanced, but so must the tubes. For example - if you have two SST tubes and you let them fill until they were full (stopped on their own), then your two tubes are equal in weight (both have 5 mls of blood).

   But if you only have 1 tube of blood (or any odd number of tubes), then you must place a 5 ml tube of water across from it in the centrifuge.

   (How do you get exactly 5 ml of water in that tube? Remember filling your tubes with water during practice? Just submerge your needle end in water, put your tube into your adapter, and let the tube fill till it stops on its own - 5 ml water.)

Centrifuges have two settings: **speed** at which it spins, and **length of time** for the spinning. These settings are specific to the type of tube (color or SST) that is being centrifuged because the rate of separation is chemically influenced, and because those fragile red blood cells can only spin for so long (under that chemical influence) before they hemolyze. There will be a chart by the machine indicating the speed and length of time that a particular type tube should be centrifuged.

The Butterfly Needle

(Reserved for pediatrics only.)

****

The butterfly needle doesn't have magic,

in the wings or anywhere else.

You hear people talk almost "reverently" about the butterfly. It is a wonderful tool, but it really doesn't have magic. It's not the needle system that makes a phlebotomist good. It's a good phlebotomist who can make any needle system work, resulting in a successful draw.

Phlebotomists who routinely use the butterfly needle think the butterfly system is easier to use, and that they are more successful with it. But, if you really observe this phlebotomist, you will see that they still fail as many times with a butterfly as they do with a regular needle system.

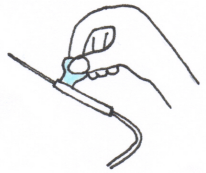
You also hear them say "get the butterfly, it's easy." I can almost promise you that when you hear that phrase, they are not using the butterfly as it was originally designed to be used. Because this tool, when used as the insert instructs, requires a huge amount of **fine motor function**, and this "ain't easy", not usually anyway.

The regular needle system utilizes **gross motor function** on our part.
The hand holds the needle and it's the arm that inserts it.

The butterfly needle system utilizes **fine motor function** on our part.
The fingers hold the needle and the hand/wrist inserts it.

As originally designed, the butterfly is held by its wings only. See the diagram.

You must pinch the wings such that the rough sides (grippers) are to the outside so that your fingers can grip the wings.



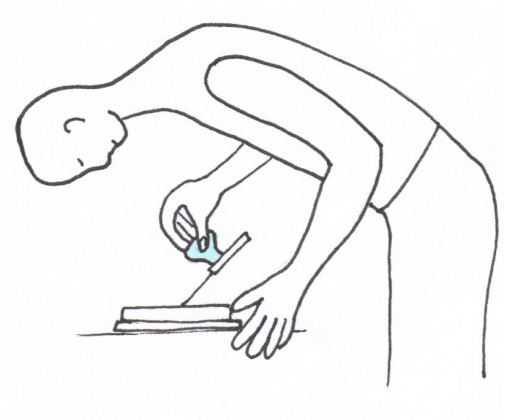
And, the wings must be in the straight up position. This is the only way the bevel will be up.

To hold the butterfly with the wings in the upright position, you will have to draw your shoulder up and in, so you can line the needle up with the vein. This is uncomfortable and awkward. So, a lot of phlebotomist lay the wings of the butterfly on their side, making it easier to hold the needle, and making it easier to see the insertion. Well, this won't work (and doesn't work), because -

- The bevel isn't up if the wings are on their side. And you already know by now the bevel story. The bevel must be up on insertion, or you cut a huge hole in the skin and vein wall and cause the patient a lot of pain.

- If you are turning the wings to the side to be able to SEE the needle insertion, then your head is not in the right location and position for that needle insertion. To be able to see the insertion, you have dropped the angle (of entry) of that needle. The angle of that needle is probably not 45˚. The angle of that needle is probably 30˚ or less. As described before, if the angle of the needle is too low, then the bevel of your needle won't be facing the canal - the bevel will be facing the anterior wall of the vein - and this can result in sucking the vein wall into the bevel opening and corking it off . . . etc.

Once you have inserted the needle into the vein, the needle must remain at a 45° angle.



This requires, then, that you position yourself (your head specifically) directly out in front of that needle to see the insertion. (Otherwise, if you are with your head positioned behind that needle you will lower the angle of that needle to see the insertion. Now your bevel is facing the vein wall, not the canal.)

The needle must remain in that 45° angle position throughout the draw. This means that you must remain in that awkward position while you are "hanging on by a fingernail" with that needle. Unstable?! Can be. That's one of the reasons why you see phlebotomists tweaking the technique of handling the butterfly.

Another error that a lot of people make with this butterfly is dropping the angle of the needle (lowering the needle) as they insert it, mimicking a "scooping" motion.

Just so you know you're not crazy, the butterfly needle was designed for a "scooping" motion - **in IVs.** It is necessary to "scoop and sit" in IVs because –

- We need to leave the needle in place, so you lower it on insertion and leave it sit in the vein, with the bevel facing the anterior wall, and this works because

- We are infusing fluids. Our bevel can face the anterior wall of the vein in IVs because we are not vacuuming, we are infusing - and the fluid goes in, hits the anterior wall of the vein and travels on.

So, these little butterfly wings are great for scooping and sitting, in IVs!

But in blood draw, scooping and sitting won't work. The needle must remain at an angle, with the bevel facing the canal, so that only blood will be sucked in, and not the vein wall. Appreciating this concept is critical to success and makes you realize that -

- ✓ if you hold the butterfly by its wings,
- ✓ with the wings in a straight up position, as designed,
- ✓ and you enter the vein at the appropriate angle (45° usually),

you are hanging on, in mid air, by your little fingernail. There is no way to stabilize your hand. What a tenuous and tiring position for you to remain in.

Remember, you are in a baby's vein. You really don't want to stick the baby twice because you moved when your hand fatigued, or when your hand swayed because you were hanging out there in mid air. And, trying to load tubes into that detached adapter is out of the question - you will move.

Keep the insertion technique for regular needle systems in mind, because this exact same needle technique applies to the butterfly needle as well. And the last person you want to stick twice is a baby.

Which brings us to another fact about butterfly needle systems -

The 23g and 25g butterfly were designed for
neonates, **infants,** and **children**.

- ✓ Their RBCs will sneak through these little openings intact.

- ✓ The tube will fill slowly and gently (the little opening controls the "suck").

- ✓ The 3/4 inch needle will barely be in (with still 1/2 inch of needle out).

- ✓ Those tiny little veins will benefit from a fine motor function insertion.

Trying to access a very small target requires a lot of fine motor skill, and this butterfly was designed just for that. And by the way, it was designed for **"healthy" baby veins.**

In fact, here are a few reasons why you will not use a butterfly of any size on an adult -

Look at the bevel opening of all three sizes of butterfly needles: 21g, 23g, 25g.

1. a) How fast would a 10 ml tube fill with 23g needle? **NOT FAST AT ALL**! That's why someone in the industry came along and created a **21g** butterfly, so the tube would fill faster.

   Well, if you're going to use a 21g needle, then use the regular needle system. The regular system is so much easier to use (gross motor function), and it cost a lot less. Economics aren't the mission, but it is an important factor.

21 g needle (regular)		21g butterfly
$ 0.16 **cents**	vs.	$ 1.60

   b) And, if you are going to use a 21g needle, you will need a pretty good size vein to stick it in. Remember, the lumen of the vessel must be big enough to accommodate the needle and still have enough space around it for blood to travel past the needle to be able to collect the blood. (And, HAND veins are not big enough for a 21g needle, even if they had a wall thick enough to tolerate the stick - and they don't!)

2. Adult RBCs are a certain size. Adult RBCs won't fit through a tiny 25g bevel opening without shearing (hemolysis), and they barely fit through a 23g bevel opening. In fact, hemolysis is a real likelihood even with a 23g needle.

3. The length of the butterfly needle is too short for an adult. The butterfly is a ½ or ¾ inches in length. Do you recall how much needle is in the arm with the 1½ inch needle? About ½ inch, on the average. If you are presented with a patient who has that deep superficial vein, you going to be out of luck and out of needle.

   (Some of you are already thinking that the short butterfly needle

is “just right” for hand veins . . . you see it all the time . . .)

REMEMBER, YOU ARE NEVER GOING TO STICK THE HAND.

So, now that we have decided that the butterfly is for pediatrics only, let’s go back to the technical discussion about how to use a butterfly needle in blood draw.

Just like with the regular needle system, the butterfly needle is held at a 45° angle on entry, and must remain at that angle once in the vein so that the bevel of the needle continues to face the canal (faces blood).

To achieve this, recall that your head is positioned directly over the needle’s insertion site. By positioning your head over the needle site you insure two things -

- ✓ You are placed in a stable position over the site and will not move – guaranteeing that the needle stays right where you have inserted it, and at the angle you inserted it.

- ✓ The bevel of the needle remains centered in the lumen of the vein, facing the canal of blood.

But I have, what I think, is a better method for using a butterfly for blood draws. Read this and try this, and decide for yourself which method of handling the butterfly works better for you. After all, **your comfort level affects your skill level**, and you need to be comfortable and skilled with this tool just like any other.

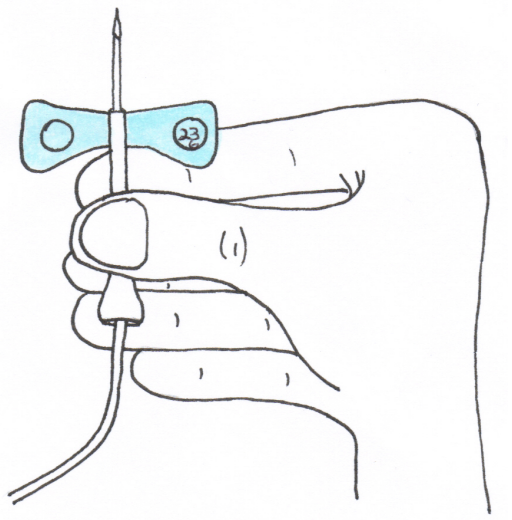
Hold the butterfly, NOT by its wings, but as if it were a “mini-adapter”.

- ➢ Now it is a comfortable, familiar skill technique.

- ➢ The bevel is easy to see, and your shoulder remains in the dropped and relaxed position.

- ➢ The angle of the needle can now be easily achieved and maintained. (Note: Remember to position your head out in front of, or over, the needle insertion site.)

- ➢ And, once in with the needle, you’ll realize you can rest, once again, on



one or more knuckles, stabilizing your needle hand.

Even though you are more stable now, **I strongly advise that you still get someone else to load the tubes on and off of your adapter.** Unlike the regular needle system, the butterfly adapter is not directly connected to your dominant hand. Your brain must stay focused on the needle in the baby's vein.

The NEEDLE is the critical function that only you can do, and the only function you should be doing. Loading tubes is a simple function that anyone can do. You do not want to stick that baby twice just because you moved the needle while wedging tubes on and off the adapter.

Again, try both methods - pinching the wings AND holding it as if it were a mini-adapter. Feel which one works the best for you.

And finally, there is one last thing to discuss - **The butterfly and the light blue tube**.

This 1.8 ml light blue tube must have exactly 1.8 ml(s) of blood. The butterfly's tubing had about 0.5 ml of air which is what will be sucked into your tube first. Your tube will then be short that amount of blood, and this won't do with this particular tube. Here's how to fix this problem.

If the first tube (or only tube) you are drawing is a light blue top tube - draw two. Just "bring blood" to the first tube, filling the **tubing** of the butterfly, and then wedge it off without filling the tube to full (don't waste blood). Now the second tube (the light blue top tube) will have the full amount. (And because the light blue tube is probably more expensive than a plain (no additive) red top tube, use a little red top tube to draw the air out of the tubing, and then discard it at the end of your draw.)

Practice

****

Practice is a critical part of this learning process. You never practice by "sticking patients". Sticking a patient is for real, and you want to be skilled with the tools before you attempt that.

Assignment 1:

1. Review your lab requisition, order of the draw. and tube handling instructions.

2. Now practice, with your regular needle system, as if you were drawing multiple tubes.
   Place your tubes in the correct order of the draw next to your needle.
   Pretend - using the mock draw method - that you are drawing all of the tubes.
   When on the last tube, release the tourniquet.

3. Practice inverting and mixing <u>before</u> labeling.

4. Practice labeling.

5. Practice with the butterfly needle. Practice the mock draws with the butterfly needle.
   (You can practice this butterfly on an **adult** arm - since practicing a mock draw on a child may not be possible or too scary for the child.)

   But, there are two rules for practicing a butterfly on an <u>adult</u>:
   a) Always **remember that butterflies are for <u>infants</u> and <u>children</u>.**
   b) You still must pick a "healthy" vein for venipuncture -
      - antecubital vein, or
      - wrist vein
      - **NEVER a hand vein.**

Practice! Practice! Practice

Assignment 2: Butterfly review, using vein block.

1. Hold the butterfly as if it were an adapter.
   Cap off (pulled off in the same manner as the regular needle system).
   Bevel up.
   Support thumb down.
   Insert (at the proper angle) the needle into the vein.
   Once finished, place the alcohol wipe over the end of the needle.
   Swiftly out and immediately apply pressure.
   Have Mom apply pressure (remember, butterflies are for babies) for 1-3 minutes.
   Safely dispose of the needle;
   a) keep the **needle** in your dominant hand
      and hold **adapter** with your non-dominant hand
      (do not marry the two - keep them separate).
   b) Place the needle into the sharps container first and then
      snake the tubing and adapter in after it.

IF you ever draw blood on an adult with the butterfly, **PLEASE** still access the veins that you know you should, that you know were designed for vein access, and that you know work - the **antecubitals** or the **wrist** veins. And, still get someone else to load your tubes on and off the adapter.

Finger Sticks and Heel Sticks

****

Finger Sticks

Let's start with finger sticks. And, of course I am going to teach you something different from the current method that is used.

Does the current method work? Does it work well?

Ask your patients if they are "okay" with this method. In fact, you've probably had a finger stick before. Did it sit well with you? Your finger was sore for how many days?

Let's review the current method for the **finger stick** –

1. Someone picks up your hand. They are holding your finger from the middle interphalangeal joint to near the tips with the fingers pointing up, and the palms of the fingers are facing up.

2. They clean the site.

3. They deliberately bring a lancet down to penetrate the tip.

4. When it doesn't bleed enough to fill their tube, they start squeezing your fingers,

especially at the tip.

5. They scrape that little capillary tube to collect every little smudge of blood (you can't really call it a "drop").

6. When they finish, they slap a band aid on it and there you go.

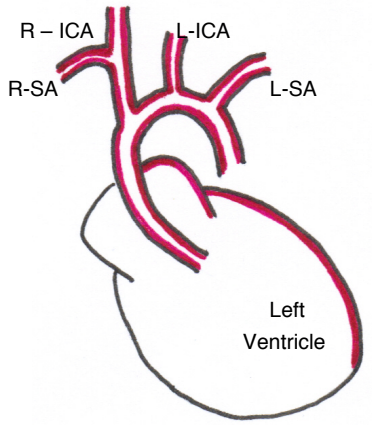
   For the next three days the tip of that finger is sore.

Does this sound about right, in the sense that "this is the way they do it"? Because your brain is already saying "this isn't right". We inherently know that this can't be right. And guess what? **It** isn't right. There is a better method, but first I need to tell you the story about Venous Blood Return before I tell you the correct method. Anatomy, physiology, and physics, when applied, make sense and work for this skill, too.

Venous Blood Return

How does blood move around the body? The answer most often given by lay people and health care professionals alike is that the **heart** contracts and moves the blood around the body.

But the physiological truth is that the heart just pumps blood **UP** and **out of the heart**.



Left ventricle contracts.

Forcing blood **UP** and out of the left ventricle at a blood pressure of 120/80 mm Hg (just enough pressure to travel the distance from your LV to your brain).

UP and out the aortic arch.
UP to the brain - thru the R-ICA and L-ICA.
UP to the right and left shoulders to the right subclavian artery (off the R-ICA) and the left subclavian artery.

And then, two other mechanisms take over from there to move blood around the body.

GRAVITY and MOVEMENT

As you know, GRAVITY takes everything DOWN. This includes blood in the body as well.

Let's follow a drop of blood as it leaves the left ventricle of the heart –

> The left ventricle contracted with a pressure of 120/80 mm Hg and propelled blood UP and out of the heart – UP to the head and shoulders. From there, everything else went DOWN the aortic arch to the rest of the body. How? By GRAVITY (mostly).

Think about this for a second. The only arterial blood going up is the blood that goes up to the brain. That's a short distance to go, and the pressure of the blood as it leaves the left ventricle is forceful enough to take the arterial blood in an upward direction to the head (against gravity). But the rest of the body is "south of the heart" (so to speak), and the arterial blood travels through these narrow lumen arteries with the help of gravity to the rest of the body.

Now that drop of arterial blood is at its final destination – the big toe – where it becomes a drop of venous blood that needs to return to the heart.

What moves venous blood, and how does venous blood return to the heart? How does a drop of blood get from my big toe back to my heart? Remember, gravity takes blood down.

There are two ways that the drop of venous blood can get back to the heart -

1. Hang upside down and let gravity bring it back.

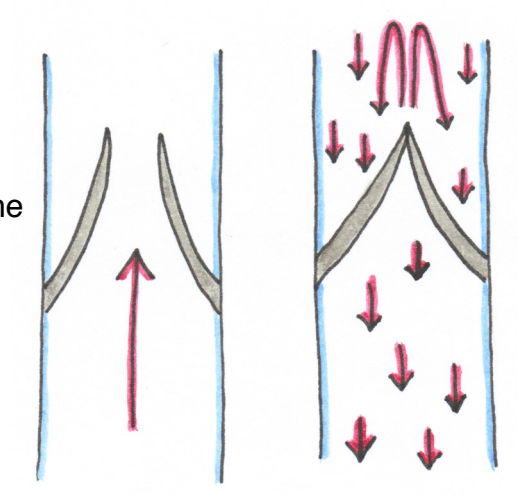
   (That's not practical – You can't "live" like that! But, it would work!)

2. MOVE! That's right. It is MOVEMENT, the contracting of skeletal muscles, that causes a squeezing of the veins. This "milks" the blood along, up the legs and back to the heart. It does the same for all the venous blood everywhere in the body. (Except in the brain. Since the brain is higher than the heart – when standing, anyway – gravity brings the brain's venous blood back to the heart.)

So, then what happens when you stop moving? Does that drop of blood in your thigh fall all the way back to your foot?

It would, except **veins have valves**. So when the blood starts to fall down, the little valves close (or open, depending on how you look at it) and hold the blood in place until you start moving again.

So, leg veins have oodles of valves because the legs are long, and they aren't always moving. But arm veins have very few valves because they are not as long, and we are constantly moving them, and therefore, the blood.

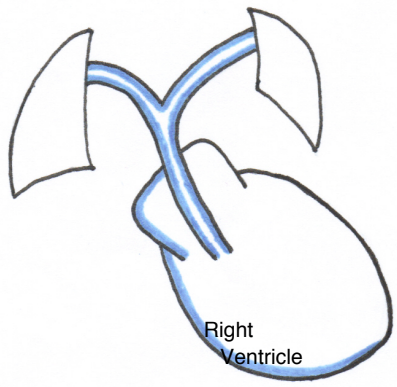


Note: Valves can become incompetent, failing to hold the blood in place, if you permanently injure the vein wall with over distention (varicosing the vein). The valves are attached to the wall of the vein, and if the wall is all stretched out, then the valve leaflets cannot touch each other and close appropriately. (And this will lead to more varicosing, more valve incompetence, more injury of the vein, and impaired venous blood return, and therefore, edema.) So, be careful with that tourniquet (SNUG, not tight).

So, the drop of venous blood in my big toe comes back to my heart by MOVEMENT – the contracting of skeletal muscles which squeeze the vein, milking the blood along, held in place with the help of valves – all the way back to my right ventricle.

The right ventricle then contracts at a pressure of 40 mm Hg (a fraction of the left ventricle pressure) to send the blood to the lungs.

(It requires less mm Hg pressure as compared to the left ventricle because the distance from the right ventricle to the lungs is much shorter than the distance from the left ventricle to the brain.)



Isn't that a neat story?!

Now, how does this apply to blood collection?

In phlebotomy (venipuncture or blood draw), we do not need to "move" the blood into the tube.

The tube is vacuumed - it sucks the blood in!

So, phlebotomy does not require "milking the hand". In fact, "milking the hand" engorges the vein with blood and causes over-distention, and injures the vein.

In blood donations (Red Cross), the bag is not vacuumed, and therefore, you must "milk the hand", moving blood along and into the bag.

In IVs, the nurse really should instruct the patient to "move" that extremity because it is the movement that moves the venous blood and the IVs you are infusing. We want the IV fluids and/or medications to circulate through the body. That is the mission, isn't it?

And this brings us right back to **Finger Sticks and Heel Sticks**.

So, let's remember gravity and describe the new method. (Keep the old method in the back of your brain for comparison.)

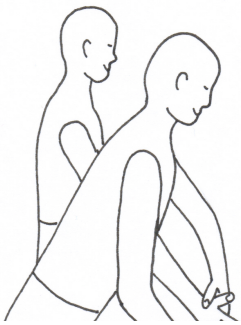
The **New Method** for **Finger Sticks** –

1. Place your patient's hand dangling in the down position (pointing to the floor), and make sure that the palmar surface of that finger you are about to stick is facing the floor (down). **Gently** support the patient's hand and finger.

   Now, where has gravity placed your blood? That's right - in the tip of the finger, and at the palmar surface where you are about to stick the lancet. This is very different, the total opposite, from the old method.

2. Clean the site and fan it dry - DO NOT touch it with your NOT sterile glove.

3. Bring the lancet up to the finger to penetrate the surface (total opposite from the old method).



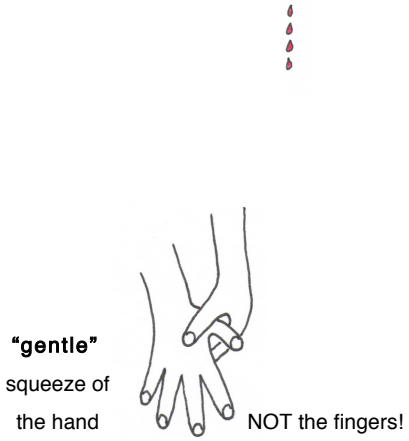
Coming up to your site should result in less impact and a less destructive site injury.

4. Immediately blood starts dripping, drop by drop, from your site. (This is the total opposite of what you would experience with the old method.)

   Let the first drop go, it may be hemolyzed from the stick. Then begin collecting the blood.

   If you have to encourage bleeding at all, **gently squeeze the HAND** - NOT the finger. (Again, the total opposite of old method.)

   Gently squeezing the hand is likened to a gentle massage of the hand. Remember, gentle touch (massage) dilates and brings more blood to the region.

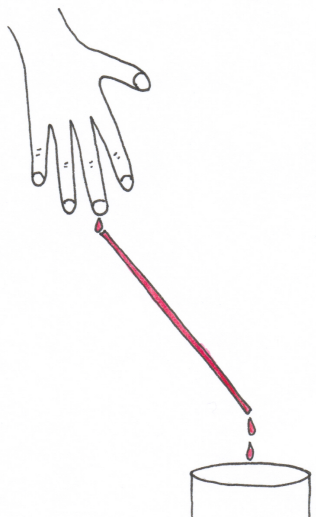


Squeezing the finger causes all kinds of problems –

- A "blow out" injury of the site (thanks CSI for that visual) which results in increased damage . . .
- Hemolysis of your specimen - all that squeezing is breaking RBCs - potentially altering the results of the tests you are about to run . . .
- Creates discomfort, fear, and pain. And as you know, all of these stimuli cause vasoconstriction . . .

5. Now, hold the tip of the capillary tube to the blood droplet - not to the skin of the finger. (And, by the way, you will have to bend way over, almost "standing on your head", to properly place this capillary tube - sorry!)

   This little capillary tube sucks blood in all by itself (that's physics again).



Do NOT scrape the surface of the finger with this capillary tube (or any collecting device). Scraping breaks the RBCs, and this is hemolysis.

Allow this tube to overfill. In other words, let a few drops of blood fall from the other end of the capillary tube into the hazardous waste basket (that was strategically placed just beneath your patient's hand just for this purpose) to insure that all of the blood in your tube is non-hemolyzed blood.

6. Hand the patient a cotton ball and have them **Apply Pressure** to the site for 1-3 minutes. Why? To avoid bleeding and bruising. (No one ever does this with the old method.) This is just like any other bleed. If you don't apply pressure, it will continue to bleed (albeit small), and remember, bleeding causes bruising.

What's so nice is that your patient's finger will heal within a matter of hours, NOT DAYS. The site is typically not even sore. (And, again, with the old method, 3 or more days of soreness.)

AND BEST OF ALL, YOUR PATIENT ONLY GETS STUCK ONCE!

Realize the reduction in injury, insult, and the potential for sequelae with this new method.

Think about a diabetic patient and their blood sugar finger sticks.

1. They already have impaired circulation due to their diabetes.
2. They have impaired healing functions due to their diabetes.
3. They have an increased risk of infection due to their diabetes.
4. They have to stick themselves every day (sometimes more than once a day), and the bruising and injury to the tissue caused by the old method can create other problems and discomfort that can get in the way.
5. And, finally, what does all that squeezing do to the results of their blood test?

This method works - even the patients agree. I have used it for the last 15 years, and this method works WELL. No hemolysis; therefore, accurate test results. No bruising. No pain. No tenderness for days. No infections. Try it, and prove it for yourself.

Heel Sticks

Now it's time to describe the heel stick. We're going to apply the same common sense and natural law to this procedure like we did with the finger stick.

Keep in mind the concept of gravity, and its affect on the flow of blood. Keep in mind that we are dealing with a tiny baby who cannot tell us when we are causing collateral damage (i.e. injuring the Achilles tendon - not only by an accidental stick of that tendon, but by overstretching that tendon in the process of supporting the heel for the stick). So, let's describe the Achilles tendon first.

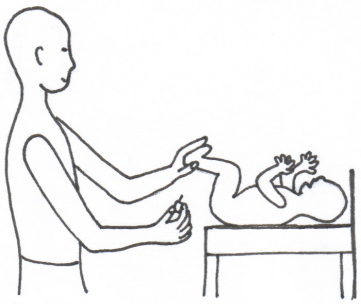
AchillesTendon

The Achilles tendon, like all tendons, consists of a fibrous tissue element that has very little elasticity to it (very limited stretch). And, like all tendons, it is essentially non-vascularized (no blood directly nurturing it), which means that it won't heal very easily if you injure it (i.e. prick it or over stretch it). Unlike smaller tendons, the Achilles tendon is moderately innervated with nerve endings (can easily experience pain). The Achilles tendon attaches the lower leg calf muscle to the bottom of the foot and is a major factor in controlling normal foot function. So, **do not** injure it.

Here's the current method for **heel stick** -

1. The baby is lying on its back. To be able to "see" the heel, the phlebotomist picks the baby's leg and foot up off the bed, positioning it in the air, and pushes the pad of the foot back towards the baby's ankle. This over stretches that innervated, non-vascularized Achilles tendon beyond the limits that nature intended. The baby already starts to cry because this hurts when your foot is forced back to your leg.

2. After cleaning the site, the phlebotomist starts squeezing blood to the site. Then they use the new blood letting tool, and now the baby really cries hard when this razor cuts the tightly stretched heel tissue.



3. It won't bleed like they need it to, **because gravity took the blood to the baby's butt, not the foot;** so they squeeze the site some more.

4. Then they start scraping every "drop" or smudge of blood they can get into the little collecting device.

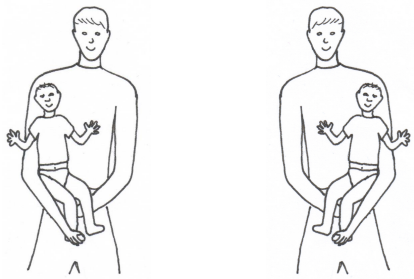
5. They wipe the site and place the foot back on the bed. Does anyone ever apply pressure? Not usually.

With this old method, your specimen goes to lab, they spin it and . . .

your specimen is hemolyzed, they pitch it, and you go stick the baby again.

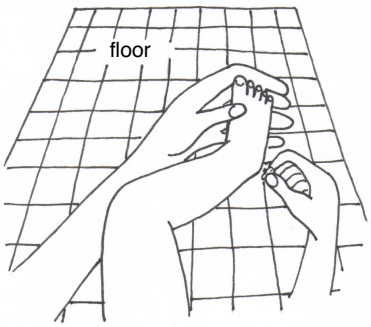
That is not a good outcome for anyone - the baby, the mom, the phlebotomist, the nurse, the lab tech, quality assurance . . .

So let's look at the **new method** for a **Heel Stick** –



1. Hold the baby in your non-dominant arm, with the baby's legs and feet basically dangling. Support the baby's foot in the palm of your support hand, allowing the heel to be exposed.

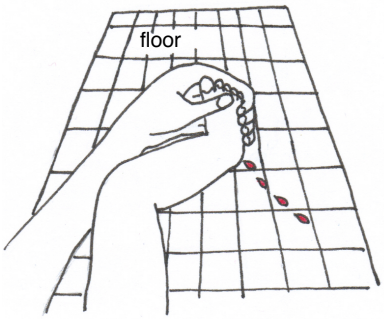
   In this position, the baby's foot is facing the floor (down), and the pad of the foot is also facing the floor (down) – now GRAVITY has taken the blood to the exact spot where we want it and need it to be - in the pad of the heel.
2. If you need to, **landmark the tendon** so as to avoid sticking it and injuring it. Clean the entire heel area, and fan it dry. Gently place the cutting device to the heel and click.



(Looking down)

> The baby might whimper. He/she will definitely "shiver". (Just like when you cut yourself shaving with a razor - the razor "slice" makes you shiver.)
>
> However, if you gently press the ankle immediately before you cut, your "press signal" will occupy the nerve path to the brain and the "cut signal" will probably not even register with the brain – the baby won't cry.

Immediately the site will start dripping blood - drop by drop - a "real" drop.



3. Let the first drop go - it may be hemolyzed from the process - then begin collecting the blood.

4. Hold the collecting device to the skin below the stick site. Do not scrape - it won't be necessary, and scraping will cause hemolysis of some of those cells.

   If you need to encourage bleeding, at all, gently caress the baby's ankle.

   DO NOT squeeze the site.

   Remember, squeezing the site will cause a "blow out" injury, which will cause bruising and tenderness and instant pain, and will cause hemolysis of the RBCs. (Then you will have to go back and stick the baby again.)

5. Once you have collected all that you need for that little container, pick up a dry cotton ball, and **APPLY PRESSURE** to the site. For how long? 1-3 minutes! This will stop the bleeding, allow clotting, and avoid bruising.

(Looking down)

The baby will hardly know you've been there. Their little site will heal almost immediately, and they won't scream every time they touch their little heel to the sheet, or start screaming the minute you pick their little foot up again (Pavlovian response).

The specimen goes to the lab, the lab centrifuges it, and there you have it . . .

a non-hemolyzed specimen - one they can run the test on, and

THE BABY GETS STUCK ONLY ONCE!

Neurovascular Anomalies

****

I'll never forget the first time I experienced a vein shrinking beneath my finger. That's right. My sense of touch detected this once huge vein getting smaller. How on earth does that happen? Can this happen?

I was gently palpating the vein. It got big like it was suppose to, and then as I decided this was "the one" that I wanted to stick, I felt that once huge healthy vein shrink to nothing. Can't stick that! Vasoconstriction had just occurred. But why? I wasn't doing anything to it to precipitate the constriction like smacking it or causing pain with a "too tight tourniquet".

The explanation: Neurovascular Anomaly.

It turns out that there are human beings out there with a neurovascular system that does not respond to stimuli the way that they should. These human beings have an ultrasensitive neural system, and that makes their vein walls ultrasensitive to stimuli.

Neurovascular anomalies do exist. Here are two perfect examples of neurovascular anomalies -

Raynaud's Phenomenon – a vasoconstrictive arterial disorder that effects the fingers and toes and sometimes the ears and nose.

In Raynaud's, there is "intermittent ischemia, usually of fingers and toes but can also involve the ears and nose . . . brought on by cold and emotional stimuli . . ." as quoted from Dorland's Medical Dictionary, page 1420.

Raynaud patients are actually quite easy to spot. As you prepare their extremity for blood draw you will (or should) notice the "blue" of the finger tips, or the extreme bright red of their digits.

Prinzmetal's Angina – a vasoconstrictive arterial disorder that affects the coronary arteries – coronary vasospasm.

Dr. Prinzmetal described this type of coronary event. The coronary artery ***spasms*** and this cuts off the flow of blood, and oxygen, to the myocardial tissue and initially causes "chest pain" – hence the name Prinzmetal Angina. And, if the spasms last long enough an infarct (cellular death) occurs.

You know from your anatomy lesson in the first part of this book that veins are also innervated and that they respond to stimuli just like the arteries. But, to my knowledge, no one has yet described this anomaly with respect to the veins during a venipuncture or vein access. So, we'll describe it now.

The patients that I have observed in vein access who have this neurovascular anomaly are **HYPER** sensitive to hot, cold, touch, and pain.

These patients **hyper**-react to these stimuli, by **hyperconstricting** or **hyperdilating**. They overreact!

Their condition is not as obvious like Raynaud's is. The only clue you might get is from the patient, who, before you even start the vein access routine, resignedly says to you -

" Let's get this over with - they usually have to stick me at least 6 times . . ."

That should set off all kinds of bells and whistles that this might be one of those patients.

Do your usual vein access routine of applying the tourniquet, palpating, locating, dilating, and grading the vein, and **PAY ATTENTION**.

- If it is a visible vein, watch to see if the blue disappears before the stick.
- Pay attention as you palpate to FEEL if the vein reduces in size after it initially dilated.
- Ask some tell tale questions: Do your feet swell with tight shoes? Do your lips swell with iced drinks? Do your ears turn bright red and get hot, while your feet and fingers are ice cold? Are you the type of person who doesn't like a back rub or foot massage?

If you do determine that they are indeed a patient who might have this hyper-reactivity to touch, here's how you handle that patient.

These patients are so sensitive that putting on a SNUG tourniquet is even too much for their ultrasensitive little nerve endings. Really! And sometimes, even palpation, as gentle as it is, is too much for them as well. So, if you are able to locate the vein, **landmark it**, because now you want to release that tourniquet and leave the patient and their vein, sit. They must go through vasoconstriction and then vasodilatation.

Yes, that vein will dilate - it will **SUPER DILATE**. That's the time to stick it – **without a tourniquet!** We don't really need that tourniquet to draw blood anyway.

In fact, after you have landmarked the vein, released the tourniquet, allowed the vein and the patient to sit and relax (recover), and allowed the vein to dilate, you will then quietly and quickly approach that vein site - NO tourniquet and do NOT re-palpate - **gently** swipe clean only the site you intend to stick (because the entire antecubital region should still be sterile from your previous prep) and insert the needle . . . you should get blood with very little or no problem. The vein could still vasoconstrict in response to the pinch of the stick, but my experience has almost always been good - blood in the tube.

The patient is shocked. Blood on the first stick?!?!?! "That never happens!" They are just thrilled. Explain to them the "what" and the "why" so that they can tell the next phlebotomist (who doesn't know this story) how to handle them.

This neurovascular anomaly or abnormality that I just described comes in varying degrees. Some patients have a very mild form of it, and some have a very extreme form of it, and consequently, the reactions (or hyperreactions - if you will) vary accordingly.

If, from the start, a patient identifies themselves as “one of those”, ideally, you don’t want to put a tourniquet on them at all (not even initially). Remember, you can locate and dilate that vein without a tourniquet. Do it very gently!

In that we don’t really need that tourniquet to draw blood anyway, and the tourniquet itself can make one feel “claustrophobic” (fear), and a “too tight tourniquet” (pain) can cause so many problems . . . maybe we should rethink the tourniquet all together.

What, exactly, is this abnormality or anomaly that I just described? I’m not sure. Unfortunately, it’s the one thing that I have not been able to document with medical or scientific literature, and I have searched. To my knowledge, no one has addressed this scientific observation in vein access yet, but I know that what I have observed and then described to you is accurate.

Dorland’s Medical Dictionary definitions pertinent to this story.

neurovascular (Dorland’s pg. 1260)

neu,ro.vas.cu.lar (noor”o-vas’ku-l r) pertaining to both the nervous and vascular elements; pertaining to the nerves that control the caliber of blood.

vasoneuropathy (Dorland’s pg. 2010)

vaso.neu,rop.a.thy (vas’o-, va”zo-noo-rop’ -the) a combined vascular and neurologic defect, the lesions being caused by simultaneous action of both the vascular and the nervous systems, or by the interaction of the two systems. See also angiopathic neuropathy and angioneuropathy (def.2).

Raynaud’s phenomenon (Dorland’s pg. 1420)

Raynaud’s p. intermittent bilateral ischemia of the fingers, toes, and sometimes ears and nose, with severe pallor and often paresthesias and pain, usually brought on by cold or emotional stimuli and relieved by heat, it is usually due to an underlying disease or anatomical abnormality. When it is idiopathic or primary it is called Raynaud’s disease.

It’s a Brain Thing

****

Here’s the story. Your brain is in charge. Most people can easily agree with that statement. But here’s what you probably don’t know - the brain can only do one thing at a time. It’s true. Neuroanatomy and neurophysiology say so.

Here's an example. You think you can do 2 things at once. Huh! Put your right hand on a typewriter and your left hand on a calculator. Now take a letter while you add up a column of numbers. You can't! You can alternate, but you can't do the calculator and the typewriter at the same time. Sorry!

You're already thinking of another argument, aren't you? You're thinking, I can walk and talk at the same time. Really?! First off, how many years did it take you to coordinate that function? And secondly, how well do you really do both at the same time? Think about it. You'll realize that what we are really doing is **coordinating** the two functions, like the left hand learns to coordinate with the right hand to play the piano. But it definitely is a **coordination,** and one that requires lots of practice. **It's a brain thing.** To do anything really well, you can only do one thing at a time.

> Think about it. You are walking along having a serious conversation with a friend, and the conversation gets really juicy . . . how many times have you stopped walking, instantly, to get the juicy details? . . . and then started walking again. In order not to miss anything, you stopped walking - to listen.

Unfortunately, our society has developed and tried to evolve to a new concept called multi-tasking. We not only think we can do more than one thing at a time, we expect it, of ourselves and of others. But, when you multi-task, something is getting cheated.

You've read "it's a brain thing" many times throughout my books. That's because venipuncture is an invasive procedure with the potential for serious complications if we don't do it correctly. So, if ever there was a time to put your undivided attention to something, it's with an invasive procedure.

You can apply this "it's a brain thing" to any field, to any walk of life, to any activity, and at any given time. I didn't make this rule, but what a wonderful rule. Just think how skilled we could be at everything if we just gave it our undivided attention. And just think how much more you will enjoy each and everything that you do, when you give it your undivided attention. And, one more wonderful benefit to this wonderful rule of "one thing at a time" - **no more multi-tasking**. Boy, that takes the pressure off of a few things - especially phlebotomy. (By the way, this is why you can't drive **and** use a cell phone at the same time.)

Enjoy!
It's a brain thing!
One wonderful thing, exclusively, at a time!

A Successful Blood Draw is Dependent Upon:

#1 - Preparation
#2 - Skill

#3 - Confidence

PREPARATION: Mental preparation - you must clear your mind of all other matters when you are drawing blood. Remember, "It's a brain thing!"?

Because you are totally dependent upon your sense of touch to locate the healthy vein, you must be in tune with that sense completely.

Know before you start what you are doing next. Have all of the necessary tools out and organized on the table. Have the patient positioned properly and comfortably. Make sure your drawing position is comfortable for you. And once you start the actual blood draw process, think the step through as you do it, before you start to think about the next step.

So, mental preparation (yours and the patient's), physical preparation (yours and the patient's), site preparation (blood draw table, chair, tools, and their position) must be secured first.

SKILL: You now have the detail of this skill. The level of skill that each of you develops will be determined by your knowledge, confidence, and in some cases, the very natural ability associated with anything that requires dexterity. (If you are "all thumbs", so to speak, you may be in trouble!)

You have been taught this skill in detail, and the skill part does not change. It is the one consistent part of blood draw. The part that you can not be taught is the patient itself. Every patient is different. In fact, one arm is different from the other in the very same patient. That's the part that changes - that's the part that can't be predicted. But utilizing the information and the technique taught to you, you will be able to deal with the variables that each patient presents.

CONFIDENCE: The confidence required for sticking another human being with a needle comes from the knowledge you just acquired. And, it comes with each successful stick. Confidence is something that can't be taught or bought. You earn it - through knowledge and experience.

Note from the Author

This written description of phlebotomy deals strictly with the blood draw process. As you realize by now, I have not included anything about the laboratory world outside of the blood draw (i.e. how to identify the patient by the name band, how to use a fire extinguisher, the anatomy and physiology of the entire circulatory system, how to wash your hands . . .). As I stated in the beginning, the current phlebotomy books and/or sections written in nursing, lab, and x-ray program books have all the medical and lab world specifics described in detail. I don't need to repeat that, and as a new phlebotomist, you will be fully informed on all of that other information during your job orientation.

My mission was to teach you the skill, and the skill only. Hopefully, you think I have.

Thank you for reading, viewing, and participating,

M. Gail Stotler, B.S.N., R.N., Phlebotomist

Glossary

****

adventitia – the outermost covering of a structure or organ

allergy – hypersensitivity to a substance

anatomy – the structure of an organism; the branch of science dealing with the structure of organisms; dissection or cutting apart

antecubital – in front of the elbow, at the bend of the elbow

artery – a vessel carrying oxygenated blood from the heart to the tissues

axillary – pertaining to the armpit

bevel - sloping at an angle; slant

bifurcate – the separation into two branches

bisecting – division into two parts by cutting

blood pressure – the pressure exerted by the blood on the wall of any vessel

cadaver – a body used for dissection

contaminate – to make impure or unclean

contraindications – an indication against the use of a particular substance or treatment

dilatation – expansion of an organ or vessel

displacement – removal from the normal or usual position or place

dissection – the cutting of parts for the purpose of separation and studying

distal – farthest from the center, or from the trunk

distend – to stretch out, to become inflated

dominant –prevailing; superior; exercising control

dorsum – the back or posterior surface of a part

dynamic – active, in motion

edema – condition in which body tissue contains an excess amount of tissue fluid; swelling

extravasate – fluids escaping from a vessel into the tissues

extravascular – outside a vessel

friction – the resistance an object encounters when moving over another object

gauge – a standard of measurement, ie. the thickness or diameter of a needle

gravity – the force that attracts an object to the center of the Earth

hematoma – a swelling or mass of blood confined to an organ, tissue, or space, caused by a break in a blood vessel

hemolysis – the destruction of red blood cells causing the release of hemoglobin into the surrounding fluid

hemorrhage – abnormal internal or external bleeding

hypovolemia – decreased or low blood volume

infection – the invasion of a pathogenic agent into the body or a part of it

inferior – beneath or lower

inferior vena cava – the principal vein with drains the lower part of the body

infiltrate – to pass into a substance or space

infusion – a liquid introduced into the body through a vein for therapeutic reasons

innervated – stimulated by nerves

interphalangeal – in a joint between two bones of a finger

intima – the innermost coating of a structure or blood vessel

intravenous (IV) – within or into a vein

invert – to turn upside down

ischemia – a reduction of the supply of blood to a part of the body

lancet – a small surgical knife with a sharp point that has two edges

lumen – the space within an artery, vein, intestine, or tube

lymphatic system – the system including all structures that are involved in moving lymph from tissue into the bloodstream

mastectomy – surgical removal of the breast

media – the middle coating of a structure or blood vessel

median – middle or central

microorganism – very small living body not seen by the naked eye

microscopic – visible only by using a microscope

neuroanatomy – the study of the anatomy of the nervous system

neurophysiology – the study of the function of the nervous system

non-sterile – not free of living microorganisms

OSHA – Occupational Safety and Health Administration

palmar – concerning the palm area of the hand from the wrist to the finger tips

palpate – to examine by touch, to feel

pathogens – a microorganism or substance that can produce a disease

Pavlovian Response – a conditioned response due to training or repetition

phlebotomy – a surgical opening of a vein to withdraw blood

physics – the science dealing with the properties and interactions of matter and energy

physiology – the study of the function of living organisms and the chemical and physical processes involved

pronation – the act of turning the hand so the palm faces downward; lying face down

proximal – nearest the point of attachment or center of the body

static – at rest, not in motion

sterile – free from living organisms

subcutaneous – beneath the skin

superficial – limited to the surface

superior – situated above something else, higher than

supination – turning of the palm (or foot) inward; lying on the back

thrombus – a blood clot obstructing a blood vessel

vacuum – a space or vessel in which the air has been removed by a pump

varicose – distended, swollen, knotted veins

vasoconstriction – the narrowing of the blood vessels

vasodilatation – the relaxation of the blood vessels

vein – a vessel carrying unaerated blood to the heart

venipuncture – the puncture of a vessel for any purpose

Volkmann's Contracture – the degeneration, contracture, fibrosis, and atrophy of a muscle due to an injury to its blood supply, usually seen in the hand

List of current and future books (b) or articles (a)

Vein Access for RNs (b)
Vein Access for IV Certified LPNs
Vein Access for X-ray Techs (b)
Vein Access for Phlebotomists (b)
Vein Access for the Blood Donation Techs (b)

Locating a Healthy Vein (b)

Palpate to Locate, Dilate, and Grade A Vein (a)

Grade A Vein (a)

The Anatomy and Physiology of the Vein (b)

Neurovascular Anomalies (a)

Venous Blood Return (a)

Veins Don't Roll (a)

The Bruise (a)

It's a Brain Thing (a)

The Vein Access Tools – for blood specimen collection (b)

The Heel Stick (a)

The Finger Stick (a)

The Vein Block (a)

The Ergonomically Correct Blood Draw Station (b)

The Ergonomically Correct Position for Vein Access (a)

How Did That Infiltrate Occur – for Nurses (b)

Venous Blood Return and The Infiltrate (a)

Venous Blood Return and The Prevention of Edema (a)

IV administration of Meds: IV Push vs. IV Drip (a)

Organizations That Hire Phlebotomists -

- Physician Groups - for their "in house" draw station

- Laboratories - referring to reference labs
    1) on site, where the lab tests are done.
    2) their free standing blood draw stations
    3) contracted nursing home draws
    4) contracted hospital positions (they sometimes staff hospital labs)

- Hospitals - in-patient floor draws, out-patient dept. draws, pediatrics, adults, part time, full time, per diem, 8 hour shifts, 12 hour shifts, etc.

- Blood Donation Organizations: American Red Cross, Community Blood Centers, plasmaphoresis units, etc.

- Veterinarian clinics - critters need blood draws too

- Staffing agencies

- Occupational Medicine Clinics

- Kidney Dialysis units

- Weight Loss Organizations (LA Weight Loss)

- Prison Systems

- Insurance Examination Industry for insurance exams

- Drug Research Organizations (Gateway Medical Research, The Cunningham Group), etc.

References

College Physics, Franklin Miller, Jr.,
Third Edition

Dorland's Illustrated Medical Dictionary (30th)

Gray's Anatomy, Henry Gray, F.R.S.,
1901 Edition

Review of Gross Anatomy, Ben Pansky, Ph.D., M.D.,
6th Edition

The Textbook of Medical Physiology, Arthur C. Guyton, M.D., and John E. Hall, Ph. D.,
10th Edition

Thank you Dr. Pansky for giving me permission to use your diagrams in this little book. (Permission granted by phone on 3/20/07.)

Thank you Becton, Dickinson and Company for granting me permission to use printed images of the alcohol wipe and for providing me with the "Order of the Draw" poster for this little book. (Permission granted by e-mail 06/06 and receipt of poster cards 12/06.)

MEDICAL DIAGNOSTIC LABORATORY, INC.

MDL

45 Sheffield Drive • Belleville, Illinois 62223
(618) 233-0522 • (800) 593-0522 • FAX: (618) 233-8335

CAP# 41903-01 • CLIA# 14D064903

PHYS
PHYSICIAN
#
UNITED STATES

PHYSICIAN NOTIFICATION

Physician/Provider: ICD9 diagnosis code(s) must be provided for each test ordered. Only tests that you believe are appropriate for patient care should be ordered. Medicare will pay only for tests that are medically necessary for the diagnosis and treatment of the patient, rather than for screening purposes.

Patient (last, first, mi) **PLEASE PRINT** | Patient Phone

BILL TO **PLEASE CIRCLE** PATIENT CLIENT *INS. *MEDICARE *MEDICAID

Sex | Age | Date of Birth **(required)** | Physician

Guarantor (last, first, mi) Required if insurance or patient billing

SSN # | Patient ID # | **ROOM #**

Address

DATE/TIME OF COLLECTION **(required)** / / TIME: | **Stat** | FASTING STATUS ☐ YES ☐ NO ____ hrs. p.p.

City State Zip

Insurance Name Required if insurance billing

*PHYSICIAN/CLINICIAN PLEASE COMPLETE: We believe that in your case Medicare is likely to deny coverage of the following test(s): _____ for the following reason(s):

☐ Medicare may not pay for this service for the provided diagnosis. ☐ Medicare does not pay for tests that do not have FDA approval. ☐ Medicare usually does not pay for routine exams or laboratory screening procedures.

*Insurance, Medicare or Medicaid #

Group Number(s) Employer

DIAGNOSTIC PROFILES:

		ICD9 CODE				ICD9 CODE				ICD9 CODE
1025	**Basic Metabolic Panel BMP** Ⓢ		1011	**Liver Function Panel** Ⓢ		8091	**Acute Hepatitis Panel** Ⓢ			
1005	**Comp Metabolic Panel CMP** Ⓢ		1035	**Renal Function Panel** Ⓢ		8121	**Arthritis Panel** ⓈⓅ			
1050	**Lipid Panel** Ⓢ		8030	**Thyroid Panel I** Ⓢ		8900	**General Health Panel** ⓈⓅ			
1030	**Electrolytes Panel** Ⓢ		8050	**Thyroid Panel III** Ⓢ		8060	**Prenatal Profile** ⓅⓇ			

ADDITIONAL TESTS

		ICD9 CODE
8165	**Anemia Panel** ⓈⓅ	

INDIVIDUAL TESTS:

1130	Alkaline Phosphatase	Ⓢ		19352	Estrogens, Total	Ⓢ		1520	LD (LDH)	Ⓢ		7070	RA, Latex	Ⓢ	
1140	ALT (SGPT)	Ⓢ		3040	Ferritin	Ⓢ		4540	Lithium	Ⓢ		2070	Reticulocyte Count	Ⓟ	
1150	Amylase	Ⓢ		3280	Folate (Folic Acid)	Ⓢ		3150	LH	Ⓢ		7080	RPR	Ⓢ	
9038	ANA	Ⓡ		3050	FSH	Ⓢ		1550	Magnesium	Ⓢ		2040	Sed Rate (ESR)	Ⓟ	
1180	AST (SGOT)	Ⓢ		1360	GGT	Ⓢ		7060	Mono Test	Ⓢ		3200	T3 Uptake	Ⓢ	
3000	B-HCG, Quantitative	Ⓢ		1450	Glucose, Fasting	Ⓢ		4030	Phenobarbital	Ⓡ		3210	T4, Total	Ⓢ	
1730	BUN (Urea Nitrogen)	Ⓢ		1460	Glucose, Random	Ⓢ		4040	Phenytoin (Dilantin)	Ⓡ		3235	T4, Free	Ⓢ	
2000	CBC Differential	Ⓟ		1420	Glucose, 1° post glu 50 gm	Ⓢ		1570	Phosphorus	Ⓢ		3230	TSH	Ⓢ	
2010	CBC w/o Differential	Ⓟ		1390	GTT 3 Hrs.	Ⓢ		2121	Platelet Count	Ⓟ		9702	Testosterone	Ⓢ	
1220	Calcium	Ⓢ		3060	Glyco. Hgb. (A1C)	Ⓟ		1610	Potassium	Ⓢ		4060	Theophylline	Ⓡ	
4010	Carbamazepine	Ⓢ		3055	H. pylori Antibody	Ⓢ		3070	Pregnancy, Qual (Serum)	Ⓢ		1710	Triglycerides	Ⓢ	
3178	CA-125	Ⓢ		2060	Hgb/Hct	Ⓟ		3080	Pregnancy, Qual (Urine)	Ⓤ		1750	Uric Acid	Ⓢ	
3010	CEA	Ⓢ		3110	Hepatitis B Surf AG	Ⓢ		3175	Progesterone	Ⓡ		6070	UA without Microscopic	Ⓤ	
1290	Cholesterol	Ⓢ		3120	Hepatitis B Surf AB	Ⓢ		3180	PSA	Ⓢ		6060	Urinalysis (UA)	Ⓤ	
1300	CK	Ⓢ		9443	Hepatitis C Antibody	Ⓢ		3170	Prolactin	Ⓢ		4070	Valproic Acid (Depakote)	Ⓡ	
1350	Creatinine	Ⓢ		3140	HIV 1/2 Screen	Ⓢ		2200	PT (Coumadin Y or N)	Ⓑ		3270	Vitamin B12	Ⓢ	
4020	Digoxin (Lanoxin)	Ⓡ		1490	Iron	Ⓢ		2210	PTT	Ⓑ		10000	Venipuncture		

MICROBIOLOGY TESTS Specimen:

Antibiotic Susceptibility Performed When Indicated.

Body Sites:

5080	Eye/Ear Culture	Ⓒ		5020	Throat Cult. (B-Strep)	Ⓒ		5095	Yeast Culture	Ⓒ		19280	Chlam/G.C., DNA Probe	ⓖⓟ	
5090	Fungal Culture	Ⓒ		5170	Urine Culture	Ⓤ		5120	Misc. Culture	Ⓒ		19279	Chlamydia, DNA Probe	ⓖⓟ	
9282	Herpes Culture	Ⓥ		5180	Vaginal Culture	Ⓒ		5300	Ova & Parasites	ⓢⓣ		19416	G.C. DNA Probe	ⓖⓟ	
5140	Stool Culture	ⓢⓣ		5105	Vaginal Cult. (B-Strep)	Ⓒ		5200	Occult Blood	ⓢⓣ					
5150	Throat Culture	Ⓒ		5190	Wound Culture	Ⓒ		9165	C. difficle Toxin	ⓢⓣ					

Ⓢ Serum/ SST	Ⓡ Red	Ⓟ Purple	Ⓑ Light Blue	Ⓤ Urine	Ⓒ Culturette	ⓖⓟ Gen. Probe	Ⓥ Viral Transport	ⓢⓣ Stool	Ⓜ MISC	PROC: _____ LOG: _____

OTHER TESTS AND DIAGNOSIS

(See Advance Beneficiary Notice on Reverse) I have read and understand the ABN and I authorize MDL to act as my agent in securing payment for all services. I further agree that MDL may receive direct payment from Medicare and/or my insurance company. I agree to pay all remaining balances.

SEND REPORT TO:
ADDRESS
COPIES TO:
ADDRESS

DATE: _____ Patient Signature _____

TOTAL TEST(S)

PH930017

PH930017 PH930017
PH930017 PH930017

Did you know . . .

...that you can't always see a vein ...that not all veins are created equal
...that you can't judge a book (or a vein) by its cover

Did you know . . .

1. The vein wall is innervated, and

- ✓ that these nerve endings, just like those in your skin, can feel hot/cold/touch/and pain.
- ✓ that these nerve endings respond to these stimuli in a predictable manner –
  hot – dilates cold – constricts
  (gentle) touch – dilates pain – constricts
- ✓ that when you use (gentle) touch on a vein, that specific segment of vessel wall relaxes and allows the wall to stretch, filling with more blood (dilating), resulting in a bigger, more palpable vein.

2. If you use your <u>sense of touch</u> to locate a vein (instead of LOOKing for one), you will be able to locate a vein EVERY time (100%), and

- ✓ that your sense of touch has a sensitivity and specificity of 99.999…% in your dominant hand index finger (the pad of the finger, not the tip).
- ✓ that if you palpate (feel) for that vein with alcohol, you can enhance your sense of touch.
- ✓ that alcohol removes the "friction" that is created when you pass your skin across the patient's skin.
- ✓ that friction is the equivalent of "noise" to the brain, and this noise signal interferes with your brain's ability to discern.

After you locate the vein, then you can LOOK to see where to stick it!

3. The vein feels like a long, skinny water balloon (imagine the rebound bounce of water against your index finger as you gently push down on the water balloon), and

- ✓ that no other structure in the human body feels like a water balloon – NOT EVEN THE ARTERY.
- ✓ that there are only two other tissues that are palpable in that region of the superficial veins –
  the muscle – feels like a firm mushroom
  the tendon – feels like a guitar string

4. You can determine the integrity of the vein wall by grading it as you palpate it, and

- ✓ that the integrity of the wall determines whether the vein will tolerate the procedure or not.
- ✓ that you can grade the vein by the firmness of the bounce.
- ✓ that if your vein scores 5-10 on the firmness scale of 0-10, it will tolerate the needle stick, and if it is less than 5, it won't.
- ✓ that a tourniquet "artificially" dilates the vein, and maybe larger than nature intended for it to be.

Did you know all that?

Well, inside this text, you can learn all of this . . . and more!!!

ISBN: 0-9723656-1-3