Phlebotomy & Specimen Considerations

by

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Phlebotomy & Specimen Considerations

- The collection, handling, and processing of specimens represent a critical step in specimen analysis.
- Physicians rely on results obtained from quality laboratory specimens to confirm health or diagnose and treat patients.
- The most sophisticated laboratory equipment cannot deliver valid results if specimen integrity is compromised.
- Consequently, standards such as those established by the Clinical and Laboratory Standards Institute (CLSI) must be followed to protect specimen integrity and ensure that quality specimens are submitted for testing.

BLOOD COLLECTION PERSONNEL

- The process of collecting blood is called **phlebotomy**, which literally translated means "to cut a vein"
- Two main phlebotomy procedures are
  - **Venipuncture**, in which the blood is collected through a needle inserted into a vein,
  - **Capillary puncture**, in which the blood is collected from a skin puncture made with a lancet or similar device.

- **Phlebotomists** have been specifically trained in blood collection techniques and are employed primarily to collect blood specimens

PUBLIC RELATIONS AND CLIENT INTERACTION

- Blood collection personnel play an important role in public relations for the laboratory (often being the *only* contact a patient has with it) and the health care facility.
- An assured professional can put the patient at ease and facilitate a positive interaction

Professionalism

- Blood collection personnel must project a professional image which involves appearance, attitude (including certain behavioral characteristics), communication skills, and bedside manner.

Appearance

- The impression a phlebotomist makes when first approaching a patient sets the stage for future interaction
  - Trust worthy professional
  - Lab coats
  - Shoes must be conservative, clean
  - Personal hygiene
  - Hair pulled back
  - Short finger nails

Attitude

- Attitude is the feeling or emotion an individual has with regard to something—a job or activity, for example. A professional attitude involves the following personal behaviors or characteristics:
  - Integrity or honesty
  - Compassion
  - Motivation
  - Dependability and work ethic
  - Diplomacy
  - Ethical behavior

Communication Skills

- Patient's perception of a health care facility and the quality of service delivered is derived from employees such as the phlebotomist with whom he or she is involved personally.
- good communication leads to favorable impression of the phlebotomist and the facility to the patient
- Listening forms the foundation for good interpersonal communication
- Using easily understood vocabulary encourages good verbal communication
- The patient's face often tells what he or she will not say.

Bedside Manner

- A phlebotomist may encounter family or visitors when collecting specimens.
- Discretion is important in dealing with them as they can help calm the patient's fears or they can raise the patient's anxiety level.
- If the phlebotomist feels it would be best, they can be asked to leave the room.
- Family members can be a source of comfort to a child during a phlebotomy procedure and are normally encouraged to stay in the room, and they may even be asked to assist

Patient Consent

- It is critical that patient consent be obtained before initiating any phlebotomy procedure

BOX 2-1. EXAMPLES OF TYPES OF PATIENT CONSENT

Informed consent	Implies voluntary permission for a medical procedure, test, or medication will be given
Expressed consent	May be given verbally or in writing
Implied consent	Does not require a verbal expression of consent. Actions can imply consent (e.g., the patient holds out an arm after being told a blood specimen is to be collected)
HIV consent	Laws specify exactly what type of information must be given to inform the client properly
Consent for minors	Parent or guardian consent is required (health care personnel who do not obtain it are liable for assault and battery)
Refusal of consent	An individual has a constitutional right to refuse a medical procedure such as venipuncture

Confidentiality and the Health Insurance Portability and Accountability Act

- Maintaining patient confidentiality protects patients and practitioners
- Treat all patient information as private and confidential
- **Health Insurance Portability and Accountability Act (HIPAA)** was passed to more closely secure patient information.
- This federal law requires that patients be given information on their rights concerning the release of protected health information (PHI) and on how it will be used.
- Penalties for HIPAA violations include disciplinary action, fines, and possible jail time.

LEGAL ISSUES

- The bulk of legal proceedings dealt with in medical offices or other health care facilities are between two private parties and fall under the category of **civil actions in which** damages may be awarded in the form of monetary penalties.
- The most common civil actions in health care are based on **tort, an intentional or unintentional wrong or act** that is committed without just cause
- Examples of tort actions phlebotomists could involve are:
- **Assault**: a threat that causes one to be in fear of immediate harm
- **Battery**: deliberate harmful or offensive touching without consent or legal justification
- **Invasion of privacy**: violation of one's right to be left alone

LEGAL ISSUES

- **Breach of confidentiality**: failure to keep private or privileged information confidential
- **Negligence**: doing something that a reasonable person would not do or not doing something that a reasonable person would do
- **Malpractice**: a type of negligence committed by a professional
- **Standard of care**: a duty to protect someone from harm established by standards of the profession and expectations of society

INFECTION CONTROL

- Standard precautions must be taken with every patient to prevent the spread of infection.
- This includes wearing personal protective equipment (PPE) when drawing blood or handling specimens and using proper hand hygiene procedures. Additional transmission-based precautions (i.e., airborne, droplet, or contact) may be required for patients with certain diseases
- **PPE**:
  - Lab coats or gowns, and gloves are required for phlebotomy procedures and during specimen handling and processing.
  - New gloves must be worn for each patient.
  - Masks or respirators may be required when drawing blood from patients with certain transmissible diseases.

INFECTION CONTROL

- **Hand hygiene**:
  - Proper hand hygiene is the most important means of preventing the spread of infection.
  - Hands must be decontaminated frequently, including after glove removal, as gloves can contain defects.
- CDC and Healthcare Infection Control Practices Advisory Committee (HICPAC) guidelines allow use of alcohol-based antiseptic hand cleaners instead of hand washing if hands are not visibly soiled.

INFECTION CONTROL

- **Isolation:**
  - Isolation procedures separate certain patients from others and limit their contact with hospital personnel and visitors.
  - A description of required precautions is normally posted on the patient's door and must be followed by all who enter the room.
  - A cart containing supplies needed to enter the room or care for the patient is typically located outside the door.

BOX 2-2. STANDARD AND TRANSMISSION-BASED PRECAUTIONS

STANDARD PRECAUTIONS

FOR INFECTION CONTROL

Handwashing
Wash after touching **body fluids**, after **removing gloves**, and between **patient contacts**.

Gloves
Wear **Gloves** before touching **body fluids**, **mucous membranes**, and **nonintact skin**.

Mask & Eye Protection or Face Shield
Protect eyes, nose, mouth during procedures that cause **splashes** or **sprays** of **body fluids**.

Gown
Wear **Gown** during procedures that may cause **splashes** or **sprays** of **body fluids**.

Patient-Care Equipment
Handle soiled equipment so as to prevent personal contamination and transfer to other patients.

Environmental Control
Follow hospital procedures for cleaning beds, equipment, and frequently touched surfaces.

Linen
Handle linen soiled with **body fluids** so as to prevent personal contamination and transfer to other patients.

Occupational Health & Bloodborne Pathogens
Prevent injuries from needles, scalpels, and other sharp devices.
Never recap needles using both hands.
Place sharps in puncture-proof sharps containers.
Use **Resuscitation Devices** as an alternative to mouth-to-mouth resuscitation.

Patient Placement
Use a Private Room for a patient who contaminates the environment.

"Body Fluids" include **blood**, **secretions**, and **excretions**.

Form No. **SPR-C** [illegible] [illegible]

AIRBORNE PRECAUTIONS

(in addition to Standard Precautions)

VISITORS: Report to nurse before entering.

Patient Placement

Use **private room** that has:
- Monitored negative air pressure,
- 6 to 12 air changes per hour,
- Discharge of air outdoors or HEPA filtration if recirculated.

Keep room door closed and patient in room.

Respiratory Protection

Wear an **N95 respirator** when entering the room of a patient with known or suspected infectious pulmonary **tuberculosis.**

Susceptible persons should not enter the room of patients known or suspected to have **measles** (rubeola) or **varicella** (chickenpox) if other immune caregivers are available. If susceptible persons must enter, they should wear an **N95 respirator.** (Respirator or surgical mask not required if immune to measles and varicella.)

Patient Transport

Limit transport of patient from room to essential purposes only.

Use **surgical mask** on patient during transport.

DROPLET PRECAUTIONS

(in addition to Standard Precautions)

VISITORS: Report to nurse before entering.

Patient Placement

Private room, if possible. Cohort or maintain spatial separation of **3 feet** from other patients or visitors if private room is not available.

Mask

Wear mask when working within **3 feet** of patient (or upon entering room).

Patient Transport

Limit transport of patient from room to essential purposes only.

Use **surgical mask** on patient during transport.

CONTACT PRECAUTIONS

(In addition to *Standard Precautions*)

VISITORS: Report to nurse before entering.

Patient Placement

Private room, if possible. Cohort if private room is not available.

Gloves

Wear gloves when entering the room.
Change gloves after having contact with infective material that may contain high concentrations of microorganisms (**fecal** material and **wound drainage**).
Remove gloves before leaving patient room.

Wash

Wash hands with an **antimicrobial** agent immediately after glove removal.
After glove removal and handwashing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room to avoid transfer of microorganisms to other patients or environments.

Gown

Wear gown when **entering** patient room if you anticipate that your clothing will have substantial contact with the patient, environmental surfaces, or items in the patient's room, or if the patient is **incontinent**, or has **diarrhea**, an **ileostomy**, a **colostomy**, or **wound drainage** not contained by a dressing. **Remove** gown before leaving the patient's environment and ensure that clothing does not contact potentially contaminated environmental surfaces to avoid transfer of microorganisms to other patients or environments.

Patient Transport

Limit transport of patient to essential purposes only. During transport, ensure that precautions are maintained to minimize the risk of transmission of microorganisms to other patients and contamination of environmental surfaces and equipment.

Patient-Care Equipment

Dedicate the use of noncritical patient-care equipment to a single patient.
If common equipment is used, clean and disinfect between patients.

THE VASCULAR SYSTEM

- **Arteries** have thick walls to withstand the pressure of ventricular contraction, which creates a pulse that can be felt, distinguishing them from veins.
- When arterial blood is collected by syringe, the pressure normally causes blood to “pump” or pulse into the syringe under its own power.
- Normal systemic arterial blood is bright red because it is oxygen rich.

- **Veins** have thinner walls than the same-size arteries because blood in them is under less pressure.
- Consequently, they collapse more easily.
- Blood is kept moving through veins by skeletal muscle movement

and the opening and closing of valves that line their inner walls.

- Normal systemic venous blood is dark bluish red because it is oxygen poor.

■ **Capillaries** are only one cell thick to allow the exchange of gases and other substances between the tissues and the blood. The capillary bed in the skin can easily be punctured with a lancet to provide blood specimens for testing.

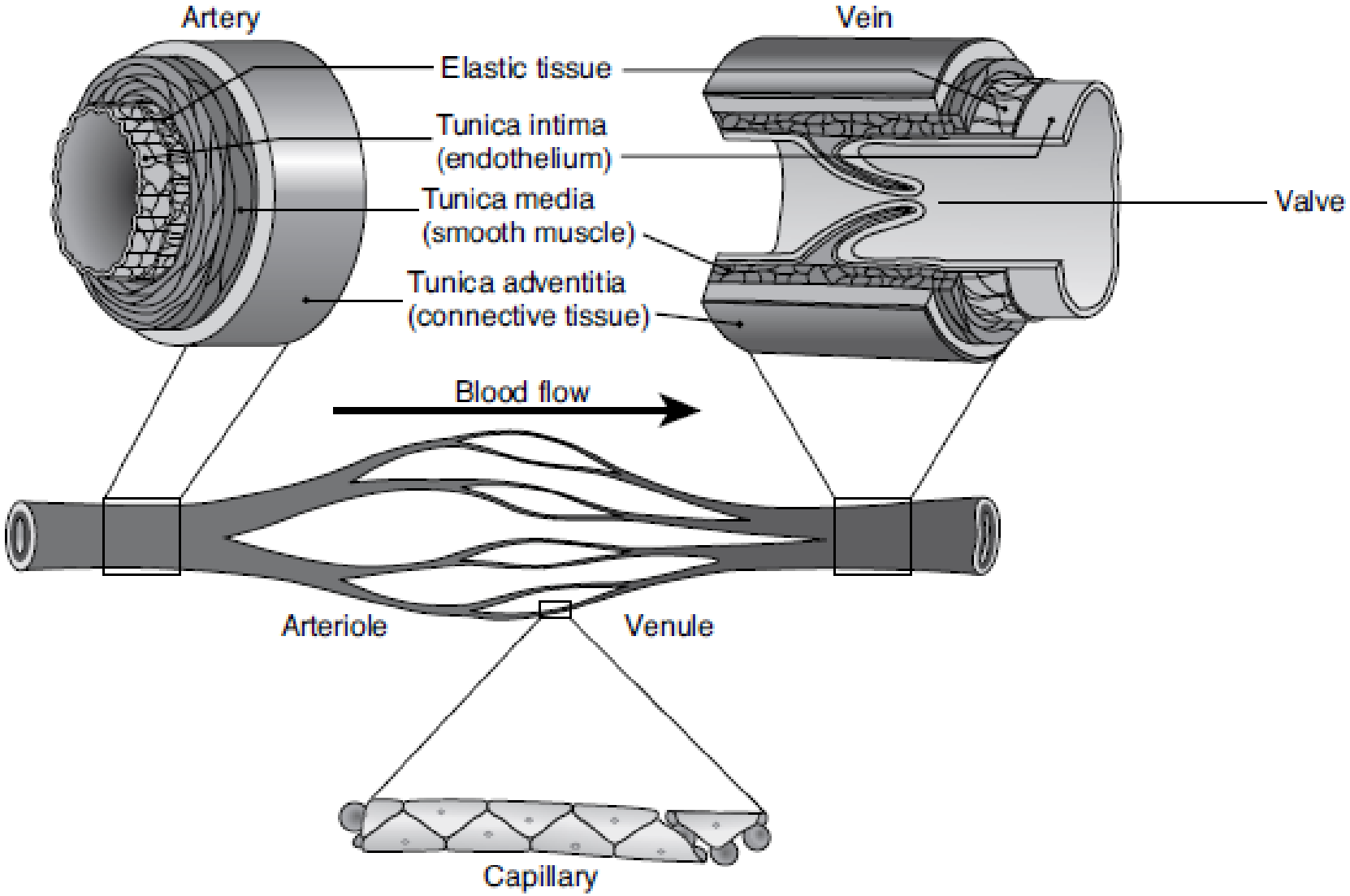


FIGURE 2-1. Artery, vein, and capillary structure. (Reprinted with permission from McCall R, Tankersley C. Phlebotomy essentials. 4th ed. Baltimore, Md.: Lippincott Williams & Wilkins, 2008.)

PHLEBOTOMY-RELATED VASCULAR ANATOMY

- The major veins for venipuncture are in the **antecubital fossa**, the area of the arm in front of the elbow.
- Here, several large veins lie near the surface, making them easier to locate and draw blood from.
- Exact location vary from person to person
- two basic patterns in which the veins form the shape of either an **“H”** or an **“M”** are seen most often

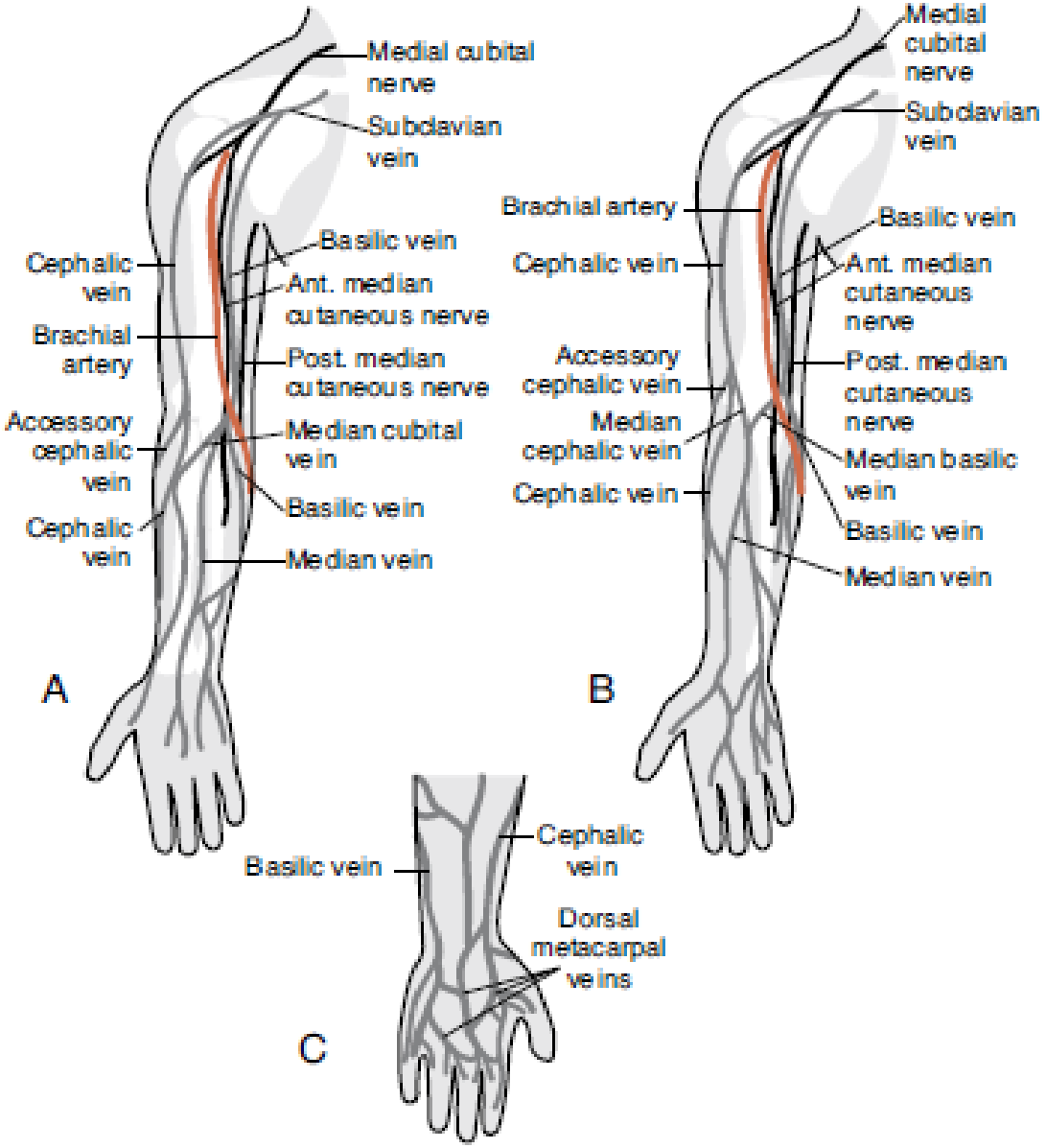


FIGURE 2-2. Principal veins of the arm including major antecubital veins. **(A)** H-shaped pattern of antecubital veins of the right arm in anatomic position. **(B)** M-shaped pattern of antecubital veins of the right arm in anatomic position. **(C)** Right forearm, wrist, and hand veins in prone position. (Reprinted with permission from McCall R, Tankersley C. Phlebotomy essentials. 4th ed. Baltimore, Md.: Lippincott Williams & Wilkins, 2008.)

H Pattern Veins

- The H pattern *is displayed by approximately* 70% of the population

Median cubital vein: located near the center of the antecubital fossa.

- preferred vein for venipuncture in the H pattern because it is typically large, closer to the surface, and the most stationary, making it the easiest and least painful to puncture and the least likely to bruise.

Cephalic vein: located in the lateral aspect of the antecubital fossa. It is the second-choice vein in the H pattern.

- fairly well anchored and often the only vein that can be felt in obese patients.

Basilic vein: located on the medial side of the antecubital fossa.

- It is the last choice in either pattern.
- Although normally large and easy to feel, it is not well anchored and rolls easily, increasing risk of puncturing a median cutaneous nerve branch or the brachial artery that is nearby.
- CLSI recommends against using it unless no other vein in either arm is more prominent.

M Pattern Veins

- The veins commonly used for venipuncture in this pattern are

Median vein: located in the very center of the pattern.

- first-choice vein in the M pattern, well anchored, tends to be less painful, not close to major nerves or arteries, safest to puncture.

Median cephalic vein: branches from the median vein to the lateral aspect of the arm.

- Second choice M-pattern vein because it is accessible, unlikely to roll, less painful, located far enough away from major nerves or arteries, and generally safe to puncture.

Median basilic vein: branches from the median vein to the medial aspect of the arm.

- third choice in the M pattern, more accessible, located near the anterior and posterior branches of the median cutaneous nerve.

Other Veins

- Although antecubital veins are used most frequently,
- veins on the back of the hand and wrist *may* also be used for venipuncture.
- Veins on the underside of the wrist, however, should *never be used for venipuncture.*
- Leg, ankle, and foot veins are sometimes used but not without permission of the patient's physician, due to a potential for significant medical complications.

Source and Composition of Blood Specimens

- Blood specimens can be obtained from arteries and veins and by puncturing the capillary bed in the skin.
- Composition varies by source
- **Arterial blood composition** is uniform throughout the body.
- arterial puncture is technically difficult and potentially hazardous,
- primarily reserved for blood gas evaluation and certain emergency situations
- performed only by those with special training.

Venous blood composition is affected by metabolic activity of the tissue it drains and varies by collection site.

- differs most from arterial blood in its lower oxygen content, but chloride, glucose, pH, CO_2, lactic acid, and ammonia levels may also differ.
- Impaired blood flow can affect other analytes.

Capillary blood contains arterial and venous blood plus tissue fluid.

- Because it enters capillaries under pressure, the arterial portion is highest.
- Warming the site increases it further.
- composition differs most from venous blood.
- Capillary glucose is normally higher; calcium, potassium, and total protein are normally lower.
- Squeezing the site can falsely elevate potassium levels

Types of Blood Specimens

- Blood is approximately **55%** fluid and **45%** blood cells.
- Tests can be performed on **serum** or **plasma** derived from the fluid portion, or on whole blood.
- The type of specimen tested depends on the test, how urgently results are needed, and the equipment used
- **Serum** is normally a clear, pale yellow fluid (nonfasting serum can be cloudy due to lipids) separated from clotted blood by centrifugation.
- Many chemistry tests are performed on serum.

- **Plasma** is normally a clear to slightly hazy, pale yellow fluid that separates from the cells when blood in an **anticoagulant tube is centrifuged.**
- Plasma contains fibrinogen; **serum does not** because it was used in clot formation.
- Many chemistry tests can be performed on either serum or plasma. Stat and other tests requiring a fast turn around time (TAT) are often collected in tubes containing **heparin anticoagulant because they** can be centrifuged immediately to obtain plasma.
- **Whole blood** contains both cells and plasma, like blood in the body. As with plasma, it must be collected in an anticoagulant tube to keep it from clotting.
- Whole blood is used for most hematology tests and many point-of-care tests (POCTs), especially in acute care and stat situations.

Venipuncture Equipment

- Venipuncture, the most common way to collect blood specimens, can be performed by three basic methods—
- 1) evacuated tube system (ETS),
- 2) needle and syringe, and
- 3) winged infusion set (butterfly).

- **ETS** is the preferred method because blood is collected
  - directly from the vein into a tube,
  - minimizing the risk of specimen contamination
  - and exposure to the blood

  butterfly set is often used to draw blood from infants and children, from hand veins

Venipuncture Equipment

- Tourniquet
- Needles
- Evacuated Tube System
- Syringe System
- Tube Additives
- Trace Element–Free Tubes

Tourniquet

- A tourniquet is applied to a patient's arm during venipuncture.
- Fastened tight enough to restrict venous flow but not arterial flow.
- This distends the veins, making them larger and easier to find, and stretches the walls so they are thinner and easier to pierce.
- A tourniquet must not be left on longer than 1 minute because specimen quality can be affected.

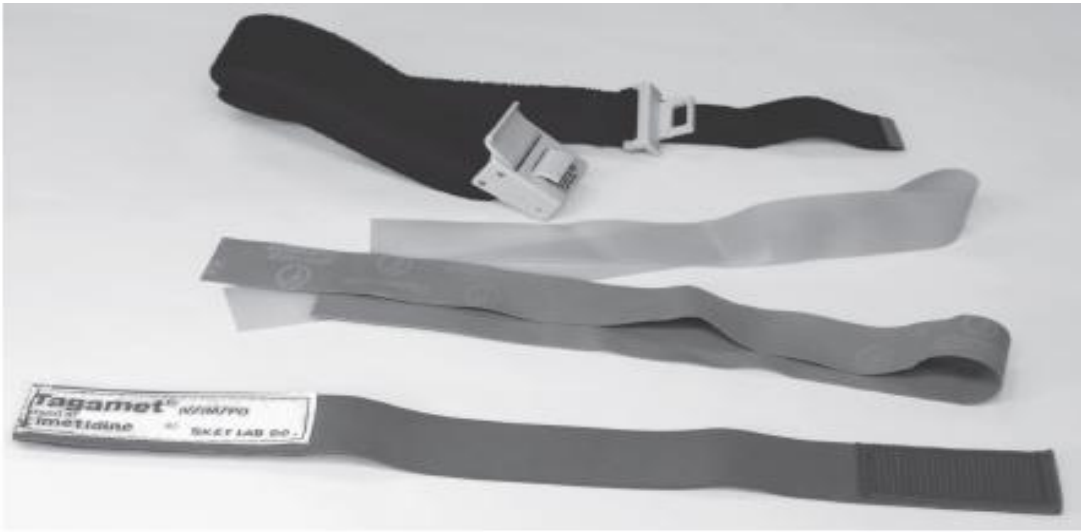


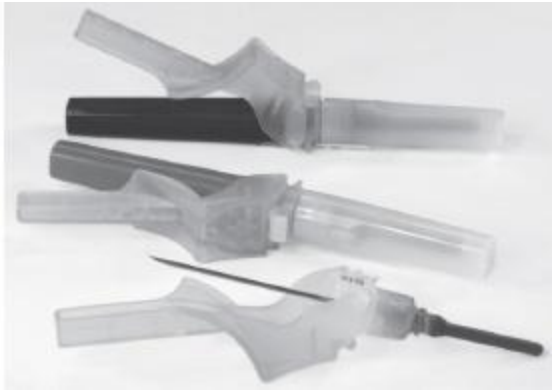
FIGURE 2-3. Several types of tourniquets (*top* to *bottom*): buckle closure, latex strap, nonlatex strap, and Velcro closure. (Reprinted with permission from McCall R, Tankersley C. Phlebotomy essentials. 4th ed. Baltimore, Md.: Lippincott Williams & Wilkins, 2008.)

Needles

- Phlebotomy needles are sterile, disposable, and sized by length and gauge.
- Length selection depends on vein depth and user preference.
- Gauge is a number that relates to needle diameter or bore. Gauge and bore are inversely related (i.e., the larger the gauge, the smaller is the bore).
- Gauge is selected for the size and condition of the vein and amount of blood required for the test.
- An appropriate gauge is important
- Venipuncture needles include gauges 21 to 23, with a **21** gauge considered **standard** for routine venipuncture.

Evacuated Tube System

- ETS has three basic components—
  - a **multisample needle,**
  - a tube holder,
  - and various types of evacuated tubes
- A **multisample needle** allows collection of multiple tubes during venipuncture.
- It is threaded so it can screw into a tube holder,
- Has a beveled point on each end.
- The tube end of the needle is covered by a sleeve that retracts as it penetrates the stopper, allowing blood flow, and recovers the needle to prevent blood leakage when the tube is removed



- A **tube holder** is a plastic cylinder with a small opening for a needle at one end and a large opening for tubes at the other.
- The tube end has flanges to help place and remove tubes.
- Holders are available with or without safety devices.
- A holder without a safety device must be used with a needle that has one.

Traditional needle and tube holders

- **Evacuated tubes** (Fig. 2-6) have a premeasured vacuum that automatically draws the volume of blood indicated on the label.
- A tube that has lost all or part of its vacuum will fail to fill with blood or fill incompletely.
- Vacuum loss occur due to improper storage, opening, dropped the tube or needle bevel backs out of the skin during the draw.
- Tube stoppers are color coded to identify a type of **additive, absence of** additive, or special tube property.

Evacuated tubes

TABLE 2-1 COMMON STOPPER COLORS, ADDITIVES, AND DEPARTMENTS INVOLVED

STOPPER COLOR	ADDITIVE	DEPARTMENT(S)
Light blue	Sodium citrate	Coagulation
Red (glass)	None	Chemistry, blood bank, serology/immunology
Red (plastic)	Clot activator	Chemistry
Red/light gray (plastic)	Nonadditive	NA (Discard tube only)
Red/black (tiger) Gold Red/gold	Clot activator and gel separator	Chemistry
Green/gray Light green	Lithium heparin and gel separator	Chemistry
Green	Lithium heparin Sodium heparin	Chemistry
Lavender Pink	EDTA	Hematology Blood bank
Gray	Sodium fluoride and potassium oxalate Sodium fluoride and EDTA Sodium fluoride	Chemistry
Orange Gray/yellow	Thrombin	Chemistry
Royal blue	None (red label) EDTA (lavender label) Sodium heparin (green label)	Chemistry
Tan (glass tube) Tan (plastic)	Sodium heparin EDTA	Chemistry
Yellow	Sodium polyanethol sulfonate (SPS)	Microbiology
Yellow	Acid citrate dextrose (ACD)	Blood bank/Immunohematology

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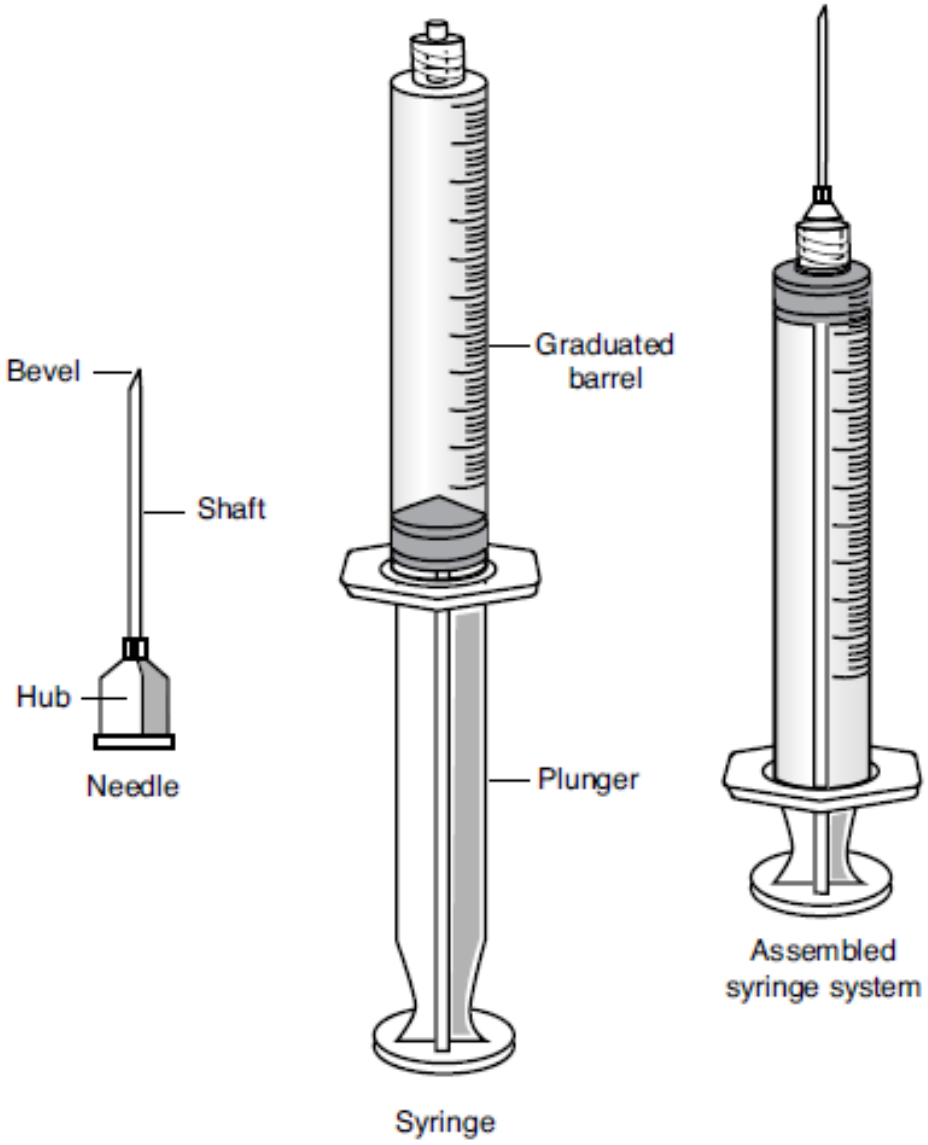
Syringe System

- A **syringe system**, includes a plastic syringe, a needle, and a transfer device
- Syringe needles are available in a wide range of gauges and lengths for many different uses.
- Syringes of various sizes (size and condition of the vein and the amount of blood needed).
- graduated barrel markings in either milliliters (mL) or cubic centimeters (cc) and a plunger
- Transfer devices reduce needle sticks and aerosol exposures when filling tubes from syringes



Traditional syringe system components

Butterfly System

- A butterfly (winged infusion set) is a short needle with a plastic part resembling butterfly wings
- Various gauges, with 23 gauge most commonly used
- During use, the plastic wings are typically held together with the thumb and index finger, allowing the user to achieve the shallow needle angle needed to access small veins.
- Smaller needles increase the risk of specimen hemolysis.
- Butterfly needles used for venipuncture must have safety devices.

Example of a safety winged infusion set

Tube Additives

- An additive functions optimally when the tube is filled to its stated volume and gently inverted immediately after collection to mix the additive with the blood.
- Specimen quality can be compromised if a tube is partially filled.
- Shaking or vigorous mixing can hemolyze the blood, making it unsuitable for testing

- EDTA, citrates, heparin, and oxalates.
- Antiglycolytic agents (sodium fluoride , potassium oxalate)
- Clot activators (Silica)
- Thixotropic gel

Trace Element–Free Tubes

- Trace element–free tubes are as contamination free as possible.
- used to collect specimens for trace element, toxicology, nutrient, and other tests that detect analytes found in the blood in such tiny amounts that trace elements leached into the blood from tube or stopper materials could falsely elevate test results.
- The tubes contain EDTA, heparin, or no additive.

TABLE 2-2 COMMON TESTS AFFECTED BY ADDITIVE CONTAMINATION

CONTAMINATING ADDITIVE	TESTS POTENTIALLY AFFECTED
Citrate	Alkaline phosphatase Calcium Phosphorus
EDTA	Alkaline phosphatase Calcium Creatine kinase Partial thromboplastin Potassium Protime Serum iron Sodium
Heparin (all formulations)	Activated clotting time Acid phosphatase Calcium (some test methods) Partial thromboplastin Protime Sodium (sodium formulations) Lithium (lithium formulations)
Oxalates	Acid phosphatase Alkaline phosphatase Amylase Calcium Lactate dehydrogenase Partial thromboplastin Potassium Protime Red cell morphology
Silica (clot activator)	Partial thromboplastin time Protime
Sodium fluoride	Sodium Urea nitrogen

Order of Draw and Additive Carry-over

BOX 2-3. CLSI ORDER OF DRAW

1. Sterile tube (e.g., blood culture)
2. Coagulation tube (e.g., blue top)
3. Serum tube with or without clot activator, with or without gel (e.g., red top)
4. Heparin tube with or without gel separator (e.g., green top)
5. EDTA tube with or without gel separator (e.g., lavender top, pearl top)
6. Glycolytic inhibitor tube (e.g., gray top)

TABLE 2-3 ORDER OF DRAW, STOPPER COLORS, AND RATIONALE FOR COLLECTION ORDER

ORDER OF DRAW	TUBE STOPPER COLOR	RATIONALE FOR COLLECTION ORDER
Blood cultures (sterile collections)	Yellow SPS Sterile media bottle	Minimizes chance of microbial contamination
Coagulation tubes	Light blue	The first additive tube in the order because all other additives affect coagulation tests
Glass nonadditive tubes	Red	Prevents contamination by additives in other tubes
Plastic clot activator tubes Serum separator tubes (SSTs)	Red Red and gray rubber Gold plastic	Filled after coagulation tests because silica particles activate clotting and affect coagulation tests (carry-over of silica into subsequent tubes can be overridden by anticoagulant in them)
Plasma separator tubes (PSTs) Heparin tubes	Green and gray rubber Light-green plastic Green	Heparin affects coagulation tests and interferes in collection of serum specimens; causes the least interference in tests other than coagulation tests
EDTA tubes Plasma preparation tubes (PPTs) Oxalate/fluoride tubes	Lavender Pink Pearl top Gray	Responsible for more carry-over problems than any other additive: elevates Na^+ and K^+ levels, chelates and decreases calcium and iron levels, elevates PT and PTT results Sodium fluoride and potassium oxalate affect sodium and potassium levels, respectively, after hematology tubes because oxalate damages cell membranes and causes abnormal RBC morphology. Oxalate interferes in enzyme reactions.

- The most common tubes in the order of draw can be remembered by recalling the phrase
- “stop, light red, stay put, green light, go”.
- *The* first letter of each word in the phrase stands for a tube in the order of draw:
- S (sterile), L (light blue), R (red), S (serum separator tube or SST), P (plasma separator tube)

VENIPUNCTURE PROCEDURES

- Procedure 2-1. Routine ETS Venipuncture
- **Purpose:** To obtain a blood specimen from an antecubital vein using the evacuated tube system
- **Equipment:** Tourniquet; gloves; antiseptic prep pad; multisample needle, tube holder, ETS tubes; gauze pads; sharps container; permanent ink pen; bandage

- Step 1: Review and Accession Test Request
- Step 2: Approach, Identify, and Prepare Patient
- Step 3: Verify Diet Restrictions and
  Latex Sensitivity
- Step 4: Sanitize Hands

Hand sanitization

- Step 5: Position Patient, Apply Tourniquet, and Ask Patient to Make a Fist

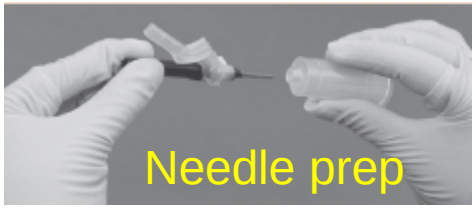
Tourniquet application

- Step 6: Select Vein, Release Tourniquet, and Ask Patient to Open Fist

- Step 7: Clean and Air Dry Site

Vein selection

- Step 8: Prepare Equipment and Put on Gloves

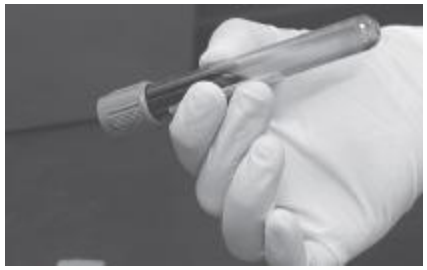


- Step 9: Reapply Tourniquet, Uncap and Inspect Needle

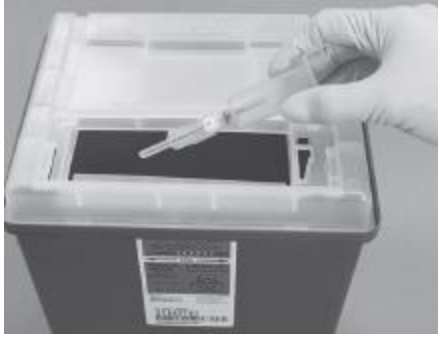
- Step 10: Ask Patient to Remake a Fist, Anchor Vein, and Insert Needle

- Step 11: Establish Blood Flow, Release Tourniquet, and Ask Patient to Open Fist

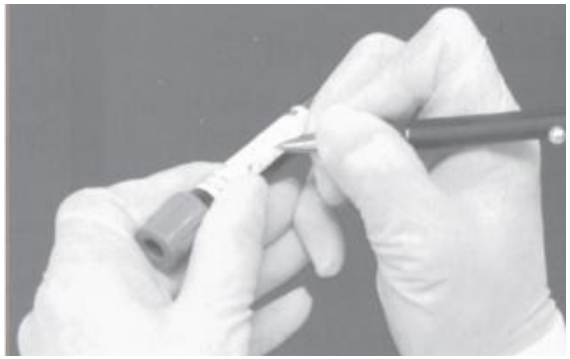
- Step 12: Fill, Remove, and Mix Tubes in Order of Draw



- Step 13: Place Gauze, Withdraw Needle, Activate Safety Feature, and Apply Pressure



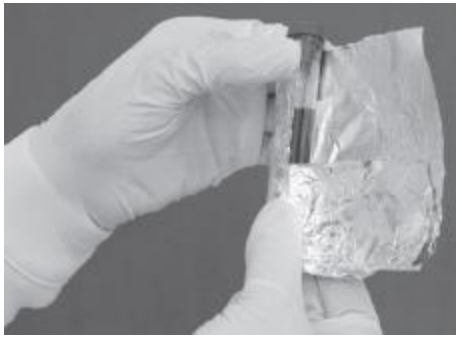
- Step 14: Discard Needle and Holder Unit



- Step 15: Label Tubes

- Step 16: Observe Special Handling Instructions

- Step 17: Check Patient's Arm and Apply Bandage



Covering tube with foil

- Step 18: Dispose of Used Materials

- Step 19: Thank Patient, Remove Gloves, and Sanitize Hands

- Step 20: Transport Specimens to the Lab

- **PROCEDURE 2-2.** VENIPUNCTURE OF A HAND VEIN USING A BUTTERFLY AND ETS HOLDER

- PROCEDURE 2-3. NEEDLE AND SYRINGE VENIPUNCTURE

PROCEDURE 2-2. VENIPUNCTURE OF A HAND VEIN USING A BUTTERFLY AND ETS HOLDER

- **Purpose:** To obtain a blood specimen from a hand vein using a butterfly and ETS holder
- **Equipment:** Tourniquet; gloves; antiseptic prep pad; butterfly needle with safety feature; ETS tube holder and tubes; gauze pads; sharps container; permanent ink pen; bandage
- **Steps 1–4:** Same as ETS venipuncture
- **Step 5:** Position Hand, Apply Tourniquet, and Ask Patient to Close the Hand
- **Step 6:** Select Vein, Release Tourniquet, and Relax Hand
- **Step 7:** Clean and Air Dry Site
- **Step 8:** Prepare Equipment and Put on Gloves

- **Step 9:** Reapply Tourniquet, Uncap and Inspect Needle
- **Step 10:** Anchor Vein and Insert Needle
- **Step 11:** Establish Blood Flow and Release Tourniquet
- **Step 12:** Fill, Remove, and Mix Tubes in Order of Draw
- **Step 13:** Place Gauze, Remove Needle, Activate Safety Device, and Apply Pressure
- **Step 14:** Discard Collection Unit

Needle insertion

Tubes filling

Needle removed

Placement of gauze

PROCEDURE 2-3. NEEDLE AND SYRINGE VENIPUNCTURE

- **Purpose:** To obtain a blood specimen from an antecubital vein using a needle and syringe
- **Equipment:** Tourniquet; gloves; antiseptic prep pad; syringe needle; syringe, transfer device, ETS tubes; gauze pads; sharps container; permanent ink pen; bandage
- **Steps 1-7:** Same as Routine ETS Venipuncture
- **Step 8:** Prepare Equipment and Put on Gloves
- **Step 9:** Reapply Tourniquet, Uncap and Inspect Needle
- **Step 10:** Have Patient Make a Fist, Anchor Vein, and Insert Needle

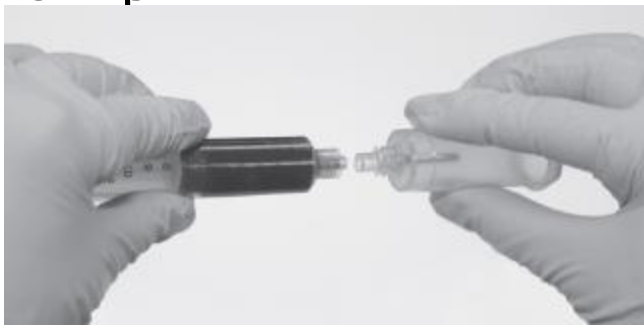
Needle insertion

- **Step 11:** Establish Blood Flow, Release Tourniquet, and Ask Patient to Open Fist
- **Step 12:** Fill Syringe
- **Step 13:** Place Gauze and Withdraw Needle
- **Step 14:** Activate Safety Device, Apply Pressure

Pulling syringe plunger

- **Step 15:** Discard Needle and Attach a Transfer Device, Rotating It to Ensure Secure Attachment

- **Step 16:** Hold the Syringe Vertically With the Tip Down and the Transfer Device at the Bottom



Transfer device attachment

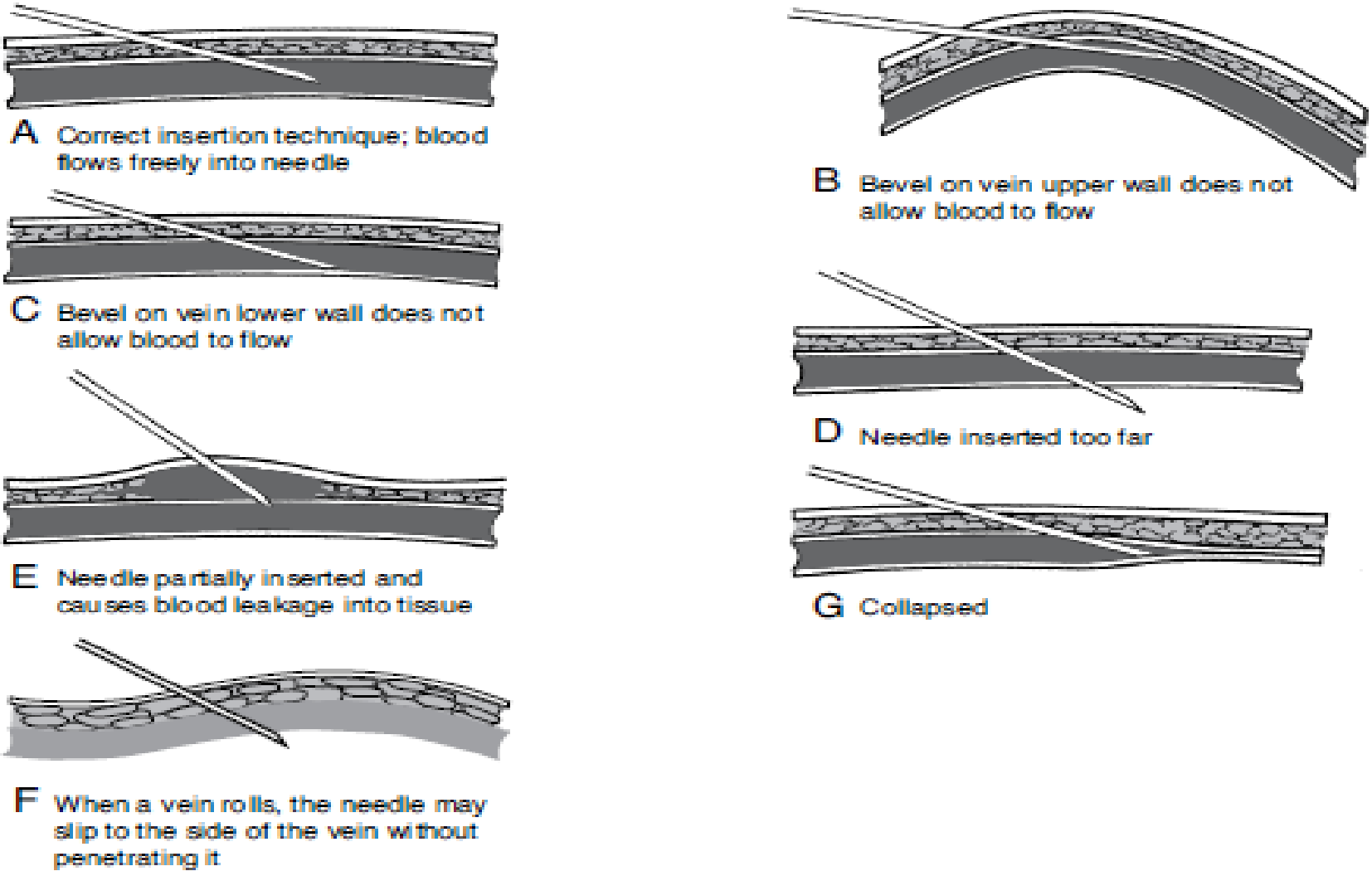
- **Step 17:** Place an ETS Tube in the Transfer Device in the Order of Draw, and Push It in All the Way
- **Step 18:** Fill the Tubes Using the Vacuum Draw of the Tube; Do Not Push on the Syringe Plunger

Tube placement

- **Step 19:** Mix Additive Tubes Upon Removal From the Transfer Device

- **Step 20:** Discard the Empty Syringe and Transfer Device Unit in a Sharps Container

Blood transfer



(A) Correct needle insertion technique (B) Bevel on upper vein wall. (C) Bevel on lower vein wall. (D) Needle inserted too far. (E) Needle partially inserted. (F) Needle slipped beside the vein. (G) Collapsed vein prevents blood flow.

Troubleshooting Failed Venipuncture

- Failure to draw blood can be caused by a misaligned tube in the holder, loss of tube vacuum, or improper position of the needle in the vein.
- If initially blood is not flowing into the tube, check the following:
- Tube position: verify proper tube position
- Vacuum: loss of vacuum in the tube
- Bevel against the vein wall
- Needle too deep: stop the blood to draw if hematoma formed
- Needle not deep enough: partial needle insertion
- Needle beside the vein: needle may slip beside rolled vein

Troubleshooting Failed Venipuncture

- Collapsed vein: If tube vacuum is too great for the vein, a syringe plunger is pulled too quickly, or the tourniquet is too tight or too close to the site, blood cannot be replaced as quickly as it is withdrawn and the vein collapses
- Undetermined needle position: If needle location in respect to the vein cannot be determined, one may have to relocate the vein. Remove the tube and withdraw the needle until the bevel is just under the skin.
  - Palpate the arm above the needle entry site. Do not feel too near to the needle, as it is painful. Locate and anchor the vein, and redirect the needle into it. If the vein cannot be located, discontinue the draw.

Multiple Venipuncture Attempts

- Upon failure of first attempt, try again below the first site, on the other arm, or on a hand or wrist vein.
- If the second attempt is unsuccessful, ask someone else to take over
- Unsuccessful venipuncture attempts frustrate both patient and phlebotomist.
- If a second person is unsuccessful on two attempts, give the patient a rest and try later unless the test is stat or timed

PEDIATRIC VENIPUNCTURE

- Requires the expertise and skill of an experienced phlebotomist
- If a child is under age 2, venipuncture should be limited to superficial veins of the antecubital fossa and forearm, and never deep, hard-to find veins.
- An infant or young child has a small blood volume and every effort must be made to collect the minimum amount of blood required for testing.
- Large amounts of blood removed at once or even small quantities on a regular basis can cause anemia.
- Removing 10% of blood volume at one time can lead to shock and cardiac arrest.

Interacting with a Child

- Approach the child slowly and determine his or her degree of anxiety or fear before handling equipment or touching arms to look for a vein
- lower yourself to the child’s level
- Explain the procedure
- Never tell a child it will not hurt; instead say it may hurt just a little, but it will be over quickly.
- Offer the child a reward for being brave, but do not put conditions on receiving it, such as if there is no crying.
- Calm a crying child quickly, however, because crying can erroneously alter blood composition.

Pediatric Venipuncture Equipment

- 23- gauge butterfly needle and tube holder
- Small-volume tubes should be used to minimize the amount of blood drawn and reduce the risk of tube vacuum collapsing the vein.
- Small amount of blood may be drawn by syringe and placed in microtubes