



Chapter 7: Blood Collection Equipment, Additives, and Order of Draw



Objectives

1. Define the key terms and abbreviations listed at the beginning of this chapter.
2. List, describe, and explain the purpose of the equipment and supplies needed to collect blood by venipuncture.
3. Compare and contrast antiseptics and disinfectants and give examples of each.
4. Identify appropriate phlebotomy needles by length, gauge, and any associated color coding.



Objectives (cont' d)

5. List and describe evacuated tube system (ETS) and syringe system components, explain how each system works, and tell how to determine which system and components to use.
6. Identify the general categories of additives used in blood collection, list the various additives within each category, and describe how each additive works.
7. Describe the color coding used to identify the presence or absence of additives in blood collection tubes and name the additive, laboratory departments, and individual tests associated with the various color-coded tubes.



Objectives (cont' d)

8. List the "order of draw" when multiple tubes are being collected and explain why it is important.

General Blood Collection Equipment and Supplies

- Blood-Drawing Station
 - Table for supplies
 - Special chair
 - Bed or reclining chair
- Phlebotomy Chair
 - Comfortable
 - Adjustable armrests



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General Blood Collection Equipment and Supplies (cont' d)

- Handheld phlebotomy equipment carriers & phlebotomy carts



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General Blood Collection Equipment and Supplies (cont' d)

- Gloves and Glove Liners
 - Required by CDC/HICPAC & OSHA when performing phlebotomy
 - New pair must be used for each patient & removed when done
 - Nonsterile, disposable latex, nitrile, neoprene, polyethylene, & vinyl are acceptable
 - Good fit is essential
 - Glove liners may be used if gloves cause allergies or dermatitis
 - Barrier hand creams help prevent skin irritation from gloves
 - Gloves with powder not recommended

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General Blood Collection Equipment and Supplies (cont' d)

- UltraFIT glove liners and SoftGUARD barrier hand cream



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General Blood Collection Equipment and Supplies (cont'd)

- Antiseptics (T)
 - Prevent sepsis (microorganisms or their toxins in the blood)
 - 70% isopropyl alcohol most common for routine blood collection
- Disinfectants (T)
 - Remove or kill microorganisms on surfaces & instruments
 - Not safe on human skin
- Hand Sanitizers (T)
 - Alcohol-based rinses, gels, & foams
 - Can replace handwashing if hands are not visibly soiled

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General Blood Collection Equipment and Supplies (cont'd)

- A personal-size bottle of hand sanitizer & a wall-mounted hand sanitizer dispenser



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General Blood Collection Equipment and Supplies (cont'd)

- Gauze Pads/Cotton Balls
 - Clean 2-by-2-inch gauze pads folded in fourths are used to hold pressure over site following blood collection
 - Some pads have fluid-proof backing to prevent contamination
 - Avoid using cotton balls, as they tend to stick
- Bandages
 - Used over blood collection site once bleeding has stopped
 - Can also use paper, cloth, or knitted tape over folded gauze
- Glass microscope slides (1- by 3-in.), ink pen, watch

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General Blood Collection Equipment and Supplies (cont'd)

- Needle & sharps disposal containers & biohazard bags



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Venipuncture Equipment

- Vein-Locating Devices
 - **Transillumination:** shine high-intensity LED or infrared light
 - Highlight veins in patient's subcutaneous tissue
- Tourniquet
 - Device applied or tied around patient's arm to restrict blood flow
 - Should restrict venous flow to inflate veins, but not arterial flow
 - Most common type: stretchable disposable straps

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Venipuncture Equipment (cont' d)

- Needles
 - Sterile, disposable, designed for single use only
 - **Types**
 - Multisample
 - Hypodermic
 - **Winged infusion (butterfly):** used on children and delicate veins
- **Parts**
 - **Bevel**
 - **Shaft**
 - **Hub**
 - **Lumen**

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Venipuncture Equipment (cont' d)

- Needles
 - **Gauge (T)**
 - Diameter of lumen
 - **Higher the gauge, the smaller the diameter of needle**
 - Appropriate range for phlebotomy: 20 to 23 (21 is most common)
 - Needles color-coded by gauge
 - **Length**
 - 1- & 1.5-in. lengths are most common for venipuncture
 - **Safety features:** resheathing, blunting, & retraction devices

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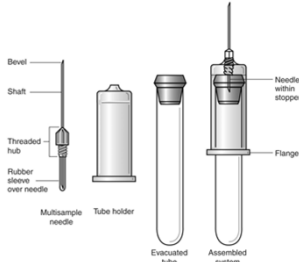
Venipuncture Equipment (cont' d)

- Evacuated Tube System (ETS) (T)
 - Closed system in which blood flows through a needle inserted into a vein & then directly into a collection tube
 - **Prevents exposure to air or outside contaminants**
 - Allows numerous tubes to be collected with a single venipuncture
 - Components
 - Multisample needle
 - Tube holder (hub)
 - Evacuated tubes

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Venipuncture Equipment (cont' d)

- Traditional components of the evacuated tube system



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Venipuncture Equipment (cont' d)

- Multisample Needles (T)
 - Allow multiple tubes to be collected in a single venipuncture
 - **Double-pointed** and have threaded part that screws into holder
 - Tube end of needle has retractable sleeve to prevent leakage
 - Available with and without safety features
 - If no safety feature: use with safety holder
- Tube Holders – Hubs (T)
 - With and without safety features
 - If no safety feature: use with safety needle

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Venipuncture Equipment (cont' d)

- Needle and Holder Units
 - Needle and holder permanently attached
- Evacuated Tubes
 - Used with both ETS & syringe method
 - Available in different sizes & volumes
 - **Size used depends on:**
 - Age of patient
 - Volume of blood needed for test
 - Size & condition of patient's vein
 - Available in glass & plastic (plastic preferred for safety)

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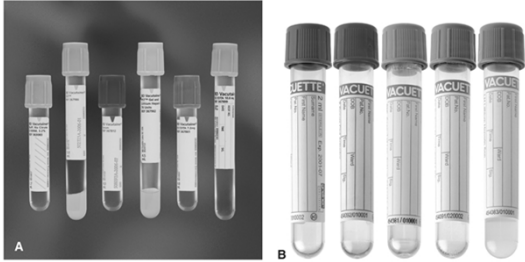
Needle and Holder Units (cont' d)

- Evacuated Tubes (cont' d)
 - **Vacuum**
 - Negative pressure artificially created by pulling air from tube
 - Designed to draw an exact volume of blood into tube
 - **Additive tubes:** substance added to tube (e.g., anticoagulant)
 - **Nonadditive tubes:** no substance added to tube (rare)
 - **Stoppers:** rubber or rubber with plastic covering
 - **Color coding:** color of stopper usually indicates type of additive
 - **Expiration dates:** for additive & vacuum, printed on tube label

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Needle and Holder Units (cont' d)

- Evacuated tubes



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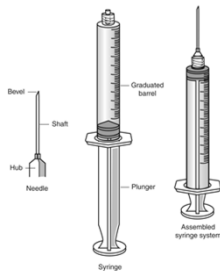
Needle and Holder Units (cont' d)

- Syringe System
 - Alternative for patients with small or difficult veins
 - **Syringe needles**
 - 1- to 1.5-in. long
 - Must have resheathing feature if used to draw blood
 - **Syringes**
 - Barrel
 - Plunger
 - **Syringe transfer device:** allows safe transfer of blood into tubes without using syringe needle or removing tube stopper

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Needle and Holder Units (cont' d)

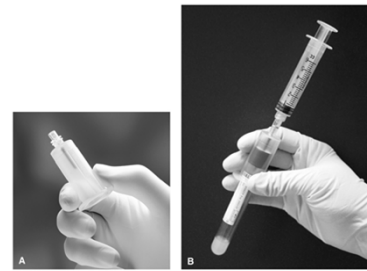
- Traditional syringe system components (T)



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Needle and Holder Units (cont' d)

- Syringe transfer devices (T)



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Needle and Holder Units (cont' d)

- Winged Infusion Set (Butterfly) (T)
 - Effective for small or difficult veins (hands; elderly & pediatric)
 - Allows more flexibility & precision than a needle & syringe
 - Consists of:
 - 1/2- to 3/4-in. stainless steel needle, 23- or 25-gauge
 - 5- to 12-in. length of tubing
 - Luer attachment (syringe) or multisample Luer adapter (ETS)
 - Plastic extensions (“wings”) allow easier manipulation for shallow angle of needle insertion
 - Safety devices required to prevent accidental needlesticks

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Needle and Holder Units (cont' d)

- Winged infusion sets attached to a syringe (left) and an evacuated tube holder by means of a Luer adapter



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Needle and Holder Units (cont' d)

- Combination Systems
 - Complete system for blood collection
 - Blood collection tube & collection apparatus are combined in single unit
 - Specimen can be collected by evacuated tube or syringe
 - Available with regular or butterfly-style needles
 - Safety devices are available

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Blood Collection Additives

- Anticoagulants (T)
 - **Substances that prevent blood from clotting**
 - Two methods of preventing clotting:
 - binding calcium
 - Inhibiting formation of thrombin
 - **Types (most common types of anticoagulants)**
 - Ethylenediaminetetraacetic acid (EDTA)
 - Citrates
 - Heparin
 - Oxalates

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Blood Collection Additives (cont'd)

- Special-Use Anticoagulants
 - Acid citrate dextrose (ACD)
 - Citrate phosphate dextrose
 - Sodium polyanethol sulfonate (SPS)
- Antiglycolytic Agents (T) Pg 218
 - Substances that prevent glycolysis (breakdown of glucose by blood cells)
 - **Sodium fluoride** (most common)
 - Preserves glucose for up to 3 days & inhibits bacteria growth
 - Used w. potassium oxalate (anticoagulant) for rapid response

Blood Collection Additives (cont'd)

- Clot Activators (T)
 - Substances that enhance coagulation in serum specimen tubes
 - Types
 - Substances that provide more surface for platelet activation
 - Glass (silica) particles
 - Inert clays (Celite)
 - Clotting factors (thrombin)

Blood Collection Additives (cont'd)

- Thixotropic Gel Separator (T) Pg 219
 - Has density between that of cells & serum or plasma
 - When centrifuged, gel moves between cells & serum or plasma
 - Prevents cells from continuing to metabolize substances
- Trace Element-Free Tubes (T)
 - Tubes made of materials free of trace element contamination
 - Used for trace element tests, toxicology studies, & nutrient determinations
 - **Heavy metals:** lead, iron, arsenic, mercury, zinc, copper
 - Feature royal-blue stoppers

Order of Draw (Use sheet in study guide) Video: Venipuncture order of draw

1. Blood cultures if ordered are always first
2. Yellow (not used very often)
3. Light blue
4. Red (glass)
5. Red (plastic)
6. SST (gold/red and gray marbled)
7. Green
8. Light green (PST)
9. Lavender
10. Pink
11. Gray
12. Royal or Navy blue

Order of Draw (cont'd)

- Carryover/Cross-Contamination (T)
 - Transfer of additive from one tube to the next
 - Can occur when:
 - Blood in additive tube touches needle during ETS collection
 - Blood is transferred from a syringe into ETS tubes
 - **Order of draw presents sequence of collection that minimizes risk for interference should carryover occur**
 - **Filling specimen tubes from bottom up minimizes carryover and reflux**

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Order of Draw (cont'd)

- Tissue Thromboplastin Contamination (T)
 - Tissue thromboplastin, present in tissue fluid:
 - Activates extrinsic coagulation pathway
 - Can interfere with coagulation tests
 - For coagulation tests (other than PT or PTT), draw a few mm of blood into a plain red top tube before collecting coagulation specimen
- Microbial Contamination: site cleaning most important!
 - Microorganisms found on skin can contaminate blood specimens
 - Blood cultures are collected first in order of draw, when sterility of site is optimal & to prevent contamination of needle (T)

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Chapter 7 test info:

- **Know the following for matching:**

<ul style="list-style-type: none"> – Multisample needles – Clot activator – Syringe transfer device – Antiglycolic agent – Carryover – Blood cultures – Thixotropic gel – Needle smaller than 23g – Improper handling – Tissue thromboplastin – Gauge – Barrel and plunger – additive 	<ul style="list-style-type: none"> - order of draw - disinfectant - anticoagulant - hub - expiration date - re-sheathing device - butterfly needles - beveled - antiseptic - evacuated tube system - short draw
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Cont. info for test

- Be able to number tubes in order of draw (1-11)
- Know what department tubes go to
- Be able to match tube to their additive (as on sheet in study guide, taken right from that)
- Know equipment needed for a venipuncture
- Matching: Complications associated with phlebotomy (See study guide)
- Matching: Match the tests with correct tubes
- Know study questions

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