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Working Together to Develop Quality Allied Healthcare Professionals!

Phlebotomy Technician Certification Study Guide (PTC)

Welcome to **AMCA's Phlebotomy Technician Certification Study Guide**.



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Additional Resources:

PTC Certification Program Outline (CPO)

PTC Exam Blueprint

Recommended Book List

Candidate Handbook

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Phlebotomy Technician Certification Study Guide (PTC)

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1. Professionalism and Regulatory Compliance

1.01 Present a professional appearance and a positive attitude.

Professional appearance for Phlebotomists

- Stickers, pins, or other types of tokens should not cover the employee or department name.
- Clean, wrinkle-free clothes, scrubs, or uniform that are in good condition.
- Shoes must be comfortable, safe in the work environment, clean, and polished.
- Sandals and flip-flops are not permitted.
- Hair should be clean, neat, and trimmed.
    - Shoulder-length hair should be pulled back and secured.
- Nails should be clean and neatly manicured.
- Minimize or eliminate the use of fragrance.
- Make-up should be lightly applied.
- If jewelry is worn, it must be worn inside the collar. Long dangling earrings are not acceptable.

Positive attitude

- Smile and pleasant can-do attitude.

1.02 Act with integrity and respect towards others.

Showing integrity and respect towards patients

- Integrity
    - As a concept it has to do with a personal feeling of "wholeness" derived from honesty and consistency of character; this can be seen in the person's actions, values, and beliefs. Professional standards of integrity or honesty require a person to do what is right regardless of the circumstances and in all situations and interaction. For example, a phlebotomist often functions independently and may be tempted to take procedural shortcuts when pressed for time. A phlebotomist with integrity understands that following the rules for collection is essential to the quality of test results.
- Respect
    - It is shown in both a positive feeling for a person and in specific action demonstrating that positive feeling. It is an attitude that conveys an understanding of the importance of that person as an individual. Believing that all people are worthy of respect at some level is extremely important in healthcare communication. The effect of honoring and respecting the person as a unique individual is confirmation of the patient's presence and needs.

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1.03 Display empathy and compassion towards others.

It is important to monitor the patient's comfort and safety during and after collection procedures. Adhering to the following guidelines will help ensure the patient's comfort and safety:

- Explain the procedure and get the patient's consent to continue.
- Never draw blood from a patient who is standing or sitting on a high stool.
- Ask the patient if he or she has ever had blood drawn before. If so, ask if he or she has had any complications in the past such as experiencing dizziness, syncope, or trouble finding a vein, etc. You may also ask if the patient has a preference of which arm to use.
- Position the patient properly by ensuring that his or her elbow is straight and supported underneath.
- Confirm with the patient if he or she is taking any anticoagulants, such as warfarin, heparin, or aspirin, as these affect bleeding time and will require extra compression to stop the bleeding after the draw.
- Try to calm nervous patients and relieve anxiety by making small talk.
- Monitor and note any changes to the patient's condition and immediately inform the supervisor of any abnormalities or changes. Noteworthy events include, but may not be limited to:
  - A change in the patient's state of consciousness, such as dizziness or syncope.
  - Excessive bleeding time.
  - If the patient experiences extreme pain, or any other symptoms that were not present prior to the blood draw.

1.04 Take responsibility for personal actions in the workplace.

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1.05 Recognize and respond to ethical dilemmas.

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1.06 Demonstrate respect for diversity.

How to demonstrate respect for diversity

- Approach all patients with a smile and use a friendly tone of voice.
- Be alert to patient reactions to your approach and direct your actions to accommodate them. Do not force your style on them.
- Do not stereotype a particular culture; not all people of same ethnic culture react in the same manner.
- The amount of personal space varies not only among people but also among cultures. Certain cultures are not as welcoming to touching as we might expect them to be. Other cultures may reach for you while you are talking.

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- Plan to spend additional time explaining procedures and patient instructions. Be sure instructions are understood by asking the patient to repeat the instructions back to you. In some cultures, nodding is considered a sign of politeness and not understanding.
- Above all, show respect for their diversity.

1.07 Perform tasks within the scope of practice of a phlebotomy technician.

Tasks within the scope of practice of a phlebotomy technician include:

- Correct identification and preparation of the patient before sample collection.
- Collection of the appropriate amount of blood by venipuncture or dermal puncture for the specified.
- Selection of the appropriate sample containers for the specified tests.
- Correct labeling of all samples with the required information.
- Appropriate transportation of samples back to the laboratory in a timely manner.
- Effective interaction with patients and hospital personnel.
- Processing of samples for delivery to the appropriate laboratory.
- Performance of computer operations and record-keeping pertaining to phlebotomy.
- Observation of all safety regulations, quality control checks, and preventive maintenance procedure.

1.08 Demonstrate respect for patient's rights under The Patient Care Partnership (formerly Patient's Bill of Rights).

The Phlebotomists Role

Your role as a phlebotomist is vital to today's allied health care field. You will be entering a field that has a great need for trained professionals. You will also meet many obstacles and challenges both mentally and physically. Maintaining a good sense of ethics is extremely important in the medical field. Phlebotomists perform routine tasks in a wide variety of locations such as hospitals, medical offices, and clinics. The Phlebotomist should only perform the range of activities that is within their scope of practice. Some of those tasks include patient identification, patient preparation, blood collection, and patient assessment after the phlebotomy procedure. They should not be confused with medical laboratory clinicians who typically have a degree in a biological science.

Clinical duties vary according to state law and the phlebotomist should only perform those tasks which are in their identified scope of practice.

Ethics is the knowledge of what is right conduct versus what is wrong conduct. There are also choices involved in ethics which may have more to do with morals. Ethical behavior is never prejudiced or biased. For example, you may have to make a choice regarding a co-worker or even a patient.

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- A co-worker of yours is consistently late. He/she often asks you to cover for him/her when he/she is late. She asks you not to tell and she will return the favor if you are ever going to be late. What would you do?
- You suspect a patient is being abused. He/she has bruises all over his/her body. The explanation given regarding those bruises is weak. What should you do?

It is your ethical duty to provide emotional support. If you suspect any type of abuse, share/report your concerns to the RN immediately and privately.
Criminal laws are concerned with offenses against the public, and civil laws are concerned with relationships between people.

A tort is a wrong committed against a person or the person's property. Torts may be intentional or unintentional.

- Negligence is an unintentional wrong.
- Malpractice is negligence by a professional person (unintentional).

Intentional torts are acts that are meant to be harmful.

- Defamation is injuring a person's name and reputation by making false statements to a third person.
- Libel is making false statements in print, writing, or through pictures.
- Slander is making false statements orally.
- Invasion of privacy is violating a person's right not to have his or her private affairs exposed.
- Fraud is saying or doing something to trick, fool, or deceive a person.
- Assault is intentionally *attempting* to touch or threaten a person's body without their consent.
- Battery *is touching* a person's body without their consent.
- Informed consent is when the person clearly understands what is going to be done.
- Implied consent occurs when the patient's nonverbal behavior indicates agreement.
- Abandonment is when a provider withdraws from the care of a patient without reasonable notice of discharge.
- There are two types of civil actions – lack of informed consent and violation of standard of care.

Standard of Care is a standard, set by statutes, representing the conduct of the average health care worker in the community.

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1.09 Obtain informed (expressed or implied) consent from a patient or a family member prior to specimen collection.

As with any procedure, the phlebotomist must obtain informed, verbal consent from the patient prior to beginning the blood draw. Explain the procedure to the patient. Advise that he or she may feel a small poke or pinch. Ask the patient if you can draw blood for the tests. Be sure to receive verbal affirmation. If the patient denies consent, do not proceed with the blood draw, and advise the supervisor or physician immediately.

1.10 Ensure the confidentiality of patient's protected health information (e.g., HIPAA).

HIPAA

- Patients must have written consent to have information to be disclosed to another party.
- All information will be kept confidential.
- Informed Consent:
  - Voluntary consent by patient for health care provider to examine or perform procedures.
  - Patient must be informed about procedures and given option to have procedure done.
  - Patient will usually sign a consent form.
  - Some agencies require special chain-of-custody forms for specific tests, etc. Drug screens, workplace drug tests, legal (forensic) samples, etc.

1.11 Follow the legislation governing laboratory testing (e.g., CLIA and OSHA) if applicable.

CLIA

- Agency that provides regulations to ensure the accuracy and quality of lab testing
- Requires laboratory certifications by the federal government
- Inspects blood collection procedures regularly to prevent improper techniques causing false test results.

During collection, be aware of the possibility of the following analytical errors:

- Wrong order of draw
- Extended tourniquet time
- Hemolysis
- Failure to invert tubes

1.12 Report patient-related incidents as required by legislation.

Incident Reports

An incident is an event that does not normally occur within the regular health care facility routine and may involve patients, visitors, physicians, hospital staff, or students.

The following incidents require written reports:

- Accidents

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- Thefts from person on hospital property
- Errors of omission of patient treatment or errors in administration of patient treatment including medication
- Exposure to blood and body fluids that may be caused by a needle stick
- Slips or falls that occur on the facility property

1.13 Effectively communicate with patients and healthcare professionals.

Medical Records

Medical Records are a written account of a person's condition and response to treatment and care. There are many parts to a medical record including:

- Admission sheet
- Nursing history
- Graphic sheet
- Progress notes
- Flow sheets

Reporting is the oral account of care, and **recording** is the written account of care and observations.

Assessment involves collecting information about the person.

Observation is using the sense of sight, hearing, touch, and smell to collect information.

Objective Data is information that is heard, felt, or smelled.

Subjective data are things a person tells you about that you cannot observe through your senses.

1.14 Engage in continuing education (e.g., online courses).

Phlebotomist continuing education

All health-care professionals are expected to participate in continuing education (CE) activities. Attendance at many workshops and seminars is documented by the issuing of certificates containing continuing education units (CEUs). Certifying organization and state licensure agencies require documentation of CE to maintain certification

2. Infection Control and Safety (incl. Standard and Transmission-based Precautions)

2.01 Perform proper hand hygiene.

How to perform proper hand hygiene

Hand hygiene is one of the most important means of preventing the spread of infection provided it is achieved properly and when required. Hand hygiene measures include the frequent use of alcohol-based antiseptic hand cleaners or hand washing, depending upon the degree of contamination. It is important that all healthcare personnel learn proper hand hygiene procedures and recognize situations when they should be performed. Follow these procedures for proper hand hygiene:

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- Remove jewelry (including rings, with the exception of watches, wedding bands, and bracelets)
- Stand at the sink without allowing clothing to touch the sink
- Turn on the faucet and wet hands under warm running water
- Apply soap and work up a lather
- Scrub all surfaces, including between the fingers and around the knuckles. Rub hands together vigorously for at least 15 seconds
- Rinse your hands in a downward motion from wrists to fingertips
- Dry hands with a clean paper towel
- Use a clean paper towel to turn off the faucet

2.02 Use respiratory hygiene and cough etiquette.

Respiratory hygiene & proper cough etiquette

The following measures to contain respiratory secretions are recommended for all individuals with signs and symptoms of a respiratory infection.

- Cover your mouth and nose with a tissue when coughing or sneezing.
- Use in the nearest waste receptable to dispose of the tissue after use.
- Perform hand hygiene (e.g., hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic handwash) after having contact with respiratory secretions and contaminated objects/materials.

Healthcare facilities should ensure the availability of materials for adhering respiratory hygiene/cough etiquette in waiting areas for patients and visitors.

- Provide tissues and no-touch receptacles for used tissue disposal.
- Provide conveniently located dispensers of alcohol-based hand rub; where sinks are available, ensure that supplies for hand washing (i.e., soap, disposable towels) are consistently available.

2.03 Properly use personal protective equipment (e.g., gloves, goggles, gown, mask).

Barrier Protection

Protective clothing provides a barrier against infection. Used properly, it will provide protection to the person wearing it; disposed of properly it will prevent the spread of infection. Learning how to put on and remove protective clothing is vital to ensure the health and wellness of the person wearing the PPE. PPE, or personal protective equipment, includes:

- Masks
- Goggles
- Respirators
- Face Shields
- Gloves

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Guidelines for the order in which PPE should be donned (put on) and removed are in place to further help prevent contamination.

Donning and Removing PPE

	Order to Don PPE	Order to Remove PPE
1	Perform hand hygiene	Gloves
2	Gown	Gown
3	Mask, Respirator, Goggles, or Face Shield	Perform hand hygiene
4	Gloves	Mask, Respirator, Goggles, or Face Shield
5		Perform hand hygiene

2.04 Follow proper isolation procedures.

Preventing Infection

Infection is a major threat and health hazard in all of our health care facilities. Everyone is at risk, and prevention of that risk is an important part of everyone's job description.

- **AIDS** stands for acquired immunodeficiency syndrome and is caused by a virus called human immunodeficiency virus. AIDS is transmitted by blood, vaginal fluids, and semen and is not spread through casual contact. AIDS also may be transmitted through the blood of an infected person that enters another person's bloodstream through a cut, an open sore, or blood that is splashed into the mouth or the eye. Thus, appropriate personal protective equipment must be worn when one is coming into contact with body fluids from all patients.
- **Hepatitis B** is an inflammation of the liver that is caused by the hepatitis B virus, also known as HBV. Since health care providers are at risk for exposure, it is essential for standard blood and body fluid precautions to be practiced. The Occupational and Safety Health Administration states that employers must provide the hepatitis B vaccine for all employees who have an occupational employer risk.
- **Tuberculosis** is a disease caused by *Mycobacterium tuberculosis*, an airborne pathogen. Health care workers that come into contact with patients who have tuberculosis must wear personal protective equipment, such as special fitted masks.

Nosocomial Infections

Any infection that first occurs during a patient's stay at a health-care facility, regardless of whether it is detected during the stay or after, is known as a nosocomial infection. Also known as health care-associated infections, they are usually transmitted to the patient by a health care worker. Proper hand washing technique is the best method of preventing the spread of nosocomial infection.

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Handwashing

Handwashing is the most important means of preventing the spread of infection and micro-organisms from one patient to another. A routine hand hygiene procedure uses plain soap to remove soil and transient bacteria.

The following procedure should be followed when performing hand hygiene:

- Remove any jewelry.
- Wet your hands.
- Apply soap.
- Scrub palms, back of hands, between fingers, and under nails vigorously for at least 15 seconds.
- Holding hands in a downward position (inferior to the wrist), rinse hands under running water.
- Use a paper towel to blot hands dry.
- Use a clean, dry paper towel to turn off the faucet.

Hand hygiene should be performed in the following situations:

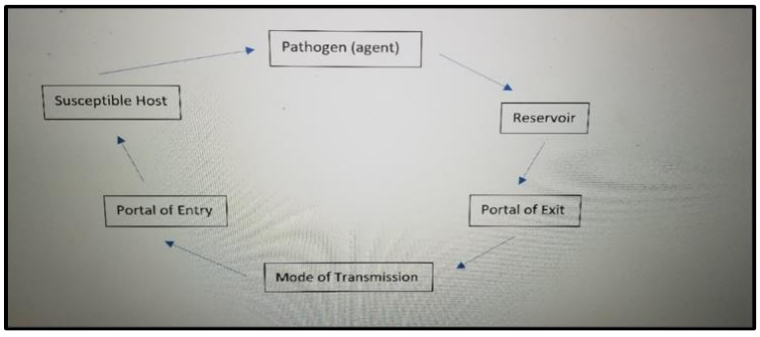
- Before and after contact with a patient.
- Before donning and upon removing gloves and PPE.
- After touching contaminated equipment.
- Before and after eating or going to break.
- Before leaving the facility at the end of a shift.

Aseptic techniques for proper blood collection include:

- Frequent hand hygiene (handwashing).
- Use of barrier garments and PPE.
- Following standard precautions.
- Using sterile procedures when necessary.

Infection Control/Chain of Infection

The chain of infection is the continuous cycle through which disease spreads from a reservoir through some means of transmission, to a susceptible host. Infection control occurs when this chain is broken.



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Pathogens (or Agents) – infectious microorganisms that can be classified into groups, namely: viruses, bacteria, fungi, and parasites. It is these agents that cause disease.

Portal of exit – the method by which an infectious agent leaves its reservoir. The nose, hands, or an open wound, for example, could be considered portals of exit.

Mode of transmission – method of transfer. There are five main modes of transmission:

- Contact: direct and indirect
- Droplet
- Airborne
- Common vehicle
- Vector

Portal of entry – an opening allowing the microorganism to enter the host. Portals include body orifices, mucus membranes, or breaks in the skin. Portals also result from tubes placed in body cavities, such as urinary catheters, or from punctures produced by invasive procedures such as intravenous fluid replacement.

Susceptible host – person who cannot resist a microorganism invading the body, multiplying, and resulting in infection. The host is susceptible to the disease, lacking immunity or physical resistance to overcome the invasion by the pathogenic microorganism.

Isolation Precautions

The CDC recommends universal precautions, which is a method of infection control that assumes all human blood and body fluids are potentially infectious. The CDC issued revised guidelines consisting of two tiers or levels of precautions: Standard Precautions and Transmission-Based Precautions. These are outlined below.

Standard Precautions

Standard precautions are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin (including rashes), and mucous membranes. These measures are to be used when providing care to all individuals, whether they appear infectious or symptomatic or not. The standard precautions are:

- Consider every person (patient or staff) as potentially infectious and susceptible to infection.
- Practice proper hand hygiene —the most important procedure for preventing cross-contamination (person to person or contaminated object to person).
- Wear gloves and other appropriate PPE before touching broken skin, mucous membranes, blood or other body fluids, or soiled instruments and contaminated waste materials or before performing invasive procedures.

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- Dispose of sharps properly in puncture-proof containers.
- Practice proper respiratory hygiene and cough etiquette – this includes covering mouth and nose with tissues instead of bare hands when coughing, properly disposing of contaminated tissues, and using hand sanitizer or washing hands with soap and water.

Transmission-Based Precautions

The second tier of precautions, also known as Expanded Precautions (EPs), are to be used when the patient is known or suspected of being infected with contagious disease. They are to be used in addition to standard precautions. In all situations, whether used alone or in combination, using the utmost care regarding patients and employees is crucial.

Contact Precautions

Infectious agents (bacteria, viruses, or parasites) are transmitted directly or indirectly from one infected or colonized person to a susceptible host. The following precautions should be taken - Wear clean, non-sterile examination gloves when entering the room. Change gloves after contact with infective material (e.g., fecal materials or wound drainage). Remove gloves before leaving patient room. Wash hands. Examples of infections/pathogens that can be spread through contact:

- Skin infections, such as Diphtheria and Herpes simplex virus.
- Enteric infections, such as *Clostridium difficile.*
- *Escherichia coli (E. Coli), Shigella,* hepatitis A, rotavirus.

Airborne Precautions

These precautions are designed to reduce the nosocomial transmission of particles 0.001mm or less in size that can remain in the air for several hours and be widely dispersed. Special air handling and ventilation are required to prevent airborne transmission. Individuals should wash hands and wear specially fit respirators prior to entering rooms with patients that are suspected of being infected with airborne illnesses. Examples of such illnesses include measles, tuberculosis, and varicella.

Droplet Precautions

These precautions reduce the risks for nosocomial transmission of pathogens spread wholly or partly by droplets larger than 0.001 mm in size. Pathogens are microbes that can cause disease. Droplet precautions are simpler than airborne precautions because the particles only remain in the air for a short time and travel only a few feet. Droplet precautions require performing hand hygiene and donning a mask upon entering the patient's room. Examples of bacterial diseases for which droplet precautions should be used include, but are not limited to Pertussis, pneumonia, and *Hemophilus influenzae* type b. Viral diseases for which droplet precautions should be used include adenovirus, influenza, mumps, Parvovirus B19, and rubella.

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2.05 Clean and disinfect phlebotomy equipment and work areas before and after a phlebotomy procedure.

Surgical asepsis of medical equipment and facilities is crucial in infection control. Cleaning equipment and facilities to prevent the spread of pathogens include the following 3 methods:

- Sanitization – involves rinsing and scrubbing with a brush and soap to remove debris. Microorganisms and pathogens are not destroyed.
- Disinfection – involves the use of chemical germicides, 1:10 bleach solutions, and boiling water. Equipment and soaked and wiped clean. While this process kills microorganisms, it is not effective in destroying spores or some viruses.
- Sterilization – involves killing all microorganisms, both pathogenic and nonpathogenic. This is often accomplished through use of an autoclave, producing heat sterilization through steam and pressure.

General guidelines for cleaning spills include:

- Wearing gloves.
- Wipe up any visible blood or biohazardous material.
- After visible fluids have been cleaned, disinfect the contaminated area, as well as the entire area of potential contamination, using a 10% bleach solution. (This solution should be made fresh once a week. It should be clearly labeled "10% bleach" along with the date that it was made.) The bleach should remain in place for 20 to 30 minutes prior to being cleaned off the surface.
- In some instances, such as for large spills, absorbent powders or gels should be used.
- Always follow protocol for the specific type of spill that has occurred. Check MSDS information, as well as policies set forth by your facility.

2.06 Use proper procedures to dispose of the contaminated sharps and biohazard fluids.

All specimens should be treated as if they contain bloodborne pathogens. OSHA outlines the following guidelines and standards for disposing of all biohazardous material:

- All biohazardous materials should be appropriately labeled.
- They should be placed in leak-proof containers.
- Any medical waste should be disposed of in appropriate containers that are clearly marked.

Biohazard Symbol



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Properly disposing of sharps is key in preventing injury and infection from bloodborne pathogens. Safety devices should be activated immediately upon completing specimen collection. Needles, lancets, and other and sharps then should be properly discarded in puncture- and leak-proof containers.

2.07 Perform basic emergency care activities (e.g., First Aid, CPR, rapid response procedures) in accordance with facility's protocol.

First Aid

External Hemorrhage

- Apply direct pressure to the wound until bleeding stops or EMS arrives.
- If bleeding continues, keep applying new cloth or gauze over the saturated ones already on the wound.

Shock

- Common symptoms:
  - clammy, pale, cold skin.
  - rapid weak pulse.
  - shallow or increased breathing rate.
  - staring eyes and expressionless face.
- First aid for shock:
  - maintain open airway.
  - call for assistance.
  - keep patient lying down with head lower than the rest of body.
  - attempt to control bleeding or other cause of shock if known
    keep patient warm until help arrives.

Emergency Care

Medical administrative assistants should be prepared to handle emergencies in the office. The first step in giving first aid to a patient who appears to be having an emergency (stopped breathing) is to check for a pulse. If it is determined that the patient is having sudden cardiac arrest, use an Automated External Defibrillator (AED). An automated external defibrillator (AED) is a portable device that checks the heart rhythm and can send an electric shock to the heart to try to restore a normal rhythm. AEDs are used to treat sudden cardiac arrest. CPR (Cardiopulmonary resuscitation) may also help in an emergency situation. A crash cart, necessary in cardiac events, would typically be located at the nurse's station.

Medical offices should have plans for emergencies and be prepared in various worst-case scenarios:

- **Fire** - Fire disasters can spread quickly and become life threatening in a matter of

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minutes; Office staff should be familiar with escape routes as well as the location of fire extinguishers and fire alarms; smoke inhalation is a major factor in fire deaths so knowing how to escape is also important.

- **Weather (Tornadoes, hurricanes, earthquakes)** - During natural disasters staff members should always check for hazards and find a place of safety; depending on the event and the severity of the situation may call for you to flee for safety; remaining calm is key.
- **Terrorism** - When faced with a terroristic situation or active shooter think Run, Hide, Fight:
  - Run - If there is a clear exit always try to get away from the threat.
  - Hide - If there is not clear exit and the threat cannot be located barricade yourself until help arrives; do not open the door for anyone besides the authorities.
  - Fight - If left with no other option, attacking the threat may save lives.

2.08 Adhere to the workplace safety regulations (e.g., CDC, OSHA, NFPA).

Sharps/Needlestick Injury Prevention

A serious concern in the health care field is that of accidental needle sticks. OSHA and federal and state guidelines enforce the use of safety devices to help reduce this risk to health care providers. Following proper procedure can also help to minimize this risk.

Injuries can be caused by the following:

- Failure to activate the safety device after using a needle
- Attempting to re-cap a needle
- Improper transferring of blood specimens from a syringe into collection tubes
- Use of needles without safety devices
- Overfilling the biohazard sharps container
- Use of non-retractable puncture devices for fingerstick
- Improper disposal of sharps

Types of safety features for needles:

- Self-capping needles – plastic sheath snaps closed over needle
- Retractable needles – needle retracts into syringe, tube holder, or another device.
- In-vein activation – when a button is pushed, the needle is automatically retracted directly from the vein into the needle device

In the case of an accidental needle stick, immediately wash the area with soap and water. This incident should be reported immediately. Each facility has an exposure control plan. Be sure to follow this plan for reporting the incident and seeking appropriate medical attention. According to OSHA's Bloodborne Pathogen Standards, employers must provide free medical care to employees that have experienced an accidental needle stick.

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3. Patient Identification, Assessment, and Site Preparation

3.01 Obtain and review a requisition form before specimen collection.

Specimen Labels and Blood Collection Lists

All specimens being submitted to the laboratory for processing should be accompanied with a corresponding requisition form. Requisitions may be submitted as a hardcopy (paper form) or electronically via a hospital's internal computer system. Regardless of the method for submitting the lab test request, it should include the following information:

- Patient I.D. (name, registration, or I.D. number, location)
- Name of physician or person ordering the test
- Tests required
- Time and date of specimen collection
- Other pertinent clinical information when appropriate
- Specimen Processing and Handling

3.02 Introduce yourself as a phlebotomy technician to the patient.

3.03 Perform patient identification using appropriate identifiers (e.g., patient's name and date of birth.

The first and most important step in venipuncture procedures is to properly identify the patient. Erroneously drawing blood from the wrong patient could lead to serious consequences, including incorrect diagnosis or treatment of the intended patient, which could result in injury or death, termination of the phlebotomist, and the potential for a lawsuit. To reduce the risk of incorrect identification of a patient, two of the following three main identifiers should be used before drawing a patient's blood:

- Patient's name
- DOB
- Hospital issued ID number

3.04 Follow facility's protocol related to patient misidentification.

Report discrepancies immediately to supervisor.

3.05 Verify patient's compliance with collection requirements (e.g., fasting, medication).

Verify that patient is prepared (fasting, medication, etc.). The basal state is usually early morning after the last ingestion of food – approximately 12 hours. If a patient's specimen is lipemic, this is usually an indicator that the patient is not fasting.

VADS and SITES

- **Arteriovenous Shunt or Fistula** - permanent surgical fusion of an artery and a vein that is typically created to provide access for dialysis.

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- **Heparin or Saline Lock** - catheter or cannula connected to a stopcock or cap with a diaphragm that provides access for administering medications.
- **Intravenous Sites** – When a patient has an IV in one arm, try the other arm. If a patient has an IV in both arms, try a capillary puncture if possible. If not possible, then the specimen may be collected below the IV site.
- **Analgesics** – relieve mild to severe pain – Tylenol, aspirin, etc.
- **Anesthetic** – prevents sensation of pain – lidocaine, etc.
- **Antibiotic** – kills bacterial microorganisms – Amoxil, ciproflaxin, zithromax, etc.
- **Anticoagulant** – prevent blood from clotting – Lovenox, heparin sodium, warfarin sodium.
- **Diuretic** – reduces blood pressure, increases urine output – various names can be found.
- **Vasoconstrictor** – constricts blood vessels, increases blood pressure.
- **Synergist** – two drugs working together.
- **Antagonist** – one drug decreases the effect of another.
- **Adverse reactions** – undesirable effects of a particular drug.

3.06 Identify patient's history that may impact specimen collection (e.g., medication, mastectomy, fistula, allergies, syncope).

Patient's history affecting the specimen collection

- Medication
  - Normally, a patient will stop bleeding from the venipuncture site within a few minutes. Some patients, particularly those on aspirin or anticoagulant therapy (Warfarin), may take longer to stop bleeding.
- Allergy
  - **Adhesive Allergy** – Some patients are allergic to the glue used in adhesive bandages. One solution is to place a clean, folded gauze square over the site and wrap it with self-adherent bandaging material.
  - **Antiseptic Allergy** – Occasionally, a patient is allergic to the antiseptic used in skin preparation prior to blood collection. Alternate antiseptics should be readily available for use in such cases.
  - **Latex Allergy** – This involves a reaction to certain substances in natural rubber latex. Increasing numbers of individuals are allergic to latex. Some latex allergies are seemingly minor and involve irritation or rashes from physical contact with latex products. Other allergies are so severe that being in the same room where latex materials are used can set off a life-threatening reaction.
- Syncope
  - The medical term for fainting is syncope, described as a loss of consciousness and postural tone resulting from insufficient blood flow to the brain. It can last for as little as a few seconds or as long as half an hour. Other contributing factors include anemia, dehydration, emotional problems, fatigue, hypoglycemia, hyperventilation, medications, nausea, needle phobia, and poor or compromised breathing. A patient

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with history of fainting should be asked to lie down for the procedure, no matter how long ago the fainting occurred. Patients who feel faint just before or even after venipuncture should be asked to lie down until recovered.

3.07 Position the patient for specimen collection to ensure safety.

Patient position is important, not only for the comfort of the patient, but also for their safety. The following guidelines should be followed:

- Patients should not be standing or sitting on a high stool.
- In an outpatient setting, patients may be seated in special chairs with arm supports, if available. Patients that have a history of fainting with prior venipuncture procedures should be laying down.
- Ensure that the patient's legs are uncrossed to improve stability and help prevent movement during the procedure.
- In the inpatient environment, the bedrail can be lowered to access the patient's arm, but it must be raised again following the procedure.
- In all situations, ensure that the patient's arm is supported.

3.08 Select a blood collection site that is appropriate for the test and the patient.

Site Selection

The best site for venipuncture is the antecubital fossa of the upper extremities. The vein should be large enough to receive the shaft of the needle, and it should be visible or palpable after tourniquet placement. When possible, have the patient sit with their arm in a straight line from shoulder to wrist.

The three major veins located in the antecubital fossa are: the median cubital vein, the first vein of choice because it is large and rarely moves during needle insertion; the cephalic vein, a more difficult vein to locate, is often the only vein that can be palpated in an obese patient; the basilic vein, located near the brachial vein, is the least firmly anchored and may be punctured if the needle is inserted too deep.

It is not encouraged to attempt to draw from sclerosed veins, which feel hard or cordlike. The phlebotomy technician should also avoid tortuous veins (veins that are winding or crooked) or an arm with IV fluids running into it. Collection from either of these sites may produce inaccurate test results.

Capillaries

- Are microscopic one cell thick vessels that link arterioles and venules that form a bridge between arteries and veins.
- Only vessels that permit the exchange of CO2 and O2 between blood and other tissues.
- Blood in the capillary bed is a mix of arterial and venous blood.

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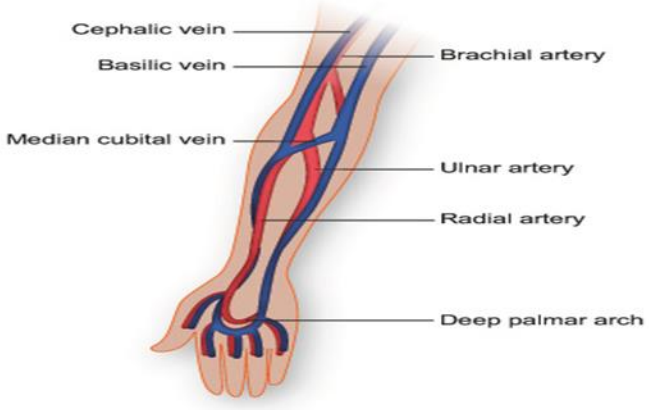
Veins of the arm

- Median cubital is the first vein of choice
- The cephalic is the second vein of choice. This is the vein used for most obese patients.
- The Basilic vein is the third vein of choice due to the location of the nerves by the vein.



3.09 Prepare a site for blood collection (e.g., application of aseptic and sterile techniques).

- Ask the patient to make a fist or open and close his/her hand.
- Allow the site to air-dry.
- Assemble the needle and tube holder.

3.10 Apply and release the tourniquet appropriately.

Blood Collection Equipment

A tourniquet is a device used to make the veins easier to find for venipuncture. These latex bands usually measure 1 to ½ inches wide and 15 inches long. When using a tourniquet for a venipuncture procedure, do not leave it on for an extended period. The recommended amount of time is approximately 1 minute.

- Apply the tourniquet; it should be applied 3-4 inches above the site where the venipuncture will be made.
- Release the tourniquet as soon as the blood is flowing freely.

3.11 Follow the CLSI guidelines pertaining to the use of a tourniquet, hand squeezing, and heating pads in blood collection.

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4. Equipment Selection and Maintenance

4.01 Identify various types of additives used in blood collection.

Vacutainer tubes, most commonly used for laboratory blood collection, are color coded based on the presence of any additives within the tube. Anticoagulants, clot activators, and preservatives are a few of the additives that may be present in the tubes.

Test Tubes, Additives, and Tests

Color of Stopper	Description and Use
Yellow	Blood culture and sterile specimens, ACD solution – additive used is sodium polyanetholesulfonate.
Blue	Additive used is sodium citrate. Additive prevents coagulation by binding calcium. It is advised to draw 2 to 3 ml of blood in a tube without additives before drawing this tube. Commonly used for coagulation tests (PT, PTT, fibrinogen).
Red	No additive required. Commonly used for serum determinations in the following: • Chemistry testing. • Blood bank testing. • Thixotropic gel can be added (this is an inert (nonreacting) synthetic substance contained in or near the bottom of certain blood collection tubes).
Green	Additive used is sodium heparin or lithium heparin, which is a natural anticoagulant that inhibits thrombin. Commonly used for routine chemistry testing.
Lavender	Additive used is ethylenediaminetetraacetic acid (EDTA). Additive binds the calcium needed for clot formation. Commonly used for hematology testing (CBC, reticulocyte count, erythrocyte sedimentation).
Gray	Additives used are sodium fluoride, a preservative that inhibits glycolic action, and potassium oxalate, an anticoagulant that binds calcium. Commonly used for glucose tolerance and lactic acid measurement.
Royal Blue and Tan	Used to collect samples for nutritional studies, therapeutic drug monitoring, and toxicology. Also used for testing aluminum, copper, arsenic, calcium, etc. Tan topped is used for lead testing and contains EDTA.

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4.02 Select appropriate evacuated tube colors for the test.

All tubes, except for the glass red-topped tube, contain one or more additives. The following are types of additives and their modes of action:

- **Anticoagulants** prevent blood from clotting. Some anticoagulants, such as ethylenediaminetetraacetic acid (EDTA), sodium citrate, potassium oxalate, and sodium polyanetholesulfonate (SPS) work by binding calcium. Others, such as heparin, prevent the conversion of prothrombin to thrombin. It is important to note that tubes with anticoagulants must be filled completely to ensure that the ratio of blood to anticoagulant is correct.
- **Clot Activators** promote coagulation. Thrombin directly increases clotting and is therefore used for stat serum chemistries or for patients taking anticoagulants. Other inert substances, such as glass, silica, siliceous earth, clay, and Celite work by providing more surface area for platelet activation. It important to invert the sample five times to ensure that the blood makes contact with clot activators that may be stuck to the side of the tube.
- **Polymer gel (or thixotropic gel)** is used to separate plasma and serum. Since its density falls between that of cells and blood serum or plasma. As a result, upon being centrifuged, the gel liquifies and settles with the cell layer below it and the serum or plasma layer above it before hardening again.

The following table shows the various tubes and their respective additives.

BD Hemo-gard Closure	Conventional Stopper	Additive
Gold	Red/Gray	Clot activator and gel for serum separation
Light Green	Green/Gray	Lithium heparin and gel for plasma separation
Red	Red	• Silicone coated (glass) • Clot activator, Silicone coated (plastic)
Orange		• Thrombin-based clot activator (with or without gel for serum separation)
Royal Blue		• Clot activator (plastic serum) • K_2EDTA (plastic)
Green	Green	• Sodium Heparin • Lithium Heparin
Gray	Gray	• Potassium oxalate/sodium fluoride • Sodium fluoride/Na_2 EDTA • Sodium fluoride (serum tube)
Tan		• K_2EDTA (plastic)

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	Yellow	• Sodium polyanethol sulfonate (SPS) • Acid citrate dextrose additives (ACD): • **Solution A** 22.0 g/L trisodium citrate, 8.0 g/L citric acid, 24.5 g/L dextrose • **Solution B** 13.2 g/L trisodium citrate, 4.8 g/L citric acid, 14.7 g/L dextrose
Lavender	Lavender	• Liquid K_3EDTA (glass) • Spray-coated K_2EDTA (plastic)
White		• K_2EDTA and gel for plasma separation
Pink	Pink	• Spray-coated K_2EDTA (plastic)
Light Blue Clear	Light Blue	• Buffered sodium citrate • Citrate, theophylline, adenosine, dipryridamole (CTAD)
Clear	Red/Light Gray	• None (plastic)

4.03 Identify the circumstances that can interfere in clinical analysis of blood constituents.

It is important to always work accurately and efficiently. With respect to specimen collection, the phlebotomy technician should take proper measures to prevent interference in the clinical analysis of blood constituents. The presence of certain substances in the blood specimen can alter test results, depending on the types of tests being performed. To prevent interference, the phlebotomy technician should be mindful of the following variables:

- **Type of antiseptic –** The type of antiseptic used in specimen collection is determined by the tests being ordered.
  - **Isopropyl alcohol**- The most common antiseptic used for cleaning a puncture site.
  - **Iodine** - When drawing samples for blood cultures, iodine is used to prevent contamination of the sample by skin flora. Likewise, povidone-iodine is used as an alternative to alcohol when prepping a puncture site for blood-alcohol testing. Iodine is never used for dermal punctures because it will contaminate the sample and interfere with results of certain tests, such as bilirubin, uric acid, and phosphorous tests.
- **Site selection –** The site from which a specimen is collected may cause interference as well. The following sites should be avoided when performing venipunctures:

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- **Hematomas** – Test results may be altered cause blood drawn from a hematoma not as fresh as venous blood.
- The side of the body that has undergone mastectomy – lymph stasis here can affect test results
- **IV sites** – when possible, avoid drawing blood from an arm that has an IV in place. If no alternate site is available, be sure to perform specimen collection from a site that is distal to (or below) the IV. The 5 mL of blood should be discarded to prevent interference by the IV medications and fluids.

- **Specimen Collection –** Collecting specimens in the correct tubes and following the proper order of draw will help to prevent contamination or interference. It is also important to ensure correct sample volume and to invert tubes properly.
- **Tourniquet application –** Tying a tourniquet too tightly can result in hemoconcentration, or an increase in the proportion of cells to plasma. This can affect many results, including plasma proteins, enzymes, RBC counts, iron, and potassium levels, among others. To prevent is, release the tourniquet as soon as blood begins to flow in the first tube, and never leave it in place for longer than 1 minute.

4.04 Select proper antiseptic agents for the test.

Before routine venipuncture selection, the patient's skin is cleaned with antiseptic to prevent contamination by normal skin flora. Most commonly, 70% isopropyl alcohol is used. The antiseptic should remain on the skin for 30-60 seconds and allowed to dry before proceeding with the venipuncture. Do not fan, blow on, or touch the site, as this may introduce more bacteria.

In certain situations, such as blood cultures or arterial punctures, Povidine-iodine may be used. It is important not to use iodine for all venipuncture procedures, as it can interfere with some chemistry test results. For patients older than 2 months of age with iodine sensitivity, Chlorhexidine gluconate or benzalkonium chloride (Zephiran Chloride).

4.05 Select proper venipuncture equipment for the test and the size and the condition of veins.

The following supplies are needed to perform venipuncture:

- Phlebotomy tray containing vacutainers, holders, needles, and syringes. *
- Tourniquet.
- Specimen labels.
- Disposable gloves.
- Sharp's container.
- 70% isopropyl alcohol.
- Gauze pads.
- Bandages.

*While evacuated tubes are more commonly used when drawing blood from veins, in some patients, especially those with fragile veins, the strong vacuum of these tubes may cause the

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vein to collapse. To avoid such complications, a syringe is used in place of the evacuated tubes. A smaller gauge needle is usually used for these types of draws and discarding once the draw is complete. The blood is then transferred from the syringe to the evacuated tubes through use of a needleless blood transfer device.

Needles

Parts of a multi-sample needle:

- Bevel
- Shaft
- Threaded hub
- Rubber sleeve over needle

Parts of a syringe system:

- Bevel
- Shaft
- Hub
- Graduated barrel
- Plunger

Gauge number indicates the diameter of the needle; the smaller the number, the larger the needle diameter and higher the flow rate. Smaller needles are for certain lab tests and typically for use on children. The butterfly needle (winged infusion set) is commonly used for IV insertion.

To perform venipuncture, it is essential to have the following supplies on hand:

- Phlebotomy tray containing antiseptic, vacutainers, holder, and needle.
- Tourniquet.
- Disposable gloves.
- Accurate specimen labels.
- Gather and prepare the necessary equipment.

4.06 Select proper capillary equipment for the site and the patient.

Proper capillary equipment & site

- Capillary puncture is also known as skin puncture, microcapillary stick, or finger stick.
- Skin is punctured with **lancet**. This is used to obtain **small amount of blood.**
- Use Alcohol for disinfectant not Iodine (as it leaves residue and affect the test result). Using a circular motion from the inside out.

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Capillary equipment & site

- Capillary Equipment
  - You are going to assemble the following equipment to ensure a successful capillary stick:
    - Gauze.
    - Bandages.
    - Prep pads.
    - Clay sealer tray.
    - Glass slides.
    - Gloves.
    - Lancets.
    - Micro collection Containers.
    - Microhematocrit tubes.
    - Spring-loaded puncture device.
  - Site
    - First choice of site middle or ring finger.
    - Second choice of site index/pointer finger and thumb.
    - Do not use the pinky finger due to thinner tissue.
    - Patient's non-dominant hand.

4.07 Select proper equipment for non-blood specimen collection.

Equipment for non-blood specimens

Midstream Clean-Catch Urine Collection

- Requestion form.
- Sterile urine container with label.
- Sterile antiseptic towelettes.
- Written instructions for cleansing and voiding.

24-Hour (Timed) Urine Sample Collection

- Requisition form.
- 24-hour urine sample container with lid.
- Label.
- Container with ice, if required.
- Preservative, if required.

Urine Drug Sample Collection

- Requisition form.
- Gloves.
- Bluing agent (dye).
- Sample container.

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- Chain of custody (COC) form.
- Temperature strip.

Throat Culture Swab

- Requisition form.
- Tongue depressor.
- Collection swab in a sterile tube containing transport media.
- Flashlight.

Nasopharyngeal Swab

- Requisition form.
- Sterile mini-tip Dacron polyester or rayon-tipped swab.
- Transport medium (saline).
- Ice slurry.

4.08 Perform quality control on equipment (e.g., needle integrity, calibration of centrifuges, point-of-care equipment).

Quality control on equipment

To do your job properly your equipment must work properly. This is a small list of things that you will oversee for quality control:

- Expiration dates on tubes and needles
- Equipment checks for POCT testing
- Preventive maintenance on centrifuges
- Routine cleaning of all surfaces

The reason for quality control and assessment of healthcare personnel is because we play a big part in patient's treatment. We are responsible for preventing what is known as the 5 D's: death, disease, disability, discomfort, and dissatisfaction. Therefore, your place of employment must keep accurate records of your quality and accuracy.

5. Collection of Blood and Non-Blood Specimens

5.01 Explain the blood collection procedure to the patient.

Most patients have had a blood test before. A statement of your intent to collect a specimen for a blood test is usually sufficient for them to understand what is about to occur. A patient who has never had a blood test may require a more detailed explanation. Special procedures may require additional information. If a patient does not speak or understand English, you may have to use sign language or other nonverbal means to demonstrate what is to occur. If this fails, an interpreter must be located. Speaking slowly and distinctly, using sign language, or writing down information may be necessary for patients with hearing problems.

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5.02 Obtain blood specimens following the order of draw recommended by CLSI.

When patients need more than one test performed, requiring more than one tube to be filled, the same multisample needle is used to fill all the tubes. This leads to potential contamination of material from earlier tubes into subsequent tubes. As a result, the Clinical and Laboratory Standards Institute (CLSI) has developed a standard order of draw for multitube draws. This applies to both syringe samples and multi-sample needle draws.

CLSI Order of Draw

- Sterile Tube (blood cultures) - Yellow top
- Coagulation Tube – Light Blue top
- Serum Tube – Red top (glass or plastic tube)
- SST (Serum Separator Tubes) – Speckled Red/Gray, Tiger top, or Gold BD Hemoguard
- PST (Plasma Separator Tubes) - Light Green or Dark Green top
- EDTA Tube – Lavender top
- Glycolytic Inhibitor Tube – Gray top

The CLSI has made several visions to the order-of-draw standards in recent years. As a result, all institutions may not be following the most recent standards. It is very important that a Procedure Manual, found in the workplace, be followed regarding specimen collection and order-of-draw standards, even if they differ from the order above.

5.03 Prioritize specimens for collection (e.g., timed, fasting, stat specimens).

In some situations, patients may need to undergo specialized or timed testing to determine metabolic function or to assess changes in the levels of specific substances over time.

Special Procedures/Special Testing

- **2-hour Post Prandial Glucose** – (Post Prandial, or PP, means after a meal.) This is used to test for diabetes mellitus. A fasting glucose level is compared to a glucose specimen that is collected 2 hours after the patient eats a meal.
- **Glucose Tolerance Test** – GTT is used to diagnose carbohydrate metabolism problems. Patient must eat well balanced meals 3 days prior to test and must fast at least 12 hours before the test. Patients must drink glucose prior to testing and have 5 minutes to finish the drink. Levels will peak within 30 minutes to an hour following glucose ingestion. Specimens are then taken at specific time intervals. The intervals and number of samples taken are determined by the suspected metabolic disorder, as shown in the chart below.

Test	Specimen Collection Schedule	Total Number of Collections	Used to Diagnose
1-Hr GTT	1 hr. (no fasting)	1	Gestational Diabetes
2-Hr GTT	Fasting, 1 hr., and 2 hr.	3	

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3-Hr GTT	Fasting, 1 hr., 2 hr., and 3 hr.	4	Hyperglycemia
5-Hr GTT	Fasting, 1 hr., 2 hr., 3 hr., 4 hr., and 5 hr.	6	Hypoglycemia

- Lactose Tolerance Test (LTT) - This is used to determine if lactase is present in the patient's digestive system. This test follows the same procedures as the GTT, but the patient must drink lactose rather than glucose.
- Bleeding Time Test (BT) - A BT test is performed on the forearm and uses a blood pressure cuff inflated to 40 mm Hg. Phlebotomist will use an automated incision device to puncture skin and will use filter paper to blot the blood drops. This is a timed test, and the phlebotomist will blot blood every 30 seconds until patient stops bleeding.
- A DNA test is done by swabbing the inside of the cheek – also known as a buccal swab.

5.04 Comply with the chain of custody collection requirements (e.g., paternity testing, drug screening).

Specimens may be used for legal and forensic purposes, such as in paternity or deoxyribonucleic acid (DNA) testing, or alcohol and drug screening. Chain of custody (COC), from the time of patient identification through the processing of the specimen, is crucial in these cases. Requirements for proper COC handling are as follows:

- Obtain valid photo identification from the patient.
- Ensure that the purpose and procedure of the test being performed is properly explained to the patient and that he or she fully understands. Have the patient sign a consent form.
- Ensure proper labeling.
- Collect the specimen in specially designated containers and use special seals so that tampering is evident.
- Place the specimen in the designated locked container prior to transport.
- Each recipient or handler of the specimen must sign for delivery.

5.05 Perform venipuncture using appropriate methods (e.g., ETS, syringe)

The following procedure should be used when performing routine venipuncture:

- Review the physician's order to ensure that it contains all the necessary information. If any part of the order is unclear, contact the appropriate person for confirmation.
- Prepare the laboratory requisition.
- Make sure all the appropriate supplies are available for the procedure.
- Greet and identify the patient, introduce yourself, and then escort him/her to the appropriate area (if necessary).
- Verify that the patient is ready for the procedure.
- Position the patient; try to be reassuring if he or she feels nervous.

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- Perform hand hygiene and put on gloves.
- Apply the tourniquet 3-4 inches above the site where the venipuncture will be performed. Avoid tying the tourniquet too tightly or leaving it on for longer than 1 minute. (Doing so may result in complications, including hemoconcentration, hemolysis, or petechiae.)
- Ask the patient to make a fist.
- Determine the vein and site of entry by palpating the antecubital fossa with your index finger. (Note that generally, the median cubital vein is the first choice, the cephalic vein is the second choice, and the basilic vein is the third choice.)
- Clean the antecubital area in a circular motion, using 70% isopropyl alcohol (or other antiseptic as necessary), and allow the site to dry for 30 to 60 seconds.
- Assemble the needle and tube holder.
- Place the patient's arm in a downward position. Using the non-dominant hand, firmly grasp the patient's arm, making sure to keep the elbow straight and to anchor the vein by gently pulling the skin taut using your thumb 1-2 inches below the venipuncture site. Angle the needle 15 to 30 degrees, and insert the needle, bevel up, in one smooth, quick motion.
- Firmly hold the needle in place with the dominant hand and push the tube toward the holder using the thumb of the non-dominant hand. Use your fingers on the same hand to pull back on the flanges of the holder to prevent pushing the needle in farther. Continue pushing the tube in this way until the stopper is punctured.
- As soon as blood is flowing free, release the tourniquet, and politely ask the patient to release his or her fist.
- Remove the tube when blood stops flowing and insert the next tube. Be sure to follow the correct inversion guidelines for tubes with additives, as well as the correct order of draw.
- After removing the last tube, gently hold folded gauze over the venipuncture site and withdraw the needle. Once the needle is withdrawn, activate its safety feature immediately, and use the gauze to apply pressure to the puncture site until the bleeding stops.
- Discard needles and collection systems properly.
- Accurately label each tube, noting the patient's name and ID number, the time and date of collection, and your initials. Prepare the specimens for transport to the laboratory, being mindful of special handling requirements (i.e., warming or exclusion from light) if applicable.
- Check the venipuncture site to ensure that bleeding has stopped, then bandage the area.
- Remove and properly dispose of gloves. Then perform proper hand hygiene.

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The following procedure should be used when performing venipuncture with a syringe:

- Perform the beginning steps for routine venipuncture (steps 1-11 from above).
- Twist the needle onto the syringe. Pull the plunger back to ensure that it moves freely, and then push it all the way in to expel any air.
- Place the patient's arm in a downward position. Using the non-dominant hand, firmly grasp the patient's arm, making sure to keep the elbow straight and to anchor the vein by gently pulling the skin taut using your thumb 1-2 inches below the venipuncture site. Angle the needle 15 to 30 degrees, and insert the needle, bevel up, in one smooth, quick motion.
- Pull back the plunger slowly and gently until the syringe is filled.
- Gently hold folded gauze over the venipuncture site and withdraw the needle. Once the needle is withdrawn, activate its safety feature immediately, and use the gauze to apply pressure to the puncture site until the bleeding stops.
- Remove the needle from the syringe and dispose of it in the proper container. Attach a needleless blood transfer device to the syringe. Transfer the blood to evacuated tubes following proper order of draw guidelines.
- Dispose of the syringe and transfer device together in the appropriate container.
- Accurately label each tube, noting the patient's name and ID number, the time and date of collection, and your initials. Prepare the specimens for transport to the laboratory, being mindful of special handling requirements (i.e., warming or exclusion from light) if applicable.
- Check the venipuncture site to ensure that bleeding has stopped, then bandage the area.
- Remove and properly dispose of gloves. Then perform proper hand hygiene.

5.06 Perform capillary puncture collection using appropriate methods (e.g., heel, finger stick).

In certain situations, venipuncture collection may be impossible or inadvisable. In such situations, capillary collection, also referred to as dermal puncture, may be used. Dermal puncture is advisable when obtaining blood from the following types of patients:

- Children, especially those younger than 2 years of age
- Geriatric patients with small, fragile veins
- Obese patients, whose veins are difficult to find or access
- Patients at risk for serious complications associated with deep venous puncture (such as iatrogenic anemia, hemorrhage, etc.)
- Patients at risk of venous thrombosis
- Patients with burns or scars over venipuncture sites
- Patients requiring frequent glucose monitoring

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Dermal puncture sites are determined based on the age of the patient:

PATIENT'S AGE	ADVISED SITE	NOTES	DEPTH
Adult or child older than 1 year	Palmar surface of the distal segments of the 3rd (middle) or 4th (ring) fingers	Puncture is made perpendicular to the ridges of the fingerprint and slightly lateral to the center of the finger	3.0 mm
Child younger than 1 year	Medial and lateral borders of the plantar surface of the heel	For older infants, the big toe may be used if an alternative site is needed	2.0 mm
Premature infants or neonates	Medial and lateral borders of the plantar surface of the heel	Puncture is made perpendicular to the heel lines	0.65-0.85 mm

When performing dermal punctures, it is important to avoid contact with the underlying bone. The depth of the puncture is determined by the age of the patient and the advised puncture site as indicated in the above chart. Following these guidelines will help to prevent serious complications resulting from bone puncture, such as:

- Osteochondritis: a painful inflammation of the bone or cartilage
- Osteomyelitis: a potentially fatal bone infection

The following procedure should be used when performing a dermal puncture:

- Review the physician's order to ensure that it contains all the necessary information. If any part of the order is unclear, contact the appropriate person for confirmation. (Be sure to note on the requisition that you are performing a capillary collection).
- Identify the patient, introduce yourself, and then escort him/her to the appropriate area (if necessary).
- Verify that the patient is prepared for the procedure.
- Assemble the necessary equipment.
- Wash your hands.
- Select an appropriate dermal puncture site depending on the age of the patient.
- Warm the site with either a warm cloth or warming device. This practice can increase the blood flow up to seven times the normal amount.
- Clean the site using 70% isopropyl alcohol. Allow the site to thoroughly air-dry for maximum antiseptic action.
- Prepare the lancet, and position and hold the finger or heel.

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- Make the puncture. Ensure that the blade has made puncture to the full depth and fully retracted before lifting the device. Properly dispose of the blade.
- Wipe away the first drop of blood with a clean gauze pad to prevent contamination. Keep the site in a downward position to promote blood flow.
- Collect the sample by lightly touching the microsample container to the blood drop and allowing the blood to flow into the tube. Be sure not to overfill the container. Properly close the container.
- Apply pressure to the site using a clean gauze pad. Once bleeding has stopped, bandage can be applied for adults and children over 2 years of age. However, due to choking hazards, bandages should never be applied to children un 2 years of age.
- Label the specimen and place it in a larger container for transport to the laboratory.

5.07 Use appropriate needle insertion and removal techniques during blood collection.

The following procedure should be used when performing routine venipuncture:

- Review the physician's order to ensure that it contains all the necessary information. If any part of the order is unclear, contact the appropriate person for confirmation.
- Prepare the laboratory requisition.
- Make sure all the appropriate supplies are available for the procedure.
- Greet and identify the patient, introduce yourself, and then escort him/her to the appropriate area (if necessary).
- Verify that the patient is ready for the procedure.
- Position the patient; try to be reassuring if he or she feels nervous.
- Perform hand hygiene and put on gloves.
- Apply the tourniquet 3-4 inches above the site where the venipuncture will be performed. Avoid tying the tourniquet too tightly or leaving it on for longer than 1 minute. (Doing so may result in complications, including hemoconcentration, hemolysis, or petechiae.)
- Ask the patient to make a fist.
- Determine the vein and site of entry by palpating the antecubital fossa with your index finger. (Note that generally, the median cubital vein is the first choice, the cephalic vein is the second choice, and the basilic vein is the third choice.)
- Clean the antecubital area in a circular motion, using 70% isopropyl alcohol (or other antiseptic as necessary), and allow the site to dry for 30 to 60 seconds.
- Assemble the needle and tube holder.
- Place the patient's arm in a downward position. Using the non-dominant hand, firmly grasp the patient's arm, making sure to keep the elbow straight and to anchor the vein by gently pulling the skin taut using your thumb 1-2 inches below the venipuncture site. Angle the needle 15 to 30 degrees, and insert the needle, bevel up, in one smooth, quick motion.

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- Firmly hold the needle in place with the dominant hand and push the tube toward the holder using the thumb of the non-dominant hand. Use your fingers on the same hand to pull back on the flanges of the holder to prevent pushing the needle in farther. Continue pushing the tube in this way until the stopper is punctured.
- As soon as blood is flowing free, release the tourniquet, and politely ask the patient to release his or her fist.
- Remove the tube when blood stops flowing and insert the next tube. Be sure to follow the correct inversion guidelines for tubes with additives, as well as the correct order of draw.
- After removing the last tube, gently hold folded gauze over the venipuncture site and withdraw the needle. Once the needle is withdrawn, activate its safety feature immediately, and use the gauze to apply pressure to the puncture site until the bleeding stops.
- Discard needles and collection systems properly.
- Accurately label each tube, noting the patient's name and ID number, the time and date of collection, and your initials. Prepare the specimens for transport to the laboratory, being mindful of special handling requirements (i.e., warming or exclusion from light) if applicable.
- Check the venipuncture site to ensure that bleeding has stopped, then bandage the area.
- Remove and properly dispose of gloves. Then perform proper hand hygiene.

The following procedure should be used when performing venipuncture with a syringe:

- Perform the beginning steps for routine venipuncture (steps 1-11 from above)
- Twist the needle onto the syringe. Pull the plunger back to ensure that it moves freely, and then push it all the way in to expel any air.
- Place the patient's arm in a downward position. Using the non-dominant hand, firmly grasp the patient's arm, making sure to keep the elbow straight and to anchor the vein by gently pulling the skin taut using your thumb 1-2 inches below the venipuncture site. Angle the needle 15 to 30 degrees, and insert the needle, bevel up, in one smooth, quick motion.
- Pull back the plunger slowly and gently until the syringe is filled.
- Gently hold folded gauze over the venipuncture site and withdraw the needle. Once the needle is withdrawn, activate its safety feature immediately, and use the gauze to apply pressure to the puncture site until the bleeding stops.
- Remove the needle from the syringe and dispose of it in the proper container. Attach a needleless blood transfer device to the syringe. Transfer the blood to evacuated tubes following proper order of draw guidelines.
- Dispose of the syringe and transfer device together in the appropriate container.

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- Accurately label each tube, noting the patient's name and ID number, the time and date of collection, and your initials. Prepare the specimens for transport to the laboratory, being mindful of special handling requirements (i.e., warming or exclusion from light) if applicable.
- Check the venipuncture site to ensure that bleeding has stopped, then bandage the area.
- Remove and properly dispose of gloves. Then perform proper hand hygiene.

5.08 Respond to patient complications during blood collection (e.g., syncope, excessive bleeding and pain, seizure, lack of circulation, arterial nick).

It is important to be able to recognize to complications that may arise with specimen collection. Knowing how to prevent and respond to these complications will reduce patient injury and testing inaccuracies.

Possible Complications Occurring with Specimen Collection:

- **Syncope** – Sudden fainting can occur during specimen collection. Therefore, communication is essential between the phlebotomist and the patient. If syncope is a known possibility, draw blood in a recumbent position. Do not turn your back on the patient and stay with the patient at least 15 minutes after the blood collection to assure the patient's safety. If syncope occurs during collection, end the draw immediately following proper procedure and call for assistance.
- **Hematoma** – This occurs when blood is leaking into the surrounding tissues. A hematoma can be caused by advancing the needle too far or at the wrong angle, causing it to go through the vein, by failing to apply appropriate pressure after needle withdrawal, or by bending the arm at the antecubital area after needle withdrawal. Not following proper procedure and removing the needle before removing the tourniquet can also cause a hematoma.
- **Petechiae** – These are small, red, smooth, hemorrhagic spots appearing on a patient's skin, which indicates that minute amounts of blood have leaked in the skin epithelium. Petechiae can be caused by applying the tourniquet too tightly.
- **Excessive bleeding** – Coagulation times may vary if the patient is on a blood thinner. Be sure to apply appropriate pressure for a longer period for patients taking anticoagulants. Physical changes in the elderly lead to longer healing times, requiring pressure to be applied for longer periods for these patients after needle withdrawal as well.
- **Hemoconcentration** – A decrease in the plasma volume with an increased concentration of cells and molecules may be caused by prolonged tourniquet application, or massaging, squeezing, or probing a site.
- **Hemolysis** – This occurs when RBCs are lysed; hemoglobin is released and serum, which is normally straw colored, becomes tinged with pink or red. There are many causes of hemolysis, including, but not limited to drawing blood too quickly into a syringe,

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excessively or vigorously inverting tubes after collection, and using too small a needle with respect to vein size.

- **Collapsed vein** – Too strong of a vacuum on a small vein may cause the vein to collapse. To prevent this from occurring, use smaller tubes if possible, or when using the syringe system, pull the plunger gently and slowly.
- **Lack of blood flow –** A lack of adequate blood flow can be attributed to several factors. Blood will not flow if a defective evacuated tube without proper vacuum is used. A complete lack of blood flow indicated that the vein was missed, while intermittent or slow blood flow indicates improper needle position.

5.09 Collect blood specimens from patients with special circumstances (e.g., bleeding disorders, burns, IV).

In some situations, special precautions should be taken regarding special needs of the patient.

- Pediatric patients
  - **Physiological needs** – It is important to keep in mind that children have a much lower total blood volume than adults. To prevent cardiac arrest and iatrogenic anemia, pediatric patients should not have more than 5% of their blood drawn within a 24-hour period.
  - **Psychological needs** – Children may often experience anxiety and fear when undergoing medical procedures. Excessive crying can alter blood test results, specifically affecting WBC count and blood pH levels. It is important to always calm pediatric patients, explain procedures, and involve the parents whenever possible. Anesthetics, most commonly EMLA (eutectic mixture of local anesthetics) may be useful in numbing venipuncture sites before the procedure.
- Geriatric patients
  - **Physical changes** – Reduction in the collagen and elasticity in the skin of geriatric patients can lead to easy bruising longer coagulation times.
  - **Other considerations** – Geriatric patients may experience other disorders that should be taken into consideration when performing specimen collection, such as hearing loss, visual impairment, Parkinson's disease, arthritis, or dementia.
  - **Guidelines for collecting specimens from geriatric patients**
    - Be sure to identify the patient using his/her ID bracelet.
    - Using a dermal puncture, when possible, will reduce blood loss and bruising.
    - Apply the tourniquet more loosely and over clothing, if possible, to prevent bruising or collapsing of the vein.
    - Massage the area to promote blood flow when locating veins, and ensure veins are anchored securely so they do not roll.
- **Patients with VADs** – only specially trained personnel may perform blood collection from vascular access devices (VADs).

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- **Patients with IVs** – It is advisable to draw blood from the opposite arm for patients who have IVs. However, if no alternate site is available, follow these guidelines:
  - Ask the nurse to turn off the IV drip and wait until the medication clears the line.
  - Select a vein that is distal to the IV site. Collection should not be taken from the same vein that has the IV.
  - The first 5mL of blood should be discarded.
  - When the venipuncture is complete, ask the nurse to restart the IV.
  - Document that the blood was drawn from an arm with an IV line.

5.10 Collect specimens for POC testing (e.g., glucose, UA, HCG).

Point-of-Care testing (POCT) is performed at the patient's bedside or in the facility without being sent to an outside laboratory. Most of these tests are "CLIA waved." This means that based on the Clinical Laboratory Improvement Act of 1988, the simplicity of these tests makes errors in testing or reading unlikely.

Types of POC tests:

- Urinalysis.
- Hemoglobin (Hgb).
- Hematocrit (HCT).
- Coagulation (ACT, PT, APTT).
- Chemistry panels.
- Glucose.
- Pregnancy (hCG).
- Electrocardiography (ECG or EKG).
- Respiratory Syncytial Virus (RSV).
- Influenza A and B.
- Group A Streptococcus (Streptococcus pyogenes).
- Human Immunodeficiency Virus (HIV) antibody test.
- Helicobacter pylori (H. Pylori) and antibody test.
- Infectious mononucleosis/Epstein-Barr virus (EBV).

5.11 Perform blood culture collections.

Equipment

- Personal protective equipment, gloves, clean uniform, and laboratory coat.
- Isopropyl alcohol preps.
- 2 iodine-tincture scrub swab sticks or chlorhexidine gluconate swab sticks (2 packages).
- 2 blood culture bottles (1 for anaerobic microorganisms and 1 for aerobic microorganisms) (2 bottles/ set collected).
- Sodium polyanethole sulfonate (SPS) evacuated tubes.
- Safety needles (21- or 23 gauge).
- Single-use evacuated tube holders.

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- Evacuated safety tube assembly.
- Safety sterile syringe, blunt-tipped connector), and direct-draw holder/adapter.
- Sterile gauze pads.
- Nonlatex bandages.
- Nonlatex tourniquet.
- Patient identification labels.
- Laboratory requisition and pen.
- Plastic Ziplock specimen label.
- Biohazard waste container.

Safety Syringe Blood Culture Collection

Preparation

- Identify the patient properly. Explain the test to the patient.
- Wash or sanitize your hands with an alcohol hand rinse, don gloves, and prepare and assemble equipment and supplies next to the patient. Offer to answer any questions for the patient. Place the tourniquet on the arm.

Procedure

- Locate the vein and loosen the tourniquet. Disinfect the rubber septum on the blood culture bottles with 70% isopropyl alcohol and allow it to dry. Scrub the site of the venipuncture with 70% isopropyl alcohol for 60 seconds to rid the site of excess dirt, and then scrub with the iodine tincture (chlorhexidine gluconate for patients sensitive to iodine or for infants older than two months) for at least 30 seconds. Begin by placing the iodine swab at the site of needle insertion and then move it outward in concentric circles to a diameter of approximately 2.5 inches.
- Alert the patient before venipuncture. Reapply the tourniquet, anchor the vein and smoothly insert the needle, bevel up.
- After the collection of the blood into the safety sterile syringe, activate the safety needle cover and aseptically dispose of the needle into the sharps container without touching the needle.
- Then, place a blunt-tipped connector on the syringe tip and attach the blunt-tipped connector to the direct-draw holder/ adapter.
- Starting with the anaerobic microbiology bottle in an upright position, place the blood-transfer device on the bottle, fill to the desired amount, and remove the syringe with blood-transfer device from the bottle.
- If anaerobic and aerobic microbiology bottles are to be filled with the patient's blood, fill the aerobic bottles immediately after the anaerobic bottle, and then fill the other blood collection tubes according to the "order of draw". NEVER push on the syringe plunger. Allow the vacuum in the microbiology bottles and tubes to pull the blood into the bottles and tubes.

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- If only 3 mL or less of blood are collected, place the entire amount in the aerobic bottle.
- For infants and small children, only 1 to 5 mL of blood can usually be collected for bacterial culture. Use blood culture bottles that are designed specifically for the pediatric patient.

Safety Butterfly Assembly Blood Culture Collection

Preparation

- Identify the patient properly. Explain the test to the patient
- Wash or sanitize your hands with an alcohol hand rinse, don gloves, and prepare and assemble equipment and supplies next to the patient.
- Offer to answer any questions for the patient. Place the tourniquet on the arm.

Procedure

- Locate the vein and loosen the tourniquet. Disinfect the rubber septum on the blood culture bottles with 70% isopropyl alcohol and allow it to dry.
- Scrub the site of the venipuncture with 70% isopropyl alcohol for 60 seconds to rid the site of excess dirt, and then scrub with iodine tincture (chlorhexidine gluconate for patients sensitive to iodine or for infants older than two months) for at least 30 seconds. Begin with the iodine swab at the site of needle insertion and then move it outward in concentric circles to a diameter of approximately 2.5 inches.
- Alert the patient before venipuncture. Reapply the tourniquet, anchor the vein, and smoothly insert the needle, bevel up
- Use a safety butterfly assembly for insertion of the butterfly needle into the venipuncture site after the appropriate skin preparation
- It can be helpful to place a strip of tape over the butterfly wings to keep the needle in place as the blood culture bottles are filled with the blood
- Transfer the blood to the microbiology bottles via a direct draw adapter that fits directly over the blood culture bottle
- Using this method, blood is transferred to the aerobic bottle first, since the assembly tubing contains air
- If only 3 mL or less of blood are collected, place the entire amount in the aerobic bottle
- For infants and small children, only 1 to 5 mL of blood can usually be collected for bacterial culture. Use blood culture bottles that are designed specifically for the pediatric patient

Evacuated Tube System for Blood Culture Collection

Preparation

- Identify the patient properly. Explain the test to the patient.
- Wash or sanitize your hands with an alcohol hand rinse, don gloves, and prepare and assemble equipment and supplies next to the patient. Offer to answer any questions for the patient. Place the tourniquet on the arm.

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Procedure

- Locate the vein, loosen the tourniquet, scrub the site of the venipuncture with 70% isopropyl alcohol for 60 seconds to rid the site of excess dirt, and then scrub with the iodine tincture (chlorhexidine gluconate for patients sensitive to iodine or for infants older than two months) for at least 30 seconds. Initially place the iodine swab at the site of needle insertion and then move it outward in concentric circles to a diameter of approximately 2.5 inches.
- Alert the patient before venipuncture. Reapply the tourniquet, anchor the vein, and smoothly insert the needle, bevel up
- After performing a venipuncture by evacuated tube system, collect blood into the SPS tubes and then fill other tubes, as required.
- The blood from SPS tube can be transferred to the blood culture media

After Blood Culture Collection by the Previous Methods

- At the patient's bedside, label the tubes and/or bottles and label each culture bottle or tube with the site of specimen collection. Ask the patient to double check his or her name on the labels if possible.
- Remove the iodine and/or chlorhexidine from the patients' arm with alcohol to prevent possible irritation of the patient's arm
- Document the following: (a) date and time specimen obtained and (b)site of specimen collection
- Discard the safety needle, evacuated tube holder/needle assembly or butterfly blood collection set in the sharp's biohazardous container
- Discard blood-soaked gauze pads, contaminated items, and gowns, or gloves used in isolation rooms in appropriate biohazardous waste containers.
- Dispose of gowns and gloves that are not from isolation rooms in the appropriate containers
- Wash or sanitize your hands
- Thank the patient for cooperating and depart with all specimens and all remaining supplies. Do not leave anything at the patient's bedside
- Deliver the blood specimens immediately to the laboratory

5.12 Identify the amount of blood needed for a tube.

It is important to access specimens to ensure that they are suitable for lab analysis. The following are variables that would cause a specimen to be rejected:

- Improper labeling or identification
- Hemolysis
- Expired tubes
- Using the improper tube for the test that is being ordered
- Clotting in anticoagulated specimens

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- Contaminated specimens
- Insufficient volume of specimen for testing. This is noted as QNS, as "quality not sufficient"
- Inadequately filled tube (lower than recommended specimen to additive ratio)
- Incorrect specimen collection time for timed specimens
- Improper handling (examples: bilirubin specimens that were not protected from the light or specimens delivered to the laboratory at the incorrect temperature)
- Delayed delivery to the laboratory

5.13 Instruct patients in the collection of non-blood specimens (e.g., urine, stool, semen, cerebrospinal fluid specimen, Amniotic fluid specimen).

Non-blood Specimens and Tests

- **Urine Specimens**
  - Urine – collection is performed in temperature measured cups. Check for clarity, specific gravity, color, and odor. Usually, a regular voided specimen is acceptable for a common UA (urinalysis). C&S (culture and sensitivity) testing is used for UTI symptoms and must be a mid-stream clean catch specimen. Drug screening is a random sample in a clean covered container. A major drawback of a 24-hour urine collection is patient cooperation – often patients get tired of participating, and the entire test is then null and void. Pregnancy testing is used to identify the presence of HCG usually present in body after 10 days post conception. First morning specimen is preferred.

Types of Urine Collection:

- Regular voided specimen, also known as a random urine specimen, is collected for urinalysis. No special measures are required. It can be collected at any time.
- Timed specimens are specimens that are collected at specific times.
- First morning specimens are collected immediately after the patient awakens. The high concentration of these specimens allows for testing and detection of chemicals or microbes that may not be detected in more dilute specimens. First morning specimens are also referred to as 8-hour specimens.
- Timed specimens are samples collected over a period of 24 hours in a single container to provide one large specimen. The patient discards the first morning urine. He or she then collects all urine samples for the next 2 hours, ending with the first urine the following morning (or at the same time that the patient started testing the previous day.)
- Midstream, clean catch specimen is the most common procedure for urine collection. The area around the urethra is cleaned with alcohol towelettes. The patient then voids some urine into the toilet and begin filling the specimen cup midstream. This produces a sterile specimen used for culture and sensitivity testing to determine if the patient has a UTI.

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- Catharized specimens are collected through use of a catheter that is inserted through the urethra into the bladder.
- Suprapubic specimens, or suprapubic aspiration collections, can only be performed by a physician. These samples are collected through use of a needle inserted through the abdominal wall directly into the bladder.

Stool Specimens
Stool or fecal specimens are collected to test for bacterial or viral intestinal infections. They may also be used to screen for occult blood, indicative of colorectal cancer. These samples must be collected in a clean, dry container with a tightly fitted lid.

Semen Specimens
Semen specimens are used in fertility testing, to determine the effectiveness of a vasectomy, or for forensic analysis as part of a rape kit. (When being used for the latter, special trained personnel collect the sample.) Patients are advised to abstain from sexual activity or ejaculation for 3 days prior to the specimen collection. For collection, the sample is ejaculated into a sterile specimen cup. The time of the collection is noted. The sample is kept warm, close to body temperature, and transported to the laboratory within 30 minutes of collection.

Cerebrospinal Fluid Specimens
Cerebrospinal fluid, referred to as CSF, is fluid that circulates in the brain and spinal cord. Testing of this fluid is used to diagnose infections of the central nervous system, such as meningitis. CSF is obtained by lumbar puncture, also called a spinal tap.

Amniotic Fluid Specimens
Amniotic fluid is found surrounding the fetus in the amniotic sac in pregnant women. These specimens are collected through a special procedure known as an amniocentesis, which may only be performed by a physician. A needle is inserted through the mother's abdominal wall and directly into the amniotic sac, from which fluid is removed and transferred into a sterile container. Special precaution must be taken to protect amniotic fluid from light. Laboratory testing on these specimens reveal information regarding the health of the fetus.

5.14 Perform non-blood specimen collection (e.g., a throat culture, sputum, and a nasal swab).
Throat Cultures
Throat culture samples, also known as throat swabs, are collected to diagnose throat infections and determine an appropriate method of treatment. Most commonly, these samples are used in Strep tests, which can be performed as either a rapid strep test (POC test) or as a standard bacterial culture in the laboratory.

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The following procedure should be used when performing routine throat swabs:

- Gather the necessary equipment
- Wearing gloves, prepare a sterile swab and ask the patient to tilt his or head back with the mouth wide open.
- Gently depress the patient's tongue with a sterile tongue depressor using one hand, while using your other hand to swab the back of the patient's throat with the sterile swab. To prevent contamination, avoid touching the inside of the cheek, the tongue, or the lips.
    - For specimens being sent to the laboratory for standard bacterial cultures, insert the swab into the holder, avoiding contact with the top or outside of the holder. Label the sample and transport it to the laboratory.
    - For POC testing, follow the directions on the packaging
- Remove and dispose of gloves. Perform proper hand hygiene

Sputum

This is mucus or phlegm that is ejected from the trachea, bronchi, and lungs through deep coughing. Sputum specimens are sometimes collected in the diagnosis or monitoring of lower respiratory tract infections such as tuberculosis (TB).

Follow these instructions to ensure that the patient is giving a good sample to the provider:

- Go to the sputum collection area you are directed to by the study nurse. This area should be outside or in a special area with negative air flow (meaning the air flows out of the room you are in).
- Relax. Take a few deep breaths while pressing your hand lightly on your stomach. When it is time to cough, you should be inhaling so deeply that you feel it in your stomach area.
- Rinse and spit with water. This is important to make sure there will not be mouth bacteria in the sputum collected.
- Get ready – Put one hand over your mouth with a tissue and then put the other hand back on your stomach.
- Cough deeply, so that you can really feel it in your stomach. Do not take shallow coughs from the throat or chest.
- Once the sputum (phlegm) is in your mouth, release it into the container provided by the study nurse.
- Check – Give the sputum (phlegm) container to the study nurse to check for quality. The study nurse should hold the container up to the light to make sure you have provided a quality sample.

Nasal Swab

Nasopharyngeal (NP) secretions can be cultured to detect the presence of microorganisms that cause diseases such as diphtheria, influenza, meningitis, pertussis (whooping cough), and pneumonia.

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This specimen is collected by using cotton-tipped flexible wire swab. The swab is inserted gently into the nose and passed into the nasopharynx. There it is gently rotated, then carefully removed, placed in a sterile tube containing transport medium, labeled, and delivered to the lab.
The following procedure should be used to ensure that the provider is getting a good sample:

- Identify the patient.
- Wash hands.
- Gently insert a mini-tip culture swab through the nose into the nasopharynx.
- Gently rotate the swab and carefully remove.
- Place swab sample in transport medium (saline).
- Mix the swab and transport medium vigorously.
- Express excess liquid from the swab.
- Dispose of the swab in the appropriate biohazard container.
- Label the sample.
- Place the sample/transport medium in a slurry of ice.
- Deliver the sample to the laboratory immediately after collection.

5.15 Perform appropriate post-puncture care for the patient (e.g., assess patient, apply pressure, check a site for bleeding, and bandaging).

Guidelines for appropriate post-puncture care

- Place folded gauze over the venipuncture site and withdraw the needle. Apply pressure until the bleeding stops.
- Keep in mind, bleeding times will vary from patient to patient, and puncture sites may require additional pressure to stop bleeding. For instance, elderly patients tend to have a longer bleeding time and may require pressure to be applied for at least 2 minutes. Generally, the puncture site should stop bleeding within 5 minutes. However, patients taking anticoagulants or who are on an aspirin regimen may require additional pressure at the puncture site. In any case, continue to apply pressure until the bleeding has stopped. Prolonged bleeding times should be documented, and the nurse or physician should be notified.
- Check the venipuncture site to see whether the bleeding has stopped, then bandage the area. Bandages can pose a choking hazard to children under 2 years of age and should not be used for these patients.

5.16 Record specimen collection details in a timely and accurate manner.

Accurate specimen labeling helps ensure quick and efficient treatment of patients. Specimens with inaccurate or incomplete labels are unable to be processed, requiring the specimen to be redrawn, and possibly prolonging patient care.

Guidelines for accurate specimen labeling

- Label tubes immediately after finishing the specimen collection. (In an inpatient setting, tubes should be labeled before leaving the patient's room.)

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- Specimen labels should contain the following information:
  - Patient's full name.
  - Patient's ID number (if applicable).
  - Time and date of collection.
  - Phlebotomist's initials.

5.17 Measure and record vital signs as requested by a facility.

Vital Signs

Vital signs include the heartbeat, breathing rate, temperature, and blood pressure. These signs may be watched, measured, and monitored to check an individual's level of physical functioning. Normal vital signs change with age, sex, weight, exercise tolerance, and condition. Normal ranges for the average healthy adult vital signs are:

- Blood Pressure: normal BP is less than 120 (Diastolic) and less than 80 (systolic) *AHA, 2017
- Breathing: 12 - 18 breaths per minute
- Pulse: 60 - 80 beats per minute (at rest)
- Temperature: 97.8 - 99.1 degrees Fahrenheit / average 98.6 degrees Fahrenheit

These ranges will vary per individual specifically from child to adult.

Temperature – Thermometers are used to measure temperature using the Fahrenheit and Centigrade or Celsius scale. Temperature sites are the following: mouth, rectum, ear (tympanic membrane), and the axilla (underarm). The normal ranges for each site are:

Site	**Normal Range**
• Rectal	98.6Fto 100.6F (37.0C to 38.1C)
• Oral	97.6F to 99.6F (36.5C to 37.5C)
• Axillary	96.6F to 98.6F (35.9C to 37.0C)
• Tympanic Membrane	98.6F (37C)

Additional terminologies for temperatures/fevers are:

- **Febrile** – presence of fever
- **Afebrile** – absence of fever
- **Fever** – elevated body temperature beyond normal range. Types of fever are:
- **Intermittent** – fluctuating fever that returns to or below baseline then rises again.
- **Remittent** – fluctuating fever that remains elevated; it does not return to baseline temperature.
- **Continuous** – a fever that remains constant above the baseline; it does not fluctuate
- **Pyrexia** – when a patient has an oral temperature of 100.8°F
- **Hyperpyrexia** – when a patient presents with an oral temperature of 104°F or higher

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Oral temperature is the most common method of measurement; however, it is not taken from the following patients:

- infants and children less than six years old
- patients who have had surgery or a facial, neck, nose, or mouth injury
- those receiving oxygen
- those with nasogastric tubes
- patients with convulsive seizures
- hemiplegic patients
- patients with altered mental status

Wait for 30 minutes to take the oral temperature in patients who have just finished eating, drinking, or smoking. When taking a temperature, leave the thermometer in the patient's mouth for 3-5 minutes or as required by agency policy.

Rectal temperature, the most accurate, is taken when oral temperature is not feasible. However, it is not taken from the following patients:

- patients with heart disease
- patients with rectal disease or disorder or has had rectal surgery
- patients with diarrhea

Rectal temperature is taken with the patient in a SIMS (side-lying) position. The thermometer and the patient's hip are held throughout the procedure, so the thermometer is not lost in the rectum or broken.

Axillary temperature is the least accurate and is taken only when no other temperature site can be used. The axilla, (the underarm) should be clean and dry and the thermometer should be held in place for 5-10 minutes or as required by the facility policy.

Tympanic temperature is useful for children and confused patients because of the speed of operation of the tympanic thermometer. A covered probe is gently inserted into the ear canal and temperature is measured within seconds (1–3 seconds). It is not used if the patient has an ear disorder or ear drainage.

Pulse

The normal adult pulse rate ranges between 60 and 100 beats per minute. The site most commonly used for taking pulse is the radial artery found in the wrist on the same side as the thumb. It is felt with the first two or three fingers (never with the thumb) and usually taken for 30 seconds multiplied by two to get the rate per minute. If the rate is unusually fast or slow, however, count it for 60 seconds. The apical pulse is a more accurate measurement of the heart rate and it is taken over the apex of the heart by auscultation using the stethoscope. It is used

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for patients with irregular heart rate and for infants and small children. A baby's pulse and respirations are faster than adults.

Several factors can affect pulse rate: age, sex, body size, physical exercise, health status, and medications. Infants and children have faster pulse than adults and women have faster pulse than men. Anxiety, fear, anger, cancer, pregnancy, and hyperthyroidism can increase the pulse rate too.

Respiration

When measuring respiration, respiratory characteristics such as rate, rhythm, and depth are considered. Rate is the number of respirations per minute. The normal range for adults is 12 to 20 per minute. One inspiration (inhale) and one expiration (exhale) count together as one respiration. It is counted for 30 seconds multiplied by two or for a full minute.
Some rate abnormalities may be:

- **Apnea** – this is a temporary complete absence of breathing which may be a result of a reduction in the stimuli to the respiratory centers of the brain.
- **Tachypnea** – this is a respiration rate of greater than 40/min. It is transient in the newborn and maybe caused by the hysteria in the adult.
- **Bradypnea** – decrease in number of respirations. This occurs during sleep. It may also be due to certain diseases.

Blood Pressure

This is the measurement of the amount of force exerted by the blood on the peripheral arterial walls and is expressed in millimeters (mm) of mercury (Hg). The measurement consists of two components: the highest (systole) and lowest (diastole) amount of pressure exerted during the cardiac cycle. The physician will often listen to the chest/heartbeats once the vitals are taken by the medical assistant. The physician is listening for any signs of abnormality in beats such as a fast heartbeat, a slow heartbeat or a murmur which may be an indication of valvular heart disease.

A stethoscope and sphygmomanometer of either aneroid or mercury type are used. The size of the cuff of the sphygmomanometer will depend on the circumference of the limb and not the age of the patient. The width of the inflatable bag within the cuff should be about 40% of this circumference – 12 cm to 14 cm in an average adult. The length of the bag should be about 80% of this circumference – almost long enough to encircle the arm. Cuffs that are too short or narrow may give falsely high readings, e.g., a regular cuff on an obese arm may lead to a false diagnosis of hypertension.

The inflatable bag is centered over the brachial artery with the lower border about 2.5cm above the antecubital crease. The cuff is positioned at heart level. If the brachial artery is far below

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the heart level the blood pressure will appear falsely high. If the brachial artery is far above heart level, blood pressure will appear falsely low.

Blood pressure is taken by determining first the palpatory systolic pressure over the brachial artery. Then with the bell of the stethoscope over the brachial artery, the cuff is inflated again to about 30 mm Hg above the palpatory systolic pressure and deflated slowly, allowing the pressure to drop at a rate of about 2 to 3 mmHg per second. Note the level at which you hear the sounds of at least two consecutive beats. This is the systolic pressure. Continue to lower the pressure slowly until the sounds become muffled and then disappear. Then deflate the cuff rapidly to zero. The disappearance point, which is usually only a few mmHg below the muffling point, marks the generally accepted diastolic pressure. Both the systolic and diastolic pressure levels are read to the nearest 2 mm Hg. Pulse pressure is the difference between the systolic and the diastolic reading of blood pressure. The average normal range for pulse pressure is 30 to 50 mm Hg.

6. Safety and Infection Control

6.01 Ensure that the specimen is properly labelled.

Every specimen that is being sent to the laboratory must have a label on the container in which it is held. It is not acceptable to label only the lid, transport bag, or other container used to transport the specimen. The label must contain the following legible information:

- Patient name
- Patient medical record number
- Collection date and time
- Specimen type and/or source
- Test required
- Ordering physician

6.02 Assess specimen quality and suitability for analysis (e.g., hemolysis, QNS, and clotting).

Hemolysis

Hemolysis is a result of red blood cells destroyed. This normally turns plasma and serum bright red or pink. This occurs when blood is obtained while the needle is up against a vein wall or the plunger is pulled back too hard. This can also happen if the tube was shaken vigorously. If you use a needle that is smaller than 25-gauge, it can cause hemolysis. Blood going through such a small size hole will break the red blood cells. Hemolysis can be an indication of a medical problem; it is important to have proper to technique. To prevent hemolysis:

- Avoid tourniquet application longer than 1 minute
- After cleansing with alcohol, allow the site to air-dry
- Do not collect a blood specimen in a site that has hematoma
- Avoid pulling the syringe plunger back too quickly
- When mixing blood in tubes containing additives, gently invert them. Do not shake them vigorously

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QNS

One of the most common problems in specimen collection is the submission of an insufficient volume of specimen for testing. The laboratory sends out a report marked QNS (quantity not sufficient), and the patient has to be called back for a report collection at an inconvenience to the patient and to the physician. To ensure an adequate specimen volume:

- Always draw whole blood in an amount 2 ½ times the required volume of serum required for a particular test
- For example, if 2 mL serum is required, draw at least 5 mL whole blood. If there is difficulty in performing venipuncture, minimum volume may be submitted if it is indicated in the test description. For most profile testing, draw at least two 8.5 mL gel-barrier tubes
- If pediatric tubes are used, be sure to collect an adequate volume of specimen to perform the test
- Provide patients with adequate containers and instructions for 24-hour urine and stool collections
- It is critical, especially for any specimen collection tube containing an additive, to allow the tube to fill "fill line" marked on the tube. This requirement is important in order to achieve the proper blood-to-additive ratio; otherwise, the specimen may be found to be QNS

6.03 Prepare blood specimens for further testing at a laboratory (e.g., centrifugation and aliquoting).

It is important to properly process blood samples that will be analyzed by other medical professionals. (Always remember to wear appropriate PPE when handling specimens.) Types of processing include:

- **Labeling** – All specimens should be properly labeled according to standard guidelines.
- **Packaging** – All specimens should be appropriately packaged in leak-proof containers. Be aware of special requirements for specimens, including temperature, protection from light, etc.
- **Centrifuging** – Tubes are placed in a centrifuge, which then spins the specimen to separate the contents based on density, with less dense components, such as plasma or serum forming the top layers. While plasma specimens can be centrifuged immediately after collection, serum specimens must be completely clotted before centrifugation can occur. This typically takes around 30 minutes.
- **Aliquoting** – For specimens that need to be distributed to and processed by various labs, small portions of the specimen, known as aliquots, are transferred into separate containers before transport. To avoid spills or aerosols, the aliquots are removed from the specimen using pipettes. Care should be taken when removing a stopper from a tube to prevent aerosols and injury.

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6.04 Prepare non-blood specimens for further testing at a laboratory (e.g., urine)

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6.05 Store specimens in the conditions appropriate to the purpose of collection (e.g., temperature, light).

The procedures regarding specimen storage are determined by the type of specimen collected, and the type of test being ordered. Factors to consider include:

- Time Constraints – Blood should be delivered to the laboratory as soon as possible after collection, or generally within 45 minutes of collection. While some specimens can be held for 24-48 hours before being tested, blood smears from EDTA tubes must be processed within 1 hour of collection.
- Temperature Requirements
  - Some specimens, such as cold agglutinins, are required to maintain a temperature of 37° C, and heel warmers should be wrapped around the specimen storage and transport.
  - Some specimens, such as pyruvate and lactic acid, should be stored in ice to keep it chilled prior to transport to the laboratory.
  - Other specimens need to remain at room temperature, and special care needs to be taken when transporting these specimens to outside facilities.
- Protection from Light
  - Some specimens contain light-sensitive analytes, such as bilirubin, vitamin B_{12}, and folate, among others. These specimens must be collected in amber-colored tubes and are often wrapped in aluminum foil to prevent analytes break down from light exposure. Forensic Samples – Specimens collected for the purpose of forensic or legal testing must be stored in designated, locked containers prior to transport to the testing facility.

6.06 Deliver specimens to the correct unit in a laboratory.

Clinical Laboratory Sections

The medical laboratory is an area in a healthcare facility where inpatient and outpatient diagnostic testing is conducted. Certain areas of the medical laboratory are designated for clinical analysis while others are for surgical and anatomical pathology analysis. The phlebotomy technician should be familiar with the following clinical sections:

Hematology Section

This department deals with the handling of various blood specimens. Tests performed in this department include WBC counts, RBC counts, CBC, hemoglobin, hematocrit (Hct), RBC indices, and platelet counts. The results of these tests indicate conditions such as dehydration, anemia, leukemia, and a wide variety of other diseases.

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Chemistry Section
The most commonly performed tests within this department include those for blood glucose levels, electrolytes (sodium, potassium, and chloride), total protein, etc. Serum Separator Tubes (SST) are commonly delivered to the Chemistry department of the laboratory. The results of these tests can range from the confirmation of pregnancy to the presence of a liver disorder.

Blood Bank Section
This is the section of the laboratory where blood is collected, stored, and prepared for transfusion. It is essential for all staff members to comply with the standards for patient identification and specimen handling to ensure the safety of all the patients. These standards are as follows:

- Tests done in the blood bank require a red top (plain) tube or a lavender or pink top tube.
- Specimens must have the following identification information
  - Patient's full name and date of birth
  - Patient's hospital identification number (inpatient)
  - Outpatient' social security number
  - Date and time of collection
  - Medical Assistant's (or phlebotomist's) initials

Microbiology Section
This section of the clinical laboratory focuses on the observation of organisms that are not visible to the human eye. The primary sections of this department include parasitology, the study of parasites; virology, the study of viruses and resulting diseases; mycology, the study of fungi; and bacteriology, the study of bacteria.

Specimen Transportation
Specimen transportation should occur as soon as possible. Once the specimen is labeled and either placed in a rack or carrier, the specimen should arrive at the lab so processing can begin. Some specimens require chilling – the use of ice slurry, water mixed with ice, is the best way for the specimens to be transported.

6.07 Take corrective action for problems with specimen processing or transportation.
Even when following procedures and guidelines to the best of your ability, there may be instances where problems occur in the processing or transporting of specimens. It is important to document such instances and notify the physician. Most likely, specimens will need to be re-collected. This may be easier to do in a hospital setting. In an outpatient setting, notify the physician or supervisor as soon as the error is noticed. If the patient is still in the facility, you can collect a new specimen at that time. If the patient has left the facility, they may be contacted and notified to return for another specimen collection.

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