EIGHTH EDITION

PHLEBOTOMY ESSENTIALS

30th Anniversary Edition

Ruth E. McCall, BS, MLS (ASCP)

Part-time Instructor, Phlebotomy Program
Retired Director, Phlebotomy and Clinical Laboratory Assistant Programs
Central New Mexico (CNM) Community College
Albuquerque, New Mexico

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To my husband, John, my sons, Chris and Scott, my daughter-in-law, Tracy, my grandchildren, Katie and Ryan, and all my extended family and friends who supported and encouraged this effort.

–Ruth E. McCall

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Preface

Phlebotomy Essentials was first published 30 years ago with the goal of training all phlebotomy students to practice correctly and safely. This eighth edition continues the tradition, while expanding the digital, student, and instructor resources beyond anything offered in the past. It offers students a complete, integrated learning system—textbook, workbook, and exam review—to provide foundational knowledge, along with opportunities to practice and synthesize that knowledge and, ultimately, to practice taking certification-style exams. The Navigate course goes even further, providing an interactive eBook with skills videos and animations, a TestPrep product that students can use to test themselves on specific subtopics, and a multitude of other resources built to set up students for success.

This product strives for the optimal student outcome: passing the course, passing a national certification exam, and serving as a phlebotomist of the highest skill. As in prior editions, the content in this new edition of *Phlebotomy Essentials* was designed in accordance with applicable National Accrediting Agency for Clinical Laboratory Science (NAACLS) competencies. Procedures have been written to conform to the latest OSHA safety regulations and, wherever applicable, standards developed by the Clinical and Laboratory Standards Institute (CLSI).

The author has more than 40 years of experience in laboratory sciences, phlebotomy program direction, and teaching many different levels and diverse populations of phlebotomy students. As with previous editions, *Phlebotomy Essentials, Eighth Edition,* provides accurate, up-to-date, and practical information and instruction in phlebotomy procedures and techniques, along with a comprehensive background in phlebotomy theory and principles. It is appropriate for use as an instructional text or as a reference for those who wish to update skills or study for national certification.

Organization

Much care has been taken to present the material in a clear and concise manner that encourages learning and promotes comprehension. A good deal of time was spent organizing and formatting the information into a logical and student-friendly reading style and in an order that allows the reader to build on information from previous chapters.

The book is divided into four units. Unit I, The Healthcare Setting, presents a basic description of the healthcare system and the role of the phlebotomist within it. Major topics include communication skills, healthcare financing, and healthcare delivery, with an emphasis on clinical laboratory services, quality assurance, and legal issues, and their relationship to the standard of care. Comprehensive instruction in infection control and safety is also provided.

Unit II, Overview of the Human Body, provides a foundation in medical terminology and will give the reader a basic understanding of each of the body systems, including associated disorders and diagnostic tests. An entire chapter is devoted to the circulatory system, with special emphasis on the vascular system, including blood vessel structure, vascular anatomy of the arm, and blood composition.

Unit III, Blood Collection Procedures, describes phlebotomy equipment (including the latest safety equipment and order of draw) and proper procedures and techniques for collecting venipuncture and capillary specimens based on the latest CLSI standards. Also included is an extensive explanation of preanalytical variables, complications, and procedural errors associated with blood collection.

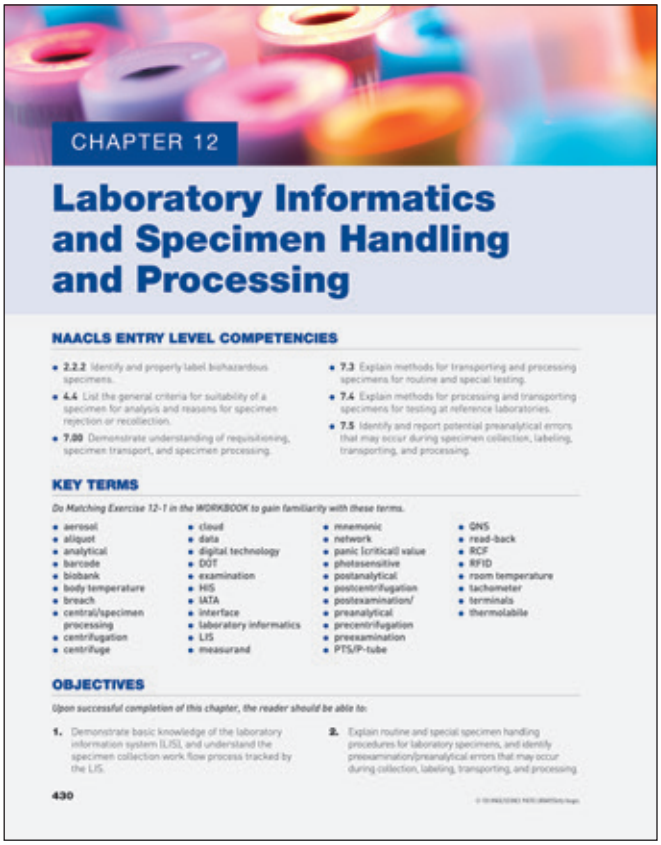
Unit IV, Special Procedures, offers information and instruction on how to handle special blood and nonblood specimen collections and describes the latest in point-of-care instruments and testing. This unit includes an overview of the laboratory

information system (LIS) and describes how the LIS supports the laboratory process and is an essential part of the network of healthcare communication. In addition, routine and special handling and processing of specimens, with an emphasis on the latest rules of safety, are also covered in this unit. Information is presented on nonblood specimens and testing, which can be an important part of the phlebotomist's responsibilities, as well as arterial puncture for those phlebotomists who currently draw arterial blood gases or who anticipate advancing beyond venous collection.

Feature Walkthrough

The eighth edition includes various features designed to help the reader learn and retain the information in *Phlebotomy Essentials*.

- The applicable **NAACLS competencies** listed at the beginning of each chapter serve as an aid to the instructors of approved programs or programs seeking approval, and as assurance to students that they are learning material expected of a graduate of a phlebotomy program.
- **Key Terms** and **Learning Objectives** begin each chapter and help students recognize important terms and concepts they will come across while reading the chapter.



CHAPTER 12

Laboratory Informatics and Specimen Handling and Processing

NAACLS ENTRY LEVEL COMPETENCIES

- 2.2.2 Identify and properly label biohazardous specimens.
- 4.4 List the general criteria for suitability of a specimen for analysis and reasons for specimen rejection or recollection.
- 7.00 Demonstrate understanding of requisitioning, specimen transport, and specimen processing.
- 7.3 Explain methods for transporting and processing specimens for routine and special testing.
- 7.4 Explain methods for processing and transporting specimens for testing at reference laboratories.
- 7.5 Identify and report potential preanalytical errors that may occur during specimen collection, labeling, transporting, and processing.

KEY TERMS

Do Matching Exercise 12-1 in the WORKBOOK to gain familiarity with these terms.

- aerosol
- aliquot
- analytical
- barcode
- biobank
- body temperature
- breach
- central/specimen processing
- centrifugation
- centrifuge
- cloud
- data
- digital technology
- DOT
- examination
- HIS
- IATA
- interface
- laboratory informatics
- LIS
- measurand
- mnemonic
- network
- panic (critical) value
- photosensitive
- postanalytical
- postcentrifugation
- postexamination/
- preanalytical
- precentrifugation
- preexamination
- PTS/P-tube
- QNS
- read-back
- RCF
- RFID
- room temperature
- tachometer
- terminals
- thermolabile

OBJECTIVES

Upon successful completion of this chapter, the reader should be able to:

1. Demonstrate basic knowledge of the laboratory information system (LIS), and understand the specimen collection work flow process tracked by the LIS.
2. Explain routine and special specimen handling procedures for laboratory specimens, and identify preexamination/preanalytical errors that may occur during collection, labeling, transporting, and processing.

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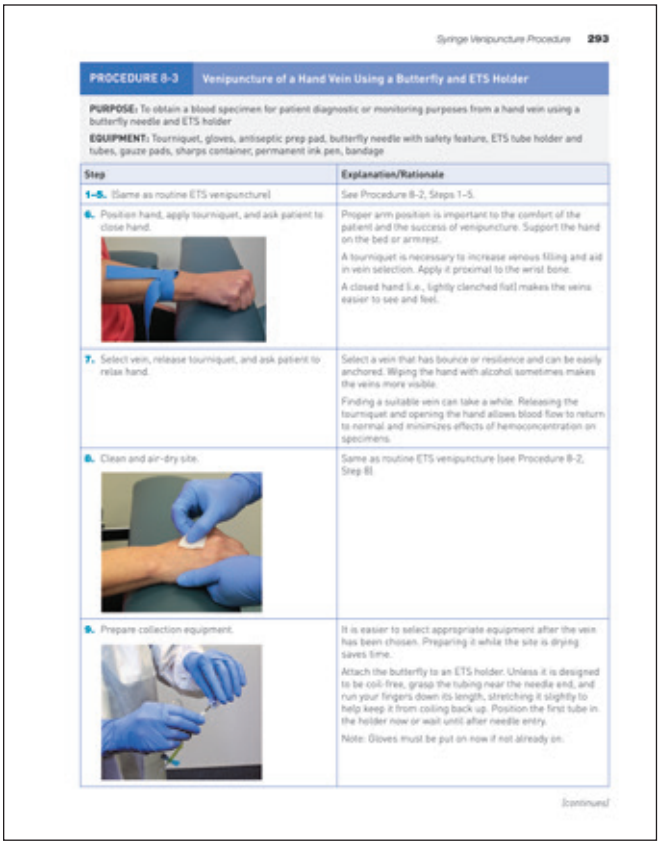


Syringe Venipuncture Procedure 293

PROCEDURE 8-3 Venipuncture of a Hand Vein Using a Butterfly and ETS Holder

PURPOSE: To obtain a blood specimen for patient diagnostic or monitoring purposes from a hand vein using a butterfly needle and ETS holder

EQUIPMENT: Tourniquet, gloves, antiseptic prep pad, butterfly needle with safety feature, ETS tube holder and tubes, gauze pads, sharps container, permanent ink pen, bandage

Step	Explanation/Rationale
1–5. (Same as routine ETS venipuncture)	See Procedure 8-2, Steps 1–5.
6. Position hand, apply tourniquet, and ask patient to close hand.	Proper arm position is important to the comfort of the patient and the success of venipuncture. Support the hand on the bed or armrest. A tourniquet is necessary to increase venous filling and aid in vein selection. Apply it proximal to the wrist bone. A closed hand (i.e., tightly clenched fist) makes the veins easier to see and feel.
7. Select vein, release tourniquet, and ask patient to relax hand.	Select a vein that has bounce or resilience and can be easily anchored. Wiping the hand with alcohol sometimes makes the veins more visible. Finding a suitable vein can take a while. Releasing the tourniquet and opening the hand allows blood flow to return to normal and minimizes effects of hemoconcentration on specimens.
8. Clean and air-dry site.	Same as routine ETS venipuncture (see Procedure 8-2, Step 8).
9. Prepare collection equipment.	It is easier to select appropriate equipment after the vein has been chosen. Preparing it while the site is drying saves time. Attach the butterfly to an ETS holder. Unless it is designed to be coil-free, grasp the tubing near the needle end, and run your fingers down its length, stretching it slightly to help keep it from coiling back up. Position the first tube in the holder now or wait until after needle entry. Note: Gloves must be put on now if not already on.

(continues)

- Consistently organized step-by-step **Procedures,** with an explanation or rationale for each step, assist the student in learning and understanding phlebotomy techniques.

- **Key Points** emphasize important concepts to enhance student learning and reinforce the significance of the stated information.

- **FYIs** add interesting notes and fun facts that will enhance practical application of the information.

- **Cautions** highlight critical information to help students identify and avoid dangerous practices.

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

vacuum is exhausted in order to contain the correct volume of blood and have the correct blood-to-anticoagulant ratio.

KEY POINT Excess EDTA, which results when tubes are underfilled, can cause RBCs to shrink and negatively affect CBC results.

Citrates

Citrates also prevent coagulation by binding (or chelating) calcium. The most common citrate is **sodium citrate**, which is used for coagulation tests (e.g., PT and aPTT) because it does the best job of preserving the coagulation factors. Sodium citrate tubes have light-blue stoppers (see **Figure 7-31**).

FYI Sodium citrate is also the additive in special erythrocyte sedimentation rate (ESR) tubes with black stoppers.

Coagulation specimens must be mixed immediately after collection to prevent activation of the coagulation process and microclot formation, which invalidates test results. Three to four gentle inversions are required for adequate mixing.

CAUTION Vigorous mixing or an excessive number of inversions can activate platelets and shorten clotting times.

Light blue-top tubes contain a 9:1 ratio of blood to anticoagulant when filled to the stated volume and must be filled to within 90% of that volume for accurate coagulation results. Exact fill volume is hard to tell on most tubes; however, Vacuette sodium citrate tubes have arrows that are used to identify correct fill volume. A guide provided by the manufacturer also helps phlebotomists or specimen processors determine whether a tube is adequately filled (Figure 7-31).

CAUTION The 9:1 ratio of blood to anticoagulant in light blue sodium citrate tubes is critical; therefore, it is extremely important to fill them to the stated volume. Underfilled tubes can cause artifically prolonged clotting times, and visibly underfilled tubes will not be accepted for testing by most laboratories.

Figure 7-31 Guide showing fill levels for sodium citrate tubes.

Coagulation tests are performed on plasma, so specimens must first be centrifuged to separate the plasma from the cells. Because sodium citrate binds calcium, calcium is added back to the specimen during the testing process so that clotting can be initiated and timed.

Special glass tubes with mottled light blue/black rubber stoppers called cell preparation tubes (CPTs) are available for separating mononuclear cells from whole blood. The tubes have a special fluid layer on the bottom, separator gel in the middle, and a sodium citrate fluid top layer.

Heparin

Heparin prevents clotting by inhibiting thrombin (an enzyme needed to convert fibrinogen into the fibrin necessary for clot formation) and factor X. Heparinized plasma has traditionally been used for some chemistry tests (e.g., ammonia and plasma hemoglobin). It is now commonly used for STAT tests (e.g., electrolytes) and in other rapid-response situations when a fast turnaround time (TAT) for chemistry tests is needed. Faster TAT is possible because tests performed on heparinized whole blood can be performed right away. Specimens for tests that are performed on heparinized plasma can be centrifuged right away. This saves the time that would normally be required for a serum specimen to clot completely and then be centrifuged to obtain serum for testing.

Fire Safety 109

Figure 3-19 Fire blanket storage box.

Box 3-13 Fire Safety DOS and DON'TS

- Do pull the nearest fire alarm.
- Do call the fire department.
- Do attempt to extinguish a small fire.
- Do close all doors and windows if leaving the area.
- Do smother a clothing fire with a fire blanket or have the person roll on the floor to smother the fire.
- Do crawl to the nearest exit if heavy smoke is present.
- Don't panic.
- Don't run.
- Don't use elevators.

oxygen to maintain combustion or burning—have traditionally been referred to as the fire triangle. The fourth component, the chemical reaction that produces fire, changes the triangle into a fire tetrahedron (Figure 3-20). Basic fire safety involves keeping the components apart to prevent fire or removing one or more of the components to extinguish a fire. Fire extinguishers work by removing one or more fire components. Different types of fire extinguishers may be used, depending on the class of fire involved.

Classes of Fire

Five classes of fire are recognized by the NFPA. Classification is based on the fuel source of the fire. The five classes are:

- Class A fires occur with ordinary combustible materials, such as wood, papers, or clothing; these fires require water or water-based solutions to cool or quench the fire in order to extinguish it.
- Class B fires occur with flammable liquids and vapors, such as paint, oil, grease, or gasoline; blocking the source of oxygen or smothering the fuel is required to extinguish this type of fire.
- Class C fires occur with electrical equipment and require nonconducting agents to extinguish.
- Class D fires occur with combustible or reactive metals, such as sodium, potassium, magnesium, and lithium. Dry powder agents or sand are required to extinguish these fires; they are the most difficult fires to control and frequently lead to explosions.
- Class K fires occur with high-temperature cooking oils, grease, or fats; these fires require agents that prevent splashing and that cool and smother the fire.

Figure 3-20 Fire tetrahedron.

MEMORY JOGGER The following are ways to remember each fire classification.

- Class A fires occur with ordinary combustible materials; emphasize the "a" when saying the word "ordinary."
- Class B fires occur with flammable liquids; emphasize the "b" when saying the word "flammable."
- Class C fires are electrical fires; emphasize the "c" when saying the word "electrical."
- Class D fires occur with combustible or reactive metals; keep in mind that when you say the word "metal" quickly, it sounds like "medal," which has a "d" in it, and medals are commonly made of metal.
- Class K fires occur with cooking oils or fats in kitchens, which begins with a "k."

- **Memory Joggers** provide ways to remember important information and concepts.

- **Law and Ethics** boxes focus on legal and ethical applications of concepts discussed in the text.

The Litigation Process 65

KEY POINT If a phlebotomist tells a patient that they are going to collect a blood specimen and the patient holds out an arm, it is normally considered implied consent.

HIV Consent

Legislation governing informed consent for HIV tests has been enacted in most states. The laws specify exactly what type of information must be given to inform the client properly. Typically, the client must be advised concerning the test and its purpose, how the test might be used, and the meaning of the test and its limitations.

Consent for Minors

As a general rule, a minor cannot give consent for the administration of medical treatment. Parental or guardian consent is required. Healthcare personnel who violate this rule are liable for assault and battery.

FYI A minor is anyone who has not reached the age of majority as determined by state law.

TESTPREP ALERT The definition of a minor seems to confuse some students. For example, the following question appeared in the Jones & Bartlett Learning TestPrep:

The definition of a minor is anyone:
who is not self-supporting.
who is not the age of majority.
younger than 18 years of age.
younger than 21 years of age.

A total of 43% of the students who answered this question mistakenly answered: "younger than 18 years of age." State law determines the age when a child ceases to be minor and reaches the age of majority (i.e., is recognized legally as an adult). The age of majority in the United States is 18 years of age in most states, but it is 19 years in several states, 21 years in one state, and the age upon high school graduation in six states. Consequently, the correct answer is: The definition of a minor is anyone "who is not the age of majority."

Refusal of Consent

An individual has a constitutional right to refuse a medical procedure, including venipuncture. The refusal may be based on religious or personal beliefs and preferences. A patient who refuses medical treatment is normally required to verify the refusal in writing on a special form.

LAW AND ETHICS A phlebotomist has a requisition to draw a blood specimen from a preteen on the pediatrics wing of the hospital. She has drawn the child several times before. The child always objected, but the parents told her to go ahead and do the draw. She has always done so with the help of the parent holding the child's arm to keep him from pulling away. Today the parents are not in the room. The child objects to the draw as usual. The phlebotomist enlists the aid of another phlebotomist to hold the child's arm and completes the draw. The child's parents enter the room and are angry because they had requested in writing that the child have no more blood draws. Not only was it unethical to draw the child without checking to see that permission had been given, but it also violates the law of consent for minors. Both phlebotomists could face a charge of assault and battery for drawing the child without parental permission.

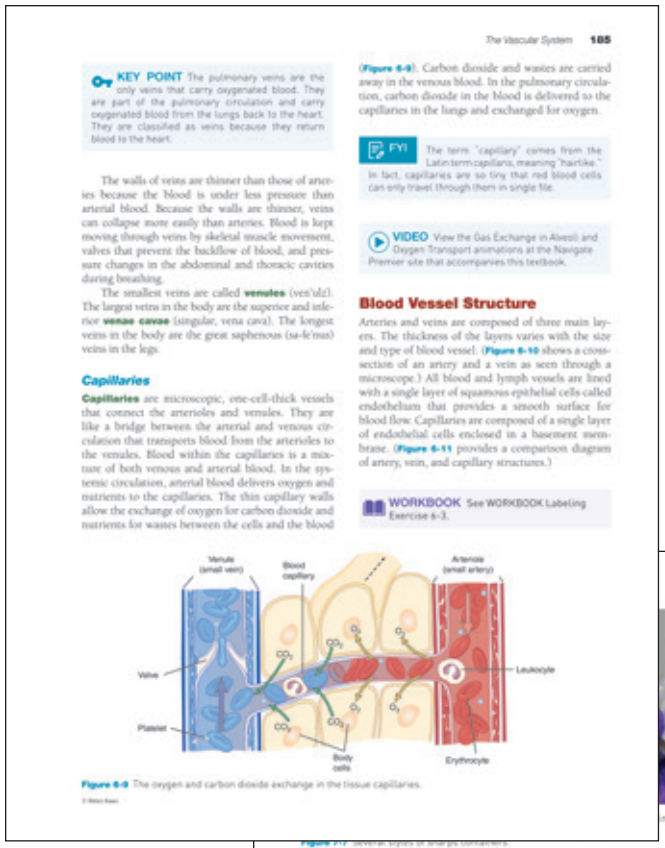
WORKBOOK Test yourself on the litigation process with the WORKBOOK exercise Knowledge Drill 2-6.

The Litigation Process

Litigation is the process used to settle legal disputes. Approximately 10% of malpractice lawsuits go to court. The rest are settled out of court, which can happen at any time before the final court decision. Malpractice litigation involves the following four phases:

- *Phase 1* begins when an alleged patient incident occurs or the patient becomes aware of a prior possible injury.
- *Phase 2* begins when the injured party or a family member consults an attorney. The attorney requests, obtains, and reviews copies of the medical records involved and decides whether to take the case. If the attorney thinks that malpractice has occurred and takes the case, an attempt to negotiate a settlement is made. If the case is not resolved by negotiation, a complaint is filed by the patient's attorney. Once a complaint is filed, the injured party becomes the **plaintiff**, and the person against whom the complaint is filed becomes the **defendant**. Both sides now conduct formal **discovery**, a process in which both sides exchange information about witnesses and evidence that will be presented

- **TestPrep Alerts** use outcome data from the Jones & Bartlett Learning TestPrep product. These alerts highlight questions that students often get wrong and present the topics that are most difficult to learn.



The Vascular System 185

KEY POINT The pulmonary veins are the only veins that carry oxygenated blood. They are part of the pulmonary circulation and carry oxygenated blood from the lungs back to the heart. They are classified as veins because they return blood to the heart.

The walls of veins are thinner than those of arteries because the blood is under less pressure than arterial blood. Because the walls are thinner, veins can collapse more easily than arteries. Blood is kept moving through veins by skeletal muscle movement, valves that prevent the backflow of blood, and pressure changes in the abdominal and thoracic cavities during breathing.

The smallest veins are called **venules** (ven'ūlz). The largest veins in the body are the superior and inferior **venae cavae** (singular, vena cava). The longest veins in the body are the great saphenous (sa-fē'nus) veins in the legs.

Capillaries

Capillaries are microscopic, one-cell-thick vessels that connect the arterioles and venules. They are like a bridge between the arterial and venous circulation that transports blood from the arterioles to the venules. Blood within the capillaries is a mixture of both venous and arterial blood. In the systemic circulation, arterial blood delivers oxygen and nutrients to the capillaries. The thin capillary walls allow the exchange of oxygen for carbon dioxide and nutrients for wastes between the cells and the blood (Figure 6-9). Carbon dioxide and wastes are carried away in the venous blood. In the pulmonary circulation, carbon dioxide in the blood is delivered to the capillaries in the lungs and exchanged for oxygen.

FYI The term "capillary" comes from the Latin term capillaris, meaning "hairlike." In fact, capillaries are so tiny that red blood cells can only travel through them in single file.

VIDEO View the Gas Exchange in Alveoli and Oxygen Transport animations at the Navigate Premier site that accompanies this textbook.

Blood Vessel Structure

Arteries and veins are composed of three main layers. The thickness of the layers varies with the size and type of blood vessel. (Figure 6-10 shows a cross-section of an artery and a vein as seen through a microscope.) All blood and lymph vessels are lined with a single layer of squamous epithelial cells called endothelium that provides a smooth surface for blood flow. Capillaries are composed of a single layer of endothelial cells enclosed in a basement membrane. (Figure 6-11 provides a comparison diagram of artery, vein, and capillary structures.)

WORKBOOK See WORKBOOK Labeling Exercise 6-3.

Figure 6-9 The oxygen and carbon dioxide exchange in the tissue capillaries.

...men in a biohazard bag.

Slides

Precleaned 25 × 75 mm (1 × 3 in.) glass microscope slides are used to make blood films for hematology determinations. Slides are available either plain or with a frosted area at one end where the patient's name or other information can be written in pencil.

Pen

A phlebotomist should always carry a pen with permanent, nonsmear ink to label tubes and record other patient information.

Watch

A watch, preferably with a sweep second hand or timer, is needed to accurately determine specimen collection times and time certain tests.

Patient Identification Equipment

Many healthcare facilities use barcode technology to identify patients. The barcode is on the ID band, and phlebotomists carry barcode readers to identify patients and generate labels for the specimen tubes. Radio frequency identification (RFID) systems are also gaining acceptance. See Chapter 12 for more information on barcode and RFID patient identification.

EXAM REVIEW Don't forget that you can test your equipment knowledge with the questions in the EXAM REVIEW.

Venipuncture Equipment

The following equipment is used for venipuncture procedures in addition to the general blood collection supplies and equipment previously described.

Vein-Locating Devices

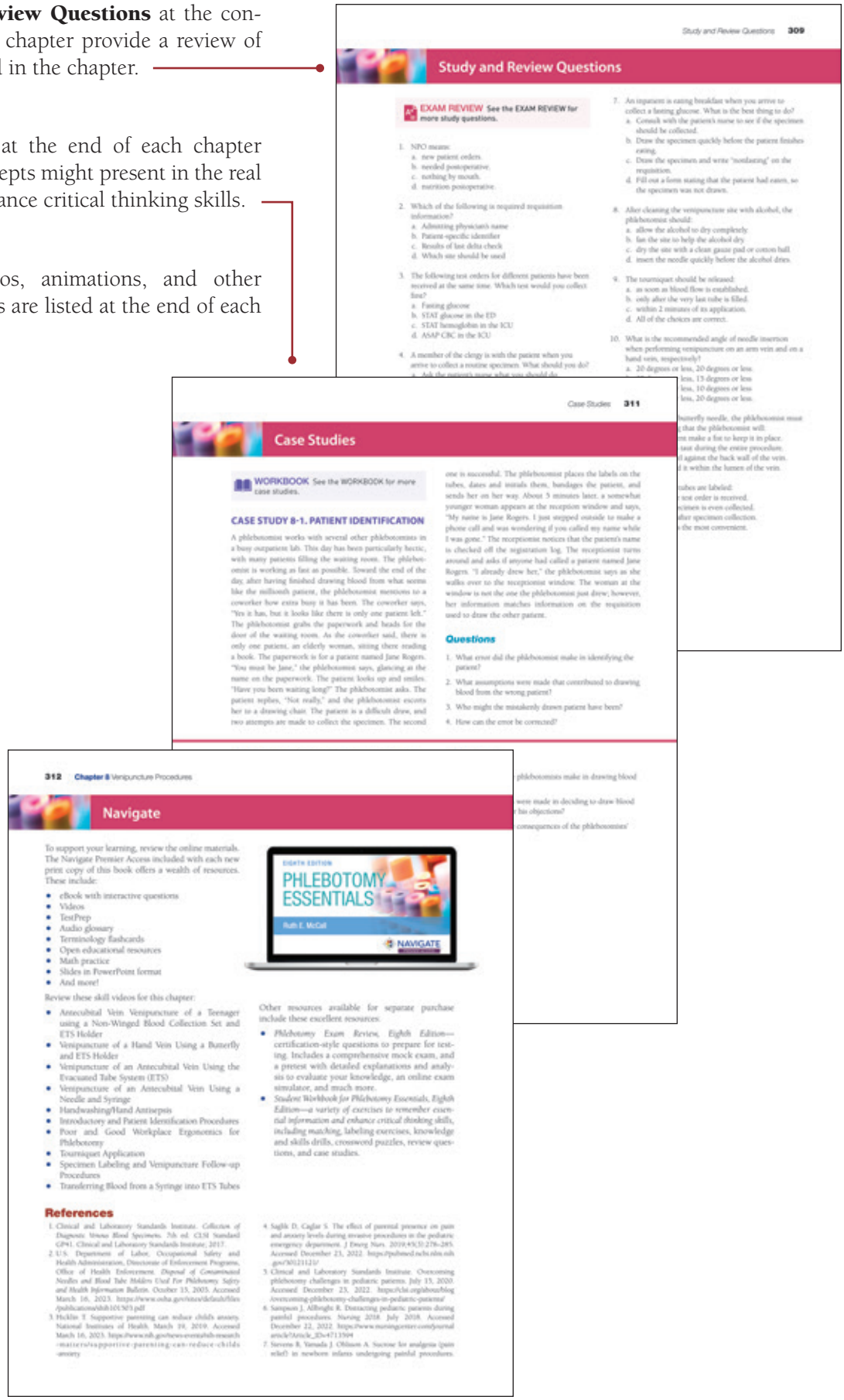
Although they are optional and tend to be expensive, portable devices are on the market that use transillumination to make it easier to locate veins that are difficult to see or feel. These devices typically shine high-intensity LED or infrared red light through the patient's skin to highlight veins. The hemoglobin in the blood within the veins absorbs the light, causing the veins to stand out as dark lines. Most devices can be used on patients of all ages. Examples include the Venoscope II (Figure 7-9A, 9B) and Neonatal Transilluminator (Venoscope, LLC, Lafayette, LA), and the AccuVein AV400 (Figure 7-9C) (AccuVein, Inc., Huntington, NY).

Tourniquet

A tourniquet is a device that is applied or tied around a patient's arm before venipuncture to compress the veins and restrict blood flow. A properly applied tourniquet is tight enough to restrict venous flow out of the area but not so tight that is restricts arterial flow into the area. Restriction of venous flow distends or inflates the veins, making them larger and easier to find, and stretches the vein walls so they are thinner and easier to pierce with a needle. Restriction of blood flow can change blood components if the tourniquet is left in place for more than 1 minute; therefore, a tourniquet must fasten in a

- **Video** and **Animation icons** indicate where to view a corresponding video or animation in the Navigate eBook, bringing content to life.
- **Workbook** and **Exam Review icons** refer readers *to Student Workbook for Phlebotomy Essentials* and *Phlebotomy Exam Review*, available for separate purchase, for further opportunities to enrich their learning.

- **Study and Review Questions** at the conclusion of each chapter provide a review of content covered in the chapter.
- **Case Studies** at the end of each chapter show how concepts might present in the real world, and enhance critical thinking skills.
- **Navigate** videos, animations, and other online resources are listed at the end of each chapter.



Study and Review Questions 309

Study and Review Questions

EXAM REVIEW See the EXAM REVIEW for more study questions.

1. NPO means:
   a. new patient orders.
   b. needed postoperative.
   c. nothing by mouth.
   d. nutrition postoperative.

2. Which of the following is required requisition information?
   a. Admitting physician's name
   b. Patient-specific identifier
   c. Results of last delta check
   d. Which site should be used

3. The following test orders for different patients have been received at the same time. Which test would you collect first?
   a. Fasting glucose
   b. STAT glucose in the ED
   c. STAT hemoglobin in the ICU
   d. ASAP CBC in the ICU

4. A member of the clergy is with the patient when you arrive to collect a routine specimen. What should you do?

7. An inpatient is eating breakfast when you arrive to collect a fasting glucose. What is the best thing to do?
   a. Consult with the patient's nurse to see if the specimen should be collected.
   b. Draw the specimen quickly before the patient finishes eating.
   c. Draw the specimen and write "nonfasting" on the requisition.
   d. Fill out a form stating that the patient had eaten, so the specimen was not drawn.

8. After cleaning the venipuncture site with alcohol, the phlebotomist should:
   a. allow the alcohol to dry completely.
   b. fan the site to help the alcohol dry.
   c. dry the site with a clean gauze pad or cotton ball.
   d. insert the needle quickly before the alcohol dries.

9. The tourniquet should be released:
   a. as soon as blood flow is established.
   b. only after the very last tube is filled.
   c. within 2 minutes of its application.
   d. All of the choices are correct.

10. What is the recommended angle of needle insertion when performing venipuncture on an arm vein and on a hand vein, respectively?
    a. 20 degrees or less, 20 degrees or less

Case Studies 311

Case Studies

WORKBOOK See the WORKBOOK for more case studies.

CASE STUDY 8-1. PATIENT IDENTIFICATION

A phlebotomist works with several other phlebotomists in a busy outpatient lab. This day has been particularly hectic, with many patients filling the waiting room. The phlebotomist is working as fast as possible. Toward the end of the day, after having finished drawing blood from what seems like the millionth patient, the phlebotomist mentions to a coworker how extra busy it has been. The coworker says, "Yes it has, but it looks like there is only one patient left." The phlebotomist grabs the paperwork and heads for the door of the waiting room. As the coworker said, there is only one patient, an elderly woman, sitting there reading a book. The paperwork is for a patient named Jane Rogers. "You must be Jane," the phlebotomist says, glancing at the name on the paperwork. The patient looks up and smiles. "Have you been waiting long?" The phlebotomist asks. The patient replies, "Not really," and the phlebotomist escorts her to a drawing chair. The patient is a difficult draw, and two attempts are made to collect the specimen. The second one is successful. The phlebotomist places the labels on the tubes, dates and initials them, bandages the patient, and sends her on her way. About 5 minutes later, a somewhat younger woman appears at the reception window and says, "My name is Jane Rogers. I just stepped outside to make a phone call and was wondering if you called my name while I was gone." The receptionist notices that the patient's name is checked off the registration log. The receptionist turns around and asks if anyone had called a patient named Jane Rogers. "I already drew her," the phlebotomist says as she walks over to the receptionist window. The woman at the window is not the one the phlebotomist just drew; however, her information matches information on the requisition used to draw the other patient.

Questions

1. What error did the phlebotomist make in identifying the patient?
2. What assumptions were made that contributed to drawing blood from the wrong patient?
3. Who might the mistakenly drawn patient have been?
4. How can the error be corrected?

312 Chapter 8 Venipuncture Procedures

Navigate

To support your learning, review the online materials. The Navigate Premier Access included with each new print copy of this book offers a wealth of resources. These include:

- eBook with interactive questions
- Videos
- TestPrep
- Audio glossary
- Terminology flashcards
- Open educational resources
- Math practice
- Slides in PowerPoint format
- And more!

Review these skill videos for this chapter:

- Antecubital Vein Venipuncture of a Teenager using a Non-Winged Blood Collection Set and ETS Holder
- Venipuncture of a Hand Vein Using a Butterfly and ETS Holder
- Venipuncture of an Antecubital Vein Using the Evacuated Tube System (ETS)
- Venipuncture of an Antecubital Vein Using a Needle and Syringe
- Handwashing/Hand Antisepsis
- Introductory and Patient Identification Procedures
- Poor and Good Workplace Ergonomics for Phlebotomy
- Tourniquet Application
- Specimen Labeling and Venipuncture Follow-up Procedures
- Transferring Blood from a Syringe into ETS Tubes

Other resources available for separate purchase include these excellent resources:

- *Phlebotomy Exam Review, Eighth Edition*—certification-style questions to prepare for testing. Includes a comprehensive mock exam, and a pretest with detailed explanations and analysis to evaluate your knowledge, an online exam simulator, and much more.
- *Student Workbook for Phlebotomy Essentials, Eighth Edition*—a variety of exercises to remember essential information and enhance critical thinking skills, including matching, labeling exercises, knowledge and skills drills, crossword puzzles, review questions, and case studies.

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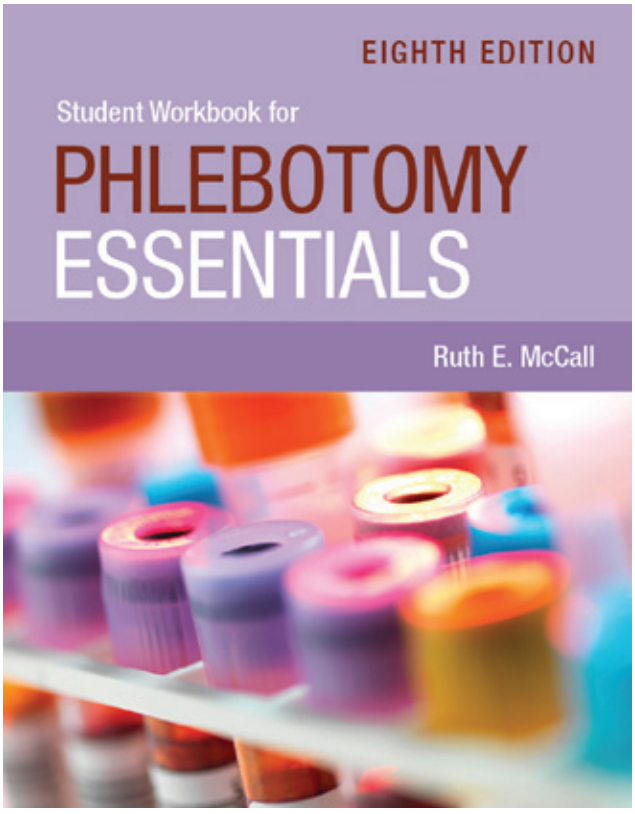
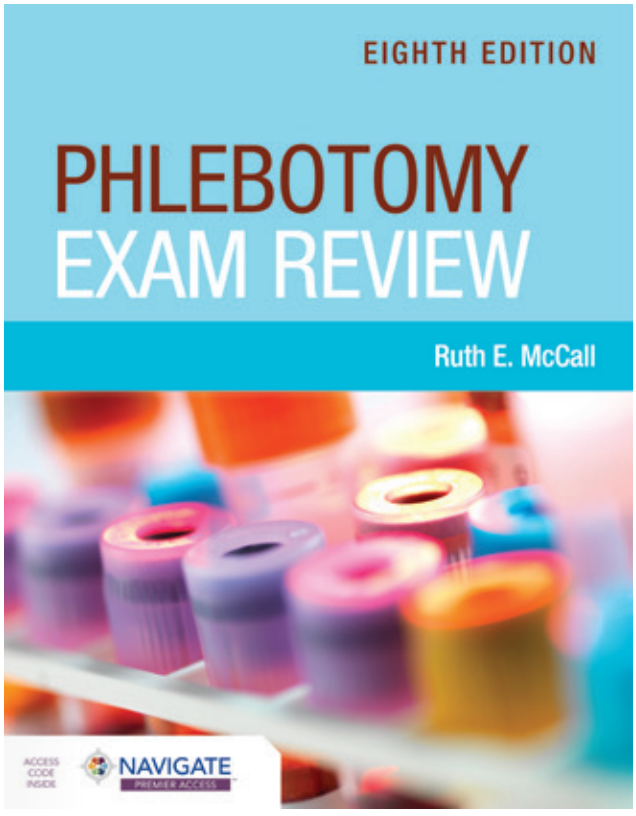
Accompanying Products

The following two titles that correspond to *Phlebotomy Essentials, Eighth Edition*, are available for separate purchase. Together, these three products create an ideal study package for phlebotomy training programs.



- ***Student Workbook for Phlebotomy Essentials, Eighth Edition***, provides students with hundreds of exercises to reinforce chapter material, assessment tools to evaluate skills, and realistic scenarios to gauge student grasp of key concepts. Each workbook chapter corresponds to the content in the main textbook. The answer key to the Workbook is not included, and is provided as an instructor resource. The Workbook includes:
  - **Matching activities** to help you learn the terms and concepts that professional phlebotomists need to know.
  - **Labeling exercises** to help you recognize important equipment, tools, and procedures.
  - **Knowledge drills** to reinforce core concepts and principles discussed in the text.
  - **Skills drills** to help you make the transition from the classroom to clinical practice.
  - **Chapter and unit crossword puzzles** that offer a fun way to reinforce and assess your knowledge.
  - **Chapter review questions** to test your comprehension as you progress through the text and build your knowledge.
  - **Case studies** that let you see how your newfound knowledge and skills can be put into practice.



- ***Phlebotomy Exam Review, Eighth Edition,*** prepares students for national certification exams in phlebotomy, presenting certification-style questions for each chapter of the textbook. On average, certified phlebotomists earn more money than those who do not to obtain certification. Students can prepare for certification success with the Exam Review. Contents include:
  - A total of 1,500 questions, each accompanied by a rationale for each correct answer
  - Appendices with 55 questions specifically on laboratory tests and laboratory mathematics
  - Pretest with 100 questions to pinpoint areas on which to focus study

- Mock Exam with 100 questions, tagged to Bloom's taxonomy
- **In total, more than 1,700 high-quality questions to test student comprehension and guide study**
- Comes with digital access to an eBook, Test-Prep, and the Health Professions Basic Math Review Module

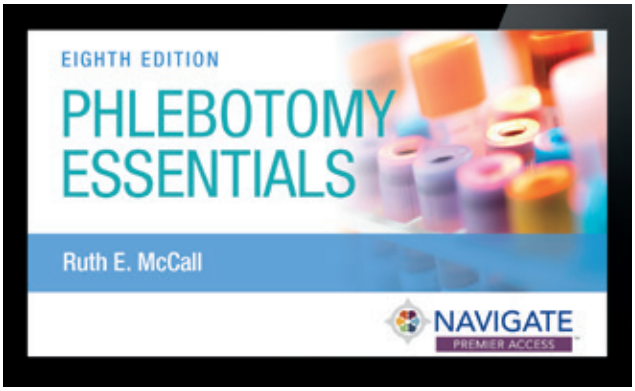
Instructor Resources

Phlebotomy Essentials, *Eighth Edition*, includes additional resources for approved adopting instructors. These are available on the book's Navigate site or through Jones & Bartlett Learning.

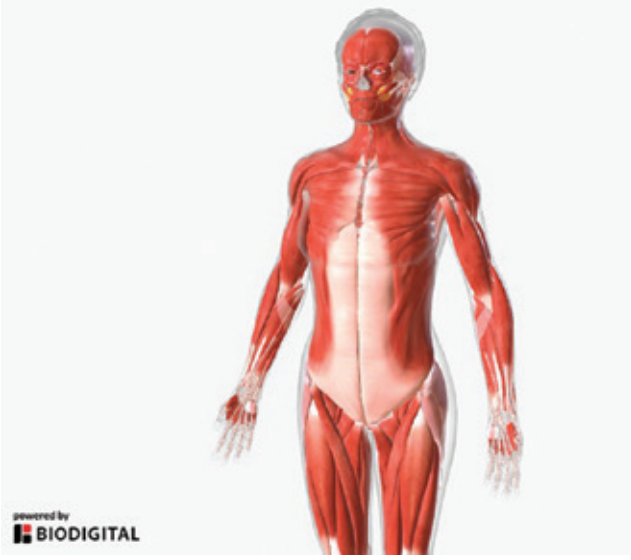
- Slides in PowerPoint format
- Lesson Plans
- NEW! Teaching Tips
- NEW! Lecture Outlines
- Test Bank
  - Tagged to NAACLS competencies, learning objectives, and Bloom's taxonomy
  - Also available in LMS-compatible formats
- Pre/Posttest
- Answer Key to Pre/Posttest
- Answer Key to Student Workbook
- Answer Key to Critical Thinking Questions
- Answer Key to Review Questions and Case Studies
- Forms (confidentiality forms, risk/consent form, lab evaluation form, and more)
- Sample Syllabus
- Image Bank

Student Resources

Each new purchase of *Phlebotomy Essentials*, *Eighth Edition*, comes with access to the following online resources. See the inside front cover of this text for more details, including the passcode you will need to gain access to Navigate. Access codes are also available from Jones & Bartlett Learning via separate purchase.



- Interactive eBook, containing:
  - NEW! eBook Knowledge Check Questions
  - NEW! eBook Quizzes
  - Videos—including NEW videos for this edition!
  - Animations—including sophisticated NEW animations!
  - NEW! Audio pronunciations
  - Procedure Evaluation Sheets
- Critical Thinking Questions
- Open Educational Resources
- Flashcards
- Learning Objectives



- Memory Jogger
  - Covers the order of draw and important vascular anatomy
  - Included on the inside back cover of the printed textbook and digitally in the Navigate course

TestPrep

- Online exam simulator of more than 2,000 additional phlebotomy questions that allows students to test themselves in review or test mode.
- A total of 34 topics are included—choose to test yourself in a certain area, or in a mix of areas.
  - Arterial Puncture Procedures
  - Blood Collection Additives
  - Blood Collection Equipment
  - The Blood and Hemostasis and Coagulation
  - Capillary Puncture Equipment
  - Capillary Puncture Principles
  - Capillary Puncture Procedures
  - Dialysis, Long-Term Care, Home Care, and Hospice Patients
  - First Aid
  - The Healthcare Setting
  - The Heart and Vascular System
  - Human Anatomy and Physiology
  - Infection Control
  - Laboratory Informatics in Health Care
  - Legal Issues
  - The Lymphatic System
  - Medical Terminology
  - Nonblood Specimens and Tests
  - Order of Draw
  - Patient Complications and Conditions
  - Pediatric and Geriatric Venipuncture
  - Personal Wellness
  - Phlebotomy Past and Present
  - Physiological Variables and Problem Sites
  - Physiological Variables, Problem Sites, and VADs
  - Point-of-Care Testing
  - Procedural Error Risks and Specimen Quality Concerns
  - Quality Assurance in Health Care
  - Routine ETS, Hand Vein, and Syringe Procedures
  - Safety
  - Special Collections
  - Specimen Handling
  - Specimen Processing
  - Troubleshooting Failed Venipuncture

Health Professions Math Review Module

- Learn, practice, and assess yourself on 33 basic math concepts. Answers are provided to ensure understanding of the material.
- Concepts covered:
  - Whole Number Addition and Subtraction
  - Whole Number Multiplication and Division
  - Order of Operations
  - Engineering Notation and Prefixes
  - Scientific Notation and Prefixes
  - Decimal Addition and Subtraction
  - Fraction Addition and Subtraction
  - Fraction Multiplication and Division
  - Converting Between Fractions and Decimals
  - Normalizing Ratios
  - Constants of Proportionality
  - Percentages of One Number to Another Number
  - Radicals as Fractional Exponents
  - Solving Simple Equations
  - Solving Simultaneous Equations
  - Formula Manipulation and the Concept of Balance
  - Formula Manipulation Creating Corollaries
  - Measurement Conversions: Inches, Feet, Yards, Miles
  - Measurement Conversions: Ounces, Pounds, and Tons
  - Conversions within the Metric System
  - Converting between Metric and Standard Measurements
  - Plane Geometry
  - Area and Surface Area
  - Volume of a Solid
  - Slope, Coordinate Plane, and Graphing
  - Measures of Central Tendency: Mean, Median, and Mode
  - Normal Distribution
  - Percentiles
  - Probability
  - Trigonometry: Sine, Cosine, Tangent
  - Interest
  - Finance: Balance and Ledgers
  - Finance and Amortization

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Ruth E. McCall

Textbook Contributors

Shanise Keith, NCPT (NHA)
Director
Center for Phlebotomy Education
American Fork, Utah

Monica Lewis, MA, MT (ASCP)
Central New Mexico Community College
Albuquerque, New Mexico

Sharon F. Whetten, MEd, MLS (ASCP)
Clinical Laboratory Education Specialist
TriCore Reference Laboratories
Phlebotomy Instructor
University of New Mexico
Albuquerque, New Mexico

Reviewers

Gary R. Anderson, MEd
Instructional Designer
Saratoga Springs, Utah

Bradley Church, MLS (ASCP)
Phlebotomy Program Chair
Milwaukee Area Technical College
Milwaukee, Wisconsin

T. Davis BS/MHP
Certified Phlebotomy Instructor
Certified EKG Tech Instructor
Instructor, Allied Health
Gifted Hands Academy Allied Health School
Hammond, Indiana

Angela Hernandez, LPN II
Adjunct Faculty
Phlebotomy/Health Science Careers
University of New Mexico CE
Albuquerque, New Mexico

Konnie King Briggs, BS, PBT-ASCP, CPI-ACA
Program Manager/Faculty
Coleman College for Health Sciences
Houston Community College
Houston, Texas

Terri A. McElhattan, MHA, MT (HEW), PBT (ASCP), CPI (ACA)
Geisinger Health System School of Phlebotomy
Danville, Pennsylvania

Eileen Rice, RN, PhD
Instructor, Intro to Phlebotomy
Community College of Vermont
Bennington, Vermont

Jo Ann Spicer, CPI
Adjunct Instructor, Phlebotomy Program
Bucks County Community College
Newtown, Pennsylvania

Tiffany Stokes, MS, BSN, AS
Program Director
Gifted Hands Academy
Hammond, Indiana

Shyla Terry, BSN, RN
Health Occupations Instructor
Macon Area Career and Technical Education Center
Macon, Missouri

April Trevizo, MLS (ASCP), MLT (AMT)
Phlebotomy Instructor
Central New Mexico Community College
Albuquerque, New Mexico

Student Reviewers

Paige Askew
Phlebotomy Student
Central New Mexico Community College
Albuquerque, New Mexico

Katie McCall
Phlebotomy Student
Eastern Florida State College
Cocoa, Florida

About the Author

Ruth McCall received her bachelor of science degree from the University of Iowa and her medical technology certificate from St. Joseph's School of Medical Technology in Phoenix, Arizona, and she has worked or taught in the clinical laboratory sciences and healthcare education fields ever since. She was the director of both the phlebotomy and clinical laboratory assistant programs at Central New Mexico (CNM) Community College in Albuquerque, New Mexico, for 18 years until she retired to pursue other related activities. Recently, she happily returned to CNM as a part-time phlebotomy instructor. Ruth has lectured on phlebotomy topics at conferences throughout the United States; participated in a medical technology exchange in China, where she gave phlebotomy presentations at several medical universities; and has served as an expert witness in phlebotomy injury cases. She participated in the development of the current seventh revision of the Clinical and Laboratory Standards Institute (CLSI) Capillary Puncture Standard (GP42) and the seventh revision of the Venipuncture Standard (GP41).

Ruth loves the outdoors and enjoys hiking in the beautiful Southwest, chasing balloons during the Albuquerque International Balloon Fiesta, downhill skiing in the mountains of Colorado, and walking along the ocean in Cocoa Beach, Florida. She is married to her true love, John, and has two sons, Christopher and Scott. Christopher and his wife, Tracy, are parents of her fantastic grandchildren, Katie and Ryan.