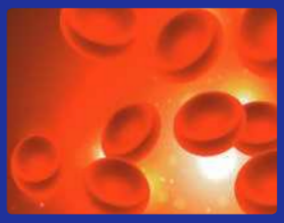
FIFTH EDITION

THE COMPLETE TEXTBOOK OF Phlebotomy

LYNN B. HOELTKE

EDITION 5


The Complete Textbook of PHLEBOTOMY

Lynn B. Hoeltke, M.B.A., M.T. (A.S.C.P.), P.B.T., D.L.M.

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The Complete Textbook of Phlebotomy, Fifth Edition
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LIST OF PROCEDURES

PREFACE

The fifth edition of *The Complete Textbook of Phlebotomy* has taken the textbook a step further to assure the student understands the information covered. This is done by using workbook-style questions in each chapter following major topic areas. Throughout the text, students learn why samples are collected from patients. This knowledge is reinforced by offering students questions that help them remember the information. Phlebotomists learns how they assist heath care practitioners in patient care because they are an integral part of the medical laboratory. *The Complete Textbook of Phlebotomy* emphasizes the relationship between sample procurement and the laboratory. Students learn how important their phlebotomist jobs are because most patient care decisions are based on laboratory results. This book is a guide both for individuals in nursing-based phlebotomy and those for whom phlebotomy is their primary duty. This text may be used in all areas of allied health education. It can be used as a one-semester course dedicated to teaching the skills of phlebotomy, or it can be used in a comprehensive medical assistant training program. The text can be an up-to-date reference for any laboratory. It can also be used as a guide in cross-training individuals in the laboratory, physician's office, or on a hospital's nursing staff.

Since the fourth edition of this text, there have been numerous updates to the Clinical and Laboratory Standards Institute (CLSI) standards. These updated standards have been incorporated into the text. The fifth edition of *The Complete Textbook of Phlebotomy* maintains its readability and concise manner of presentation. More information has been added that focuses on what students need to know to do the job.

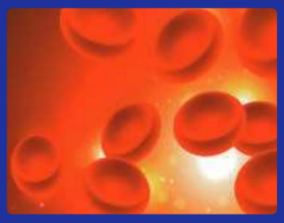
The information in *The Complete Textbook of Phlebotomy* will prepare students to pass any of the available phlebotomy certification exams. The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) Phlebotomist Competencies was used to ensure that all the information needed was included. These relevant competencies are listed at the beginning of each chapter.

WHY THIS BOOK WAS WRITTEN

I started writing *The Complete Textbook of Phlebotomy* because I was teaching and the textbooks available either did not offer enough information or overwhelmed students with nonessential details. I worked to develop a book that gave students everything they needed to know but did not cloud the subject with information they would never need. As I continued to teach various students I realized that they wanted simple, concise information. Students wanted information they could quickly use as part of a hands-on approach to learning. I have continued to improve this learning process for students through the five editions of the textbook. The book has continued to expand through the five editions as the need for multiskilled individuals has increased. Students need to know more but need it to be concise and relevant. With the addition of workbook questions and electronic resources, students have access to more information that will help them excel in phlebotomy. I feel that I have continued to meet the objective of giving students the best learning experience possible.

As the health care market has changed to emphasize multiskilled individuals, I have seen the need to have a book that can be used as a reference for those individuals who have been performing phlebotomy for a number of years but need updates on new techniques and procedures. Competency assessments of students are included with this text so they will know each step that is required.

CHAPTER 1


Introduction to Phlebotomy

OBJECTIVES

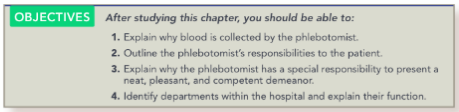
After studying this chapter, you should be able to:

1. Explain why blood is collected by the phlebotomist.
2. Outline the phlebotomist's responsibilities to the patient.
3. Explain why the phlebotomist has a special responsibility to present a neat, pleasant, and competent demeanor.
4. Identify departments within the hospital and explain their function.
5. Identify each section of the laboratory and give examples of tests that would be performed in that section.
6. Identify members of the laboratory staff; describe the duties of each of these staff members and their education level.
7. Describe the importance of communication within the laboratory and that with other departments of the hospital.
8. List five patient rights and explain how these patient rights would affect a phlebotomist's job.
9. Explain advance directives and how they can direct a patient's care.

HOW TO USE THIS TEXT

Getting Started

Learning objectives and **Key terms lists** with definitions provide a focus for each chapter to help students identify the important concepts discussed in each chapter.


OBJECTIVES

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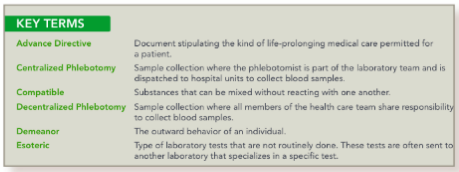
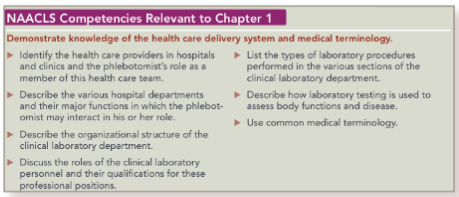

KEY TERMS

Advance Directive	Document stipulating the kind of life-prolonging medical care permitted for a patient.
Centralized Phlebotomy	Sample collection where the phlebotomist is part of the laboratory team and is dispatched to hospital units to collect blood samples.
Compatible	Substances that can be mixed without reacting with one another.
Decentralized Phlebotomy	Sample collection where all members of the health care team share responsibility to collect blood samples.
Demeanor	The outward behavior of an individual.
Esoteric	Type of laboratory tests that are not routinely done. These tests are often sent to another laboratory that specializes in a specific test.

Alignment to NAACLS Competencies

Each chapter includes a list of the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) competencies. This information helps phlebotomy programs ensure compliance with the latest accreditation standards and ensure students are getting the appropriate education based on the latest industry standards.

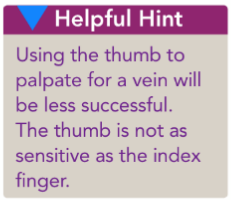

NAACLS Competencies Relevant to Chapter 1

Demonstrate knowledge of the health care delivery system and medical terminology.

- Identify the health care providers in hospitals and clinics and the phlebotomist's role as a member of this health care team.
- Describe the various hospital departments and their major functions in which the phlebotomist may interact in his or her role.
- Describe the organizational structure of the clinical laboratory department.
- Discuss the roles of the clinical laboratory personnel and their qualifications for these professional positions.
- List the types of laboratory procedures performed in the various sections of the clinical laboratory department.
- Describe how laboratory testing is used to assess body functions and disease.
- Use common medical terminology.

Helpful Hints

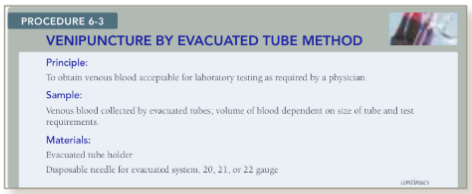
New! **Helpful Hints** provides ideas and quick tips that will enhance on-the-job practice.


Helpful Hint

Using the thumb to palpate for a vein will be less successful. The thumb is not as sensitive as the index finger.

Step-by-Step Procedures

Critical phlebotomy procedures are highlighted in the Table of Contents and described in step-by-step detail throughout the book. **Full-color photographs** illustrate important steps so that students are prepared for actual practice.


PROCEDURE 6-3

VENIPUNCTURE BY EVACUATED TUBE METHOD

Principle:

To obtain venous blood acceptable for laboratory testing as required by a physician.

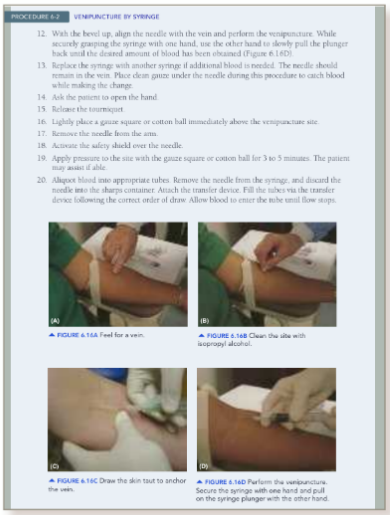
Sample:

Venous blood collected by evacuated tubes; volume of blood dependent on size of tube and test requirements.

Materials:

Evacuated tube holder

Disposable needle for evacuated system, 20, 21, or 22 gauge


PROCEDURE 6-2 VENIPUNCTURE BY SYRINGE

12. With the bevel up, align the needle with the vein and perform the venipuncture. While securely grasping the syringe with one hand, use the other hand to slowly pull the plunger back until the desired amount of blood has been obtained (Figure 6.16D).
13. Replace the syringe with another syringe if additional blood is needed. The needle should remain in the vein. Place clean gauze under the needle during this procedure to catch blood while making the change.
14. Ask the patient to open the hand.
15. Release the tourniquet.
16. Lightly place a gauze square or cotton ball immediately above the venipuncture site.
17. Remove the needle from the arm.
18. Activate the safety shield over the needle.
19. Apply pressure to the site with the gauze square or cotton ball for 3 to 5 minutes. The patient may assist if able.
20. Aliquot blood into appropriate tubes. Remove the needle from the syringe, and discard the needle into the sharps container. Attach the transfer device. Fill the tubes via the transfer device following the correct order of draw. Allow blood to enter the tube until flow stops.

FIGURE 6.16A Feel for a vein. FIGURE 6.16B Clean the site with isopropyl alcohol. FIGURE 6.16C Draw the skin taut to anchor the vein. FIGURE 6.16D Perform the venipuncture. Secure the syringe with one hand and pull on the syringe plunger with the other hand.

Visual Learning

Hundreds of full-color photographs and illustrations identify proper equipment, important anatomy, and procedural duties related to being a phlebotomist.

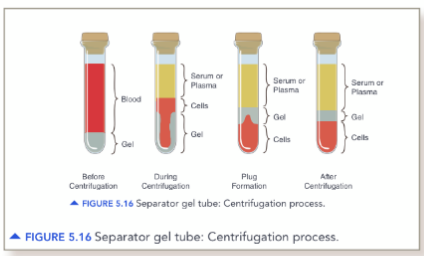


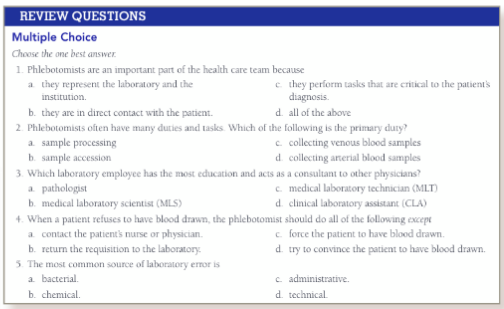
FIGURE 5.16 Separator gel tube: Centrifugation process.

FIGURE 5.16 Separator gel tube: Centrifugation process.


FIGURE 5.13 Assorted evacuated tubes.

Re-cap and Apply

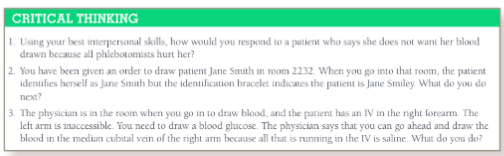
End-of-**chapter review and critical thinking questions** re-cap and urge students to apply major concepts discussed in each chapter.


REVIEW QUESTIONS

Multiple Choice

Choose the one best answer.

1. Phlebotomists are an important part of the health care team because
   a. they represent the laboratory and the institution.
   b. they are in direct contact with the patient.
   c. they perform tasks that are critical to the patient's diagnosis.
   d. all of the above
2. Phlebotomists often have many duties and tasks. Which of the following is the primary duty?
   a. sample processing
   b. sample accession
   c. collecting venous blood samples
   d. collecting arterial blood samples
3. Which laboratory employee has the most education and acts as a consultant to other physicians?
   a. pathologist
   b. medical laboratory scientist (MLS)
   c. medical laboratory technician (MLT)
   d. clinical laboratory assistant (CLA)
4. When a patient refuses to have blood drawn, the phlebotomist should do all of the following except
   a. contact the patient's nurse or physician.
   b. return the requisition to the laboratory.
   c. force the patient to have blood drawn.
   d. try to convince the patient to have blood drawn.
5. The most common source of laboratory error is
   a. bacterial.
   b. chemical.
   c. administrative.
   d. technical.


CRITICAL THINKING

1. Using your best interpersonal skills, how would you respond to a patient who says she does not want her blood drawn because all phlebotomists hurt her?
2. You have been given an order to draw patient Jane Smith in room 2232. When you go into that room, the patient identifies herself as Jane Smith but the identification bracelet indicates the patient is Jane Smiley. What do you do next?
3. The physician is in the room when you go in to draw blood, and the patient has an IV in the right forearm. The left arm is inaccessible. You need to draw a blood glucose. The physician says that you can go ahead and draw the blood in the median cubital vein of the right arm because all that is running in the IV is saline. What do you do?

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For the Student

MindTap® for Hoeltke's The Complete Textbook of Phlebotomy, provides you with the tools you need to better manage your limited time—you can complete assignments whenever and wherever you are ready to learn with course material specially customized for you by your instructor and streamlined in one proven, easy-to-use interface. With an array of tools and apps—from note taking to flashcards—you'll get a true understanding of course concepts, helping you to achieve better grades and setting the groundwork for your future courses.

ABOUT THE AUTHOR

Lynn B. Hoeltke, M.B.A., M.T. (A.S.C.P.), P.B.T., D.L.M., most recently worked for a leading hospital laboratory in the Midwest. Lynn has more than 40 years' experience in various laboratory leadership roles in hospital settings and reference laboratories. He has taught on the technical college level and has developed and taught a nursing-based program for a hospital. He has served as phlebotomy advisor with Evena Medical Corporation to develop infrared imaging as a tool to assist in finding veins for venipuncture. He has taught phlebotomy as a career development program for entry-level positions into the laboratory. He has consulted with several nursing homes and laboratories in teaching phlebotomy techniques to their staff. He has published several magazine articles, has been a contributing author for *Comprehensive Medical Assisting,* and is author of *The Clinical Laboratory Manual Series: Phlebotomy* and *Phlebotomy: Procedures and Practice* by Delmar Cengage Learning. Lynn has also assisted in the production of a Phlebotomy Skills Video Review based on the procedures in his textbook.

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HOW EACH CHAPTER IS ORGANIZED

All chapters contain similar features and are arranged to focus on key points needed in the phlebotomy education process. After a topic is presented, there are questions to test the students' knowledge and comprehension of the topic. Color photographs of the actual equipment and procedures are extensively used to assist students in understanding the equipment and procedures. The logical flow of the chapters helps students develop and build knowledge as each chapter is completed. Key points are then reviewed in later chapters to show how that early information is relevant to more advanced procedures.

NEW TO THIS EDITION

To help students make the transition from student to working phlebotomist, more **"Helpful Hints" have been added to each chapter**. These helpful hints take the information that was just covered and furnish students with ideas and quick tips that will enhance their job talents. They also provide warnings about common mistakes that can be made in the performance of specific tasks.

Workbook-style questions have been added to each chapter to challenge learners' knowledge and reinforce understanding of the material presented.

There continues to be an emphasis on training students to have all the knowledge and skills necessary to move from the classroom to the job. The relevant NAACLS Phlebotomist Competencies are outlined at the beginning of each chapter to show students the skills that are required by accrediting agencies to pass certification exams. Procedures such as Blood Gas Collection, Tuberculin Skin Test, and Urine Collection prepare students to work in a multiskilled environment where phlebotomy is not the only job the person does.

TEACHING AND LEARNING PACKAGE

For the Instructor

Instructor's Companion Website

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With Cengage Learning's Instructor Resources to Accompany *The Complete Textbook of Phlebotomy*, preparing for class and evaluating students have never been easier! As an instructor, you will find that this website offers invaluable assistance by giving you access to all of your resources—anywhere and at any time. All content included on the website has been updated to correlate with the content updates made to the textbook.

Features:

- New! The **Instructor's Manual** for each chapter includes a chapter overview, resources list, student advance preparation, learning objectives and competencies, key terms with definitions, after-lecture activities, additional in-class activities, after-class activities, and suggestions for students who need help or who are ahead. It is available in Adobe Acrobat PDF® format.
- The **Computerized Testbank in Cognero®** makes generating tests and quizzes a snap. With hundreds of questions and different styles to choose from, you can create customized assessments for your students with the click of a button. Add your own unique questions and print rationales for easy class preparation.
- Customizable instructor support slide presentations in **PowerPoint®** format focus on key points for each chapter. Use for in-class lectures, as handouts, and for student review.
- **Student Study Guides** are available for each chapter and provide workbook-like short-answer and fill-in activities that provide an excellent tool for end-of-chapter review and exam preparation.
- **Competency Checklists** are provided in Microsoft Word® and Adobe Acrobat PDF® format to facilitate use of these valuable assessment forms.

Hybrid phlebotomy, a blend of centralized and decentralized phlebotomy, has been used in some health care facilities to reduce the errors of decentralized phlebotomy. Hybrid phlebotomy typically sends laboratory-based phlebotomists to the nursing units during the early morning collections and then keeps a limited number of phlebotomists available the rest of the day to help patient care technicians with difficult collections.

AREAS OF THE HOSPITAL AND HEALTH CARE SETTING

The phlebotomist will work in diverse health care settings and with all levels of individuals—from the physician with several advanced degrees to support staff with little education. Whatever the level of education or responsibility each individual has, the phlebotomist must maintain professionalism. Patients will also range from the highly educated to individuals who have mental deficiencies. Each one of these individuals is a customer of the phlebotomist and laboratory. The phlebotomist is the "laboratory representative" because he or she is the person from the laboratory with whom most health care staff and patients have contact.

Phlebotomists must be familiar with the organization to function in this complex health care field. They usually work directly with the laboratory but indirectly with nurses, physicians, and the staff in the radiology, pharmacy, and physical therapy departments. Many people from different departments need time with the patient. To be better capable of working together, it is best to understand a little about each area.

The phlebotomist often encounters staff from the electrocardiography department. This department does electrocardiograms (EKGs). An EKG is a recording of impulses of the heart. Impulses from a normal heart make tracing records of a specific size and shape. The abnormal heart shows changes that are different from this pattern. These EKGs are performed in the patient's room, and the phlebotomist often waits for the test to be completed to draw blood.

Another staff member who may visit the patient's room is from the electroencephalography department. This department does electroencephalograms (EEGs), which record the electrical activity of the brain. EEGs help locate and assess the extent of brain injury or determine if there is any brain activity.

The pharmacy department of the hospital is much different from the corner drugstore. The hospital pharmacy dispenses many types of therapeutic drugs that often are much more potent than a prescription taken at home. These drugs are prescribed and monitored under controlled conditions while the patient is in the hospital. The phlebotomist plays an integral part in this monitoring through the blood samples that are collected at specific times. With the results of the samples, the pharmacist is able to consult with the laboratory and the patient's physician to provide the best treatment possible for the patient. Therapeutic drug monitoring is discussed in more detail in Chapter 9.

The physical therapy department works with patients who, due to disease or injury, are no longer able to function to their full physical capacity. The therapy may involve rebuilding deteriorated muscles after a long illness or learning to function after an amputation. Related to physical therapy is the department of occupational therapy, where patients work to overcome their physical handicaps so they can be productive again in their old job or function in a new job. Speech therapy is another area related to physical therapy. Patients who have difficulty speaking or who have lost the ability to speak because of a stroke or disease are retaught how to speak.

Radiology is an area of the hospital that has changed rapidly in recent years. Radiologists used to just x-ray lungs or broken bones, but the field has expanded to include cardiac catheterization, computed tomography (CT) scans, magnetic resonance imaging (MRI), and ultrasound. Each of these techniques has become a subspecialty of radiology that still looks into the body as the traditional x-ray did but in a much more detailed and sophisticated way.

The largest department the phlebotomist works with is the department of nursing. When phlebotomists work closely with many different types of nurses, it leads to the best

laboratory at 0530. A second group of patient collection orders is then ready, and the phlebotomist starts on the second round of collections. This consists of 15 patients who need sample collection no later than 0700. The remainder of the day is spent in returning to the nursing units to collect one or two blood samples at a time as new tests are ordered. Some time is also spent collecting blood from outpatients who come to the hospital to have their blood drawn. The phlebotomist who works the evening and night shift waits until a test is ordered to be collected. This single-skilled role for the phlebotomist often results in times of no work and other times of more work than can be done in a short time. This time of waiting for work to do is called waiting-to-serve time.

This process works well until there is a large number of patients to draw and the work cannot all be completed by 0700. Difficulties in collecting blood from a patient also add a delay to the collection. Getting the blood collected is not the final process. The tests on the blood must be processed, placed on instruments, and analyzed, and the results reviewed and given to the physician. A physician coming into the hospital to make morning rounds is usually there by 0730, if not sooner. If the results are not available, the physician must delay treatment of the patient. This may result in lengthening of the patient's stay in the hospital and added costs to the patient and the health care system.

It is a continuous challenge to draw blood from a large number of patients quickly and have laboratory information for the physician to review in a timely manner. The **decentralized phlebotomy** approach to phlebotomy is how 15 percent of the hospitals work to meet this challenge. With decentralized phlebotomy, more people are collecting blood samples during the busy times. It is difficult for a hospital to hire people to come in at 0430 to just draw 10 patients for an hour and then go home. It is easier to use the people who are already working. Everyone who has contact with the patient needs to become multiskilled. The nurse needs to learn how to collect blood samples, and the phlebotomist needs to learn some of the nursing duties. This has become what is commonly called *patient-focused care.* The duties of the hospital staff revolve more around the patient and the need to treat the patient quickly rather than being restricted to a specific job description. This is similar to the duties of a medical assistant in a physician's office. The job is not restricted to one duty; rather, multiple tasks are done as the need arises.

The routine in the hospital has become more focused on prompt care of the patient. At 0430, or sooner, both the nursing staff and the phlebotomist start collecting blood samples. Since more people are collecting the samples, each person does not have as many to collect. As each individual completes sample collection, the samples are sent to the laboratory. This creates a steady stream of samples flowing to the laboratory and has eliminated the large batches of samples arriving as each phlebotomist finishes. This helps with the workflow for the laboratory, and the results are available for the physician sooner.

When the phlebotomist's blood collection duties are completed, he or she does not return to the laboratory but instead continues to work on the nursing unit. During the rest of the day, the phlebotomist collects blood samples that are needed, handles patient care, and does point of care laboratory tests such as blood sugar/glucose on the patient in the patient's room. This multiskilled training for the phlebotomist makes him or her more versatile and an asset to the organization. In some hospitals, this position is known as a *patient care technician.*

Helpful Hint

When interviewing for a phlebotomy position, ask what duties other than phlebotomy you will be performing. It is best to go into a job knowing as much as possible about the extent of your duties.

Each health care facility must determine if a centralized phlebotomy or decentralized phlebotomy program is the best for that facility. There has been much written in the literature debating the pros and cons of each type of program. Studies have shown that with decentralized phlebotomy there is an increase in hemolyzed samples, patient identification errors, and contaminated blood cultures. However, decentralized phlebotomy has been effective in many health care facilities. The key to effectiveness and reduction of errors is based on extensive training of individuals doing the phlebotomy.

from the patient. Venesection was often used to reduce fever or to produce a faint so an expectant mother would deliver her baby by the time she recovered.

In *cupping,* a heated glass cup was placed on a person's back. As the cup cooled, it created a suction that pulled blood to the capillaries under the cup. Then a spring-loaded box containing multiple blades cut the area to produce massive bleeding. Both venesection and cupping produced much scarring.

In December 1799, George Washington, the first president of the United States, had a severe throat infection. The cure for the infection was heavy bleeding. George Washington was bled of more than 9 pints of blood in less than 24 hours and died on December 14, 1799. Soon after his death, the philosophy of bleeding as the cure to disease began to change.

However, it was not until the middle of the nineteenth century that bloodletting was no longer considered the cure for all illnesses. The discovery of microorganisms as the causative agent for many diseases started to change the thinking of how to treat diseases. Blood began to be examined for diagnostic purposes. Urine and feces had been examined since medieval times. The knowledge obtained from these early examinations was small compared with what we can determine today.

A more modern method was to use *leeches.* It was not uncommon to apply leeches routinely to one's body with the belief that it prevented disease. Leeches still have limited uses today. When a person's finger is reattached after accidental amputation, for example, the arteries and veins do not return to normal blood flow immediately. The blood tends to pool in the end of the finger, causing pain and pressure. A leech is placed on the end of the finger to remove the excess blood and relieve the symptoms. The only problem is that leeches get full rapidly and have to be changed after several hours.

Bleeding of individuals to reduce the patient's amount of blood does occur today to treat diseases called polycythemia vera and hereditary hemochromatosis. The treatment involves withdrawing 500 milliliters of blood through therapeutic phlebotomy. But contemporary bloodletting takes a broader approach. Blood is still removed to cure the person, but it is primarily done to find the cure, not as the cure itself. Blood collection has changed from being therapeutic to being diagnostic. Thousands of different types of diagnostic tests are available. Phlebotomy provides accurate and precise test results so the patient can be diagnosed and treated. But this can be accomplished only after the phlebotomist has provided the laboratory with an accurate sample.

PHLEBOTOMY'S ROLE IN HEALTH CARE

The phlebotomist's primary role is to collect blood for accurate and reliable test results as quickly as possible and with the least discomfort to the patient. The job description can vary greatly from one health care environment to another. The phlebotomist is usually cross-trained in **venipuncture**, capillary collection, patient care, receptionist duties, sample processing, and computer work. Phlebotomists have become key players on the health care team. They represent the laboratory and the health care center, they are in direct contact with the patient, and they perform tasks that are critical to the patient's diagnosis and care. Phlebotomists are part of a health care team that can be as large as 5,000 people in a large hospital or just 2 or 3 people in a small clinic.

The traditional role of the phlebotomist in a hospital is only one job: to collect blood samples. Eighty-five percent of hospitals follow this **centralized phlebotomy** approach where the phlebotomist is dispatched from the laboratory to either nursing units or outpatient areas. An example of a typical day for the traditional phlebotomist is to arrive at work around 0430 and then have a list of patients for collection. The reason for this early start is so that the patients are still fasting when their blood is collected. Usually this consists of collecting from 10 patients on the nursing units and then bringing the samples to the

Pathology	Study of the nature and cause of disease.
Phlebotomy	Act or practice of bloodletting as a therapeutic or diagnostic measure.
Postexamination (Postanalytical)	Process in which the results of the testing are communicated to the health care provider.
Preexamination (Preanalytical)	All processes that it takes to collect the sample and get to the point in which the testing of the sample can occur.
Qualitative Analysis	The chemical analysis designed to identify the components of a substance. The results from this analysis are released as a positive (present) or negative (not present) result.
Quality Assurance	Program that strives to have the health care facility guarantee that all areas are providing the highest quality and most appropriate level of care.
Quality Control	Methods to monitor processes and confirm that processes are within the preestablished limits.
Quality Improvement	Review and monitoring of outcomes to strive toward continuous improvement in performance.
Quantitative Analysis	The analysis of a substance to determine the amount or proportions of the substance. Results will be released as an amount, such as grams per liter.
Root Cause	Analysis of an event to determine the actual reason for the incident and corrective action needed to prevent a recurrence.
Sentinel Event	An unexpected occurrence involving death or serious physical and psychological injury.
Threshold	Acceptable level of performance.
Venipuncture	Collection of blood from a vein by penetrating the vein with a needle.

Chapter 1 of this text covers the basic information that is needed before one can perform phlebotomy. The history of phlebotomy and how it has changed over the years is covered first. Then the duties of the people who will be working with the phlebotomist both in the laboratory and in a health care facility are outlined. The phlebotomist will gain a familiarity with the departments of the laboratory and the testing that is performed in each department. The student will also better understand the agencies that regulate how health care facilities must operate.

HISTORY OF PHLEBOTOMY

Phlebotomy is the process of collecting blood and is defined in *Webster's* dictionary as "the act or practice of bloodletting as a therapeutic measure." The history of bloodletting dates back to the early Egyptians and continues into modern times. It was once thought that the practice would rid the body of diseases and provide a cure for almost all ailments. Picture a Roman gladiator bleeding and being carried off on a stretcher to receive the cure-all treatment of further bleeding. Perhaps the unfortunate results of the practice are one reason that moment in history did not last very long. In the twelfth century, bloodletting was practiced by barbers, whose red-and-white barber poles became the symbol of their trade.

Historically, phlebotomy used two basic methods: venesection and cupping. *Venesection* was the most common. A sharp lancet-type instrument pierced the veins and made them bleed. Lancing the veins was thought to eliminate the "bad" blood and remove the disease

NAACLS Competencies Relevant to Chapter 1

Demonstrate knowledge of the health care delivery system and medical terminology.

- Identify the health care providers in hospitals and clinics and the phlebotomist's role as a member of this health care team.
- Describe the various hospital departments and their major functions in which the phlebotomist may interact in his or her role.
- Describe the organizational structure of the clinical laboratory department.
- Discuss the roles of the clinical laboratory personnel and their qualifications for these professional positions.
- List the types of laboratory procedures performed in the various sections of the clinical laboratory department.
- Describe how laboratory testing is used to assess body functions and disease.
- Use common medical terminology.

Demonstrate understanding of quality assurance and quality control in phlebotomy.

- Describe the system for monitoring quality assurance in the collection of blood samples.
- Identify policies and procedures used in the clinical laboratory to ensure quality in the obtaining of blood samples.
- Perform quality control procedures.
- Record quality control results.
- Identify and report control results that do not meet predetermined criteria.

Communicate (verbally and nonverbally) effectively and appropriately in the workplace.

- Maintain confidentiality of privileged information on individuals.
- Value diversity in the workplace.
- Interact appropriately and professionally with other individuals.
- Discuss the major points of the American Hospital Association's Patient Care Partnership.
- Model professional appearance and appropriate behavior.

KEY TERMS

Advance Directive	Document stipulating the kind of life-prolonging medical care permitted for a patient.
Centralized Phlebotomy	Sample collection where the phlebotomist is part of the laboratory team and is dispatched to hospital units to collect blood samples.
Compatible	Substances that can be mixed without reacting with one another.
Decentralized Phlebotomy	Sample collection where all members of the health care team share responsibility to collect blood samples.
Demeanor	The outward behavior of an individual.
Esoteric	Type of laboratory tests that are not routinely done. These tests are often sent to another laboratory that specializes in a specific test.
Ethics	Professional code of conduct in the treatment of patients. Ingrained in this is a moral philosophy of how the phlebotomist treats the patient.
Examination	All processes that are done to perform the test(s) on the sample to achieve a result.
Failure	A case when the system does not meet user or customer expectations.

receive the wrong type of blood, with serious complications to the patient, including fatal transfusion reaction. The complications can range from fever to death by kidney failure. Few hospitals draw their own donors. Most hospitals procure the blood they transfuse from a central donor facility, such as the Red Cross or local blood centers. Other products that the blood bank issues to patients are plasma, platelets, and cryoprecipitate.

Cytogenetics is an area found in some of the larger laboratories. This section studies deficiencies that are related to genetic diseases. Genetic testing is expanding rapidly.

Molecular diagnostics testing provides higher sensitivity than many traditional testing methods. Molecular diagnostics detects levels of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), proteins, or metabolites to determine the severity or presence of various diseases or infections. Most laboratories use polymerase chain reaction (PCR) technology for the testing. Often special types of evacuated tubes will be used for PCR tests.

The area of cytology and histology, also known as pathology, examines tissues and cell smears for evidence of cancer, infection, or other abnormalities. All tissue biopsy samples, surgical samples obtained in surgery, or tissues obtained in minor surgeries at a physician's office are submitted to histology for examination. The samples are prepared by a histologist and then examined macroscopically and microscopically by the pathologist. Cytology samples are processed and then examined microscopically by a cytotechnologist. Most of the cytology samples are Pap tests.

The stat laboratory handles stat (emergency) requests. It is staffed 24 hours a day, 7 days a week. The stat laboratory can do many of the same tests done in the main laboratory but does these tests individually as they are ordered and not in a batch mode (large groups together), as is often done in the main laboratory. It also provides a backup system for the main laboratory in case of instrument malfunctions. Not all laboratories have a separate stat laboratory. Often the stats are handled out of the main laboratory.

Near the outpatient entrance of some hospitals, the ambulatory care laboratory (outpatient laboratory) is found. It provides rapid turnaround of results on frequently ordered tests for outpatients. It also has an active marketing and outreach program that includes services for nursing homes, physicians' offices, and health screening for businesses.

Even with the elaborate testing facilities available in most laboratories, outside laboratories are often needed to do specialized testing. These reference laboratories can be in the same city or many miles away. The samples are transported to the reference laboratory each evening, and results are sent back via computer and Internet lines as soon as the testing is completed.

All these laboratory areas are involved in the goal of the laboratory, which is to get results on the patient's condition to the physician. This encompasses three phases of sample testing: **preexamination**, **examination**, and **postexamination**. The Clinical Laboratory Standards Institute (CLSI) guideline *Accuracy in Patient and Sample Identification* (GP33-A1) is now using these terms in its standards and guidelines. These were previously referred to as preanalytical, analytical, and postanalytical, respectively.

Preexamination—Starting, in chronological order, all steps that it takes to collect the sample and get it to the point in which the testing of the sample can occur. These include the following:

- The clinician's request
- Patient identification and information
- Correct sample collection
- Correct primary sample identification
- Correct use of all equipment
- Sample preparation or centrifugation
- Proper preparation of sample aliquots
- Maintaining sample integrity until the examination (analytical) process can begin

manual or automated techniques. A variety of analyzers measures for chemicals such as glucose, electrolytes, blood urea nitrogen (BUN), and creatinine. With almost all instruments, the sample is added to various chemicals and a color (immunofluorescence) or chemical change occurs. For example, the more glucose in the blood, the more intense the color change. In addition to single tests, instruments often run multiple tests on one sample. The panel, a battery of several tests performed on one sample, is a quick method to screen patients for illness. More complex testing is also performed in the chemistry section. Examples of these tests are protein electrophoresis, thyroid studies, aminoglycoside levels, and therapeutic drug monitoring (TDM) (Figure 1.3).

Microbiology studies organisms that are so small they can be seen only with the aid of a microscope. There the technologist identifies aerobic and anaerobic bacteria, fungi, mycobacteria (such as tuberculosis), and parasites. Samples brought to this area include throat cultures, urine cultures, wound and skin cultures, blood cultures, and other types of cultures. Once the organism that is causing the problem is determined, a test called a *sensitivity* is run to determine what antibiotic would be best to eliminate the problem organism.

The immunology section studies antigen–antibody reactions. Antigens are substances seen as being "foreign" in the body, and antibodies are proteins made by the body to combat specific antigens. Staff in this section performs tests to detect and evaluate human immunodeficiency virus (HIV), hepatitis, infectious mononucleosis, rheumatoid arthritis, and syphilis, and they also perform fluorescent antibody tests.

The blood bank section, sometimes called immunohematology, studies antigens and antibodies as they relate to the red blood cells. This section performs ABO Rh blood typing, type and screen testing, cross-matching/compatibility testing, and screening for antibodies. The primary testing is to determine compatibility of blood cells from a donor with the plasma of the recipient. This cross-matching of donor to recipient determines if the blood that the recipient will receive is **compatible**. Proper patient identification is critical when the blood the phlebotomist draws will be used to determine a product that will be infused into a patient. A misidentification of a patient opens the possibility that the patient will

These are groups of tests that have been arranged into panels for general information about a patient's health. These panels are approved for use by the American Medical Association (AMA).

Complete Blood Cell Count (CBC): White blood cell (leukocyte) count and differential white count; red blood cell (erythrocyte) count; hematocrit; hemoglobin; red blood cell indices, which include the mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and the platelet (thrombocyte) count

Electrolyte Panel (Lytes): Sodium, potassium, chloride, carbon dioxide (CO_2)

Hepatic Function Panel: Total protein; albumin; total and direct bilirubin; alkaline phosphatase; AST, also known as serum glutamic oxaloacetic transaminase (SGOT); ALT, also known as serum glutamic pyruvic transaminase (SGPT)

Basic Metabolic Panel: Sodium, potassium, chloride, carbon dioxide (CO_2), glucose, blood urea nitrogen (BUN), calcium, and creatinine

Renal Panel: Sodium, potassium, chloride, carbon dioxide (CO_2), glucose, blood urea nitrogen (BUN), calcium, creatinine, phosphorous, and albumin

Lipid Panel: Cholesterol, triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL)

Comprehensive Metabolic Panel: Glucose, BUN, creatinine, sodium, potassium, chloride, calcium, carbon dioxide (CO_2), albumin, total protein, alkaline phosphatase, AST, ALT, and total bilirubin

▲ FIGURE 1.3 Panels of laboratory tests.

LABORATORY SECTIONS AND THEIR PURPOSE

Administrative Office—Responds to telephone calls, handles specimen collection requests, and handles some specimens

Phlebotomy (Sample Collection)—Collects samples from patients and processes samples for testing or transport

Hematology—Studies the blood in normal and diseased states. Usually limited to the study of cellular components and not the chemistry of blood

Examples of Tests: Complete blood cell count (CBC), hemoglobin, hematocrit, platelet count, sedimentation rate, body fluid cell counts

Coagulation—Study of blood clotting mechanisms as an aid in diagnosis or monitoring of patient therapy

Examples of Tests: Prothrombin time (PT), activated partial thromboplastin time (aPTT), D-dimer, factor VIII, fibrinogen assay, heparin level, von Willebrand factor (ristocetin)

Urinalysis—Study of urine to aid in patient diagnosis to follow the course of a disease or the body's metabolism

Examples of Tests: Urinalysis, reducing substance, urine pH, urine glucose

Chemistry—Performs biochemical analysis of blood and body fluids to determine the status of a patient

Examples of Tests: Comprehensive metabolic panel, iron studies, renal panel, carcinoembryonic antigen (CEA), glucose, alanine aminotransferase (ALT), aspartate aminotransferase (AST), cholesterol

Microbiology—Cultures samples to determine if pathogenic organisms are present in a sample and determines the organisms' sensitivity to antibiotics (culture and sensitivity)

Examples of Tests: Blood cultures, throat cultures, anaerobic cultures, urine cultures, parasite identification, stool culture, mycobacterial (tuberculosis) culture, virus cultures, fungal cultures, genital cultures, mycoplasma cultures, antibiotic susceptibility testing

Immunology—Studies antigens and antibodies to determine immunity to disease or presence of disease

Examples of Tests: Human immunodeficiency virus (HIV) testing, rubella, syphilis (rapid plasma reagin [RPR]), hepatitis testing

Immunohematology (Blood Bank)—Determines compatibility of blood and blood products that are to be administered to patients

Examples of Tests: Compatibility testing, antibody screens or ABO, Rh determination

Cytogenetics—Study of deficiencies related to genetic diseases

Examples of Tests: Chromosomes analysis, prenatal chromosome screening

Molecular Diagnostics—Using polymerase chain reaction (PCR) technologies to study the presence of various diseases or infections

Examples of Tests: Methicillin-resistant *Staphylococcus aureus* (MRSA) infections, HIV and other infectious diseases

▲ FIGURE 1.2 Laboratory sections.

Staff in the urinalysis section performs qualitative and quantitative chemical and microscopic examinations of urine to detect urinary tract infections, diabetes, and liver or kidney diseases. Urinalysis is often performed in or near the same area as hematology in order to share microscopes.

The chemistry section works with the fluid portion of the blood (the serum or plasma) or other body fluids. The staff performs biochemical analysis of blood and body fluids by

as *point of care testing.* The instrument is taken to the patient's room, the patient's blood is collected, the blood is tested in the instrument, and results are determined at the patient's bedside. This speeds the process of treatment for the patient. A health care practitioner can examine the patient, order a blood sugar/glucose, and then the patient is tested. Within a few minutes, the health care practitioner can have results and decide to continue or change treatment. Bedside testing eliminates the transportation time of the sample to the laboratory and the wait time to get the results to the nursing unit. However, only a limited number of tests can be performed with the instrumentation available. Federal regulations also limit to some extent what tests can be performed this way. This testing of the blood work at the patient's bedside is often the duty of the multiskilled phlebotomist or nurse.

The function of the laboratory is often not understood by an outsider. All the patient sees is the phlebotomist and is not aware of the many sections and functions within the laboratory (Figure 1.2).The main laboratory is the largest laboratory. The office section of the main laboratory receives and routes laboratory-related telephone calls, sample collection requests, and some patient samples.

In close proximity to the office is the area of sample collection, more commonly known as phlebotomy. From there the phlebotomists are dispatched to collect blood samples from patients throughout the hospital. Patients are most familiar with this section because often the phlebotomist is the only representative from the laboratory they see. Once collected, the samples go to any one of the laboratories within the hospital.

EXERCISE 1 Matching/Identification

Directions: Match the ancillary areas of a hospital to their purpose.

Purpose	Area of hospital
1. _____ Maintains patient records	A. Electrocardiography (EKG)
2. _____ Uses imaging for diagnosis and treatment	B. Electrocephalography (EEG)
3. _____ Provides therapy to evaluate the lungs	C. Food Service (Dietary)
4. _____ Diagnosis of neurophysiological disorders	D. Laboratory
5. _____ Monitor patients with cardiovascular disease	E. Medical Records
6. _____ Provides diets to patients	F. Nursing
7. _____ Provides therapy to help maintain living skills	G. Occupational Therapy
8. _____ Provides testing of patient blood and body fluid samples	H. Pharmacy
9. _____ Provides therapy to restore mobility	I. Physical Therapy
10. _____ Dispenses drugs and advises on drug usage	J. Radiology
11. _____ Provides therapy to restore speech	K. Respiratory Therapy
12. _____ Provides direct patient care	L. Speech Therapy

The hematology staff studies blood cells and performs **qualitative** and **quantitative** analyses along with microscopic examinations. The CBC, or complete blood cell count (see Figure 1.2), is a routine test, providing the physician with a large amount of valuable information about a patient's state of health.

Coagulation/hemostasis is usually in the same area as hematology. Coagulation/hemostasis is the study of the clotting of blood. Patients have diseases where they bleed too much or form clots too easily (thrombosis). Staff from this section monitors patients on anticoagulant therapy, patients with bleeding or clotting disorders, as well as presurgical patients.

care to patients. Phlebotomists may need to ask nurses for assistance with patients who are unwilling to hold still or to check with them about the proper time to draw a sample. The ability to work smoothly with other departments of the hospital is a key trait of the best phlebotomists. The phlebotomist who is well liked and cooperates with others for the patients' care is the one who will earn cooperation from other individuals.

Examples of areas of the hospital are shown in Figure 1.1. The clinical laboratory may be in one location or may be decentralized in a variety of locations in the hospital. These include the main laboratory, ambulatory care laboratory (outpatient laboratory), stat laboratory, and surgery laboratory. Each laboratory serves a specific function and often has sections within it.

The patient-focused care concept takes the laboratory out of a physical location and to the patient. As instrumentation for laboratory testing becomes smaller, the instrumentation is located on the nursing unit. This testing that is done at the patient's bedside is also known

ANCILLARY HOSPITAL AREAS AND THEIR PURPOSE

Administration—Keeps the hospital in compliance

Electrocardiography (EKG)—Monitors patients with cardiovascular disease

Electroencephalography (EEG)—Diagnosis of neurophysiological disorders

Environmental Services—Maintains a clean facility

Food Service (Dietary)—Provides diets to patients

Gastrointestinal (GI) Laboratory—Diagnoses gastrointestinal disorders

Laboratory—Provides testing of patient samples

Medical Records—Maintains patient records

Nursing—Provides direct patient care

Occupational Therapy—Provides therapy to help maintain living skills

Pharmacy—Dispenses drugs and advises on drug usage

Physical Therapy—Provides therapy to restore mobility

Radiology—Uses imaging for diagnosis and treatment

Respiratory Therapy—Provides therapy to evaluate the lungs

Speech Therapy—Provides therapy to restore speech

AREAS OF NURSING AND TYPE OF CARE

Coronary Care Unit (CCU)—Increased care of the patient due to a heart condition

Emergency Department—Emergency treatment of patients

Geriatric—Elderly patients

Home Health Care—Follow-up care of a patient at home

Intensive Care Unit (ICU)—Increased care due to the critical needs of the patient

Neonatal—Newborn care

Nephrology—Patients on dialysis

Obstetrics—Patients in labor of childbirth

Oncology—Patients with cancer

Orthopedic—Patients with broken bones

Pediatrics—Infants and children

Recovery—Recovery treatment of patients

▲ FIGURE 1.1 Examples of areas of the hospital.

THE LABORATORY STAFF

Pathologist—Physician who reads and interprets the results of laboratory tests or examines tissues under a microscope to diagnosis and monitor disease. Pathologists are experts in diagnosing such diseases as cancer, diabetes, acquired immunodeficiency syndrome (AIDS), hepatitis, and thyroid conditions. The American Board of Pathology requires 5 years of training following graduation from medical school to be eligible to take examinations leading to board certification as a clinical/anatomic pathologist.

Medical Laboratory Scientist (MLS) or Clinical Laboratory Scientist (CLS)—Holds a minimum of a baccalaureate degree and is responsible for performing a full range of laboratory tests, confirming the accuracy of test results, and reporting laboratory findings to the pathologist and other physicians. Medical technologists work in five major areas of the laboratory: blood banking, chemistry, hematology, immunology, and microbiology.

Medical Laboratory Technician (MLT)—Under the supervision of the medical technologist, performs general tests. Medical laboratory technicians have special training in addition to a high school diploma or an associate degree.

Phlebotomy Technician (PBT)—Collects blood samples to be used in many laboratory tests to detect and monitor treatment. Phlebotomists have training in addition to a high school diploma.

Cytotechnologist (CT)—Examines cells under the microscope to detect signs of cancer in the earliest stages, when a cure is most likely. Cytotechnologists must hold baccalaureate degrees and have special training to search out the smallest abnormalities in color, shape, or size of cells.

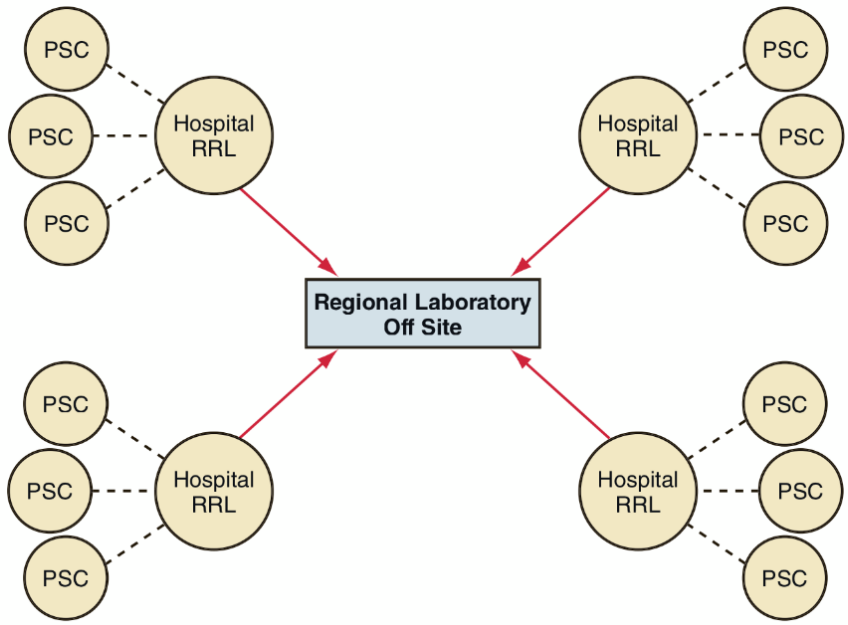
Histotechnologist (HTL)—Prepares body tissue samples for microscopic examination by the pathologist using sophisticated techniques such as immunohistochemistry. Histotechnologists must hold baccalaureate degrees and have special training to freeze, cut, mount, and stain the tissues, often while the patient is still in surgery, thus playing a major role in the diagnosis of malignancy.

▲ FIGURE 1.5 Laboratory staff. Based on information from the American Society for Clinical Pathology (ASCP), http://www.ascp.org.

California has enacted a set of standards that falls under the Department of Health Services (DHS), Laboratory Field Services section. There have been regulations for many years in California, but in 2003 new categories of phlebotomy technicians were created. Even if phlebotomists are certified by another organization, they must meet the California standards. In California phlebotomists must be licensed before they can hold a phlebotomy job. There are now three separate categories of California phlebotomy technicians requiring three separate qualification standards:

1. Limited Phlebotomy Technician—This technician is only able to perform skin punctures. The technician must perform 25 skin punctures (fingersticks) before meeting the qualifications for this standard.
2. Phlebotomy Technician I—This technician performs skin punctures and venipunctures. The technician must perform 50 venipunctures and 10 skin punctures (fingersticks) and pass an approved national certifying organization's exam.
3. Phlebotomy Technician II—This technician performs skin punctures, venipunctures, and arterial punctures. The technician must perform 20 arterial punctures and meet the requirements of the Certified Phlebotomy Technician I.

Laboratories often employ an individual with a high school education and laboratory experience to work as a laboratory assistant. A laboratory assistant usually has received on-the-job training. A phlebotomist who has shown exceptional abilities and attitude is often considered for such a program. This kind of internship generally occurs in a clinic or small hospital setting. The length of training varies from one health care center to another.



▲ FIGURE 1.4 Regional laboratory concept.

LABORATORY STAFF

The staff working in the laboratory has a large range of duties and training, resulting in numerous job titles and roles. The technical positions are either 4-year degree positions or 2-year associate degree positions. A medical laboratory scientist (technologist) has a bachelor's degree and a medical technology or clinical laboratory scientist certification. A technician has a 2-year associate degree in medical technology and a certification. Both roles are needed to make a laboratory run smoothly and efficiently. The secretarial or clerical positions in the office areas of the laboratory require a high school education and some secretarial/clerical training. Knowledge of medical terminology is helpful. The laboratory staff is made up of a wide range of individuals with varying degrees and experience (Figure 1.5).

The phlebotomist position is the one we focus on here. The phlebotomist must have a special **demeanor** to perform the job. They are interacting with many different people and must be able to appropriately interrelate with everyone. The job of the phlebotomist is to provide samples for accurate and reliable test results as quickly as possible. The phlebotomist needs a high school education and specialized training in phlebotomy: a minimum of 40 hours of classroom training and 100 hours of clinical or practical training is the standard set by the American Society for Clinical Pathology. Individuals with this minimum amount of training may have to work in a clinic, outpatient setting, or small hospital. Once experienced they will be capable of working in a large hospital. Many hospitals and clinics are willing to hire a phlebotomist who has completed only classroom training. The hospital or clinic may offer practical on-the-job training with the hope that the phlebotomist-in-training will learn rapidly and be willing to remain at the institution. Many hospitals have established such training programs to fill phlebotomy positions. Phlebotomists may now take certification exams to prove their knowledge in phlebotomy. Various certification and registry exams accredit the person as a phlebotomy technician. In most states phlebotomists do not have to be certified in order to work. Some states require that phlebotomists obtain a state license before they can work as a phlebotomist. Certification is a voluntary process and controlled and run by a professional organization; licensure is a requirement run by the state.

With point of care testing, the test results are available faster. This provides a faster result for the physician to respond to with treatment, and the patient is released sooner. This in turn benefits the patient because he or she is back to a normal lifestyle sooner.

The second method for avoiding a loss is reducing the hospital's cost to below $1,000 per day. Consolidation and reengineering of the laboratory are an attempt to make this happen. Laboratories were originally organized around the need to perform inpatient testing. With the emphasis on outpatient surgery and shorter lengths of stay in the hospital, there is an increased demand for outpatient services and presurgery testing. This increase in demand for outpatient services has resulted in hospitals building patient service centers (PSCs) to handle patients. PSCs are located away from the hospital near groups of physician practices. Patients do not have to go all the way to the hospital to get their blood drawn. Patients can have their blood drawn at the service center, which might be in the same building as the physician's office. Patients can even have presurgery work done at the service center and then go to the hospital for surgery. This concept is a benefit to the phlebotomist. Each of these service centers needs to be staffed with a multiskilled phlebotomist. In the hospital the nursing staff might draw the blood, but in the service center the multiskilled phlebotomist collects the samples. Service centers are less expensive to operate than the hospital laboratory. This in turn reduces the costs to the hospital for patient care, resulting in the hospital avoiding a monetary loss in the care of the patient.

Historically hospitals have competed for patients. This vigorous competition is evident in newspaper and television advertisements. The hospital-run laboratory has become a cost that many hospitals wish to remove. Competing hospitals are now forming joint laboratory ventures but still compete vigorously against each other in all other areas. The hospitals join to form a new laboratory company with each hospital as a part owner; sometimes a commercial reference laboratory is another part owner in this joint venture. The employees of the laboratory become employees of the new company and no longer work for the hospital or commercial laboratory. At the center of this joint venture is what is called a regional laboratory. This regional laboratory is usually at an off-site location, central to all the hospitals involved. This laboratory is where most of the PSC and outpatient testing are performed. All the testing from outpatients is sent to one centrally located regional laboratory instead of multiple hospital locations. The advantage is that only one test instrument must be purchased instead of one instrument for each hospital. This also increases the volume of testing done, and more instrument automation can be implemented to reduce labor costs. With the testing coming in from multiple locations, certain tests that are not very common, called **esoteric** tests, can be performed at the regional laboratory. Before the joint venture, no one hospital would have enough volume to do certain tests. By joining forces, certain not-so-common tests have become common. This provides the physician the ability to order tests and get results back faster than when the testing had to be sent to an out-of-state commercial laboratory. Hospital laboratories reduce the variety of tests that are completed and concentrate on the tests needed for the immediate care of the inpatient and emergency department patient. These hospital-based laboratories are usually termed stat laboratories or rapid response laboratories (RRLs). The key to making all this work is an efficient courier and sample tracking system. Instead of samples being walked to another area of the hospital, they have to be transported to another area of the city. To avoid delays, this has to be fast and efficient (Figure 1.4). This concept opens up a multitude of opportunities for the phlebotomist. The phlebotomist can do venipuncture in any of the sites or can become multiskilled and rotate to any of the areas, taking on tasks from processing samples to being a courier. The opportunities become endless for the individual who is willing to learn and rotate to a variety of locations.

LABORATORIES IN THE TWENTY-FIRST CENTURY

Traditionally, health care in the United States offered patients freedom to choose whatever physician or health care facility they wanted. A third party, usually the insurance company, would pay for all the services at the providers' usual fees. Many people could not afford to pay for the insurance plan if they were unemployed or their employer did not provide subsidized insurance. These patients had no choice in an emergency but to receive services at a hospital but would be unable to pay. This would cause those patients to go into default on the bill, and the hospitals had to raise prices to make up for the lost income. The insurance companies realized that they were paying out considerable money to organizations without restrictions or guarantees. As health care costs continued to rise, the insurance companies tried to find ways to lower costs and control the cost of the premium to the patient or employer.

Managed care was developed as a complex system to coordinate the provision of health services and health benefits. Most of these systems were put in place to control the use of health services and control costs. This was an unusual concept to the United States even though many other countries had national health insurance that controlled many health services. What developed out of this policy were managed care organizations that would contract with health care providers to provide health care services on a capitated (per-member per-month) basis.

Health maintenance organizations (HMOs) were formed to provide health coverage for both hospital and physician services. Members of the HMO are required to use only certain contracted physicians and hospitals for their care. To become one of the contracted physicians or hospitals, the physician or hospital would offer to provide services at a discount. This is in contrast to a preferred provider organization (PPO), which also contracts with certain health care facilities but offers more freedom for patients to choose to whom they go. This freedom results in a higher cost to the patient or the employer.

The United States now has added another option for many patients. The Affordable Healthcare Act has been enacted to help those that could not afford insurance. This requires all people to have health insurance. The theory is that if everyone has insurance, there will be fewer people defaulting on health care bills.

There is continued pressure on laboratories to produce quality testing in less time for less cost. These pressures are a result of the managed care programs that are in all areas of health care. Emphasis is on increasing outpatient services and decreasing length of stay for inpatients. This puts pressure on the laboratory to do the testing faster and more frequently so that there is no delay in the health care practitioner getting results and being able to treat the patient. The sooner the diagnosis and treatment are determined, the sooner the patient can be on the road to recovery.

Two methods are being used to treat patients faster with less of a wait on the test results. The first method, mentioned earlier, is point of care testing. The laboratory instrument is taken to the patient, the testing is done in the patient's room, and results are determined at the bedside. The multiskilled phlebotomist often does this type of testing. The results are documented on the patient's chart without any delays. This method of blood testing is usually more expensive than the traditional laboratory test, but often the total cost of care is reduced. With managed care, the hospital is often paid one set fee for a patient. The sooner the patient can be released from the hospital, the less it costs the hospital to care for the patient.

Here is an example of how this system works: The managed care provider pays the hospital $1,000 per day for a total of 5 days to care for a patient. It costs the hospital $1,000 per day to care for this patient. If the patient takes 7 days to be well enough to be released, the costs are $7,000, but the hospital will be paid only $5,000 by the managed care provider, for a loss of $2,000. The incentive for the hospital is to complete the patient's care in less than 5 days. This is one way the hospital could avoid a loss.