Phlebotomy Essentials  Fifth Edition

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Phlebotomy Essentials / Ruth E. McCall, Retired Director of Phlebotomy and Clinical Laboratory Assistant Programs, Central New Mexico Community College, Albuquerque, New Mexico, Cathee M. Tankersley, MT(ASCP), President, NuHealth Educators, LLC, Faculty, Emeritus, Phoenix College, Phoenix, Arizona. — Fifth Edition.

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To the memory of my parents Charles and Marie Ruppert, whose love and encouragement is missed immensely.

RUTH E. McCALL

To my daughter, Jaime, my son, Todd, and my daughter-in-law, Christina, for their continuing support and encouragement, and to my everlasting love, Earl, my husband for 45 years.

CATHEE M. TANKERSLEY
About the Authors

Ruth McCall received her bachelor’s degree from the University of Iowa and her medical technology certificate after a year’s internship at Saint Joseph’s School of Medical Technology in Phoenix, Arizona, and has worked or taught in the area of Clinical Laboratory Sciences and Health Care Education since 1969. Ruth recently retired as Director of the Phlebotomy and Clinical Laboratory Assistant Programs after 18 years of teaching in the Health, Wellness and Public Safety Department at Central New Mexico (CNM) Community College (formerly TVI Community College). While at CNM, Ruth proposed creation of the Clinical Laboratory Assistant Program, was instrumental in its development, and was responsible for its becoming one of the first programs at CNM offered entirely through distance education. Ruth participated with science instructors from a local high school in a program that introduced the students to health careers and was the first CNM phlebotomy instructor to teach phlebotomy to high school students through concurrent enrollment. She has lectured on phlebotomy at conferences throughout the United States, served as an expert witness in phlebotomy injury cases, and especially enjoyed participating in a medical technology exchange trip to China. Most recently Ruth had the privilege of being a member of the CLSI Working Group on Venipuncture charged with the sixth revision of the H3 Venipuncture Standard and the CLSI Working Group on Skin Puncture charged with the sixth revision of the H4 Capillary Puncture Standard.

Ruth loves the outdoors. She enjoys hiking in the beautiful Southwest and downhill skiing in the mountains of Colorado and New Mexico. She has even tried her hand at paragliding. She has been married for over 40 years to her husband, John, and has two sons, Christopher and Scott. Christopher and his wife Tracy are parents of her fantastic grandchildren, Katie and Ryan.

Cathee Tankersley recently retired as Faculty Emeritus after 27 years of teaching at Phoenix College in the Health Enhancement Department. She has worked or taught in the area of Clinical Laboratory Sciences and Health Care Education since graduating in Medical Technology from New Mexico State University in 1964. Since she became a medical technologist, Cathee has been active in many professional organizations. She has served on many committees at the state and national levels. While at St. Joseph’s Hospital and Medical Center, she was the Director of the Medical Technology Program during her last two years at that facility. Her tenure at Phoenix College has been as Clinical Coordinator for the MLT Program, Director of the ERG and EEG Programs, and as the Phlebotomy Program Director from 1982 until 2006. While at PC, she established one of the first accredited phlebotomy programs in the United States. In 2000, she developed and directed the first and only college-based Law Enforcement Phlebotomy Program in the United States.

Cathee served on the initial National Credentialing Agency for Laboratory Personnel (NCA) Phlebotomy Certification Committee as chair from 1983 to 1985. She was one of the original six members of the National Accrediting agency for Clinical Laboratory Sciences (NAACLS) Approval Committee for Phlebotomy Programs in 1985. She went on to serve as the chair of that committee from 1993 to 1995. Since 1997, when she established her company, NuHealth Educators, LLC, she has been a healthcare educator and consultant for several organizations.
She has served as an expert witness in the area of phlebotomy techniques and has lectured at numerous conferences across the United States.

Cathee continues to teach part time at Phoenix College in healthcare education and the Law Enforcement Phlebotomy (LEP) program. She works with the Arizona Governor’s Office of Highway Safety to maintain current curricular materials for law enforcement phlebotomy. Ruth and Cathee have collaborated for over 20 years on textbook writing and as presenters at national and state conferences.

Family is very important to Cathee. Her husband of 45 years, Earl; their two children, Todd and Jaime; daughter-in-law, Chris; and two wonderful grandsons, Trevor and Connor, help her keep everything in perspective.
Preface

Phlebotomy Essentials, fifth edition, was written for all who want to correctly and safely practice phlebotomy. The authors have over 70 years of combined experience in laboratory sciences, phlebotomy program direction, and teaching many different levels and diverse populations of phlebotomy students. As with previous editions, the goal of Phlebotomy Essentials, fifth edition, is to provide 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 their 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 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 delivery with an emphasis on clinical laboratory services, quality assurance and legal issues and their relationship to the standard of care, and comprehensive instruction in infection control and safety.

Unit II, Overview of the Human Body, provides a foundation in medical terminology and 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 upon 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 the latest in point-of-care instruments and testing. Routine and special handling and processing of specimens, with an emphasis on the latest rules of safety, are included in this section. Covered in this unit is an overview of the Laboratory Information System (LIS)—how it supports the laboratory process and is used by the phlebotomist in specimen collection. Also included is a discussion of nonblood specimens and testing information, which can be an important part of the phlebotomist’s responsibilities, as well as arterial puncture for those phlebotomists who do ABGs or who anticipate advancing beyond venous collection.
The appendices give readers ready access to helpful supplementary information as they progress through the text.

- Appendix A is an alphabetical list of laboratory tests including specimen type, handling considerations, and the department that does the testing. Not only does this help readers categorize the many different tests performed by a laboratory, but it also provides practice in using a reference manual.
- Appendix B, Laboratory Math, provides a quick review and reference for certain calculations that may be needed but are not always used enough to have been committed to memory.
- English to Spanish translation of conversational phrases, including phonetic Spanish pronunciation guidelines, found in Appendix C can help non-Spanish-speaking phlebotomists provide safe and appropriate directions to patients who speak only Spanish.
- Appendix D identifies conditions that require work restrictions for healthcare workers, a quick reference that can help phlebotomists learn when and how to protect themselves and others from infection.
- Appendix E, Answers to Study and Review Questions and Case Studies, allows readers to check their answers, reinforcing the material and assuring that they have learned it correctly.
- Appendix F gives the reader immediate access to tube guides from two leading manufacturers for a quick reference and colorful way to learn by association.

There are many technical and specialized terms associated with healthcare in general and phlebotomy in particular. The extensive updated and alphabetically arranged glossary makes the meanings of unfamiliar terms within easy reach.

Features

The fifth edition includes various features meant to help the reader learn and retain the information in Phlebotomy Essentials.

- **Key Terms and Objectives** open each chapter and help students recognize the important terms and concepts that they will come across in reading the chapter.
- 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.
- **Cautions** highlight critical information to help students identify and avoid dangerous practices.
- **FYI**s are interesting notes and fun facts that will enhance practical application of the information.
- **Memory Joggers** offer a proven way to help students remember important information.
- **Study and Review Questions** at the end of each chapter provide a review of each chapter’s content.
- **Case studies** at the end of each chapter bring concepts to life and enhance critical thinking skills.
- **A Media Menu** at the end of each chapter points out online student resources available for that chapter.
- **Book Icons** throughout the text refer readers to the Student Workbook for Phlebotomy Essentials and the Phlebotomy Exam Review, for further opportunities to enrich their learning (available for separate purchase).
- **Online Icons** throughout the text refer readers to corresponding videos and animations on the book’s companion Web site, which bring the content to life (see “Additional Resources,” below, for more information).

The content of 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 CLSI.

Additional Resources

Phlebotomy Essentials, fifth edition, includes additional resources for both instructors and students that are available on the book’s companion Web site at http://thepoint.lww.com/McCall5e.

INSTRUCTORS

Approved adopting instructors will be given access to the following additional resources:

- Lesson Plans
- Critical Thinking Questions
- Brownstone Test Generator
- Image Collection
- All the appendices from the book
- PowerPoint Slides with Images and Tables
- WebCT/Blackboard-Ready Cartridges
- Signature Papers (i.e., HIPAA/confidentiality forms, blood-borne pathogen statements, assumption-of-risk form, health declaration form)
- Log Examples
- Lab Skills Evaluation Checklists (i.e., venipuncture, skin puncture, special test procedures)
- Phlebotomy Program Pre-test and Post-test and their answer keys

STUDENTS

Students who have purchased Phlebotomy Essentials, fifth edition, have access to the following additional resources:

- New to the fifth edition, interactive games and exercises offer a fun way to study and review. Exercise types include Look and Label, Zooming In, Word Building, Body Building, Roboterms, Interactive Crossword Puzzles, Quiz Show, and Concentration.
- 23 videos, including 10 that are new to the fifth edition
- 17 animations, including 12 that are new to the fifth edition
- Audio flash cards and, new to the fifth edition, a flash card generator
- An audio glossary, new to the fifth edition

In addition, purchasers of the text can access the searchable Full Text Online by going to the Phlebotomy Essentials, fifth edition Web site at http://thepoint.lww.com/McCall5e. See the inside front cover of this text for more details, including the passcode you will need to gain access to the Web site.

Related Titles

The authors of this textbook have created the following two titles, available for separate purchase, that correspond to Phlebotomy Essentials, fifth edition, to create an ideal study package for phlebotomy training programs. Each corresponds to this main textbook in chapter sequence.

- The companion workbook (McCall R, Tankersley C. Student Workbook for Phlebotomy Essentials, 5th ed., available for separate purchase) provides students with chapter-by-chapter exercises to reinforce text material, assessment tools to evaluate their skills, realistic scenarios to gauge their grasp of key concepts, and skills logs to chart their progress. The workbook includes key terms matching exercises, chapter review questions,
crossword puzzles, skill and knowledge drills, requisition activities, case studies, and procedure evaluation forms.

• The companion exam review book (McCall R, Tankersley C. Phlebotomy Exam Review, 4th ed., available for separate purchase) prepares students for all the national certification exams in phlebotomy.

Acknowledgments

The authors wish to express their gratitude to the many individuals who gave of their time, talent, and expertise to make this edition of Phlebotomy Essentials current and accurate. In particular, we would like to thank Jane Adrian, David Berg, Theresa McGillvray-Dodd, Joyce Hall, Maureane Hoffman, Glenda Hiddessen, Bob Kaplanis, Scott Leece, Jeri Litteral, Charez Norris, Mary Robitaille, Phil Tate, and Janet Vittori.

In addition we would like to thank animator Mark Flanders, illustrator Christine Vernon, photographer Bruce Knapus, videographer Michael Norde, and all who played a role in the latest videos, including Jim Gregory, Lynette Hales, Nancy Jefferys, Bruce Knaphus, Patty Lewis, April Meyers, Flavia Pradolin, Donald Pryor, and Maura Smith.

Finally, we would like to thank Acquisitions Editor Pete Sabatini and the production and editorial staff at Lippincott Williams & Wilkins, especially those with whom we worked most closely, with an extra special thank you to Senior Product Manager Meredith Brittain for her patience, support, and dedication to this endeavor.

RUTH E. McCALL
CATHEE M. TANKERSLEY
User’s Guide

*Phlebotomy Essentials* is designed for anyone wanting to correctly and safely practice phlebotomy. This User’s Guide shows you how to put the features of this book to work for you.

Chapter Opening Elements

Each chapter begins with the following elements to introduce the material and help make your experience consistent!

### KEY TERMS

*KEY TERMS* are listed at the beginning of each chapter and defined in the glossary.

### OBJECTIVES

*OBJECTIVES* provide a quick overview of content to be covered.

---

**CHAPTER 1**

### Past and Present and The Healthcare Setting

**KEY TERMS**

- AHCCCS
- APC
- case manager certification
- CLIA '88
- CMS
- communication barriers
- CPT
- exsanguinate
- HIPAA
- AHOS
- ICD-9-CM
- IDS
- kinesic slip
- kinestics
- MCOs
- Medicaid
- Medicare
- MLS
- PHI
- PHS
- phlebotomy
- polycythemia
- PPOs
- primary care
- presence
- reference laboratories
- secondary care
- tertiary care
- third-party payer

**OBJECTIVES**

1. Define the key terms and abbreviations listed at the beginning of this chapter.
2. Describe the evolution of phlebotomy and the role of the phlebotomist in today’s healthcare setting.
3. Describe the traits that form the professional image and identify national organizations that support professional recognition of phlebotomists.
4. Describe the basic concepts of communication as they relate to healthcare and how appearance and nonverbal messages affect the communication process.
5. Describe proper telephone protocol in a laboratory or other healthcare setting.
6. Demonstrate an awareness of the different types of healthcare settings.
7. Compare types of third-party payers, coverage, and methods of payment to the patient, provider, and institutions.
8. Describe traditional hospital organization and identify the healthcare providers in the inpatient facility.
9. List the clinical analysis areas of the laboratory and the types of laboratory procedures performed in the different areas.
10. Describe the different levels of personnel found in the clinical laboratory and how Clinical Laboratory Improvement Amendment regulations affect their job descriptions.
Special Features

Unique chapter features draw your attention to crucial material and heighten your comprehension and retention of information.

**Key Points** help you to identify and retain important concepts.

**Caution Boxes** alert you to potential mistakes and problems so you can avoid them!

**FyI Boxes** offer interesting and relevant information.
ONLINE ICONS direct you to informative videos and animations on the book’s companion website at http://thepoint.lww.com/McCall5e that bring material to life.

PROCEDURES present you with easy-to-follow steps with explanations.

TABLES give you important information in an easy-to-understand format.
Chapter Closing Elements

Each chapter closes with the following elements to help you study and test your knowledge of what you’ve learned:

**STUDY AND REVIEW QUESTIONS** provoke thought and help test your comprehension of each chapter’s major concepts.

**CASE STUDIES** Enhance critical thinking skills and show how to apply concepts in the real world.

**MEDIA MENUS** point out online student resources available for that chapter.

**Additional Learning Resources**

In addition to the helpful tools outlined here, you also have access to a variety of free resources at http://thepoint.lww.com/McCall5e designed to help make learning exciting and effective. These include:

- Interactive games and exercises that offer a fun way to study and review. Exercise types include Look and Label, Word Building, Body Building, Roboterms, Interactive Crossword Puzzles, Quiz Show, and Concentration.
- 23 videos and 17 animations that illustrate important procedures and concepts
- Audio flash cards, flash card generator, and audio glossary
- Fully searchable Full Text Online
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