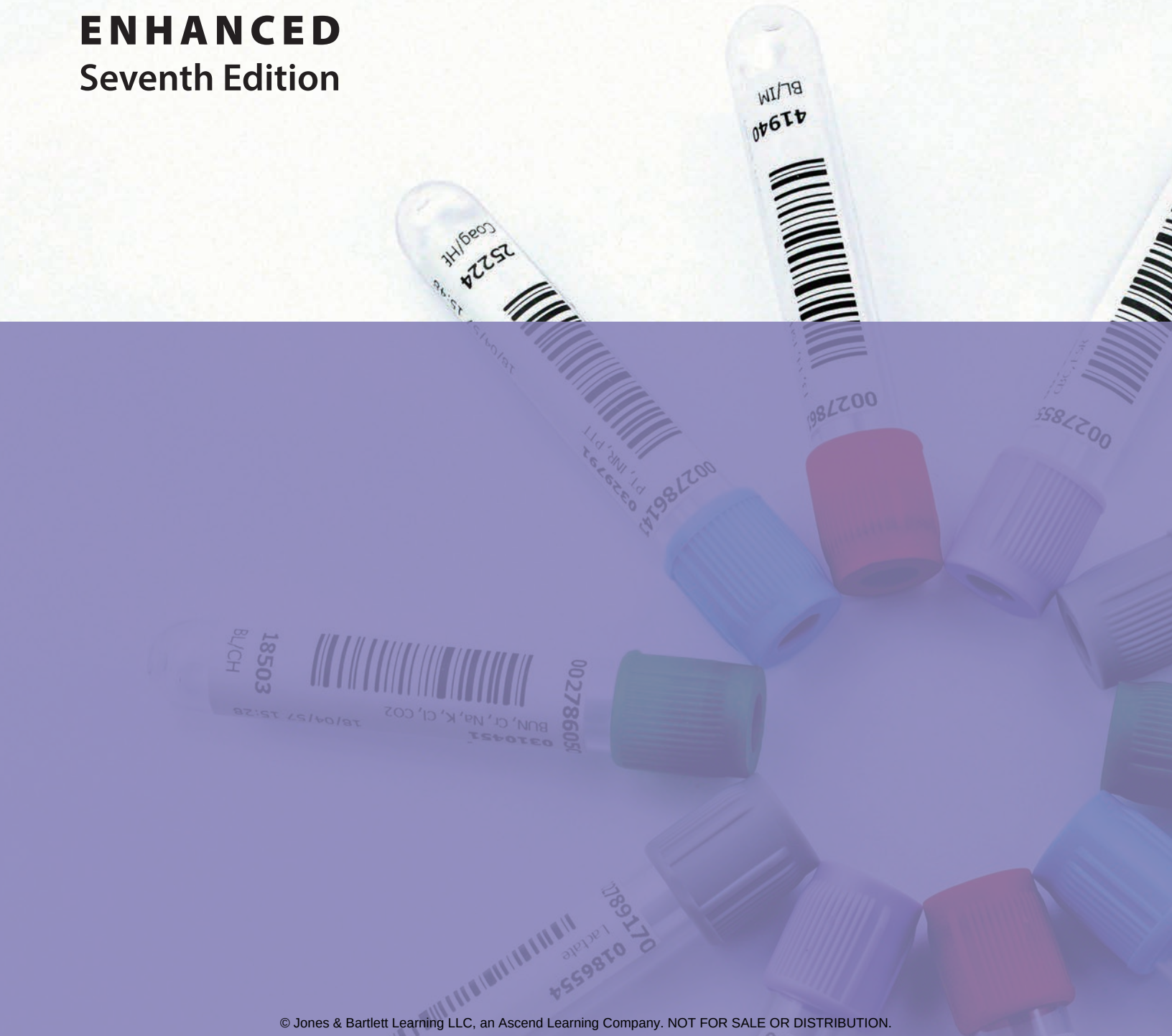
Phlebotomy Essentials

ENHANCED
Seventh Edition



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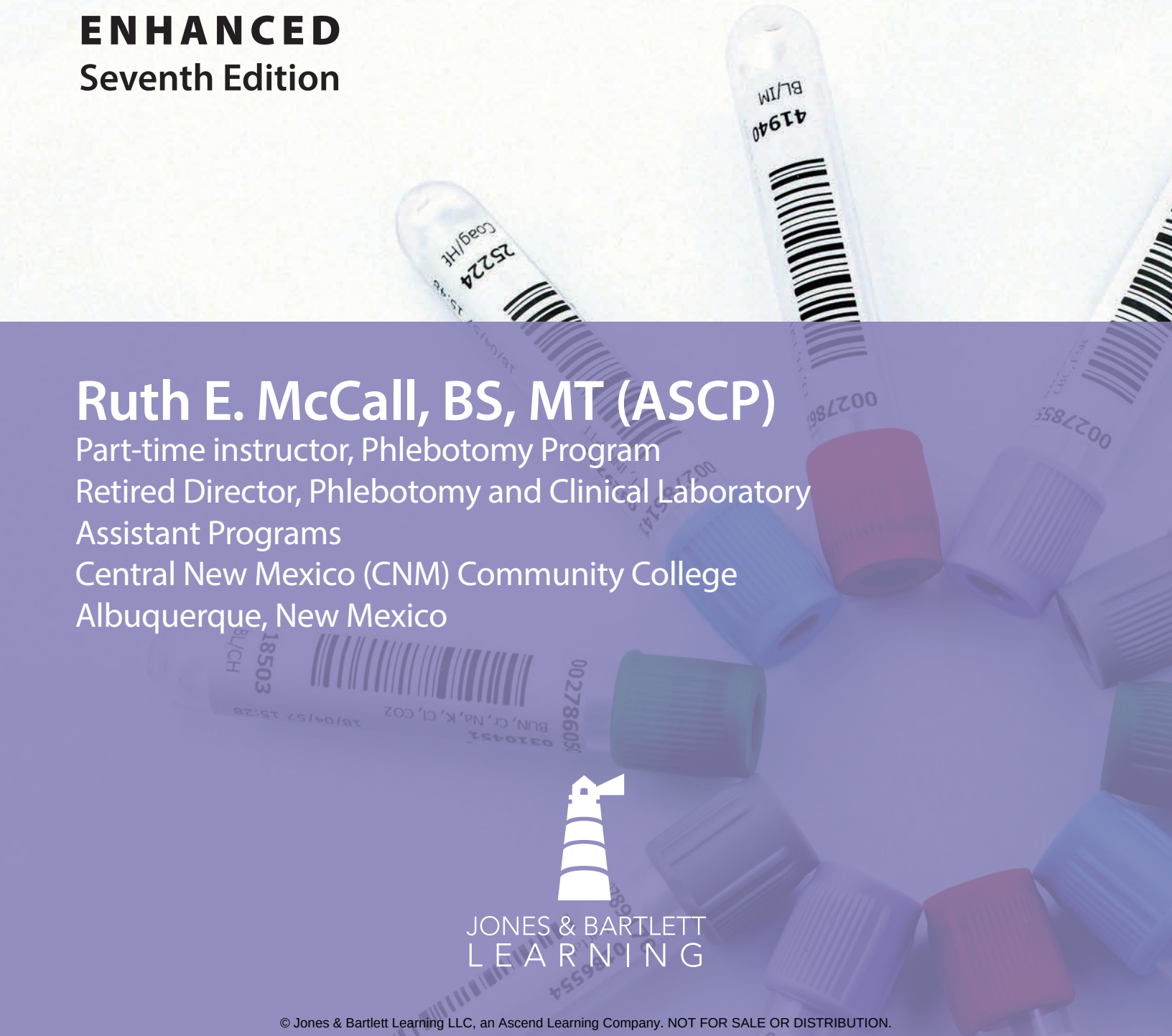

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20950-1

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Cover Design: Kristin E. Parker
Rights Specialist: Rebecca Damon
Cover Image (Title Page, Part Opener, Chapter Opener): © Janeness/Shutterstock
Printing and Binding: LSC Communications

Library of Congress Cataloging-in-Publication Data
Library of Congress Cataloging-in-Publication Data unavailable at time of printing.

LCCN: 2020934802

6048

Printed in the United States of America

24 23 22 21 20 10 9 8 7 6 5 4 3 2 1

To my amazing former coauthor Cathee Tankersley, my husband John, my sons Chris and Scott, and 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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The following reviewers provided valuable information and feedback during the updating of this edition of *Phlebotomy Essentials*. We thank all these professionals for their time, talent, and expertise.

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About the Author

Ruth McCall received her bachelor's degree from the University of Iowa and her medical technology certificate from Saint Joseph's School of Medical Technology in Phoenix, Arizona, and has worked or taught in the Clinical Laboratory Sciences and Healthcare Education ever since. She was the Director of 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 is currently a member of the Clinical and Laboratory Standards Institute (CLSI) Document Development Committee working on the seventh revision of the Capillary Puncture Standard (GP42). Ruth also had the privilege of being a member of the CLSI committee that revised the seventh edition 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 walks 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.

Preface

Phlebotomy Essentials, Enhanced Seventh Edition, was written for all who want to correctly and safely practice phlebotomy. The author has over 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, the goal of *Phlebotomy Essentials, Enhanced Seventh 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 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 described in this section. Included in this unit is an overview of the laboratory information system (LIS) including how it supports the laboratory process and is an essential part of the network of healthcare communication. Also included is information 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.

Features

The enhanced seventh edition includes various features meant 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 an 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.
- 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.
- **Cautions** highlight critical information to help students identify and avoid dangerous practices.

- **FYIs** add interesting notes and fun facts that will enhance practical application of the information.
- **Memory Joggers** offer a proven way to aid some students in remembering important information.
- New **Law and Ethics** boxes highlight potential ethical and legal dilemmas phlebotomists face.
- Additional **Study and Review Questions** at the conclusion of each chapter provide a review of content covered in the chapter.
- **Case Studies** bring concepts to life and enhance critical thinking skills at the end of each chapter.
- 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 Student Workbook for Phlebotomy Essentials* and *Phlebotomy Exam Review*, available for separate purchase, for further opportunities to enrich their learning.
- **Online icons** throughout the text refer readers to corresponding videos and animations on the book's companion website that bring the content to life (see "Additional Resources," below, for more information on these resources).

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).

Additional Resources

Phlebotomy Essentials, Enhanced Seventh Edition, includes additional resources for both instructors and students that are available on the book's companion website.

Instructors

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

- Lesson Plans
- Pre- and Post-Test Questions
- Image Bank
- Test Bank
- PowerPoint Slides with images and tables
- Signature Papers (i.e., HIPAA/confidentiality forms, bloodborne pathogen statements, assumption of risk form, health declaration form)
- Syllabus
- Procedure Evaluation Forms

Students

Students who have purchased *Phlebotomy Essentials, Enhanced Seventh Edition*, have access to the following additional resources:

- Procedure videos
- Animations of key concepts
- Flash cards
- An audio glossary

See the inside front cover of this text for more details, including the passcode you will need to gain access to the website.

Related Titles

The following two titles that correspond to *Phlebotomy Essentials, Enhanced Seventh Edition*, are available for separate purchase to create an ideal study package for phlebotomy training programs. Each corresponds to this main textbook in chapter sequence.

- Companion Workbook 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.
- Companion Exam Review book prepares students for national certification exams in phlebotomy.

Acknowledgments

The author sincerely wishes to express her gratitude to the many individuals who gave of their time, talent, and expertise to make this edition of *Phlebotomy Essentials* current and accurate.

- John Caffo
- Kathleen David
- Mark Kellogg
- Bruce Knaphus
- Monica Lewis
- Tracy McCall

- John McCall
- Michelle Neel
- Charez Norris
- Jacqueline Salas-Alcázar
- J. Eric Stanford
- Cathee Tankersley
- Jaime Tankersley
- Phil Tate
- Sharon Whetten
- Stuart Winter
- Lauren Zabicki

A special thanks to Monica Lewis and the instructors and students at CNM South Valley and West Side campuses for allowing us to photograph equipment and procedures, Cathee Tankersley and Phoenix College instructors for allowing us to use their facilities to photograph procedures, Sharon Whetten of TriCore Laboratories, our venipuncture procedure models Jacqueline Salas-Alcázar, Marcos Gaspar, and Jamie Tankersley, and our photographer Bruce Knaphus.

Finally, we would like to thank Acquisitions Editor **Jonathan Joyce**, with a special thank you to Development Editor **Staci Wolfson**, Editorial Coordinator **Emily Buccieri**, and Artist/Illustrator **Jennifer Clements** for their patience, support, and dedication to this endeavor. We also extend a special thank you to **Indu Jawwad** and the compositor team at Aptara for their patience and professionalism as they brought together the many components of the texts.

Ruth E. McCall

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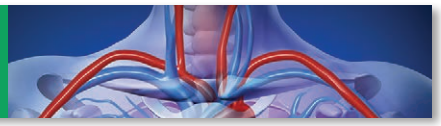

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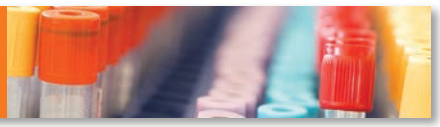

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List of Procedures

User's Guide

Connecting Learning to Practice

Phlebotomists have a critical role within the healthcare system. At Jones & Bartlett Learning, we believe your text should not only help you understand the critical tasks associated with your chosen profession, but also prepare you to step into the role of a practicing phlebotomist. This User's Guide provides a tour of the elements of Phlebotomy Essentials to help you do just that.

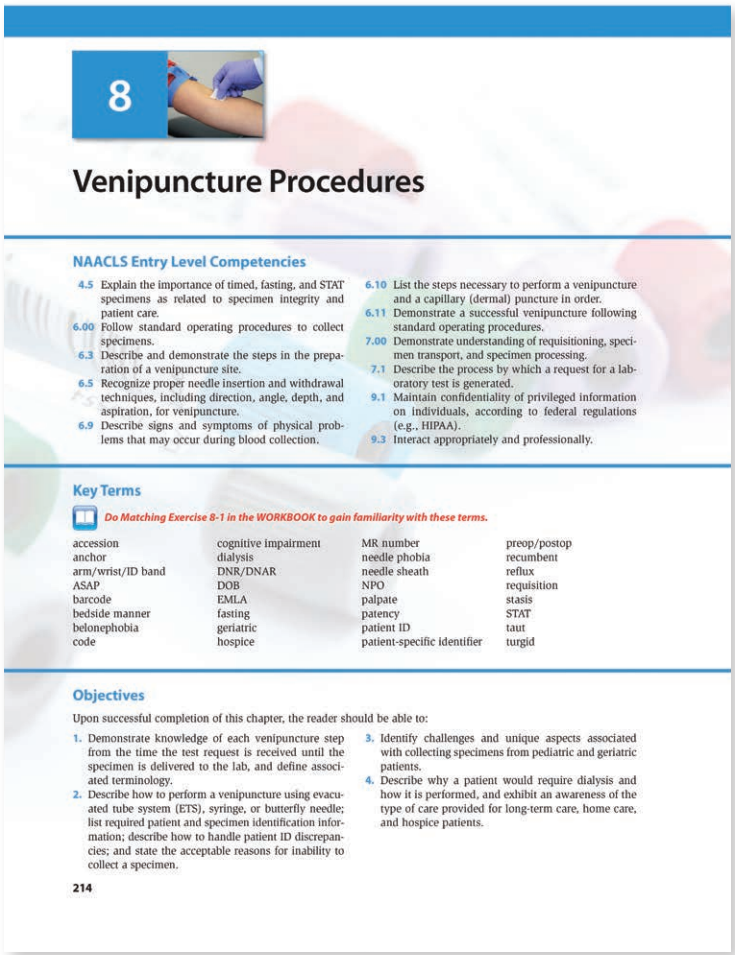
Laying the Foundation

To practice effectively, you need strong content understanding. Consistent chapter opening elements let you preview what each chapter has to offer.

NACCLS Competencies show you what you'll need to know on Day 1 of your first job.

Key Terms, listed at the beginning of each chapter and defined in the glossary, help you "talk the talk" of your profession.

Objectives provide a quick overview of the content covered within the chapter and what you're going to learn.



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Venipuncture Procedures

NAACLS Entry Level Competencies

4.5 Explain the importance of timed, fasting, and STAT specimens as related to specimen integrity and patient care.
6.00 Follow standard operating procedures to collect specimens.
6.3 Describe and demonstrate the steps in the preparation of a venipuncture site.
6.5 Recognize proper needle insertion and withdrawal techniques, including direction, angle, depth, and aspiration, for venipuncture.
6.9 Describe signs and symptoms of physical problems that may occur during blood collection.
6.10 List the steps necessary to perform a venipuncture and a capillary (dermal) puncture in order.
6.11 Demonstrate a successful venipuncture following standard operating procedures.
7.00 Demonstrate understanding of requisitioning, specimen transport, and specimen processing.
7.1 Describe the process by which a request for a laboratory test is generated.
9.1 Maintain confidentiality of privileged information on individuals, according to federal regulations (e.g., HIPAA).
9.3 Interact appropriately and professionally.

Key Terms

Do Matching Exercise 8-1 in the WORKBOOK to gain familiarity with these terms.

accession
anchor
arm/wrist/ID band
ASAP
barcode
bedside manner
belonephobia
code
cognitive impairment
dialysis
DNR/DNAR
DOB
EMLA
fasting
geriatric
hospice
MR number
needle phobia
needle sheath
NPO
palpate
patency
patient ID
patient-specific identifier
preop/postop
recumbent
reflux
requisition
stasis
STAT
taut
turgid

Objectives

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

1. Demonstrate knowledge of each venipuncture step from the time the test request is received until the specimen is delivered to the lab, and define associated terminology.
2. Describe how to perform a venipuncture using evacuated tube system (ETS), syringe, or butterfly needle; list required patient and specimen identification information; describe how to handle patient ID discrepancies; and state the acceptable reasons for inability to collect a specimen.
3. Identify challenges and unique aspects associated with collecting specimens from pediatric and geriatric patients.
4. Describe why a patient would require dialysis and how it is performed, and exhibit an awareness of the type of care provided for long-term care, home care, and hospice patients.

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Enhancing Your Learning

Did you know that free online resources can help you be more successful? Or that boxes within the text can make your studying easier? Don't overlook the tools we've built into this book to help you graduate with high marks and a high level of confidence in your abilities!

Key Points highlight important concepts to help you study and ensure you carry your knowledge into the clinical setting.

Key Point: The medical science and specialty practice concerned with all aspects of disease—including the characteristics, causes, and effects of disease on the structure and function of the body—is called pathology, and the medical professional trained

Caution Boxes provide a heads-up about potential mistakes to help you avoid them.

CAUTION: Fasting beyond 12 hours can cause serious health problems, such as electrolyte imbalance and heart rhythm disturbances. Consequently, fasting specimens, especially those requiring a 12-hour fast, should be collected promptly without unreasonable delay.

Icons throughout the text let you know where related material in the Workbook or Exam Review can help you practice putting what you've learned to work.

Test your knowledge of proper handwashing procedure with WORKBOOK Skills Drill 3-3.

Memory Joggers help you to learn and provide for easy recall of key tips and facts long after you've entered the workplace.

Memory Jogger The word root *lip* means "fat." To associate lipemic with fat, think "fat lip" or visualize a big fat white cloud, because fats make the specimen appear cloudy white.

FYI Boxes provide interesting, relevant information and add context to the materials you're learning.

FYI: The act of turning the hand so that the palm faces down is called pronation. The act of turning the palm to face upward is called supination.

New **Misconception Alerts** clarify difficult-to-learn topics based on student data from the Jones & Bartlett Learning TestPrep.

Misconception Alert: When asked the following question in the Jones & Bartlett Learning TestPrep:

Why do pregnant patients have lower reference ranges for red blood cell (RBC) counts?

26% of the students incorrectly chose "The growing fetus uses up the mother's iron reserves." The cor-

New **Law and Ethics Boxes** highlight potential ethical and legal dilemmas phlebotomists face.

Law and Ethics: Sometimes there can be signs of nerve involvement during a blood draw even though the tubes are filling with blood. When this happens, it is tempting for the phlebotomist to finish collecting the specimens. The standard of care based on CLSI venipuncture standards is to immediately terminate the venipuncture. The ethical phlebotomist must always

Study and Review Questions test how well you understand each chapter's major concepts.

Study and Review Questions

See the EXAM REVIEW for more study questions.

1. **Which of the following is the oldest and largest healthcare standards–setting body in the nation?**
   a. American Medical Association
   b. Centers for Medicare and Medicaid Services
   c. College of American Pathologists
   d. The Joint Commission

2. **The CLIA federal regulations are administered by**
   a. CAP.
   b. CLSI.
   c. CMS.
   d. CoW.

7. **Informed consent means that a**
   a. nurse has the right to perform a procedure on a patient even if the patient refuses.
   b. patient agrees to a procedure after being told of the consequences associated with it.
   c. patient has the right to look at all his or her medical records and test results.
   d. phlebotomist tells the patient why the test is ordered and the meaning of the results.

8. **A national organization that develops guidelines and sets standards for laboratory procedures is the**
   a. CAP.
   b. CLIAC.
   c. CLSI.
   d. NAACLS.

Media Menus recap and highlight all of the resources available for each chapter.

MEDIA MENU

Online Ancillaries

- Animations and videos
- Animations:
  - Gas Exchange in Alveoli
  - Oxygen Transport
- Flashcards
- Audio Glossary

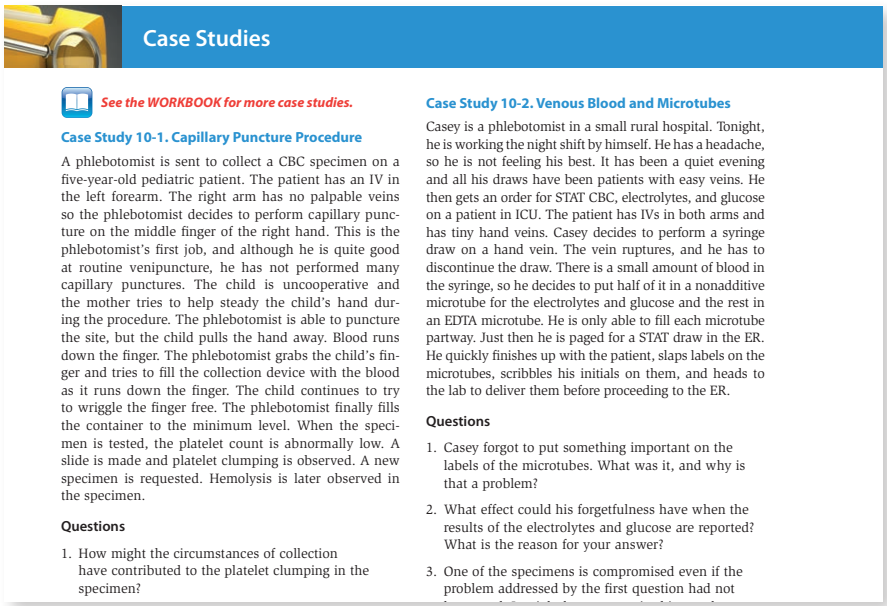
Internet Resources

- Anatomy Arcade. www.anatomyarcade.com
- GetBodySmart.com. http://www.getbodysmart.com/ap/site/resourcelinks/links.html
- free-ed.net™, free education on the Internet. https://waybuilder.net/free-ed
- Human Anatomy online. http://ect.downstate.edu/courseware/haonline/index.htm
- National Institute of Diabetes and Digestive and Kidney Diseases. http://www.niddk.nih.gov

Stepping into Success

Do you feel like you learn better when you understand not only the what, but also the why of what you're learning? We think you do. *Phlebotomy Essentials* provides many opportunities for you to step into the shoes of practicing phlebotomists and understand what wearing those shoes feels like!

Case Studies help you see exactly how the concept you're learning might present itself in the real world. You'll start to think like you're already in practice so you're fully ready for the workforce when you graduate.



Case Studies

See the WORKBOOK for more case studies.

Case Study 10-1. Capillary Puncture Procedure

A phlebotomist is sent to collect a CBC specimen on a five-year-old pediatric patient. The patient has an IV in the left forearm. The right arm has no palpable veins so the phlebotomist decides to perform capillary puncture on the middle finger of the right hand. This is the phlebotomist's first job, and although he is quite good at routine venipuncture, he has not performed many capillary punctures. The child is uncooperative and the mother tries to help steady the child's hand during the procedure. The phlebotomist is able to puncture the site, but the child pulls the hand away. Blood runs down the finger. The phlebotomist grabs the child's finger and tries to fill the collection device with the blood as it runs down the finger. The child continues to try to wriggle the finger free. The phlebotomist finally fills the container to the minimum level. When the specimen is tested, the platelet count is abnormally low. A slide is made and platelet clumping is observed. A new specimen is requested. Hemolysis is later observed in the specimen.

Questions

1. How might the circumstances of collection have contributed to the platelet clumping in the specimen?

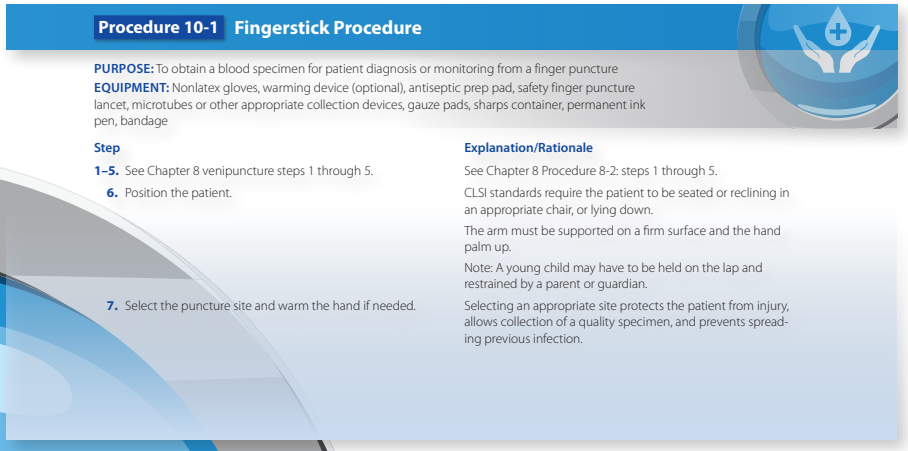
Case Study 10-2. Venous Blood and Microtubes

Casey is a phlebotomist in a small rural hospital. Tonight, he is working the night shift by himself. He has a headache, so he is not feeling his best. It has been a quiet evening and all his draws have been patients with easy veins. He then gets an order for STAT CBC, electrolytes, and glucose on a patient in ICU. The patient has IVs in both arms and has tiny hand veins. Casey decides to perform a syringe draw on a hand vein. The vein ruptures, and he has to discontinue the draw. There is a small amount of blood in the syringe, so he decides to put half of it in a nonadditive microtube for the electrolytes and glucose and the rest in an EDTA microtube. He is only able to fill each microtube partway. Just then he is paged for a STAT draw in the ER. He quickly finishes up with the patient, slaps labels on the microtubes, scribbles his initials on them, and heads to the lab to deliver them before proceeding to the ER.

Questions

1. Casey forgot to put something important on the labels of the microtubes. What was it, and why is that a problem?
2. What effect could his forgetfulness have when the results of the electrolytes and glucose are reported? What is the reason for your answer?
3. One of the specimens is compromised even if the problem addressed by the first question had not

Practicing phlebotomy means successfully performing a variety of **procedures**. Our visual, step-by-step instructions can help you get ready to do just that!



Procedure 10-1 Fingerstick Procedure

PURPOSE: To obtain a blood specimen for patient diagnosis or monitoring from a finger puncture

EQUIPMENT: Nonlatex gloves, warming device (optional), antiseptic prep pad, safety finger puncture lancet, microtubes or other appropriate collection devices, gauze pads, sharps container, permanent ink pen, bandage

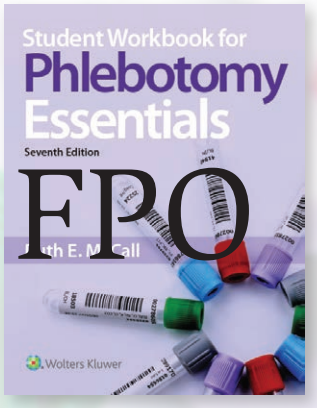
Step	Explanation/Rationale
1–5. See Chapter 8 venipuncture steps 1 through 5.	See Chapter 8 Procedure 8-2: steps 1 through 5.
6. Position the patient.	CLSI standards require the patient to be seated or reclining in an appropriate chair, or lying down. The arm must be supported on a firm surface and the hand palm up. Note: A young child may have to be held on the lap and restrained by a parent or guardian.
7. Select the puncture site and warm the hand if needed.	Selecting an appropriate site protects the patient from injury, allows collection of a quality specimen, and prevents spreading previous infection.

Strengthening Your Learning

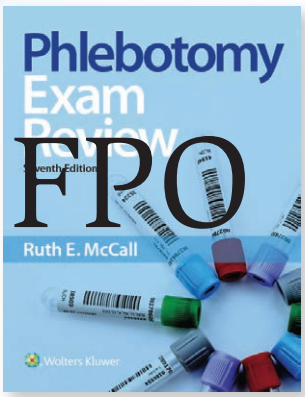
Ever feel like you're struggling to keep up in class? Make sure you're taking advantage of all of the tools available to help you own your success!

Student Workbook for Phlebotomy Essentials provides new tools and resources to help you supplement your text and build on your learning. Activities include:

- **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.

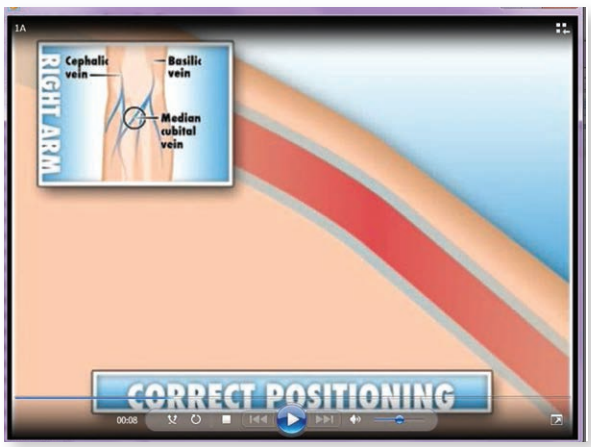


Want to sit for certification? Do you know that, on average, certified phlebotomists earn more money than those who opt not to obtain certification? If you're considering certification, then consider *Phlebotomy Exam Review*, which can help you prepare for several national exams.



Phlebotomy Essentials, Enhanced Seventh Edition includes additional resources for both instructors and students that are available on the book's online site. Instructors can also request access to the instructor resources from their Jones & Bartlett Learning Account Representative. These resources include:

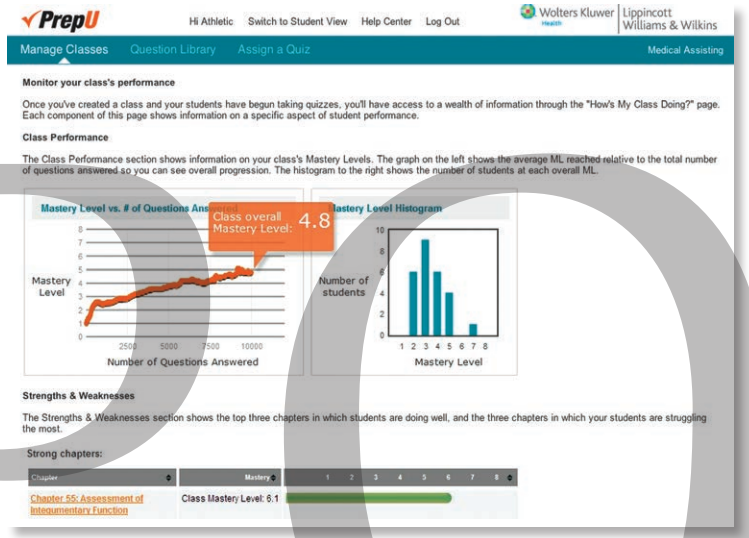
- Videos and animations that illustrate important procedures and concepts
- Study tools, like crossword puzzles and an audio glossary, that can help you check your learning



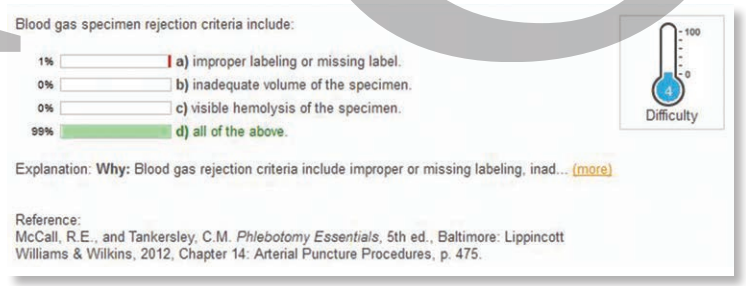
Get Your Customized Success Play

Ever had a study plan that was completely customized for you? Now you can have one by purchasing PrepU for *Phlebotomy Essentials Exam Review*. PrepU is an adaptive quizzing engine that is simple to use and extraordinary in what it can do to help you learn!

- **Personalized Quiz Builder:** TestPrep uses data gathered from student performance to create personalized quizzes that focus on exactly what each student needs to understand! After each quiz, PrepU adapts to continue helping students progress on their next quiz!
- **Personalized Reports:** PrepU gives students feedback about their performance—broken down by topics so students know exactly where to focus their study efforts.



- **Quick and Meaningful Remediation:** PrepU offers an Answer Key for each completed quiz including rationales for each answer with specific textbook pages to help students quickly remediate.



Take a look at these solutions at thePoint.lww.com/McCall7e.