EMERGENCY CARE

13th Edition

Daniel Limmer
Michael F. O'Keefe
Medical Editor: Edward T. Dickinson, MD, FACEP

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NOTICE ON CARE PROCEDURES

It is the intent of the authors and publisher that this text be used as part of a formal Emergency Medical Technician (EMT) education program taught by qualified instructors and supervised by a licensed physician. The procedures described in this textbook are based on consultation with EMT and medical authorities. The authors and publisher have taken care to make certain that these procedures reflect currently accepted clinical practice; however, they cannot be considered absolute recommendations.

The material in this text contains the most current information available at the time of publication. However, federal, state, and local guidelines concerning clinical practices, including (without limitation) those governing infection control and universal precautions, change rapidly. The reader should note, therefore, that the new regulations may require changes in some procedures.

It is the reader's responsibility to familiarize himself or herself with the policies and procedures set by federal, state, and local agencies as well as the institution or agency where the reader is employed. The authors and the publisher of this text and the supplements written to accompany it disclaim any liability, loss, or risk resulting directly or indirectly from the suggested procedures and theory, from any undetected errors, or from the reader's misunderstanding of the text. It is the reader's responsibility to stay informed of any new changes or recommendations made by any federal, state, or local agency as well as by his or her employing institution or agency.

NOTICE ON GENDER USAGE

The English language has historically given preference to the male gender. Among many words, the pronouns *he* and *his* are commonly used to describe both genders. Society evolves faster than language, and the male pronouns still predominate in our speech. The authors have made great effort to treat the two genders equally, recognizing that a significant percentage of EMTs are women. However, in some instances, male pronouns may be used to describe both males and females solely for the purpose of brevity. This is not intended to offend any women readers.

NOTICE REGARDING "STREET SCENES" AND "SCENARIOS"

The names used and situations depicted in the Street Scenes and Scenarios throughout this text are fictitious.

NOTICE ON MEDICATIONS

The authors and the publisher of this text have taken care to make certain that the equipment, doses of drugs, and schedules of treatment are correct and compatible with the standards generally accepted at the time of publication. Nevertheless, as new information becomes available, changes in treatment and in the use of equipment and drugs become necessary. The reader is advised to carefully consult the instruction and information material included in the page insert of each drug or therapeutic agent, piece of equipment, or device before administration. This advice is especially important when using new or infrequently used drugs. Prehospital care providers are warned that use of any drugs or techniques must be authorized by their Medical Director, in accordance with local laws and regulations. The publisher disclaims any liability, loss, injury, or damage incurred as a consequence, directly or indirectly, of the use and application of any of the contents of this text.

Library of Congress Cataloging-in-Publication Data
Limmer, Daniel, author.
Emergency care. — 13th ed. / Daniel Limmer, Michael F. O'Keefe; medical editor, Edward T. Dickinson; legacy authors, Harvey D. Grant, Robert H. Murray, Jr., J. David Bergeron.
p. ; cm.
Includes index.
ISBN-13: 978-0-13-402455-4
ISBN-10: 0-13-402455-9
I. Limmer, Daniel. II. O'Keefe, Michael F., author. III. Dickinson, Edward T., editor. IV. Title.
[DNLM: 1. Emergency Medical Services—methods. 2. Emergencies. 3. Emergency Medical Technicians. 4. Emergency Treatment—methods. WX 215]
RC86.7
616.02′5—dc23

2014043533

10 9 8 7 6 5 4 3 2 1

PEARSON

ISBN-10 0-13-402455-9
ISBN-13 978-0-13-402455-4

Textbooks are not simply about authors. The 6th edition of *Emergency Care* brought together an editorial team that changed the rules for EMS publishing. Coming in during a time of author—and industry—transition, three women taught us about publishing, vision, quality, and unyielding dedication to process and product.

We dedicate this 13th Edition of *Emergency Care* to Lois Berlowitz, Sandy Breuer, and Michal Heron.

You set a bar that we consider a gold standard to this day. Everything that is done is set upon the foundation you built. We are forever grateful.

D.L.

M.O'K.

E.T.D.

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Brief CONTENTS

Detailed CONTENTS

SECTION 1 Foundations 1

SECTION 2

Airway Management, Respiration, and Artificial Ventilation 189

SECTION 3

Patient Assessment 260

SECTION 6

Special Populations 881

Photo SCANS

Visual GUIDES

Letter to **STUDENTS**

BRADY

Dear Student:

You are beginning your EMT education at a pivotal time in EMS. The course you are taking is based on EMS Education Standards that will govern the way you will learn and practice EMS. This course contains more science knowledge than previous courses and expects you, the EMT, to practice at a level of knowledge, skills, and clinical thinking unlike ever before in EMS.

We believe our book, *Emergency Care*, will provide you with the best possible resources to take you through class and into the field. The hallmark of this text—over generations of EMTs—has been a combination of readability, practicality, and the information you need to know to pass your exam.

This edition has many features to help you learn. We are particularly proud of the way we integrated scientific principles in an easy-to-understand manner. No other text out there helps you to think like an EMT more than *Emergency Care*. You will find multiple critical thinking and decision-based features throughout this text to help you integrate the need-to-know material of the classroom with the reality of being an EMT on the street.

Your author team has been working together on *Emergency Care* for seven consecutive editions and more than twenty years. With more than 120 combined years of experience in EMS, firefighting, law enforcement, and education, we still practice EMS and emergency medicine to ensure the book you will use is as current and practical as possible.

We are proud of our book and pleased you will use it in your studies to become an EMT. Our email addresses are in the book. If we may ever be of service to answer a question about EMS or anything in this text, please contact us.

Our best wishes go out to you for a wonderful course and for safe, rewarding experiences on the street

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PREFACE

EMERGENCY CARE has set the standard for EMT training for more than thirty years. We strive to stay current with new research and developments in EMS, and this new edition is no exception. The text meets the current American Heart Association guidelines for CPR and ECC to prepare your students for testing and practice today and beyond.

The foundation of *Emergency Care* is the National EMS Education Standards. While using the Standards as our base, *Emergency Care*, thirteenth edition, has been written to go beyond the Standards to provide the most current reflection of EMS practice and show readers what EMS systems and EMTs are actually doing around the country today. The caveat "follow local protocols," of course, appears frequently—whenever the equipment or practice described has been adopted in some but not all systems.

In addition, the text was developed taking into account the years of experience that the authors, with the input of countless instructors and students, have had with EMS curricula and practice. The result is a proven text with outstanding readability and a level of detail that instructors have found more appropriate for their classrooms than any other.

The content of the thirteenth edition is summarized in the following text, with emphasis on "what's new" in each section of this edition.

SECTION 1 FOUNDATIONS: CHAPTERS 1–8

The first section sets a framework for all the sections that follow by introducing some essential concepts, information, and skills. The section introduces the EMS system and the EMT's role within the system. The section then covers issues of EMT safety and well-being, including safe techniques of lifting and moving patients. Legal and ethical issues are then discussed. Basic medical terminology, anatomy, physiology, pathophysiology, and life span development round out this first section.

What's New in the Foundations Section?

- In Chapter 1, "Introduction to Emergency Medical Care," we've expanded the section on the **role of research in EMS** (including its influence on the development of **evidence-based practices**).
- In Chapter 2, "The Well-Being of the EMT," there is a expanded information on **safe glove removal**, and the information on the **Ryan White HIV/AIDS CARE Act** is updated to include the Ryan White Extension Act of 2009. Expanded information about **PTSD** (post-traumatic stress disorder) is also included.
- Chapter 4, "Medical/Legal and Ethical Issues," now discusses **POLST** (physician orders for life-sustaining treatment) in addition to the discussion of DNR orders, and there is added information about the **HIPAA Privacy Rule**.
- Chapter 5, "Medical Terminology," and Chapter 6, "Anatomy and Physiology," **are now separate chapters** (they were a single chapter in the prior edition) allowing for greater focus on these concepts.

SECTION 2 AIRWAY MANAGEMENT, RESPIRATION, AND ARTIFICIAL VENTILATION: CHAPTERS 9–10

There are only two chapters in Section 2, but it may be the most important section in the text because no patient will survive without an adequate airway, adequate respiration, and adequate ventilation.

The chapters in this section and throughout the text have been updated to conform to the *2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.*

What's New in the Airway Management, Respiration, and Artificial Ventilation Section?

- Chapter 10, "Respiration and Artificial Ventilation," has added information on the **selective use of oxygen for patients with chest pain with inclusion** of the American Heart Association and International Liaison Committee on Resuscitation recommendations on this topic. There is an added section on the **use of oxygen saturation information in recognizing respiratory distress and failure.**

SECTION 3 PATIENT ASSESSMENT: CHAPTERS 11–15

Key elements of the EMT's job are the ability to perform a thorough and accurate assessment, treat for life-threatening conditions, and initiate transport to the hospital within optimum time limits. This section explains and illustrates all of the assessment steps and their application to different types of trauma and medical patients. In addition, it focuses on the skills of measuring vital signs, using monitoring devices, taking a patient history, communicating, and documenting.

What's New in the Patient Assessment Section?

- In Chapter 11, "Scene Size-Up," there is a new emphasis that severe mechanism of injury (MOI) no longer means automatically immobilizing the spine. (The student is referred to Chapter 29, "Trauma to the Head, Neck, and Spine," for detailed discussion of this issue.) There is a new emphasis on the use of **ANSI-approved reflective vests** at emergency scenes.
- Chapter 12, "The Primary Assessment," includes updated information on the **selective use of oxygenation** and on **spinal immobilization decisions.** (As in Chapter 11, the student is referred to Chapter 29, "Trauma to the Head, Neck, and Spine," for details on this topic.)
- Chapter 13, "Vital Signs and Monitoring Devices," has new information in **implanted ventricular assist devices** (if the patient has one, you won't feel a pulse) and, as in chapters 11 and 12, updated information on **spinal immobilization decisions**.
- Chapter 14, "Secondary Assessment," is **a new chapter** created primarily by combining, resequencing, and updating the prior edition's chapters on **medical patient assessment, trauma patient assessment, reassessment,** and **critical thinking/decision making.** There are many new photos throughout the chapter.

  The mnemonic DCAP-BTLS is no longer used, replaced with a simpler list of what to look for during the physical exam: **wounds**, **tenderness**, **and deformities**. The **field triage criteria** (for significant mechanisms of injury warranting transport to a trauma center) have been updated in accordance with current Centers for Disease Control (CDC) guidelines.
- Chapter 15, "Communication and Documentation," has updated photos and text about **ambulance-mounted radios, tablets with PCR software, pen-based computers,** and **electronic PCR formats.**

SECTION 4 MEDICAL EMERGENCIES: CHAPTERS 16–24

The Medical Emergencies section begins with a chapter on pharmacology that introduces the medications the EMT can administer or assist with under the 1994 curriculum. The section continues with chapters on respiratory, cardiac, diabetic/altered mental status (including seizure and stroke), allergic, poisoning/overdose, abdominal, behavioral/psychiatric, and hematologic/renal emergencies.

What's New in the Medical Emergencies Section?

- Chapter 16, "General Pharmacology," has added **naloxone** as a drug for reversing narcotic overdose, the **intranasal route** of drug administration (for naloxone), and the **Auvi-Q talking epinephrine injector**.
- Chapter 18, "Cardiac Emergencies," now includes information on a **new approach to oxygen administration for ACS** (acute cardiac syndrome), **high-performance CPR (including a new photo scan), therapeutic hypothermia, titration of oxygen post arrest, the Lucas automatic CPR device,** and **ventricular assist devices.**
- Chapter 19, "Diabetic Emergencies and Altered Mental Status," expands the discussion of **primary assessment of a patient with altered mental status** and new information on **intranasal glucagon, sepsis as a dangerous cause of altered mental status,** and **cardiovascular causes of dizziness/syncope** as well as an expanded discussion of **care for stroke.**
- Chapter 20, "Allergic Reaction," now presents information about the **Auvi-Q talking epinephrine injector** and an emphasis that **while anaphylaxis requires oxygen, mild allergic reactions do not.**
- Chapter 21, "Poisoning and Overdose Emergencies," now includes a section on **naloxone** as a drug that EMTs will be able to carry and administer to reverse narcotic overdose and introduces new information about **"detergent suicides," "bath salts,"** and **"designer drugs."**
- Chapter 22, "Abdominal Emergencies," now includes the **Wong-Baker pain scale.**
- Chapter 23, "Behavioral and Psychiatric Emergencies and Suicide," offers **updated mental illness statistics**, a new section on **Acute Psychosis,** a greater emphasis on **scene safety,** on **faceup restraint**, and on **the patient who remains agitated although in restraint.**
- Chapter 24, "Hematologic and Renal Emergencies," has expanded information throughout, including new information on **blood clotting** and patients with **urinary catheters**.

SECTION 5 TRAUMA: CHAPTERS 25–31

The Trauma section begins with a chapter on bleeding and shock and continues with chapters on soft-tissue trauma; chest and abdominal trauma; musculoskeletal trauma;

trauma to the head, neck, and spine; multisystem trauma; and environmental emergencies.

What's New in the Trauma Section?

- In Chapter 25, "Bleeding and Shock," an important addition is information on **septic shock** and **"sepsis alerts."** The **2014 American College of Surgeons Evidence-Based Prehospital External Hemorrhage Control Protocol** is discussed and illustrated. No longer included **are the use of PASG** and **the concept of irreversible shock.**
- Chapter 26, "Soft-Tissue Trauma," now discusses **not immobilizing a patient with penetrating trauma to the torso unless there is a neurologic deficit** (may harm ability to breathe). There is expanded information on **blast injuries**, use of a **tourniquet** as needed, and **burns or potential burns to the airway.** There are new sections on **bite wounds** and **radiological burns.**
- In Chapter 27, "Chest and Abdominal Trauma," the use of **PASG is** no longer recommended**.**
- In Chapter 28, "Musculoskeletal Trauma," the use of **PASG is** no longer recommended**.** There is a de-emphasis **on treatment for shock in patients with non-life-threatening injuries**.
- In Chapter 29, "Trauma to the Head, Neck, and Spine," there is increased emphasis on **traumatic brain injury.** The discussion on **spinal injury** is expanded, and the **NEXUS algorithm for identifying potential spinal injury** is introduced. New to the chapter are information on **methods of spinal motion restriction** and a **new photo scan on "The Ambulatory Self-Extricated Patient."**
- Chapter 30, "Multisystem Trauma," includes **updated CDC trauma triage guidelines** for physiologic criteria, anatomic criteria, mechanism of injury criteria, and special patient or system considerations.

SECTION 6 SPECIAL POPULATIONS: CHAPTERS 32–35

Special populations discussed in this section include those with emergencies related to the female reproductive system, pregnancy, or childbirth; pediatric patients; geriatric patients; patients with certain disabilities; and those who rely on advanced medical devices at home. The chapters in this section emphasize how to serve all of these patients by applying the basics of patient assessment and care that the student has already learned.

What's New in the Special Populations Section?

- Chapter 32, "Obstetric and Gynecologic Emergencies," includes new information on **when to cut or not to cut the umbilical cord.** There is a new section on **how to conduct CPR on a pregnant patient.**
- Chapter 34, "Geriatric Emergencies," includes **updated statistics on the number of patients older than sixty-five and the few who live in nursing homes** as well as a discussion of **how illness or injury in an elderly patient affects relationships**.

SECTION 7 OPERATIONS: CHAPTERS 36–39

This section deals with nonmedical operations and special situations, including EMS operations, hazardous materials, multiple-casualty incidents and incident management, highway safety, vehicle extrication, and the EMS response to terrorism.

What's New in the Operations Section?

- Chapter 36, "EMS Operations," has added information on the use of **GPS maps** for **navigating** and for **locating an air rescue.** A new section discusses use and maintenance of an **ambulance back-up camera**.
- Chapter 38, "Highway Safety and Vehicle Extrication," includes a new emphasis on and illustrations of **ANSI-approved safety vests and helmets** as well as information on understanding that **the time it takes for air bags to deactivate differs in different vehicles**.
- Chapter 39, "EMS Response to Terrorism," has been **thoroughly updated and revised by** the specially qualified contributing writer **Eric Powell, PhD, FF/NRP, Visiting Professor, Homeland Defense and Security Issues Group, Center for Strategic Leadership and Development, United States Army War College, Carlisle Barracks, Pennsylvania**.

APPENDIXES AND REFERENCES

Appendixes in this edition include a practice examination and a basic cardiac life support review. References include an article on medical terms, anatomy and physiology illustrations, the answer key, glossary, and index. All have been reviewed and updated as necessary.

OUR GOAL: IMPROVING FUTURE TRAINING AND EDUCATION

Some of the best ideas for better training and education methods come from instructors who can tell us what areas of study caused their students the most trouble. Other sound ideas come from practicing EMTs who let us know what problems they faced in the field. We welcome any of your suggestions. If you are an EMS instructor who has an idea on how to improve this book or EMT training in general, please write to us at:

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Becoming an EMT requires study in a number of content areas ranging from airway to medical and trauma emergencies to pediatrics and rescue. To ensure that each area is covered accurately and in the most up-to-date manner, we have enlisted the help of several expert contributors. We are grateful for the time and energy each has put into his or her contribution.

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We would also like to acknowledge Dean R. Kelble, Jr., EMT-P, for the information he provided on autism from his article "The ABCs of Autism."

Reviewers

We wish to thank the following reviewers for providing invaluable feedback and suggestions in preparation of the 13th edition of *Emergency Care*.

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We wish to thanks the following organizations for their assistance in creating the photo program for this edition:

Cypress Creek EMS, Spring, TX
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Cypress Creek Volunteer Fire Department, Cypress, TX
Chief Richard Lieder

Grahamsville EMS Squad, Grahamsville, NY
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Klein Fire Department, Klein, TX
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All photographs not credited adjacent to the photograph were photographed on assignment for Brady Prentice Hall Pearson Education.

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Thanks to the following for valuable assistance directing the medical accuracy of the shoots and coordinating models, props, and locations for our photo shoots:

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Clayton Harrison, Field EMT, Cypress Creek EMS

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Wren Nealy, Special Operations Manager, Cypress Creek EMS Bike Medic Response Team

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Thanks to the following people who portrayed patients and EMS providers in our photographs:

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Karen Butler
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Thomas Calloway
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Began EMS in 1978. Became an EMT in 1980 and a Paramedic in 1981.

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Enjoys especially teaching patient assessment and believes critical thinking and decision-making skills are the key to successful clinical practice of EMS.

Works part time as a freelance photojournalist and is working on a documentary project photographing EMS people and agencies throughout the United States.

In addition to his EMS experience, was a dispatcher and police officer in upstate New York.

Lives in Maine with his wife, Stephanie, and daughters Sarah and Margo.

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MICHAEL F. O'KEEFE AUTHOR

EMT Provider Level Leader for National EMS Education Standards.

Expert writer for 1994 revision of EMT-Basic curriculum.

EMS volunteer since college in 1976.

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Past chairperson of the National Council of State EMS Training Coordinators.

Interests include science fiction, travel, foreign languages, and stained glass.

EDWARD T. DICKINSON MEDICAL EDITOR

In 1985 was the first volunteer firefighter to receive the top award from *Firehouse Magazine* for heroism for the rescue of two elderly women trapped in a house fire.

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First certified as an EMT in 1979 in upstate New York.

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Has served as medical editor for numerous Brady EMT and First Responder texts.

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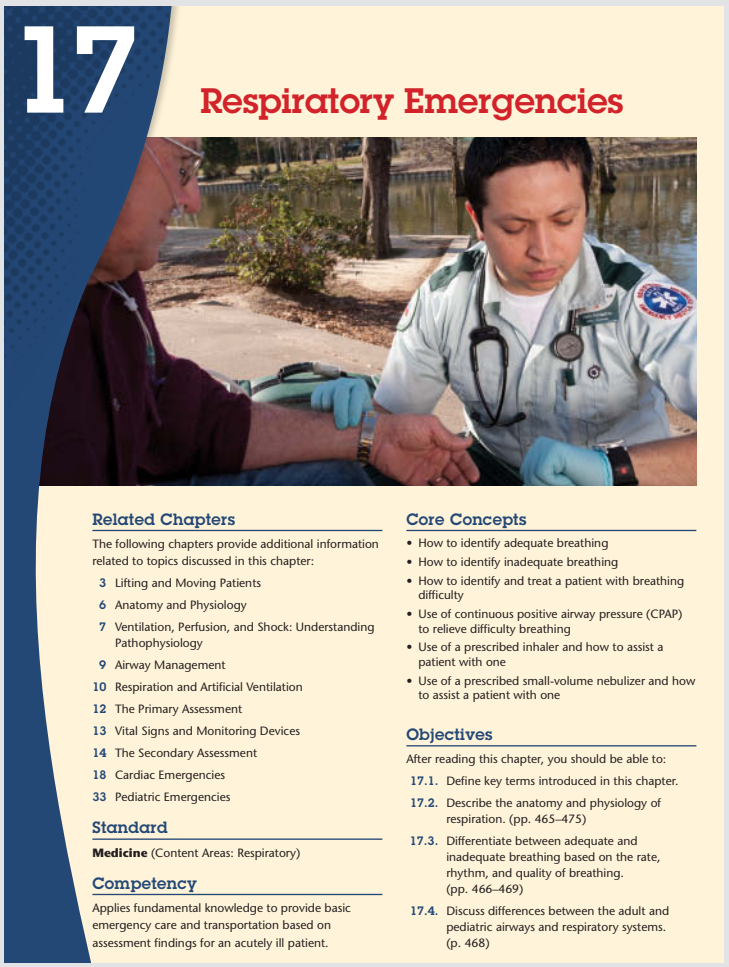
A Guide to Key FEATURES



CORE CONCEPTS

Highlights the key points addressed in each chapter. The topics not only help students anticipate chapter content, but also guide their studies through the textbook and supplements.

Core Concepts

- How to identify adequate breathing
- How to identify inadequate breathing
- How to identify and treat a patient with breathing difficulty
- Use of continuous positive airway pressure (CPAP) to relieve difficulty breathing
- Use of a prescribed inhaler and how to assist a patient with one
- Use of a prescribed small-volume nebulizer and how to assist a patient with one

OBJECTIVES

Objectives form the basis of each chapter and were developed around the Education Standards and Instructional Guidelines.

Objectives

After reading this chapter, you should be able to:

3.1 Define key terms introduced in this chapter.

3.2 Describe the factors that you must consider before lifting any patient. (pp. 56–58)

3.3 Use principles of proper body mechanics when lifting and moving patients and other heavy objects. (pp. 56–58)

3.4 Demonstrate the power lift and power grip when lifting a patient-carrying device. (pp. 57–58)

3.5 Follow principles of good body mechanics when reaching, pushing, and pulling. (pp. 57–58)

3.6 Give examples of situations that require emergency, urgent, and non-urgent patient moves. (pp. 58–63)

INSIDE/OUTSIDE

Calls out relevant pathophysiology for a condition or series of conditions. Helps students understand disease presentation and treatment.

Inside Outside

RECOGNIZING SYMPATHETIC NERVOUS SYSTEM RESPONSE

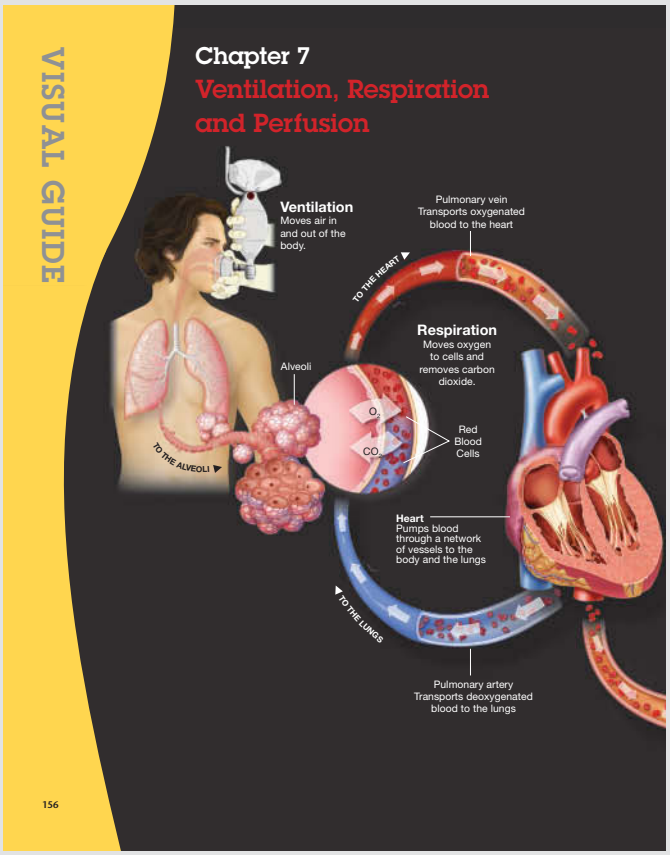
Recognizing a sympathetic nervous system response can be an important part of a patient assessment. Often a patient's sympathetic nervous system will be engaged as the result of injury or illness, and recognizing its signs can help alert you to a problem even when the immediate cause is unknown. Let's use the example of a sixty-two-year-old male having an acute myocardial infarction:

Inside

In this patient something very wrong is happening. A coronary artery is blocked, and his heart is not getting the oxygen supply it desperately needs. In most people this will cause chest pain, but in this case the patient is diabetic and, for an unknown reason, no chest pain is present. He does, however, feel weak and nauseated. Despite his obscure symptoms, his body is reacting. His brain engages the sympathetic nervous system to respond to the challenge. His heart beats a bit faster, he breathes a bit quicker. His blood vessels constrict and divert blood away from the skin.

Outside

Although he is presenting atypically, that is, in an unusual fashion, your assessment reveals a few red flags. You notice he is pale and sweaty (a result of constricted blood vessels). You also observe the elevated heart rate and respiratory rate. By noticing these signs, you recognize a "sympathetic discharge" and know that the body is responding to a serious problem. *This may be more than an upset stomach.*



VISUAL GUIDES

Visually presents patient assessment in a series of flow charts.

DECISION POINTS

Found within the patient assessment/patient care feature in the book, these call out key decisions that are made during assessment and care of a patient.

Decision Points

- Does my patient have signs of life? Should I go immediately to compressions, or should I take the A-B-C approach?
- Do I have a defibrillator immediately available? How will I integrate defibrillation?

CRITICAL DECISION MAKING

A scenario-based feature that offers practice in making critical decisions.

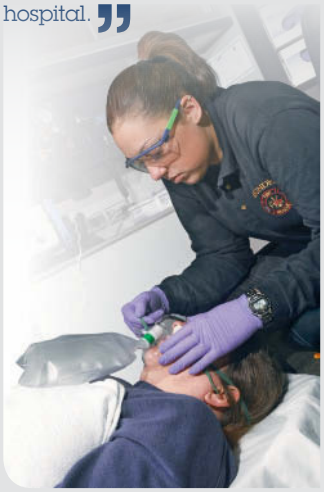
Critical Decision Making

Determining Priority

At the end of the primary assessment, you will make a priority determination. This determination is a key decision that will affect the rest of your assessment and care. Patients deemed a high priority will receive a streamlined assessment process leading to prompt transport. Patients who are not a high priority will receive their assessment and care at a slower (although not slow) pace. Determine whether each patient described here should be classified as a high or low priority at the end of the primary assessment.

1. A responsive patient who is sitting up and having difficulty breathing
2. A man who passed out at a wedding and is still unresponsive
3. A responsive child who got his foot caught in bike spokes and may have broken the foot
4. A responsive patient who describes severe pain in his abdomen
5. A patient who only moans (doesn't respond with words or actions) and appears to have ingested alcohol

"Never let your guard down. Assess, reassess, and then assess again. You aren't done until you get to the hospital."



VOICES

Insights or facts from EMTs in the field.

POINT OF VIEW

Tells stories of EMS care from the patient's perspective and includes photos that illustrate the patient's viewpoint.

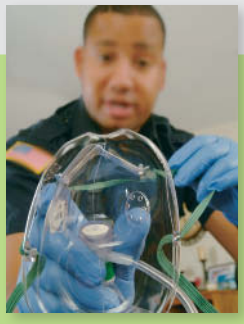
POINT of VIEW

"I couldn't breathe. I mean, I really couldn't breathe. I felt like I couldn't get air in and out, and I was pretty sure I was going to die.

"I tell you this because I feel bad about how I yelled at the EMT. I can't remember everything, but I seem to remember being downright nasty. You see, I have asthma but have never had an attack like that before.

"My husband called the EMTs, and they came to the house pretty quickly. But my breathing was getting worse and worse and, well, like I said, I wasn't sure I'd live through this one. It makes you crazy.

"When the EMT tried to put that mask on my face, I felt like I was being smothered. Even though I know it's supposed to help, I couldn't stop myself from lashing out at the EMT. I pushed his hand away and yelled. I can't



imagine what it must've looked like . . . or what was going through his mind while I was yelling at him.

"He finally got me to put the mask on. He was very patient and calm. The oxygen did help me, but it wasn't easy. By the time we got to the hospital, I felt a little better. And I apologized to him. He told me not to worry about it. But I do.

"I really hope this never happens again."

CHAPTER REVIEW

Includes a summary of key points, key terms and definitions, review questions, and critical thinking exercises that ask students to apply knowledge, case studies, and more!

Chapter Review

Key Facts and Concepts

- Respiratory failure is the result of inadequate breathing, breathing that is insufficient to support life.
- A patient in respiratory failure or respiratory arrest must receive artificial ventilations.
- Oxygen can be delivered to the nonbreathing patient as a supplement to artificial ventilation.
- Oxygen can also be administered as therapy to the breathing patient whose breathing is inadequate or who is cyanotic, cool and clammy, short of breath, suffering chest pain, suffering severe injuries, or displaying an altered mental status.

Key Decisions

- Is the patient breathing? Is the patient breathing adequately (ventilating *and* oxygenating)? Does the patient need supplemental oxygen?
- Is there a need to initiate artificial ventilation?
- Are my artificial ventilations adequate (proper rate and volume)?

Street Scenes

"Dispatch to unit 401, respond to 244 Lisbon Street for a patient with shortness of breath." En route, you make a preliminary plan with your partners, Danielle and Jim. You discuss what equipment the team will bring in and briefly review the immediate life threats associated with shortness of breath. Going into the apartment building, you bring in the stretcher, jump kit, oxygen, portable suction, and BVM unit.

As you approach the apartment, you notice that the hall smells of cigarette smoke. The odor is worse as you enter the unit. Your patient is found sitting at the kitchen table. He is a tall, thin, seventy-year-old man. He appears anxious and is obviously having trouble breathing.

Street Scene Questions

1. What is your first priority when starting to assess this patient?
2. Assuming his airway is patent, what are the essential elements in assessing this patient's breathing?
3. What type of emergency care should you be prepared to give?

As you assess the patient, you note he is breathing rapidly with an audible wheeze. He seems very tired. He can speak only one or two words at a time, and you notice that his fingernails are blue. You also notice that his respiratory rate slows down and becomes slightly irregular from time to time.

Street Scene Questions

4. Is this patient's breathing adequate (why or why not)?
5. Does this patient require artificial ventilation?

The team decides that this patient is in respiratory failure, is tiring out, and needs immediate ventilation. You connect the BVM to high-concentration oxygen and begin to ventilate the patient. At first the patient is uncooperative and you find it difficult to time your ventilations with his. However, after a few breaths, your timing begins to work. About every fourth patient breath, you administer a breath to help increase tidal volume. The patient becomes more and more comfortable with this.

Jim continues the assessment while Danielle requests Advanced Life Support backup and prepares for rapid transport.

You continue ventilating as the team loads the patient and initiates transport.

STUDENT RESOURCE

WORKBOOK FOR EMERGENCY CARE, 13TH EDITION

This self-paced workbook contains updated and revised matching exercises, multiple-choice questions, short-answer questions, labeling exercises, skills checklists, and case studies that promote critical decision-making, and a NEW Grey Zone feature with real-life practice scenarios. This workbook is available for purchase at www.bradybooks.com.

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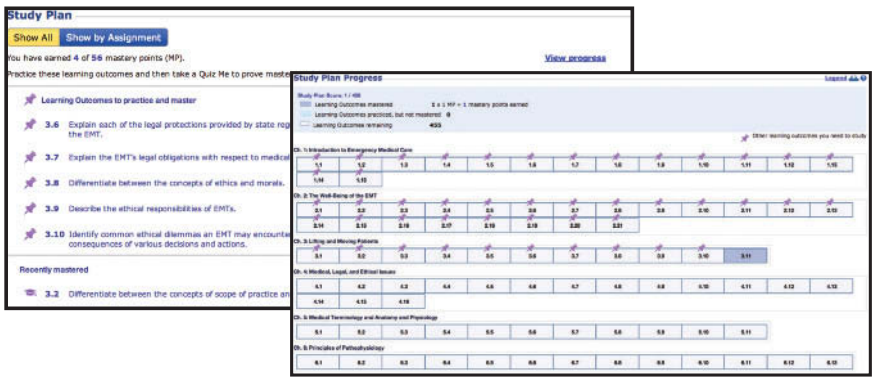

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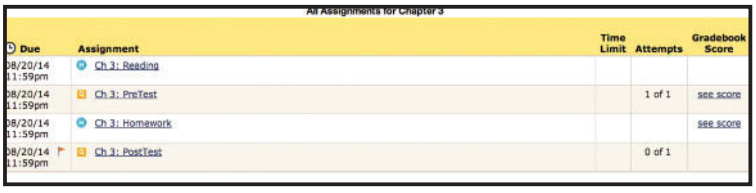

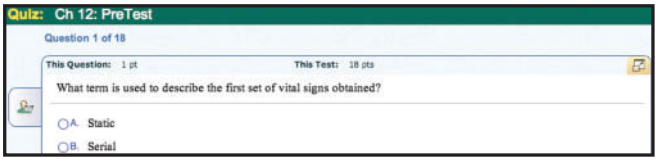

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Key Features, continued

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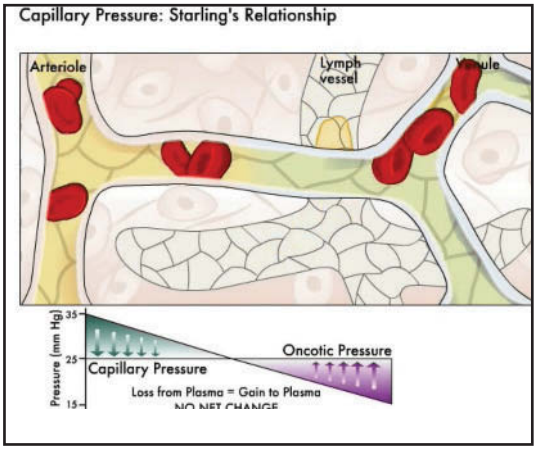
The Multimedia Library allows students and instructors to quickly search through resources to find the supporting media they are looking for.



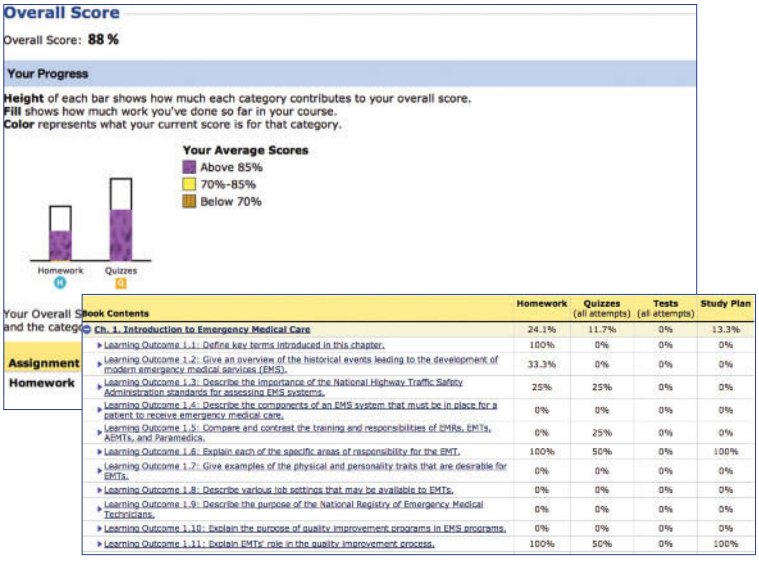
5. Flash Cards

Available as a remediation tool, these interactive online flash cards are great for individual, group, or classroom study!

6. Results

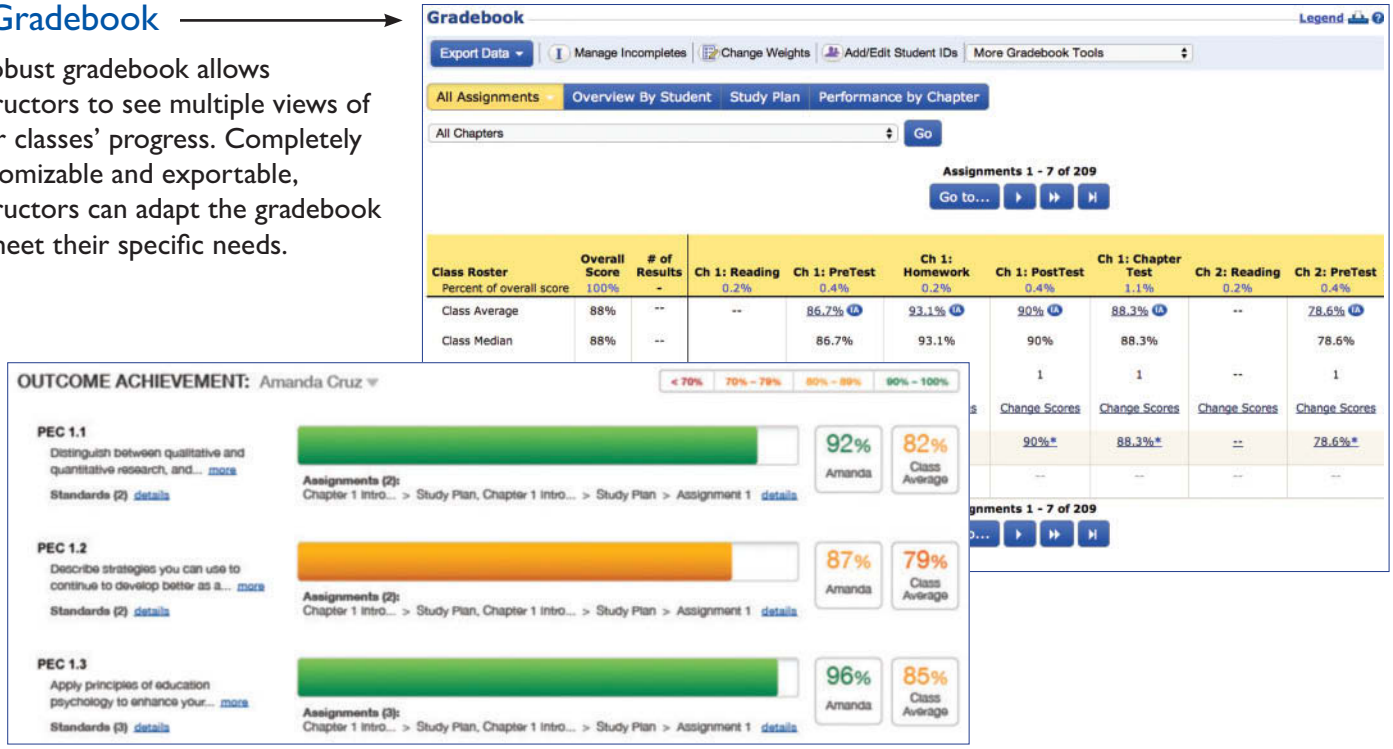
Students can view overall progress and quickly identify what their grades are on individual assignments.

Instructors can view students results by chapter, outcome, homework, and more to help identify where more classroom time is needed!



7. Gradebook

A robust gradebook allows instructors to see multiple views of their classes' progress. Completely customizable and exportable, instructors can adapt the gradebook to meet their specific needs.



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Instructor resources are available and include access to PowerPoint® presentations, test generating software, and curriculum support that includes detailed lesson plans, reinforcement and assessment handouts, objective checklists, and more!

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SECTION 1

Foundations

The "Foundations" section details essential concepts and skills you will need as an Emergency Medical Technician.

Chapter 1 overviews Emergency Medical Services and the health care system. Chapter 2 emphasizes how to keep yourself safe and well. Chapter 3 explains techniques for safe lifting and moving. Chapter 4 discusses legal and ethical issues you will face as part of your career.

Chapter 5 provides basic information about how medical terms are constructed. Chapter 6 offers an overview of the structure (anatomy) and function (physiology) of the human body. Chapter 7 introduces principles of pathophysiology: how illness and injury affect the body. Finally, Chapter 8 concerns life span development: physical and mental patterns common to the different age groups who will be your patients.

1 Introduction to Emergency Medical Care

Standard

Preparatory (EMS Systems; Research); **Public Health**

Competency

Applies fundamental knowledge of the EMS system, safety/well-being of the EMT, medical/legal and ethical issues to the provision of emergency care.

Core Concepts

- The chain of human resources that forms the EMS system
- How the public activates the EMS system
- Your roles and responsibilities as an EMT
- The process of EMS quality improvement

Objectives

After reading this chapter, you should be able to:

1.1 Define key terms introduced in this chapter.

1.2 Give an overview of the historical events leading to the development of modern Emergency Medical Services (EMS). (pp. 3–4)

1.3 Describe the importance of each of the National Highway Traffic Safety Administration standards for assessing EMS systems. (pp. 4–5)

1.4 Describe the components of an EMS system that must be in place for a patient to receive emergency medical care. (pp. 5–6)

1.5 Compare and contrast the training and responsibilities of EMRs, EMTs, AEMTs, and Paramedics. (pp. 7–8)

1.6 Explain each of the specific areas of responsibility for the EMT. (pp. 8–9)

1.7 Give examples of the physical and personality traits that are desirable for EMTs. (pp. 9–10)

1.8 Describe various job settings that may be available to EMTs. (p. 11)

1.9 Describe the purpose of the National Registry of Emergency Medical Technicians. (pp. 11–12)

1.10 Explain the purpose of quality improvement programs in EMS programs. (pp. 12–13)

1.11 Explain EMT's role in the quality improvement process. (p. 13)

1.12 Explain medical direction as it relates to EMS systems. (pp. 13–14)

1.13 List ways in which research may influence EMT practice. (pp. 15–22)

1.14 Give examples of how EMS providers can play a role in public health. (pp. 14–15)

1.15 Given scenarios, decide how an EMT may demonstrate professional behavior. (pp. 9–11)

Key Terms

designated agent, *p. 13*
evidence-based, *p. 15*
medical direction, *p. 13*
Medical Director, *p. 13*
911 system, *p. 6*
off-line medical direction, *p. 13*
on-line medical direction, *p. 13*
patient outcomes, *p. 15*
protocols, *p. 13*
quality improvement, *p. 12*
standing orders, *p. 13*

WHEN A PERSON is injured or becomes ill, it rarely happens in a hospital with doctors and nurses standing by. In fact, some time usually passes between the onset of the injury or illness and the patient's arrival at the hospital, time in which the patient's condition may deteriorate, time in which the patient may even die. The modern Emergency Medical Services (EMS) system has been developed to provide what is known as *prehospital* or *out-of-hospital* care. Its purpose is to get trained personnel to the patient as quickly as possible and to provide emergency care on the scene, en route to the hospital, and at the hospital until care is assumed by the hospital staff. The Emergency Medical Technician (EMT) is a key member of the EMS team.

As you begin to study for a career as an EMT, you will want to answer some basic questions, such as, "What is the EMS system?" "How did it develop?" and "What will be my role in the system?" This chapter will help you begin to answer these questions.

The Emergency Medical Services System

How It Began

In the 1790s the French began to transport wounded soldiers away from the scene of battle so they could be cared for by physicians. This is the earliest documented Emergency Medical Service. However, no medical care was provided for the wounded on the battlefield. The idea was simply to carry the victim from the scene to a place where medical care was available.

Other wars inspired similar emergency services. For example, during the American Civil War, Clara Barton began such a service for the wounded and later helped establish the American Red Cross. During World War I, many volunteers joined battlefield ambulance corps. And during the Korean Conflict and the Vietnam War, medical teams produced further advances in field care, many of which led to advances in the civilian sector, including specialized emergency medical centers devoted to the treatment of trauma (injuries).

Nonmilitary ambulance services began in some major American cities in the early 1900s—again as transport services only, offering little or no emergency care. Smaller communities did not develop ambulance services until the late 1940s, after World War II. Often the local undertaker provided a hearse for ambulance transport. In locations where emergency care was offered along with transport to the hospital, the fire service often was the responsible agency.

The importance of providing hospital-quality care at the emergency scene—that is, beginning care at the scene and continuing it, uninterrupted, during transport to the

“Where else can you work with great people, have fun, and make a difference? Welcome to EMS.”

hospital—soon became apparent. The need to organize systems for such emergency prehospital care and to train personnel to provide it also was recognized.

EMS Today

During the 1960s, the development of the modern EMS system began. In 1966 the National Highway Safety Act charged the U.S. Department of Transportation (DOT) with developing EMS standards and assisting the states to upgrade the quality of their prehospital emergency care. Most EMT courses today are based on models developed by the DOT.

In 1970 the National Registry of Emergency Medical Technicians was founded to establish professional standards. In 1973 Congress passed the National Emergency Medical Services Systems Act as the cornerstone of a federal effort to implement and improve EMS systems across the United States.

Since then, the states have gained more control over their EMS systems, although the federal government continues to provide guidance and support. For example, the National Highway Traffic Safety Administration (NHTSA) Technical Assistance Program has established an assessment program with a set of standards for EMS systems. The categories and standards set forth by NHTSA, summarized in the following list, will be discussed in more detail throughout this chapter and the rest of this textbook.

- **Regulation and policy.** Each state EMS system must have in place enabling legislation (laws that allow the system to exist), a lead EMS agency, a funding mechanism, regulations, policies, and procedures.
- **Resource management.** There must be centralized coordination of resources so that all victims of trauma or medical emergencies have equal access to basic emergency care and transport by certified personnel, in a licensed and equipped ambulance, to an appropriate facility.
- **Human resources and training.** At a minimum, all those transporting prehospital personnel (those who ride the ambulances) should be trained to the EMT level using National EMS Education Standards that are taught by qualified instructors.
- **Transportation.** Safe, reliable ambulance transportation is a critical component. Most patients can be effectively transported by ground ambulances. Other patients require rapid transportation, or transportation from remote areas, by helicopter or airplane.
- **Facilities.** The seriously ill or injured patient must be delivered in a timely manner to the closest appropriate facility.
- **Communications.** There must be an effective communications system, beginning with the universal system access number (911), dispatch-to-ambulance, ambulance-to-ambulance, ambulance-to-hospital, and hospital-to-hospital communications.
- **Public information and education.** EMS personnel may participate in efforts to educate the public about their role in the system, their ability to access the system, and prevention of injuries.
- **Medical direction.** Each EMS system must have a physician as a Medical Director accountable for the activities of EMS personnel within that system. The Medical Director delegates medical practice to nonphysician providers (such as EMTs) and must be involved in all aspects of the patient-care system.
- **Trauma systems.** In each state, enabling legislation must exist to develop a trauma system including one or more trauma centers, triage and transfer guidelines for trauma patients, rehabilitation programs, data collection, mandatory autopsies (examination of a body to determine cause of death), and means for managing and ensuring the quality of the system.
- **Evaluation.** Each state must have a program for evaluating and improving the effectiveness of the EMS system, known as a quality improvement (QI) program, a quality assurance (QA) program, or total quality management (TQM).

With the development of the modern EMS system, the concept of ambulance service as a means merely for transporting the sick and injured passed into oblivion. No longer could ambulance personnel be viewed as people with little more than the strength to lift

FIGURE 1-1 New methods of delivering Emergency Medical Services: (A) By bicycle. (B) By mobile EMS unit.

(A)

(B)

a patient into and out of an ambulance. The hospital emergency department was extended, through the EMS system, to reach the sick and injured at the emergency scene. "Victims" became patients, receiving prehospital assessment and emergency care from highly trained professionals. The "ambulance attendant" was replaced by the Emergency Medical Technician (EMT).

A current development in some areas is use of the term *out-of-hospital care*, rather than *prehospital care*, as EMS personnel begin to provide primary care for some conditions and in some circumstances without transport to a hospital (Figure 1-1). However, the term *prehospital care* will be used in the remainder of this text.

Components of the EMS System

To understand the EMS system, you must look at it from the patient's viewpoint rather than from that of the EMT (Figure 1-2). For the patient, care begins with the initial phone call to the Emergency Medical Dispatcher (EMD). The EMS system responds to the call for help by sending to the scene available responders, including Emergency Medical Responders, EMTs, and advanced life support providers (Advanced EMTs and Paramedics). An ambulance will transport the patient to the hospital.

CORE CONCEPT
The chain of human resources that forms the EMS system

From the ambulance, the patient is received by the emergency department. There, the patient receives laboratory tests, diagnosis, and further treatment. The emergency department serves as the gateway for the rest of the services offered by the hospital. If a patient is brought to the emergency department with serious injuries, care is given to stabilize the patient, and the operating room is readied to provide further lifesaving measures.

Some hospitals handle all routine and emergency cases but have a specialty that sets them apart from other hospitals. One specialty hospital is the trauma center. In some hospitals a surgery team may not be available at all times. In a trauma center, surgery teams capable of the comprehensive treatment of trauma patients are available twenty-four hours a day.

In addition to trauma centers, there are also hospitals that specialize in the care of certain conditions and patients, such as burn centers, pediatric centers, cardiac centers, and stroke centers.

As an EMT, you will become familiar with the hospital resources available in your area. Many EMS regions have specific criteria for transporting patients with special needs. Choosing the right hospital may actually be a lifesaving decision. Of course, it is important to weigh the patient's condition against the additional transport time that may be required to take him to a specialized facility. On-line medical direction (discussed later) may be available to help with this decision.

Dispatchers and EMTs are key members of the prehospital EMS team. (The levels of EMS training will be discussed later in the chapter.) Many others make up the hospital portion of the EMS system. They include physicians, nurses, physician's assistants, respiratory and physical therapists, technicians, aides, and others.

FIGURE 1-2 The chain of human resources making up the EMS system. *(Emergency Department staff photo: © Edward T. Dickinson, MD)*

CORE CONCEPT
How the public activates the EMS system

Accessing the EMS System

Most localities have a ***911 system*** for telephone access to report emergencies. A dispatcher answers the call, takes the information, and alerts EMS or the fire or police departments as needed. Since the number 911 is designed to be a national emergency number, there will be a time when someone may dial 911 from any phone in the country and be connected to the appropriate emergency center.

Many communications centers have *enhanced 911*. This system has the capability of automatically identifying the caller's phone number and location. If the phone is disconnected or the patient loses consciousness, the dispatcher will still be able to send emergency personnel to the scene.

There are still a few communities that do not have 911 systems. In these locations a standard seven-digit telephone number must be dialed to reach ambulance, fire, or police

911 system
a system for telephone access to report emergencies. A dispatcher takes the information and alerts EMS or the fire or police department as needed. *Enhanced 911* has the additional capability of automatically identifying the caller's phone number and location.

services. Dialing 911 where a 911 system is not in operation will usually connect the caller to an operator who will attempt to route the call to the appropriate dispatch center. This adds an extra step and extra time to the process, so it is important to make sure that the emergency numbers in use in a local area are prominently displayed on all telephones.

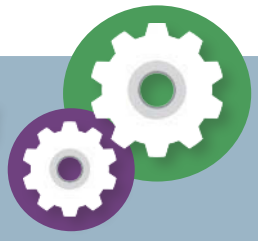
Another development in the communication and dispatch portion of the EMS system is the training and certification of EMDs. These specially trained dispatchers not only obtain the appropriate information from callers, but they also provide medical instructions for emergency care. These include instructions for CPR, artificial ventilation, bleeding control, and more. Research has consistently pointed to the importance of early access and prompt initiation of emergency care and CPR. The EMD is one example of the EMS system providing emergency care at the earliest possible moment.

Levels of EMS Training

There are four general levels of EMS training and certification (described in the following list). These levels vary from place to place. Your instructor will explain any variations that may exist in your region or state.

1. ***Emergency Medical Responder (EMR)*** **(previously called first responder).** This level of training is designed for the person who is often first at the scene. Many police officers, firefighters, and industrial health personnel function in this capacity. The emphasis is on activating the EMS system and providing immediate care for life-threatening injuries, controlling the scene, and preparing for the arrival of the ambulance.
2. ***Emergency Medical Technician (EMT)*** **(previously called EMT-Basic).** In most areas, the EMT is considered the minimum level of certification for ambulance personnel. EMTs provide basic-level medical and trauma care and transportation to a medical facility.
3. ***Advanced Emergency Medical Technician (AEMT)*** **(previously called EMT-Intermediate).** The AEMT, like the EMT, provides basic-level care and transportation as well as some advanced-level care, including use of advanced airway devices, monitoring of blood glucose levels, and administration of some medications, which may include intravenous and intraosseous administration.

Critical Decision Making



A Key Concept

Critical decision making is a very important concept. It essentially means that an EMT takes in information from the scene, the patient assessment, and other sources and makes appropriate decisions after synthesizing—or interpreting—all the information. There are times when the information you obtain initially won't be enough to be a basis for decision making, so you will need to ask more questions and perform additional examinations to get everything you need to make a decision.

It may be difficult to see how this all fits together now. Before long, however, you'll be learning and practicing patient assessment and care. Some examples of critical decision making that will be a part of the assessment and care you will perform include:

- **Deciding which hospital to transport someone to.** Should you take your patient to the closest hospital or to a more distant specialty hospital?
- **Deciding whether you should administer a medication to a patient.** Will it help the patient's current condition? Could it make the condition worse?

When you begin to work with more experienced EMTs, you will come across many who are smart and know what to do and how to treat patients (both clinically and personally). These are the EMTs you would want to take care of you or your family should EMS be needed. These EMTs are good critical decision makers.

4. ***Paramedic*** **(previously sometimes called EMT-Paramedic).** The Paramedic performs all of the skills of the EMT and AEMT plus advanced-level skills. The Paramedic provides the most advanced level of prehospital care.

Roles and Responsibilities of the EMT

CORE CONCEPT
Your roles and responsibilities as an EMT

As an EMT, you will be responsible for a wide range of activities. In addition to patient assessment and emergency care, your responsibilities will include preparation, a safe response to the scene, safe transportation to the hospital, and transferring the patient to hospital personnel for continuity of care. The following are specific areas of responsibility for the EMT.

- **Personal safety.** It is not possible to help a patient if you are injured before you reach him or while you are providing care, so your first responsibility is to keep yourself safe. Safety concerns include dangers from other human beings, animals, unstable buildings, fires, explosions, and more. Though emergency scenes are usually safe, they also can be unpredictable. You must take care at all times to stay safe.
- **Safety of the crew, patient, and bystanders.** The same dangers you face will also be faced by others at the scene. As a professional, you must be concerned with their safety as well as your own.
- **Patient assessment.** As an EMT, one of your most important functions will be assessment of your patient, or finding out enough about what is wrong with your patient to be able to provide the appropriate emergency care. Assessment always precedes emergency care.
- **Patient care.** The actual care required for an individual patient may range from simple emotional support to lifesaving CPR and defibrillation. Based on your assessment findings, patient care is an action or series of actions that your training will prepare you to take to help the patient deal with and survive his illness or injury.
- **Lifting and moving.** Since EMTs are usually involved in transporting patients to the hospital, lifting and moving patients are important tasks. You must perform them without injury to yourself and without aggravating or adding to the patient's existing injuries.
- **Transport.** It is a serious responsibility to operate an ambulance at any time, but even more so when there is a patient on board. Safe operation of the ambulance, as well as securing and caring for the patient in the ambulance, will be important parts of your job as an EMT.
- **Transfer of care.** Upon arrival at the hospital, you will turn the patient over to hospital personnel. You will provide information on the patient's condition, your observations of the scene, and other pertinent data so that there will be continuity in the patient's care. Although this part of patient care comes at the end of the call, it is very important. You must never abandon care of the patient at the hospital until transfer to hospital personnel has been properly completed.
- **Patient advocacy.** As an EMT, you are there for your patient. You are an advocate, the person who speaks up for your patient and pleads his cause. It is your responsibility to address the patient's needs and to bring any of his concerns to the attention of the hospital staff. You will have developed a rapport with the patient during your brief but very important time together, a rapport that gives you an understanding of his condition and needs. As an advocate, you will do your best to transmit this knowledge to help the patient continue through the EMS and hospital systems. In your role as an advocate, you may perform a task as important as reporting information that will enable the hospital staff to save the patient's life or as simple as making sure a relative of the patient is notified. Acts that may seem minor to you may often provide major comfort to your patient.

EMTs may also be involved in community health initiatives such as injury prevention. The EMT is in a position to observe situations where injuries are possible and help correct them before injuries, or further injuries, are sustained. Hospital personnel do not see the scene and cannot offer this information. An example might be a call to the residence of a senior citizen who has fallen. You make observations about improper railings or slippery throw rugs or shoes and bring this to the attention of the patient and his family. Another place where injury prevention may be beneficial is with children. If you respond to a residence where there are small children and you observe potential for injury (e.g., poisons the

child can access or unsafe conditions such as a loose railing), your interventions can make a difference. These community health issues are discussed throughout the book and can be found in these chapters: "Poisoning and Overdose Emergencies," "Pediatric Emergencies," and "Geriatric Emergencies."

Traits of a Good EMT

Certain physical traits and aspects of personality are desirable for an EMT.

Physical Traits

Physically you should be in good health and fit to carry out your duties. If you are unable to provide needed care because you cannot bend over or catch your breath, then all your training may be worthless to the patient who is in need of your help.

You should be able to lift and carry up to 125 pounds. Practice with other EMTs is essential so you can learn how to carry your share of the combined weight of the patient, stretcher, linens, blankets, and portable oxygen equipment. For such moves, you need coordination and dexterity as well as strength. You will have to perform basic rescue procedures, lower stretchers and patients from upper levels, and negotiate fire escapes and stairways while carrying patients.

Your eyesight is very important in performing your EMT duties. Make certain that you can clearly see distant objects as well as those close at hand. Both types of vision are needed for patient assessment, reading labels, controlling emergency scenes, and driving. Should you have any eyesight problems, they must be corrected with prescription eyeglasses or contact lenses.

Be aware of any problems you may have with color vision. Not only is this important to driving, but it could also be critical for patient assessment. Color of the patient's skin, lips, and nail beds often provides valuable clues to the patient's condition.

You should be able to give and receive oral and written instructions and communicate with the patient, bystanders, and other members of the EMS system. Eyesight, hearing, and speech are important to the EMT; thus, any significant problems must be corrected if you are going to be an EMT.

Personal Traits

Good personal traits are very important to the EMT (Figure 1-3). You should be:

- *Pleasant* to inspire confidence and help to calm the sick and injured.
- *Sincere* to be able to convey an understanding of the situation and the patient's feelings.
- *Cooperative* to allow for faster and better care, establish better coordination with other members of the EMS system, and bolster the confidence of patients and bystanders.
- *Resourceful* to be able to adapt a tool or technique to fit an unusual situation.
- *A self-starter* to show initiative and accomplish what must be done without having to depend on someone else to start procedures.
- *Emotionally stable* to help overcome the unpleasant aspects of an emergency so needed care may be rendered and any uneasy feelings that exist afterward may be resolved.
- *Able to lead* to take the steps necessary to control a scene, organize bystanders, deliver emergency care, and, when necessary, take charge.
- *Neat and clean* to promote confidence in both patients and bystanders and to reduce the possibility of contamination.
- *Of good moral character and respectful of others* to allow for trust in situations when the patient cannot protect his own body or valuables and so all information relayed is truthful and reliable.
- *In control of personal habits* to reduce the possibility of rendering improper care and to prevent patient discomfort. This includes never consuming alcohol within eight hours of duty and not smoking when providing care. (Remember: Smoking can contaminate wounds and is dangerous around oxygen delivery systems.)
- *Controlled in conversation and able to communicate properly* to inspire confidence and avoid inappropriate conversation that may upset or anger the patient or bystanders or violate patient confidentiality.