

DANIEL LIMMER • MICHAEL F. O'KEEFE

MEDICAL EDITOR: EDWARD T. DICKINSON, MD, NRP, FACEP



EMERGENCY CARE

14TH EDITION



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Dedication

This edition is dedicated to Stephanie, Sarah and Margo. I am fortunate to be surrounded by your love and support. And to my buddy, Lulu.

– D.L.

To the memory of my parents, Mike and Noreen, and to my family.

– M.O’K.

To my wife Debbie for her endless patience and support for this 14th edition, and to all the EMS providers of PennStar and the Malvern, Berwyn, and Radnor Fire Companies who keep me grounded in the prehospital environment.

– E.T.D.

Acknowledgments

This 14th edition of *Emergency Care*, like others, has left your authors feeling grateful for the dynamic and talented team we have worked with. It is also a time for change, so as we give our thanks, we must sadly say goodbye to some people very dear to us.

First on this list is Michal Heron. Since the 6th edition of *Emergency Care*, Michal has been our photo editor and photographer extraordinaire. Her talent, vision, and attention to detail have been a foundation not only for the visuals, but for the book itself, creating a bright and welcoming appearance with accurate images to learn from. Michal—there will never be another you and we will miss you acutely.

Sandy Breuer was the editor of *Emergency Care*, also since the 6th edition. She came onboard with Michal and changed the way books were done at Brady. Her talent and sense of humor were limitless. Her dedication is legendary. We didn’t get to work with Sandy on this edition but her legacy lives on in the book you see before you today.

Faye Gemmellaro is a gentle giant behind the scenes. If books had air traffic controllers, Faye would be ours. Guiding this edition to a safe landing with skill and aplomb, Faye manages multiple tasks effortlessly and coordinates pieces that, while unseen to many who write and read these books, are so necessary. Faye has moved to another part of Pearson. It won’t be the same without you, Faye.

Editors come and go over the years. This edition saw several members of the editorial team leave the fold. Marlene Pratt, Executive Editor, is no longer with the team. Marlene was the editor for this product for many years, including the Pearson award-winning

10th edition. She later oversaw all of Brady. Derril Trakalo was with us for the kick-off of this edition and got us started on a solid course before relocating to another corner of Pearson. Our sincere thanks to both Marlene and Derril for their dedication to this book and our best wishes to you. Julie Alexander was a Vice President over Brady for many, many years and also no longer with us. Julie was always personable and approachable while at the helm. We are sad knowing you aren't there.

When we say so many goodbyes, there are many people to introduce to you. Katrin Beacom is the new Director of Product Management. She is a familiar and friendly face to us as the former marketing manager for Brady years ago. Kat, it is good to have you back. Kevin Wilson recently replaced Derril Trakalo. We still call him an editor even though Pearson calls him Content Manager. Kevin comes from the sales force and has brought much to the table bringing this edition to fruition. We look forward to working with you.

Our editor this edition is Rachel Bedard. Rachel had tough shoes to fill but did so admirably. Rachel and her team tracked content and schedules, edited manuscript, made sure photos were placed and referenced, and perhaps the most difficult task, dealt with busy authors. Your authors know EMS and EMS education, but putting together a textbook is something totally different and sometimes foreign. We are grateful for Rachel and her team for artfully assembling the book you have before you now.

There are so many people to thank including Pearson's editorial assistants, the sales reps who help get the book out to you and your instructors, Beth Muniz who directs our sales force, magician and problem solver Lenny Losacco, marketing professionals like our old friends Brian Hoehl, Rachele Strober, and more. We're sorry we can't name you all.

We thank our families who put up with the schedule of writing and publishing a textbook and support us in this labor of love.

We are grateful for the educators who put their trust in us to provide the book which serves as a foundation for their course. We salute the current EMRs, EMTs, AEMTs, and paramedics who make EMS what it is today. Finally, we welcome the students who enter EMS through their EMT course. You give us hope for the future. We wish you the joys, successes and lasting friendships we have gained over the years we have been in EMS.

– D.L.

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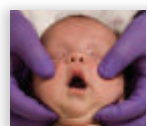
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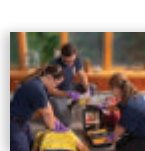
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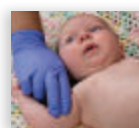
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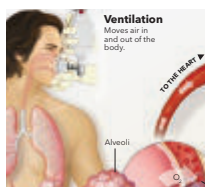
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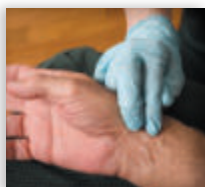
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Letter to Students

Dear Student:

Welcome to the exciting world of EMS.

We are pleased that your instructor has chosen *Emergency Care* as your classroom textbook. We believe our textbook will serve you well in class, on your certification exam, and long into your experience as an EMT, whether you are seeking your first job in EMS or looking to serve your community as a volunteer.

We would like to offer some advice to you as you begin your program—advice likely given to you by your instructor as well. Please be sure to keep up on your reading and assignments, pay attention in class, and engage fully in your skills during labs. Teachers will teach, but true *learning* is driven by you, the student. Take notes and make flash cards. Pay particular attention to the pathophysiology material in this text. Understanding pathophysiology is the difference between understanding a disease process and simply memorizing the signs and symptoms.

This is a very exciting time in EMS. EMTs are using new and exciting technologies. You may have opportunities to take additional classes such as Advanced EMT (AEMT) and paramedic in the future. We have seen growth in the critical care and flight paramedic roles and a relatively new area called community paramedic, which bridges EMS with primary, in-home medical care.

We hope you share our excitement about the class you are beginning. Our sincerest best wishes to you for success in your class—and wherever EMS takes you.



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PREFACE

EMERGENCY CARE has set the standard for EMT training for more than thirty-five 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*, fourteenth 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 have had with EMS curricula and practice, with the input of countless instructors and students. 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 fourteenth edition is summarized in the following text, followed by brief details on “what’s new” in each section of this edition.

What’s New in the Fourteenth Edition?

The fourteenth edition has undergone extensive development and change.

This edition boasts more new professional photos than any previous edition. The author and photographic team worked together to supply a combination of realistic and real-life emergency images that are unrivaled in EMT literature. The resulting artwork in *Emergency Care* 14e is a powerful teaching tool for students.

The Patient Care feature that appears in clinical chapters has been fine-tuned to address Fundamental Principles of Care first, followed by actions that the EMT may need to employ in caring for the patient. In this edition, actions are not numbered, because there is no one correct sequence for patient care. The EMT must continually base decisions and priority actions on the evolving condition of the patient.

All chapters throughout the text have been updated to conform to the most current American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

The Operations section of the book has been updated and expanded to include new triage procedures and updated guidelines for handling incident scenes.

There is significant **organizational change** in this edition.

- This edition has integrated the assessment, care, and treatment of children into all parts of the text. We take the approach that children, while having some physiological differences from adults, do not constitute a distinct and separate population. Their needs and functions are generally like those of adults. We provide clear information about the differences while providing the overall continuity of care for patients from neonates to older adults.
- Likewise, the care of older adults is no longer discussed separately. Our text provides chapters with patient scenarios that cover a range of ages, so that students have continuous practice considering age as a factor in their overall information gathering and assessment.
- The Secondary Assessment chapter was reworked into three more focused chapters that address specific aspects of the EMT’s role and care of patients. Details are provided below under Section 3.
- *Cardiac Emergencies* and *Resuscitation* are two distinct chapters in the fourteenth edition. *Infectious Diseases and Sepsis* is a new chapter in this edition, as you will see under Section 4.
- *Special Populations*, Section 6 of the fourteenth edition, has been changed significantly, with pediatric and geriatric care integrated throughout the text, and updates to remaining chapters.

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 lifespan development round out this first section.

What's New in the Foundations Section?

- *In Chapter 2, Well-Being of the EMT*, there is new text on Invisible Wounds—Preventing Psychological Trauma and discussion of eSCAPE, a mnemonic for dealing with posttraumatic stress. There are also updated sections on Realities of Well-Being and self-protection in a violent event.
- *Chapter 3, Lifting and Moving Patients*, has new text on bariatric patients and provides new images of the “no lift-at-all” stretcher. It also updates information on the use of long spine boards
- *Chapter 7, Principles of Pathophysiology*, has new text on the regulation of homeostasis and the fight-or-flight response, plus new information about pediatric vascular response and pediatric compensation.

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.

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

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

- *In Chapter 9, Airway Management* has new text on the head-elevated, sniffing position; providing an airway; manual airway maneuvers; obstructed airways; conscious choking adults and children; and unconscious choking. It also includes Scan 9-5 Insertion of a King Airway and Scan 9-6 Insertion of an i-gel™ Airway, and covers using gravity to clear an airway. There are new pediatric text sections on pediatric airway physiology and suctioning in pediatrics.
- *Chapter 10, Respiration and Artificial Ventilation*, has added new text: Face Mask Ventilation—Core Principles, and Ventilation Rates and Volume. There is also new pediatric text in the form of a Pediatric Note about providing supplemental oxygen.

SECTION 3

Patient Assessment: Chapters 11-17

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 Think Like an EMT section (Should I or Shouldn't I stay or retreat from a scene?) There is also additional text on airbag deployment.
- *Chapter 12, Primary Assessment*, includes updated text on spinal motion restriction.
- *Chapter 13, Vital Signs and Monitoring Devices*, has new text on capnography.
- *Chapter 14, Principles of Assessment*, pulls together assessment processes for adults and children. It also discusses critical thinking skills that EMTs can develop to improve their work in the field.
- *Chapter 15, Secondary Assessment*, drills down on the secondary assessment needs of patients with medical emergencies and traumatic emergencies. A section of this chapter covers important considerations for caring for children who are experiencing trauma.
- *Chapter 16, Reassessment*, focuses on the need for continual review of patient status until patient care has been transferred to the Emergency Department or health care facility.
- *Chapter 17, Communication and Documentation*, has updated forms and equipment as well as new text on completion of the Prehospital Care Report.

SECTION 4

Medical Emergencies: Chapters 18-28

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

What's New in the Medical Emergencies Section?

- *Chapter 18, General Pharmacology*, has updated text on naloxone plus new photos of nasal naloxone administration.
- *Chapter 19, Respiratory Emergencies*, has new text on the pressures of the respiratory system, a Pediatric Note on

bronchiolitis, as well as content on pediatric respiratory distress and croup.

- **Chapter 20, Cardiac Emergencies**, includes more information on 12 lead ECG and special information for helping pediatric patients. This chapter focuses on the needs of the incipient medical cardiac patient.
- **Chapter 21, Resuscitation**, focuses on patients who require life-restoring procedures. In particular, the updated *Resuscitation* chapter provides procedures and requirements for high-performance CPR.
- **Chapter 22, Diabetic Emergencies and Altered Mental Status**, has new content on pediatric patients with seizures. It also describes thrombectomy, and advances in the treatment of patients with stroke.
- **Chapter 23, Allergic Reactions**, includes pediatric as well as adult epinephrine devices.
- **Chapter 24, Infectious Diseases and Sepsis**, is a **new chapter** in Emergency Care's fourteenth edition. It provides an overview of common infectious diseases that EMTs may encounter. It also describes conditions that lead to sepsis and signs that sepsis may be occurring.
- **Chapter 25, Poisoning and Overdose Emergencies**, includes a new Scan 25-6 Absorbed Poisons—HAZMAT—Illegal Meth Lab.
- **Chapter 26, Abdominal Emergencies**, now includes text on abdominal pain associated with the female reproductive system.

SECTION 5

Trauma: Chapters 29-35

The Trauma Emergencies 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?

- **Chapter 29, Bleeding and Shock**, has had an extensive rewrite with information on progression of actions in response to extensive bleeding. New content includes junctional tourniquets and methods of preventing or coping with the development of shock.
- **Chapter 30, Soft-Tissue Trauma**, has numerous new images to prepare students for events they may encounter in the field.
- **Chapter 31, Chest and Abdominal Trauma**, includes sections on the pathophysiology of the chest and abdomen and on rib fracture, plus additional material on occlusive and flutter-valve dressings.
- **In Chapter 33, Trauma to the Head, Neck, and Spine**, there is continued updating on methods of spinal motion restriction and new text on the rigid spine board and scoop stretcher.
- **Chapter 34, Multisystem Trauma**, includes new content on multiple trauma in the pediatric patient.

- **Chapter 35, Environmental Emergencies**, has updated information on scuba and water accidents and a new section on high-altitude emergencies.

SECTION 6

Special Populations: Chapters 36-37

Special populations discussed in this section include those with emergencies related to the female reproductive system, pregnancy, or childbirth; and to patients with certain disabilities or those who rely on advanced medical devices at home. As mentioned, pediatric and geriatric information has been integrated into appropriate chapters throughout the book. 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 36, Obstetric and Gynecologic Emergencies**, contains updated text on neonatal resuscitation.
- **Chapter 37, "Emergencies for Patients with Special Challenges"**, has new text addressing an emergency involving a home ventilator and a new section stressing the need for awareness of vulnerable populations (including child, elder, and domestic abuse and human trafficking).

SECTION 7

Operations: Chapters 38-41

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 38, EMS Operations**, has updated images and procedures required by EMTs.
- **Chapter 39, Hazardous Materials, Multiple-Casualty Incidents, and Incident Management**. Includes a new swxtion on SALT (Sort, Assess, Lifesaving Interventions, Treatment/Transport), a triage method used at MCIs that is gaining popularity and acceptance in EMS systems.
- **Chapter 40, Highway Safety and Vehicle Extrication**, includes new text on alternative fuel vehicles.
- **Chapter 41, EMS Response to Terrorism**, has been updated to address "homegrown" terrorist attacks and strategies for providing care safely during such events.

APPENDIX AND REFERENCES

The Appendix in this edition provides a basic cardiac life support review. References include a listing of medical terms along with root prefixes and suffixes; anatomy and physiology illustrations; and the answer key, glossary, and index. All have been reviewed and updated.

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 they have put into their contributions.

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A Guide to...

9

Airway Management



Related Chapters

The following chapters provide additional information related to the topics discussed in this chapter:

- 3 Lifting and Moving Patients
- 6 Anatomy and Physiology
- 7 Principles of Pathophysiology
- 10 Respiration and Artificial Ventilation
- 19 Respiratory Emergencies

Standard

Airway Management, Respiration, and Artificial Ventilation (Management)

Competency

Applies knowledge (fundamental depth, foundational breadth) of anatomy and physiology to patient assessment and management of a patent airway, adequate mechanical ventilation, and respiration of all ages.

Core Concepts

- Physiology of the airway
- Pathophysiology of the airway

Outcomes

After reading this chapter, you should be able to:

- 9.1 Describe the structure and function of the normal airway. (pp. 203-206)
 - Differentiate the structures of the upper airway from those of the lower airway.
 - Match airway structures to their functions.
- 9.2 Explain concepts of airway pathophysiology. (pp. 206-210)
 - List causes of obstruction of the upper and lower airway.
 - List the steps to airway assessment in the primary assessment.
 - Distinguish between signs that indicate absent breathing, inadequate airway, and adequate airway.
 - List signs of inadequate airway that are more likely in children than in adults.
 - Explain how to determine whether a patient's airway status may worsen.
- 9.3 Describe the use of manual maneuvers to open the airway. (pp. 210-216)
 - Given a scenario, provide a rationale for selecting the type of manual maneuver that is best for the patient in the scenario.
- 9.4 Explain the use of adjunctive equipment to manage a patient's airway. (pp. 216-234)
 - State the importance of having a suction device immediately available during airway management procedures.
 - Given scenarios, identify adherence to general rules for using airway adjuncts.
 - Describe how the features of an oropharyngeal airway allow it to provide an air passage in patients who cannot maintain their own airways.
 - List the sequence of steps used in the insertion of an oropharyngeal airway.
 - Identify instances when a nasopharyngeal airway offers benefits over an oropharyngeal airway.
 - List the sequence of steps used in the insertion of a nasopharyngeal airway.
 - Describe the minimum features required of suction units.
 - Match the components and attachments of suction devices with their designed purposes.
 - Suggest responses to complications encountered when suctioning a patient's airway.

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CORE CONCEPTS Highlight 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

- Physiology of the airway
- Pathophysiology of the airway



CORE CONCEPT

Components of the secondary assessment

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

Outcomes

After reading this chapter, you should be able to:

- 9.1 Describe the structure and function of the normal airway. (pp. 203-206)
 - Differentiate the structures of the upper airway from those of the lower airway.
 - Match airway structures to their functions.
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 - List signs of inadequate airway that are more likely in children than in adults.
 - Explain how to determine whether a patient's airway status may worsen.

VISUAL GUIDES Visually present patient assessment in a series of flow charts.

“The most important things we can do for our patients are in the A-B-Cs.”



(© Daniel Limmer)

VOICES Insights or facts from EMTs in the field.

VISUAL GUIDE

12

Primary Assessment

Identify and Treat Life Threats

* GENERAL IMPRESSION: Chief Complaint and AVPU

Key Decision:



How does the patient look?



If the patient is apparently lifeless (no breathing or agonal breathing), go directly to a pulse check and the C-A-B approach.

You may perform **airway, breathing, and circulation** in any order.

This is dependent on the patient's presentation and emergent needs. Multiple parts of the primary assessment can be performed simultaneously when more than one EMT is present.

* AIRWAY

Key Decision:



Open the airway.



Suction if necessary.



Place an oral or nasal airway if indicated.

* BREATHING

Key Decision:



Is the patient breathing?

Oxygen saturation readings below 94%



Is the patient breathing adequately?

Significant respiratory distress and hypoxia (very low oxygen saturation or cyanosis)



Is the patient hypoxic?

Absent or inadequate breathing

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Point of View



“It happened so fast. I knew I was allergic to bees, but I never had a reaction that bad. It was like all of a sudden, I just couldn't breathe. I was fine just a few moments earlier, then my voice started to get real raspy and I could barely take a breath. I thought I was going to die. I remember the EMTs arriving, but not much more. I know they helped me with a dose of epinephrine, but by the time I regained consciousness, I was at the hospital. That medicine saved my life.”



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

PATIENT CARE SECTIONS Provide descriptions of the fundamental principles and critical actions needed for various patient care scenarios.

Patient Care

Care of the Patient with Severe Choking

Fundamental Principles of Care

Severe choking implies that the airway is completely blocked by a foreign body. It is indicated (and differentiated from nonsevere choking) by an inability to move air. Here the patient is not breathing, coughing, or speaking. This situation requires immediate intervention.

In patients with signs and symptoms indicating severe choking, take the following steps:

- Call for advanced life support assistance.
- Immediately assess for air movement. If no air movement is found, begin foreign-body airway maneuvers.
- For conscious adults and children (patients over the age of 1 year), initiate abdominal thrusts.
- For conscious infants (patients 1 year old or younger), initiate back slaps and chest thrusts.
- For any unconscious choking patient, or a patient who becomes unconscious due to choking, begin CPR.

THINK LIKE AN EMT A scenario-based feature that offers practice in making critical decisions.



Think Like an EMT

Will the Airway Stay Open?

You have learned about the signs of an unstable airway. Use this information to consider whether the following patients have airways that will stay open.

1. A 16-year-old asthma patient who tells you he is tired and seems to be nodding off to sleep.
2. A 72-year-old female who was recently diagnosed with pneumonia. Today she has called you because her breathing is much worse. She is breathing rapidly and has diminished lung sounds on the left side.
3. A 35-year-old male who tells you he is having trouble breathing. You notice he is drooling and is sitting bolt upright. When you attempt to lean him back on the stretcher, he coughs, gags, and repositions himself in a sniffling position.
4. A 16-month-old whose mother tells you the child has had a cold for two days and woke up with a cough tonight. The child is awake and alert but barking like a seal when coughing.

Chapter Review

Key Facts and Concepts

- The primary assessment is a systematic approach to quickly finding and treating immediate threats to life.
- The general impression, although somewhat subjective, can provide extremely useful information regarding the urgency of a patient's condition.
- The determination of mental status follows the AVPU approach.
- Evaluating airway, breathing, and circulation quickly but thoroughly will reveal immediate threats to life that must be treated before the EMT proceeds further with assessment.
- Your approach to a patient will vary depending on how the patient presents. The American Heart Association recommends a C-A-B approach for patients who appear

- lifeless and apparently are not breathing or have only agonal respirations. This begins with a pulse check and chest compressions if there is no pulse.
- If your patient shows signs of life (e.g., moving, moaning, talking) and is breathing, you will take a traditional A-B-C approach.
- Remember that the mnemonic A-B-C is a guide to interventions that may be taken. You will choose your interventions based on the patient's immediate needs. They may be done in any order that fits the patient's needs.
- The patient's priority describes how urgent the patient's need to be transported is and how to conduct the rest of your assessment.

Key Decisions

- Is this patient medical or trauma; responsive or unresponsive; adult, child, or infant?
- Does this patient have any signs of life?
- Does this patient require a C-A-B approach (likely in cardiac arrest)? Does the patient therefore require chest compressions and defibrillation as the first priority?
- Do I need to stop and suction the airway, insert an artificial airway, administer oxygen, or ventilate the patient?
- Is the patient's condition stable enough to allow further assessment and treatment at the scene?

Chapter Glossary

A-B-Cs airway, breathing, and circulation.

AVPU a memory aid for classifying a patient's level of responsiveness or mental status. The letters stand for alert, verbal response, painful response, unresponsive.

chief complaint in emergency medicine, the reason EMS was called, usually in the patient's own words.

general impression impression of the patient's condition that is formed on first approaching the patient, based on the patient's environment, chief complaint, and appearance.

interventions actions taken to correct or manage a patient's problems.

manual stabilization using one's hands to prevent movement of a patient's head and neck until a cervical collar can be applied.

mental status level of responsiveness.

primary assessment the first element in a patient assessment; steps taken for the purpose of discovering and dealing with any life-threatening problems. The six parts of primary assessment are: (1) forming a general impression, (2) assessing mental status, (3) assessing airway, (4) assessing breathing, (5) assessing circulation, and (6) determining the priority of the patient for treatment and transport to the hospital.

priority the decision regarding the need for immediate transport of the patient versus further assessment and care at the scene.

spinal motion restriction a procedure for limiting movement of the head, neck, and spine when spinal injury is possible or likely.

Preparation for Your Examination and Practice

Short Answer

1. List factors you will take into account in forming a general impression of a patient.
2. Explain how to assess a patient's mental status with regard to the AVPU levels of responsiveness.
3. Explain how to assess airway, breathing, and circulation during the primary assessment. Explain the interventions you will take for possible problems with airway, breathing, and circulation.
4. Explain the C-A-B approach to the primary assessment, and explain the circumstances in which the C-A-B approach would be appropriate.

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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.

STUDENT RESOURCE

WORKBOOK FOR EMERGENCY CARE, 14TH 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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SECTION

1

Foundations

CHAPTER 1

Introduction to Emergency
Medical Services

CHAPTER 2

Well-Being of the EMT

CHAPTER 3

Lifting and Moving Patients

CHAPTER 4

Medical, Legal, and Ethical Issues

CHAPTER 5

Medical Terminology

CHAPTER 6

Anatomy and Physiology

CHAPTER 7

Principles of Pathophysiology

CHAPTER 8

Life Span Development

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

Chapter 1 gives an overview of the 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 Services



Standard

Preparatory (EMS Systems; Research); Public Health

Competency

Applies fundamental knowledge of the EMS system, safety/well-being of the EMT, and 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

Outcomes

After reading this chapter, you should be able to:

- 1.1** Describe the components of the EMS system. (pp. 3-8)
 - Describe the connections between EMS history and EMS today.
 - Recognize components that make up EMS systems.
 - Diagram the chain of human resources in EMS systems.
 - Describe the communications systems by which the public can access EMS.
- 1.2** Summarize the roles and responsibilities of EMTs. (pp. 9-15)
 - Explain the different levels of EMS training.
 - Describe the tasks within the roles and responsibilities of an EMT.

- Explain the traits of an EMT that convey professionalism.
- Explain the EMT's role in quality improvement.
- Explain the role of an EMS system physician Medical Director.

1.3 Describe the connection between public health and EMS systems. (pp. 16-17)

- List ways that EMS systems can support public health.

1.4 Summarize the role of evidence-based research in EMS. (pp. 17-19)

- Identify ways research impacts EMS.
- Explain the evidence-based process for EMTs.
- Compare the different methods of medical research.
- Explain how to evaluate medical research.

Key Terms

evidence-based techniques, 17
medical direction, 14
Medical Director, 14

911 system, 7
off-line medical direction, 15
on-line medical direction, 15
patient outcomes, 17

peer reviewed, 19
protocols, 14
quality improvement, 13
standing orders, 14

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, or 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 my role be 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, Clara Barton began such a service for the wounded during the American Civil War 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

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



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). Lessons from military settings continue to provide new information for improving emergency care.

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 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 the U.S. 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 that encompasses the universal system access number (911) and 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.

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

- **Medical direction.** Each EMS system must have a physician as a Medical Director who is accountable for the activities of EMS personnel within that system. The Medical Director must be involved in all aspects of the patient-care system, including protocol development, training, and quality improvement.
- **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 a patient into and out of an ambulance. Instead, the EMS system extended the hospital emergency department 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.

Becoming an EMT now offers even more possibilities for advancement in EMS (Figure 1-1). In addition to the traditional path to Advanced Emergency Medical Technician (AEMT) and paramedic, opportunities exist in tactical EMS, Mobile Integrated Healthcare (community paramedicine), and employment in emergency departments. Many colleges and universities have degrees specifically focused on EMS majors such as paramedic and EMS leadership programs.

Components of the EMS System

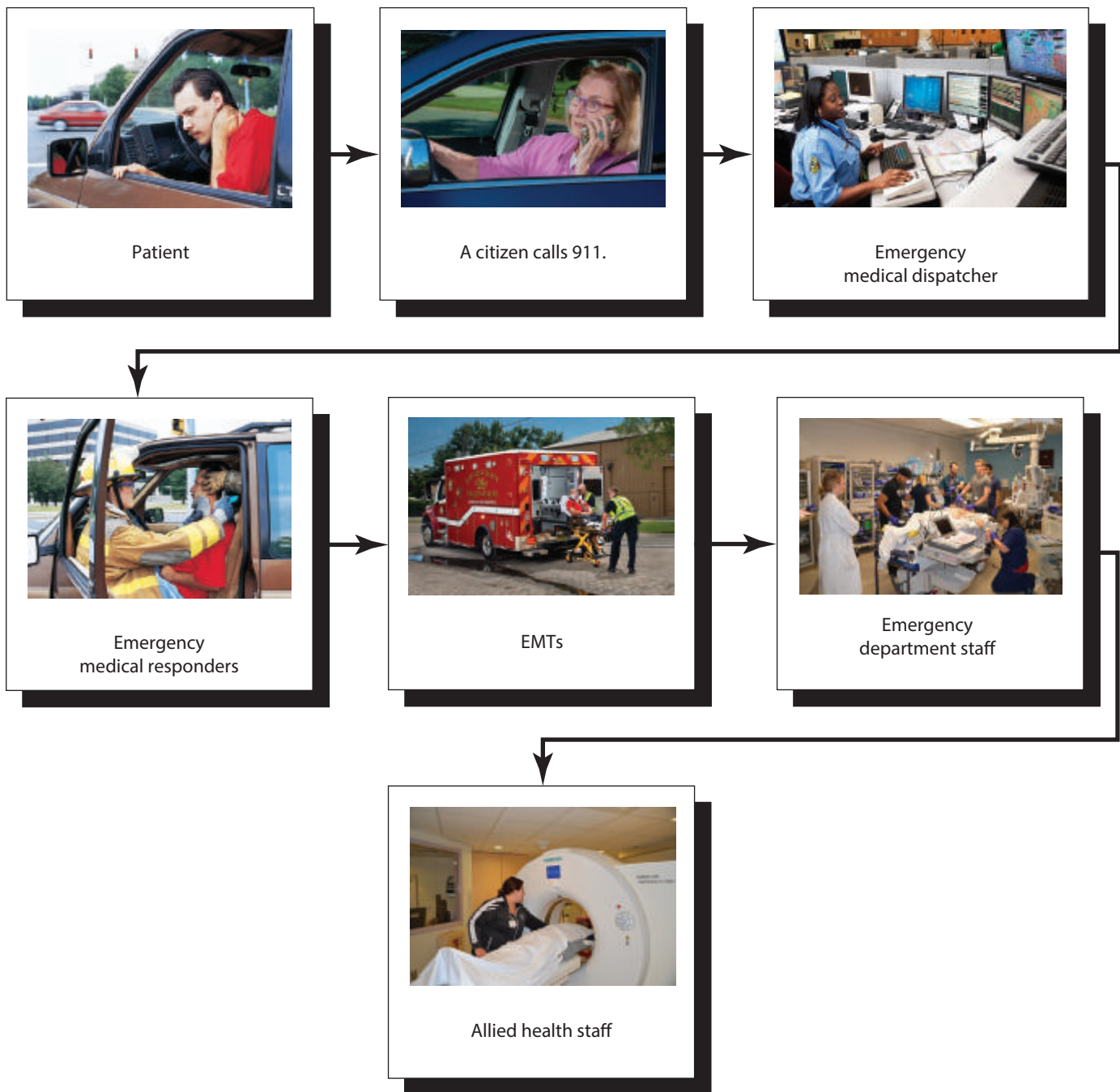
To understand the EMS system, you must look at it from the patient’s viewpoint rather than from that of the EMT (Figure 1-2). For the patient, care begins with the initial phone call to the Emergency Medical Dispatcher (EMD). The EMS system responds to the call for help by sending to the scene available 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



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



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 24 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 reach 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.

Accessing the EMS System

For 99% of the population, a **911 system** provides telephone access to report emergencies. A dispatcher answers the call, takes the information, and alerts EMS, the fire department, and law enforcement as needed. According to the National Emergency Number Association, about 240 million calls are received by 911 centers each year, and more than 80% of those calls come from mobile devices. Wireless carriers and 911 centers are working together on two phases of development so that emergency dispatchers can see the number the mobile caller is calling from (phase 1) and identify the actual physical location of the mobile device (phase 2). Success in developing this capacity will have a huge impact on locating and providing care to ill or injured callers. VoIP (Voice over Internet Protocol) also poses challenges for communication centers in locating callers. Technological solutions are in the works for this issue as well.

Enhanced 911 centers have the capability of identifying the caller's landline phone number and location automatically, and some have the additional capability of locating wireless callers. This enables the dispatcher to send emergency personnel to the scene even if the phone is disconnected or the patient loses consciousness.

Another development in the communication and dispatch portion of the EMS system is the training and certification of emergency medical directors (EMDs). Not only do these specially trained dispatchers 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 may vary slightly from place to place. Your instructor will explain any variations that exist in your region or state.

1. **Emergency Medical Responder (EMR).** 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).** In most areas, EMT certification is considered the minimum level of training for ambulance personnel. EMTs provide basic-level medical and trauma care and transportation to a medical facility and frequently work with advanced-level EMS providers.

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* also identifies the caller's phone number and location automatically.



CORE CONCEPT

How the public activates the EMS system



3. **Advanced Emergency Medical Technician (AEMT).** The AEMT, like the EMT, provides basic-level care and transportation but also provides some advanced-level care. Advanced care may include use of advanced airway devices and administration of some fluids or medications via intravenous (IV) and intraosseous (IO) routes.
4. **Paramedic.** The paramedic performs all of the skills of the EMT and AEMT plus additional advanced-level assessment, decision making, and skills. The paramedic provides the most advanced level of prehospital care.

In some states, specially trained registered nurses and physicians can also hold prehospital certification and provide even more advanced patient care as part of the prehospital EMS system (Figure 1-3).

FIGURE 1-3 (Left) As an EMT, you will work with patients of many ages, from older adults to newborns. (Right) Specially trained physicians and RNs may provide advanced care as part of the prehospital care in some EMS systems. Some states have a prehospital EMS system that can provide more advanced patient care at the scene. (Right photo: © Edward T. Dickinson, MD)



Think Like an EMT

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. When this happens, 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:

1. *Deciding which hospital to transport someone to.* Should you take your patient to the closest hospital or to a more distant specialty hospital?
2. *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.



Roles and Responsibilities of the 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, 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.

 **CORE CONCEPT**
Your roles and responsibilities as an EMT

- **Personal safety.** It is not possible to help patients if you are injured before you reach them 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, and more. EMTs may be called to respond to incidents where mass violence has occurred, including shootings, explosions, and attacks with vehicles. 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.
- **Working with other public safety professionals.** As an EMT you will work closely with advanced EMS providers, firefighters, police officers, specialty rescue teams, and others.
- **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 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 life-saving 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 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 and 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 crucial. 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 patients. You are an advocate, the person who speaks up for your patients and pleads their cause. It is your responsibility to address each patient's needs and to bring patients' 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 the patient's 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. Actions that may seem minor to you 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 to 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 and bring this to the attention of the patient and the family. Another instance 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 in the chapter *Poisoning and Overdose 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 (57 kg). 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. Any eyesight problems must be corrected (as with prescription eyeglasses or contact lenses) in order to provide safe patient care.

Be aware of any problems you may have with color vision. Not only is this important when 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, so any significant problems must be corrected if you are going to be an EMT.

Personal Traits

Good personal traits are very important in an EMT (Figure 1-4). 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 that needed care may be given 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.



FIGURE 1-4 A professional appearance inspires confidence.

- *Of good moral character and respectful of others* to allow for trust in situations when patients cannot protect their own bodies or valuables and to convey all information truthfully and reliably.
- *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.
- *Able to listen to others* to be compassionate and empathetic, to be accurate with interviews, and to inspire confidence.
- *Nonjudgmental and fair*, treating all patients equally regardless of race, religion, lifestyle, or culture. You will encounter many cultural differences among patients. Figure 1-5 highlights one example of the cultures you may encounter in EMS. You will find additional features involving cultural issues throughout the book.



FIGURE 1-5 Your patients may come from a wide variety of cultures. As an example, Muslims such as this woman from Afghanistan have standards of modesty that may require examination by an EMT of the same sex.



Education

An EMT must maintain up-to-date knowledge and skills. Since ongoing research in emergency care causes frequent changes in procedure, some of the information you receive while you are studying to become an EMT will become outdated during your career—and sometimes during your course! You must always be prepared to update your understanding and practice with newer, evidence-based procedures.

There are many ways to stay current. One way is through refresher training. Most areas require recertification at regular intervals. Refresher courses present material to the EMT who has already been through a full course but needs to receive updated information. Refresher courses, which are usually shorter than original courses, are required at two- to four-year intervals.

Continuing education is another way to stay current. This type of training supplements the EMT's original course. It should not take the place of original training. For example, you may wish to learn more about pediatric or trauma skills or driving techniques. You can obtain this education in conferences and seminars and through lectures, classes, videos, or demonstrations.

It is important to realize that education is a constant process that extends long past your original EMT course.

Where Will You Become a Provider?

As an EMT, you will have a wide variety of opportunities to use the skills you will learn in class. EMTs are employed in public and private settings—such as fire departments, ambulance services, and in urban/industrial settings as well as rural/wilderness settings (Figure 1-6). In fact, most fire departments require their firefighters to be cross-trained as both firefighters and EMTs.

You may be taking this course as a volunteer. A large portion of the United States is served by volunteer fire departments and Emergency Medical Services. Your willingness to participate in training to help others is both necessary for and appreciated by your community.

National Registry of Emergency Medical Technicians

The National Registry of Emergency Medical Technicians (NREMT), as part of its effort to establish and maintain national standards for EMTs, provides registration to EMRs, EMTs, AEMTs, and paramedics. Registration is obtained by successful completion of NREMT practical and computer-based knowledge examinations. Holding an NREMT registration may help in reciprocity (transferring to another state or region). It is usually considered favorably when you apply for employment, even in areas where NREMT registration is not required (Figure 1-7).

FIGURE 1-6 There are many career opportunities for EMTs, including work in (A) urban/industrial settings and (B) rural/wilderness settings. (Photo B: © Edward T. Dickinson, MD)



A



B

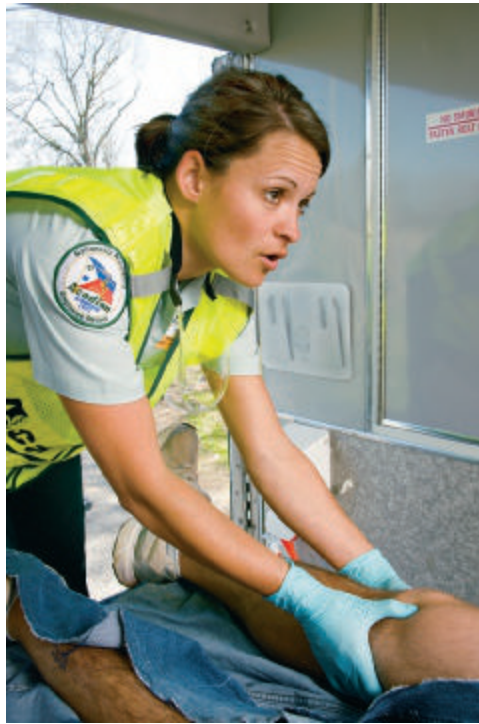


FIGURE 1-7 In many states an EMT candidate must have passed the NREMT exam to be licensed and certified by the state. This EMT practices in Louisiana, one state that requires NREMT registration.

Most states use the National Registry examinations as their certification exams. If your state or region does not use the registry exam, ask your instructor how you can sit for the examination. Upon passing the exam and obtaining registry, you will be entitled to wear the NREMT patch.

The National Registry is also active in EMS curriculum development and other issues that affect EMS today. For information, contact:

National Registry of Emergency Medical Technicians
6610 Busch Boulevard
P.O. Box 29233
Columbus, OH 43229
614-888-4484
www.nremt.org

Quality Improvement

Quality improvement, an important concept in EMS, consists of continuous self-review with the purpose of identifying aspects of the system that require improvement. Once a problem is identified, a plan is developed and implemented to prevent further occurrences of the same problem. As implied by the name, quality improvement is designed and performed to ensure that the public receives the highest-quality prehospital care.

A sample quality improvement review might go as follows:

As part of a continuous review of calls, the Quality Improvement (QI) committee has reviewed all of your squad's run reports that involve trauma during one particular month. The committee has noted that the time spent at the scene of serious trauma calls was excessive. (You will learn in later chapters that time at the scene of serious trauma should be kept to a minimum because the injured patient must be transported to the hospital for care that cannot be provided in the field.)

The QI committee has brought this fact to the attention of the Medical Director and the leadership of the ambulance squad. As a result, better protocols have been instituted. Monthly squad training is developed that covers topics such as how to identify serious trauma patients and that requires skill practice to reinforce techniques of trauma care. (Later in the year, the QI committee will review the same criteria to ensure that the extra training has been effective in improving the areas that were found to be deficient.)

quality improvement

a process of continuous self-review with the purpose of identifying and correcting aspects of the system that require improvement.

CORE CONCEPT
*The process of EMS
quality improvement*

During the review, the QI committee has also identified calls during which the crews followed procedures and performed well. A letter has been sent to these EMTs commending them for their efforts.

As an EMT, you will have a role in the quality improvement process. In fact, a dedication to quality can be one of the strongest assets of an EMT. There are several ways you can work toward quality care. These include:

- **Carefully preparing written documentation.** Call reviews are based on the pre-hospital care reports that you and other crew members write. If a report is incomplete, it is difficult for a QI team to assess the events of a call. If you are ever involved in a lawsuit, an inaccurate or incomplete report may also be a cause for liability. Be sure the reports you write are neat, complete, and accurate.
- **Becoming involved in the QI process.** As you gain experience, you may wish to volunteer for assignment to the QI committee. In addition, quality improvement can be implemented on every call. An individual ambulance crew can perform a critique after each call to determine things that went well and others that may need improvement. You can have another EMT or advanced EMT look over your report before turning it in to ensure it is accurate and complete.
- **Obtaining feedback from patients and the hospital staff.** This may be done informally or, in some cases, formally. Your organization may send a letter to patients that asks for comments on the care they were given while you were attending them. Hospital staff may be able to provide information that will help strengthen your care-giving skills.
- **Maintaining your equipment.** It will be difficult to provide quality care with substandard, damaged, or missing equipment. Although the ingenuity of EMTs should never be underestimated, it could be dangerous to administer oxygen or provide cardiac defibrillation without proper, functional equipment. Check and maintain equipment regularly.
- **Continuing your education.** An EMT who was certified several years ago and has never attended subsequent training will have a problem providing quality care. Seldom-used skills deteriorate without practice. Procedures change. Without some form of regular continuing education, it is difficult to maintain standards of quality.

Quality improvement is another name for providing the care that you would want to have provided to you or a loved one in a time of emergency. That is the best care possible. Maintaining continuous high quality is not easy; it requires constant attention and a sense of pride and obligation. Striving for quality—both in the care you personally give to patients and as a collective part of an ambulance squad—is the way to uphold the highest standards of the EMS system.

Medical Director

a physician who assumes ultimate responsibility for the patient-care aspects of the EMS system.

medical direction

oversight of the patient-care aspects of an EMS system by the Medical Director. Direction can be either off-line or on-line.

protocols

lists of steps, such as assessments and interventions, to be taken in different situations. Protocols are developed by the Medical Director of an EMS system.

standing orders

a policy or protocol issued by a Medical Director that authorizes EMTs and others to perform particular skills in certain situations.

Medical Direction

Each EMS service or agency has a **Medical Director**, a physician who assumes the ultimate responsibility for **medical direction**, or oversight of the patient-care aspects of the EMS system. *Off-line medical direction* consists of standing orders issued by the Medical Director that allow EMTs to give certain medications or perform certain procedures without speaking to the Medical Director or another physician. *On-line medical direction* consists of orders from the on-duty physician given directly to an EMT in the field by radio or telephone.

The Medical Director also oversees training, develops **protocols** (lists of steps for assessment and interventions to be performed in different situations), and is a crucial part of the quality improvement process. Presence of a physician who is actively involved in an EMS system is one sign of a high-quality EMS agency.

The physician obviously cannot physically be at every call. This is why EMS systems develop **standing orders**. The physician issues a policy or protocol that authorizes EMTs

and others to perform particular skills in certain situations. An example may be the administration of naloxone. Naloxone is used to reverse opioid overdoses when the patient has a decreased respiratory drive. The Medical Director issues a standing order that allows EMTs to give naloxone in certain circumstances without speaking to the Medical Director or another physician. This kind of “behind the scenes” medical direction is called **off-line medical direction**.

Certain other procedures that are not covered by standing orders or protocols require the EMT to contact the on-duty physician by radio or telephone prior to performing a skill or administering a medication. For example, EMTs carry aspirin, which is beneficial to many—but not all—patients who have possible cardiac symptoms. Prior to administering aspirin, you may be required to consult with the on-duty physician. You would use a radio or cell phone from the ambulance to provide patient information to the physician. After receiving your information, the physician would instruct you on whether and how to administer the aspirin. Orders from the on-duty physician given by radio or phone are called **on-line medical direction**. On-line medical direction may be requested at any time you feel that medical advice would be beneficial to patient care.

Protocols and procedures for on-line and off-line medical direction vary from system to system. Many have protocols available online or in an application that is accessible from a smartphone or tablet. Your instructor will inform you what your local policies are and where to locate your protocols. Always follow your local protocols.

off-line medical direction

standing orders issued by the Medical Director that allow EMTs to give certain medications or perform certain procedures without speaking to the Medical Director or another physician.

on-line medical direction

orders from the on-duty physician given directly to an EMT in the field by radio or telephone.



Point of View

“I was driving along, not a care in the world, when all of a sudden this car pulled out from a side street—and pulled right in front of me. I couldn’t brake in time. I couldn’t steer in time. The crash made thunder seem like a whisper. I didn’t just hear it. I felt it. The next thing I knew I was sitting in my car and it was smoky. I thought it was on fire. Then I noticed the air bag, which must’ve gone off. People were running up to my window to ask if I was OK. I felt so foggy, I didn’t even know what to say.

“A fireman came up to my window and asked how I was doing. By then I had a minute to think and compose myself. It felt like I’d cry if I opened my mouth to say anything. The ambulance came in, and the EMTs and firefighters worked to get me out of the car. The fireman who came to my window must’ve climbed into the backseat. I could feel hands alongside my head.

“The collar felt like it was going to choke me. And everything was so, so loud. But what I remember most, more than the crash or the hospital or the bills, were the kind words the fireman said from behind me. In spite of everything going on that day, his reassuring, kind voice is my best memory from the whole miserable day. It was like an angel being there for me.”

As you begin your training as an EMT, you will learn many clinical skills. For this patient, you will perform an assessment, restrict motion of the neck and spine, take vital signs, and transport the patient—perhaps to a trauma center.

You will also provide emotional reassurance and support in this time of crisis. It has been said that you should treat your patients as you would want your family to be treated. This is a good rule.

“Point of View” features such as this one will appear throughout the text. Their purpose is to present an emergency from the patient’s perspective because understanding how the patient feels is a critical element in developing people skills. The clinical skills you learn are vital to your success in becoming an EMT. However, people skills are essential for you to thrive as an EMT.



The EMS Role in Public Health

From clean drinking water and sewage systems to the decline of infectious diseases through vaccination, we have reaped the benefits of public health. Although public health has many definitions, it is generally considered to be the system by which the medical community oversees the basic health of a population. Additional efforts by the public health system include prenatal care, reducing injury in children and geriatric patients, campaigns to reduce the use of tobacco, and campaigns to reduce the incidence of obesity through better diet choices.

EMS has a role in many public safety issues, including:

- **Injury prevention for geriatric patients.** When on a call to a patient's home, the EMT can identify things that may cause falls, such as loose-fitting footwear or throw rugs (Figure 1-8). EMS may also run blood pressure clinics and offer methods for older adults to present medications and medical history to EMTs in the event of emergency (e.g., File of Life).
- **Injury prevention for youth.** EMS is frequently involved in car-seat clinics, distribution of bicycle helmets, and other programs for youth.
- **Public vaccination programs.** More and more EMS providers are being trained and allowed to provide vaccination clinics for the public. Seasonal flu and variations such as H1N1 are examples of vaccinations that are frequently offered by EMS providers. Some regions allow specially trained EMS providers to take routine vaccinations (e.g., routine childhood vaccinations) out to the public—especially in areas where many children do not have routine well care and are at risk.
- **Disease surveillance.** On the front lines, EMS reports may serve as an indication that a trend in injury or disease is beginning. Such trends may range from flu to opioid overdose to terrorist attacks.

Programs are being developed around the country that use EMS providers in different and innovative public health roles. These programs vary from location to location according to need but are collectively referred to as Mobile Integrated Health Care. Unlike hospital- or office-based medicine, EMS is always in the field, in patients' homes, and in the public eye. This visibility and access are vital to bringing health services

FIGURE 1-8 EMTs play important roles in public safety issues, such as providing fall-prevention advice to older patients.



to points where they are needed and to identifying areas where injuries and disease may be prevented.

One thing is certain: EMS does more than just respond to emergencies. In your future as an EMT, you will likely play an even greater role in public health.

Research

Medicine is based on research. Some—but not all—of the procedures you will be trained to perform have been developed as a result of research. Experts universally agree that research must play a greater role in EMS for it to continue to evolve as a respected profession. Many of the things we do are based on tradition—meaning they are done because that is how we have always done them. Other techniques have been developed from hospital procedures and applied to the field.

Although teaching how to perform or even interpret research is beyond the scope of your EMT class, it is important for you to know the importance of research and how it will shape the future of EMS.

Two ways research affects EMS are through a focus on improving **patient outcomes** and through **evidence-based techniques**.

Although our concern may seem to be whether patients make it to the hospital alive, we must remember that EMS is part of a larger system. What we do also affects the patient's long-term survival. If something appears to help in the short term but has no effect in the long term, it is not useful. Research into long-term results (patient outcomes) allows us to make the best decisions for the patient's overall care.

Evidence-based decision making means that the procedures and knowledge we use in determining what care works are based on scientific evidence. A scenario involving evidence-based decision making might go like this:

You are at the ambulance bay when an experienced member of your crew is talking with your Medical Director about adding a new medication to the EMT scope of practice. This member has heard that the new drug has been successful in other local squads and has seen it in magazines for EMS providers.

Your Medical Director finds it interesting but asks the member for evidence. "Check the literature," she says. "If we can find evidence that this makes a difference in outcomes and doesn't have a significant risk, we'll take a look at it."

The evidence-based process here demonstrates the general procedures needed to make these decisions. It includes:

- **Forming a hypothesis.** In this case, the experienced provider felt that a new medication would be safe to use and beneficial.
- **Reviewing literature.** The provider searches medical literature to determine if the new medication has been studied—especially for use by EMTs (Figure 1-9).
- **Evaluating the evidence.** The provider meets with the Medical Director to review the literature. If there was no literature, they could decide to create a research project to study it in the organization or region.
- **Adopting the practice if evidence supports it.** It turns out that the medication has been studied and appears safe. The Medical Director is convinced that the medication should be brought into the EMT scope of practice. Training sessions are scheduled prior to implementation.

patient outcomes

the long-term survival of patients.

evidence-based techniques

techniques or practices that are supported by scientific evidence of their safety and efficacy, rather than merely on supposition and tradition.

The Basics of EMS Research

Moving to evidence-based medicine is not simple. EMS is not an easy field in which to gather research, and serious challenges exist. As a provider, you should understand the value of research not only to your profession but to your everyday practice. There are



FIGURE 1-9 Many EMS/rescue operations adopt new procedures and equipment on the basis of research providing evidence that they are effective.



simple steps you can take to improve your understanding and to help move EMS toward a more evidence-based approach.

Here is an example of how research affects your practice as an EMT:

It was not long ago that EMTs gave oxygen—a lot of oxygen—to almost every patient. Oxygen was nicknamed the “wonder drug” because it was needed by humans to live—and EMTs could administer it. However, oxygen use turns out to be a bit more complicated than that.

Oxygen, given at the wrong time or in excess, can cause harm. Research showed that raising the oxygen levels of patients with certain conditions (e.g., heart attack and stroke) can make their condition worse. While some patients who need it will still receive oxygen, EMTs have learned that it is not the “wonder drug” anymore and that *all* medications should be administered wisely and according to the patient’s needs.

The dynamic nature of our treatment setting makes research difficult at best. We encounter many obstacles to research that simply do not exist in other areas of the health care field. Often our work environment is unstable, our encounters are brief, and our data collection is disjointed and lacks centralization. Furthermore, we face many ethical dilemmas. Obtaining consent from patients in critical condition is challenging at best. We do have many opportunities to create valid and important studies on prehospital care, but to do so we must promote the best practices of research so our outcomes can truly guide us to high-quality care.

Not all research is created equal. There are good studies, and there are bad studies. As we evolve in an evidence-based environment, we should embrace the best practices of conducting and evaluating research (Figure 1-10). The finer points of medical research are by no means a simple topic, and a thorough examination of how to evaluate research is beyond the scope of this text. However, a few broad concepts can be helpful to consider.

Remember that the process of research is the same whether you are an EMS researcher or a scientist in a laboratory. We all rely on the *scientific method*, a process of experimentation for answering questions and acquiring new knowledge that was developed by Galileo about four hundred years ago. In this method, general observations are turned into a *hypothesis* (or unproven theory). Predictions are then made, based on the hypothesis, and these predictions are tested to help prove or disprove the hypothesis.