





### **Nancy Caroline's**

# Emergency Care in the Streets



Series Editor:

Alfonso Mejia, MD, MPH, FAAOS

**Lead Editors:** 

Barbara Aehlert, MSEd, BSPA, RN
Bob Elling, MPA, EMT-P







World Headquarters Jones & Bartlett Learning 25 Mall Road Burlington, MA 01803 978-443-5000 info@jblearning.com www.jblearning.com www.psglearning.com



#### American Academy of Orthopaedic Surgeons 2022 Board of Directors

President: Felix H. Savoie, III, MD, FAAOS First Vice-President: Kevin J. Bozic, MD, MBA, FAAOS Second Vice-President: Paul Tornetta, III, MD, FAAOS Treasurer: Michael L. Parks, MD, FAAOS Past-President: Daniel K. Guy, MD, FAAOS BOC Chair: Claudette M. Lajam, MD, FAAOS BOC Chair-Elect: Alfonso Mejia, MD, MPH, FAAOS BOC Secretary: Joel L. Maverson, MD, FAAOS BOS Chair: Alexandra E. Page, MD, FAAOS BOS Chair-Elect: Armando F. Vidal, MD, FAAOS BOS Secretary: Adolph J. Yates, Jr., MD, FAAOS

Members-at-Large: Chad A. Krueger, MD, FAAOS Valerae O. Lewis, MD, FAAOS Toni M. McLaurin, MD, FAAOS

Karen M. Sutton, MD, FAAOS Lay Member: Lisa N. Masters

Chief Executive Officer (ex-officio): Thomas E. Arend, Jr., Esq., CAE

#### **Editorial Credits**

Chief Commercial Officer: Anna Salt Troise, MBA Director, Publishing: Hans J. Koelsch, PhD Senior Manager, Editorial: Lisa Claxton Moore Senior Editor: Steven Kellert

Jones & Bartlett Learning books and products are available through most bookstores and online booksellers. To contact the Jones & Bartlett Learning Public Safety Group directly, call 800-832-0034, fax 978-443-8000, or visit our website, www.psglearning.com.

Substantial discounts on bulk quantities of Jones & Bartlett Learning publications are available to corporations, professional associations, and other qualified organizations. For details and specific discount information, contact the special sales department at Jones & Bartlett Learning via the above contact information or send an email to specialsales@iblearning.com.

Copyright © 2023 by Jones & Bartlett Learning, LLC, an Ascend Learning Company and the American Academy of Orthopaedic Surgeons

All rights reserved. No part of the material protected by this copyright may be reproduced or utilized in any form, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without written permission from the copyright owner.

The content, statements, views, and opinions herein are the sole expression of the respective authors and not that of Jones & Bartlett Learning, LLC. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not constitute or imply its endorsement or recommendation by Jones & Bartlett Learning, LLC and such reference shall not be used for advertising or product endorsement purposes. All trademarks displayed are the trademarks of the parties noted herein. Nancy Caroline's Emergency Care in the Streets, Ninth Edition is an independent publication and has not been authorized, sponsored, or otherwise approved by the owners of the trademarks or service marks referenced in this product.

There may be images in this book that feature models; these models do not necessarily endorse, represent, or participate in the activities represented in the images. Any screenshots in this product are for educational and instructive purposes only. Any individuals and scenarios featured in the case studies throughout this product may be real or fictitious but are used for instructional purposes only.

The procedures and protocols in this book are based on the most current recommendations of responsible medical sources. The American Academy of Orthopaedic Surgeons and the publisher, however, make no guarantee as to, and assume no responsibility for, the correctness, sufficiency, or completeness of such information or recommendations. Other or additional safety measures may be required under particular circumstances. Clinicians should use their own, independent medical judgment, in addition to open discussion with the patient, when developing patient care recommendations and treatment plans.

This textbook is intended solely as a guide to the appropriate procedures to be employed when rendering emergency care to the sick and injured. It is not intended as a statement of the standards of care required in any particular situation, because circumstances and the patient's physical condition can vary widely from one emergency to another. Nor is it intended that this textbook shall in any way advise emergency personnel concerning legal authority to perform the activities or procedures discussed. Such local determination should be made only with the aid of legal counsel.

23749-8

#### Production Credits

Vice President, Product Management: Marisa R. Urbano Vice President, Content Strategy and Implementation: Christine Emerton Director, Product Management: Cathy Esperti Director, Product Management: Laura Carney Director, Content Management: Donna Gridley Manager, Content Strategy: Tiffany Sliter Developmental Editor: Mike Boblitt Content Coordinator: Mark Restuccia Director, Project Management and Content Services: Karen Scott Manager, Program Management: Kristen Rogers Project Manager: John Fuller Senior Digital Project Specialist: Angela Dooley

#### Library of Congress Cataloging-in-Publication Data

Names: American Academy of Orthopaedic Surgeons, author, issuing body. Aehlert, Barbara, editor. | Elling, Bob, editor. | Caroline, Nancy L. Title: Nancy Caroline's emergency care in the streets / AAOS; Nancy Caroline; series editor, Alfonso Mejia; lead editors, Barbara Aehlert, Bob Elling. Other titles: Emergency care in the streets Description: Ninth edition. | Burlington, MA : Jones & Bartlett Learning, [2023] | Includes index. Identifiers: LCCN 2021039667 | ISBN 9781284256789 (hardcover) Subjects: MESH: Emergency Treatment | Emergency Medical Services | **Emergency Medical Technicians** Classification: LCC RC86.7 | NLM WB 105 | DDC 616.02/5--dc23 LC record available at https://lccn.loc.gov/2021039667

Printed in the United States of America 26 25 24 23 22 10 9 8 7 6 5 4 3 2 1 Director of Marketing: Brian Rooney Vice President, International Sales, Public Safety Group: Matthew Maniscalco

Director of Sales, Public Safety Group: Brian Hendrickson

Content Services Manager: Colleen Lamy

Vice President, Manufacturing and Inventory Control: Therese Connell Composition: S4Carlisle Publishing Services

Cover and Text Design: Scott Moden Senior Media Development Editor: Troy Liston

Rights & Permissions Manager: John Rusk

Rights Specialist: Benjamin Roy

Cover Image and Title Pages: © John Moore/Getty Images News/Getty Images

Printing and Binding: LSC Communications





# **Brief Contents**

### **VOLUME 1**

SECTION 1 Preparatory	1
1 EMS Systems	3
2 Workforce Safety and Wellne	ess 45
3 Public Health	91
4 Medical, Legal, and Ethical Is	sues 117
5 Communications	163
6 Documentation	205
7 Medical Terminology	231
<b>SECTION 2</b> The Human B and Human Systems	ody 267
8 Anatomy and Physiology	269
9 Pathophysiology	487
10 Life Span Development	555
SECTION 3 Patient Assess	sment 579
11 Patient Assessment	581
12 Critical Thinking and Clinical Decision Making	l 705
SECTION 4 Pharmacology	y 723
13 Principles of Pharmacology	725
14 Medication Administration	795

**15 Emergency Medications** 

S	ECTION 5 Airway Management	953
16	Airway Management	955
S	ECTION 6 Medical	1091
17	Respiratory Emergencies	1093
18	Cardiovascular Emergencies	1157
19	Neurologic Emergencies	1297
20	Diseases of the Eyes, Ears, Nose, and Throat	1363
21	Abdominal and Gastrointestinal Emergencies	1395
22	Genitourinary and Renal Emergencies	1445
23	Gynecologic Emergencies	1473
24	<b>Endocrine Emergencies</b>	1495
25	Hematologic Emergencies	1535
26	Immunologic Emergencies	1559
27	Infectious Diseases	1587
28	Toxicology	1655
29	Psychiatric Emergencies	1721
Glo	ssary: Volume 1	G-1
Ind	ex: Volume 1	1-1







# **Brief Contents**

### **VOLUME 2**

SECTION 7 Trauma	1769
30 Trauma Systems and Mechanism of Injury	1771
31 Bleeding	1819
32 Soft-Tissue Trauma	1853
33 Burns	1887
34 Face and Neck Trauma	1931
35 Head and Spine Trauma	1971
36 Chest Trauma	2053
37 Abdominal and Genitourinary Trauma	2089
38 Orthopaedic Trauma	2117
39 Environmental Emergencies	2169
SECTION 8 Shock and Resuscitation	2233
40 Responding to the Field Code	2235
41 Management and Resuscitation of the Critical Patient	2273

<b>SECTION 9</b> Special Patient Populations	2321
42 Obstetrics	2323
43 Neonatal Care	2377
44 Pediatric Emergencies	2429
45 Geriatric Emergencies	2537
46 Patients With Special Challenges	2589
SECTION 10 Operations	2649
47 Transport Operations	2651
48 Incident Management and Mass-Casualty Incidents	2685
49 Vehicle Extrication and Special Rescue	2717
50 Hazardous Materials	2761
51 Terrorism Response	2801
52 Disaster Response	2839
53 Crime Scene Awareness	2875
Glossary: Volume 2	G-41
Index: Volume 2	I- <b>5</b> 1







# **Contents**

### **VOLUME 2**

S	SECTION 7 Trauma	1769	Patient Assessment Scene Size-up	1829 1829
			Primary Survey	1829
n	Trauma Systems and Mechanism		History Taking	1831
	of Injury	1771	Secondary Assessment	1831
			Reassessment	1833
	Introduction	1772	Emergency Medical Care of Bleeding	1000
	Trauma, Energy, and Kinetics	1773	and Hemorrhagic Shock	1833
	Factors Affecting Types of Injuries	1773	Managing External Hemorrhage	1833
	Kinetics	1775	Special Management Techniques for	1000
	Multisystem Trauma	1777	External Hemorrhage	1835
	Blunt Trauma	1777	Managing Internal Hemorrhage	1842
	Motor Vehicle Crashes	1777	Management of Hemorrhagic Shock	1843
	Motorcycle Crashes	1786	Management of Hemormagic Shock	1040
	Pedestrian Injuries	1789	32 Soft-Tissue Trauma	1853
	Falls From Heights	1790	lakas da aktora	1054
	Penetrating Trauma	1791	Introduction	1854
	Stab Wounds	1791	Incidence, Mortality, and Morbidity	1855
	Gunshot Wounds	1792	Anatomy and Physiology Review	1855
	Blast Injuries	1795	Skin Structure and Function	1855
	Categories of Blast Injuries	1795	Skin Tension Lines	1856
	The Physics of an Explosion	1796	General Pathophysiology: Closed Versus	1057
	Tissues at Risk	1797	Open Wounds	1857
	Assessment and Management of Blast Injuries	1798	Closed Wounds	1857
	General Assessment of Trauma	1799	Open Wounds	1857
	Scene Size-up	1799	Crush Injuries	1858
	Primary Survey	1800	Compartment Syndrome	1858
	History Taking	1801	Blast Injuries	1858
	Secondary Assessment	1802	Wound Healing	1858
	Reassessment	1804	The Process of Wound Healing	1858
	Trauma Score	1804	Alterations of Wound Healing	1860
	Revised Trauma Score	1804	Infection	1861
	Management of Trauma	1805	Patient Assessment	1862
	Trauma Lethal Triad	1806	Scene Size-up	1862
	Criteria for Referral to a Trauma Center	1806	Primary Survey	1862
	Mode of Transport	1810	History Taking	1863
	Research and Trauma Care	1811	Secondary Assessment	1863
			Reassessment	1863
1	Bleeding	1819	Emergency Medical Care	1864
•			Bandaging and Dressing Wounds	1864
	Introduction	1820	Complications of Improperly Applied	
	Anatomy and Physiology Review	1820	Dressings	1866
	The Cardiac Cycle	1821	Control of External Bleeding	1866
	Blood and Its Components	1822	Managing Wound Healing and Infection	1867
	Blood Circulation and Perfusion	1822	Pain Control	1870
	Pathophysiology of Hemorrhage	1824	Pathophysiology, Assessment, and Management	
	External Hemorrhage	1824	of Specific Injuries	1870
	Internal Hemorrhage	1824	Abrasions	1870
	The Significance of Hemorrhage	1825	Lacerations	1870
	Physiologic Response to Hemorrhage	1825	Puncture Wounds	1871
	Shock	1826	Avulsions	1873
	Hemorrhagic Shock	1827	Amnutations	1874

vii









### viii Contents: Volume 2

	Bite Wounds	1875	Emergency Medical Care	1940
	High-Pressure Injection Injuries	1876	Pathophysiology, Assessment, and Management	
	Pathophysiology, Assessment, and		of Face Injuries	1941
	Management of Soft-Tissue Injuries		Pathophysiology	1941
	to Specific Anatomic Sites	1877	Assessment	1944
	Facial and Neck Injuries	1877	Management	1944
	Thoracic Injuries	1878	Pathophysiology, Assessment, and Management	1277
	Abdominal Injuries	1878	of Eye Injuries	1946
	Pathophysiology, Assessment, and Management	1070	Pathophysiology	1946
	of Soft-Tissue Infections	1878	Assessment	1950
	Myositis	1878	Management	1952
	Gangrene	1878	Pathophysiology, Assessment, and Management	1056
	Tetanus	1879	of Ear Injuries	1956
	Necrotizing Fasciitis	1879	Pathophysiology	1956
	Paronychia	1879	Assessment and Management	1956
	Flexor Tenosynovitis of the Hand	1879	Pathophysiology, Assessment, and Management	
			of Oral and Dental Injuries	1957
33	Burns	1887	Pathophysiology	1958
55			Assessment and Management	1958
	Introduction	1888	Pathophysiology, Assessment, and Management	
	Anatomy and Physiology Review	1889	of Injuries to the Anterior Part of the Neck	1959
	Layers of the Skin	1890	Pathophysiology	1960
	The Eye	1890	Assessment	1962
	Pathophysiology	1891	Management	1963
	Hypovolemic Shock	1892	Pathophysiology, Assessment, and Management	.,,,,
	Thermal Burns	1892	of Spine Trauma	1964
	Inhalation Burns and Intoxication	1896		1964
	Patient Assessment	1898	Pathophysiology	
	Scene Size-up	1899	Assessment	1964
	•	1899	Management	1964
	Primary Survey	1903	Injury Prevention	1964
	History Taking			
	Secondary Assessment	1904	35 Head and Spine Trauma	1971
	Reassessment	1904		
	Emergency Medical Care	1904	Introduction	1973
	General Management	1905	Anatomy and Physiology Review	1973
	Hypovolemic Shock	1907	The Scalp	1973
	Thermal Burns	1908	The Skull	1974
	Thermal Inhalation Burns	1909	The Brain	1974
	Pathophysiology, Assessment, and Management		The Meninges	1976
	of Specific Burns	1909	The Spine	1976
	Chemical Burns of the Skin	1909	Patient Assessment of Head and Spine Injuries	1980
	Inhalation Burns From Other Toxic Chemicals	1912	Scene Size-up	1981
	Chemical Burns of the Eye	1913	Primary Survey	1981
	Electrical Burns and Associated Injuries	1914	History Taking	1988
	Lightning-Related Injuries	1918	Secondary Assessment	1989
	Radiation Burns	1920	Reassessment	1994
	Management of Burns in Pediatric Patients	1922	The Incidence of Head Trauma	1995
	Management of Burns in Geriatric Patients	1922		1990
	Long-Term Consequences of Burns	1922	Pathophysiology, Assessment, and Management	100E
	The Patient	1923	of Head Injuries	1995
			Scalp Injuries	1995
	The Provider	1923	Skull Fracture	1996
			Pathophysiology, Assessment, and Management	
34	Face and Neck Trauma	1931	of TBI and Diffuse Brain Injuries	1998
54			Intracranial Pressure	1999
	Introduction	1932	Herniation	2000
	Anatomy and Physiology Review	1933	Diffuse Brain Injuries	2001
	The Facial Bones	1933	Pathophysiology, Assessment, and Management	
	The Eyes, Ears, Teeth, and Mouth	1934	of Focal Brain Injuries	2006
	The Anterior Region of the Neck	1935	Cerebral Contusion	2006
	Patient Assessment	1937	Intracranial Hemorrhage	2006
	Scene Size-up	1937	General Management of Head Trauma	2009
	Primary Survey	1937	Thermal Management	2010
	History Taking	1939	Pharmacologic Therapy	2010
	Secondary Assessment	1939	Pathophysiology, Assessment, and Management	2010
		1939		2010
	Reassessment	1940	of Spinal Injuries	∠U I U







ix

	MOI of Spinal Injury	2011	Motorcycle Falls or Crashes	2098
	Categories of Spinal Cord Injuries	2014	Falls From Heights	2098
	The Evolution of Spinal Care	2017	Blast Injuries	2098
	Assessment and Management of Spinal Injury	2019	General Pathophysiology	2098
	Pharmacotherapy of SCI	2037	Patient Assessment	2099
	Complications of SCI	2038	Scene Size-up	2099
	Nontraumatic Spinal Conditions	2039	Primary Survey	2099
	Spinal Stenosis	2040	History Taking	2101
	Injury Prevention	2040	Secondary Assessment	2101
	<b>,</b> , , , , , , , , , , , , , , , , , ,		Reassessment	2104
76	Chest Trauma	2053	Emergency Medical Care	2104
30			Evisceration	2105
	Introduction	2054	Impaled Objects	2105
	Anatomy and Physiology Review	2054	Pathophysiology, Assessment, and Managemen	t
	Pathophysiology	2055	of Specific Injuries	2106
	Patient Assessment	2057	Pathophysiology	2106
	Scene Size-up	2057	Assessment	2110
	Primary Survey	2057 2059	Management	2111
	History Taking Secondary Assessment	2060	Pathophysiology, Assessment, and Managemen	
	Reassessment	2060	of Injuries to the Male Genitalia	2111
	Emergency Medical Care	2061	Pathophysiology	2111
	Pathophysiology, Assessment, and Management	2001	Assessment	2111
	of Chest Wall Injuries	2062	Management	2112
	Flail Chest	2062	Pathophysiology, Assessment, and Managemen	
	Rib Fractures	2064	of Injuries to the Female Genitalia	2112
	Sternal Fractures	2065	Pathophysiology	2112
	Clavicle Fractures	2065	Assessment	2112 2112
	Pathophysiology, Assessment, and Management		Management	2112
	of Lung Injuries	2066		
	Simple Pneumothorax	2066	38 Orthopaedic Trauma	2117
	Open Pneumothorax	2067	Introduction	2119
	Tension Pneumothorax	2069	Anatomy and Physiology Review	2119
	Hemothorax	2070	Functions of the Musculoskeletal System	2119
	Pulmonary Contusion	2073	The Body's Scaffolding: The Skeleton	2120
	Pathophysiology, Assessment, and Management		Patterns and Mechanisms of Musculoskeletal	
	of Myocardial Injuries	2075	Injury	2120
	Cardiac Tamponade	2075	Injury Forces and Motions	2121
	Myocardial Contusion	2077	Pathophysiology	2122
	Myocardial Rupture	2078	Fractures	2122
	Commotio Cordis	2078	Ligament Injuries and Dislocations	2126
	Pathophysiology, Assessment, and Management	0070	Muscle and Tendon Injuries	2127
	of Vascular Injuries	2078	Patient Assessment	2127
	Traumatic Aortic Disruption	2078	Scene Size-up	2128
	Great Vessel Injury	2079	Primary Survey	2128
	Pathophysiology, Assessment, and Management of Other Thoracic Injuries	2080	History Taking	2129
	Diaphragmatic Injuries	2080	Secondary Assessment	2130
	Esophageal Injuries	2082	Reassessment	2131
	Tracheobronchial Injuries	2082	Emergency Medical Care	2131
	Traumatic Asphyxia	2082	Volume Deficit Due to Musculoskeletal Injuries Pain Control	2134 2135
	таатано лорпухна	2002	Cold and Heat Application	2135
			Splinting	2135
<b>37</b>	<b>Abdominal and Genitourinary Trauma</b>	2089	Pathophysiology, Assessment, and Managemen	
	Introduction	2090	of Complications of Musculoskeletal Injuries	2141
	Anatomy and Physiology Review	2091	Peripheral Nerve Injury	2141
	Anatomic Regions	2092	Compartment Syndrome	2142
	Abdominal Organs and Vital Vessels	2092	Crush Syndrome	2143
	Organs of the Genitourinary System	2093	Thromboembolic Disease	2144
	The Diaphragm	2094	Pathophysiology, Assessment, and Managemen	
	Pathophysiology of the Injury	2095	of Specific Fractures	2144
	Mechanism of Injury	2095	Shoulder Girdle Fractures	2144
	Blunt Trauma	2096	Midshaft Humerus Fractures	2145
	Penetrating Trauma	2097	Elbow Fractures	2145
	Motor Vehicle Crashes	2097	Forearm Fractures	2146

**(** 







### x Contents: Volume 2

	Wrist and Hand Fractures	2146	Pathophysiology, Assessment, and Management	
	Pelvis Fractures	2147	of Lightning Strike	2211
	Hip Fractures	2151	Pathophysiology	2211
	Femoral Shaft Fractures	2151	Assessment and Management	2212
	Knee Fractures	2152	Pathophysiology, Assessment, and Management	2212
	Tibia and Fibula Fractures	2153	of Envenomation: Bites and Stings	2213
		2153		
	Ankle Fractures		Hymenoptera	2213
	Calcaneus Fractures	2154	Snake Bites	2214
	Pathophysiology, Assessment, and Management		Spider Bites	2217
	of Ligament Injuries and Dislocations	2154	Scorpion Stings	2220
	Shoulder Girdle Injuries and Dislocations	2154	Tick Bites	2221
	Elbow Dislocation	2155		
	Wrist and Hand Dislocation	2156	CECTION O. Charal	
	Finger Dislocation	2156	SECTION 8 Shock	
	Hip Dislocation	2156	and Resuscitation	2233
	Knee Dislocation	2157		
	Tendon/Ligament Lacerations, Transections,		40 Responding to the Field Code	2235
	and Ruptures	2158	40 Responding to the Field Code	2233
	Achilles Tendon Rupture	2158	Introduction	2236
		2130	Improving the Response to Cardiac Arrest	2237
	Pathophysiology, Assessment, and Management	0150	The Chain of Survival	2237
	of Nontraumatic Musculoskeletal Disorders	2159	Developing Out-of-Hospital Program	
	Bony Abnormalities	2159	Objectives: The SMART Way	2238
	Muscle Disorders	2160	Simulation Training	2239
	Overuse Syndromes	2160		2240
			Ongoing Development of CPR Guidelines	
<b>3</b> 0	Environmental Emergencies	2169	Adult CPR	2242
33	Life in the interest of the in	2103	Two-Rescuer CPR	2244
	Introduction	2170	CPR for Infants and Children	2245
	Anatomy and Physiology Review	2172	Technique for Children	2248
	Homeostasis and Body Temperature	2172	Technique for Infants	2248
	Thermoregulatory Mechanisms	2173	Defibrillation	2251
	Physiologic Responses to Heat and Cold	2174	Manual Defibrillation	2253
	Pathophysiology, Assessment, and Management		Shockable ECG Rhythms	2254
	of Heat Illness	2176	Effective Shocks and Special Circumstances	2254
	Risk Factors for Heat Illness	2176	Advanced Cardiac Life Support and OHCA	2256
	Heat Cramps	2176	Managing Patients in VF or pVT	2256
	·	2178	Managing Patients in PEA or Asystole	2257
	Heat Syncope		Mechanical Adjuncts to Circulation	2258
	Heat Exhaustion	2178	Load-Distributing Band CPR Device	2259
	Heatstroke	2180	Mechanical Chest Compression Device	2259
	Pathophysiology, Assessment, and Management		Mechanical Piston Device	2260
	of Cold Injuries	2184		
	Local Cold Injury/Frostbite	2184	Impedance Threshold Device	2260
	Trench Foot and Chilblains	2186	Post-Cardiac Arrest Care	2261
	Hypothermia	2187	Pandemic Considerations for Cardiac Arrest Care	2261
	Pathophysiology, Assessment, and Management		When to Start and When to Stop CPR	2261
	of Drowning	2194	Terminating Resuscitation Efforts	2262
	Pathophysiology	2194	Termination Rules	2263
	Assessment and Initial Treatment	2195	Scene Choreography and Teamwork	2263
	Management	2196	Code Team Member and Code Team	
	Submerged Vehicle Incidents	2199	Leader Roles	2264
	Pathophysiology, Assessment, and Management	2177	Plan for a Code	2265
		2100	. Idi. For a codo	2200
	of Diving Injuries	2199	41 Management and Resuscitation	
	General Pathophysiology: Physical Principles	0100	of the Critical Patient	2273
	of Pressure Effects	2199		
	General Assessment: Diving History	2201	Introduction	2274
	Injuries at Depth	2201	Developing Critical Thinking and Decision-Making	
	Injuries During Descent and Ascent	2201	Abilities	2274
	Other Gas-Related Problems	2207	Critical Patients	2275
	Hypoxic Blackout	2207	The EMS Approach to Diagnosis	2276
	Getting Help for Diving Injuries	2208	The Role of Intuition in Critical Decision	
	Pathophysiology, Assessment, and Management		Making	2277
	of Altitude Illness	2208	Bias in Decision Making	2278
	Pathophysiology	2209	A Snapshot of Critical Decision Making	2278
	Assessment	2209	Shock: The Critical Patient Evolving	2270
	Management	2210	in Front of You	2281
	iviariayerrierit	ZZ I U	III I I I I I I I I I I I I I I I I I	ZZ0 I







2343

2343

2346

2347

2347

2388

2388

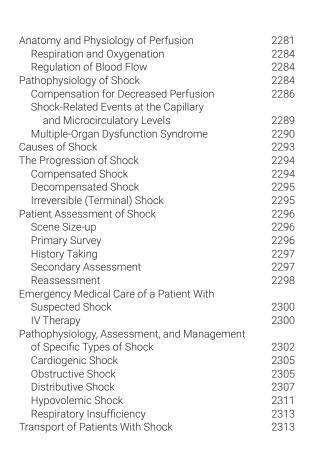
Pathophysiology, Assessment, and Management

of Bleeding Related to Pregnancy

Assessment and Management

Pathophysiology

Normal Childbirth



S	SECTION 9 Special Patient	
	Populations	2321
2	Obstetrics	2323
	Introduction	2325
	Anatomy and Physiology Review	2325
	Conception and Fetal Development	2327
	Physiologic Maternal Changes During	
	Pregnancy	2329
	Cultural Values Considerations	2332
	Adolescent Pregnancy	2332
	Patient Assessment	2333
	Scene Size-up	2333
	Primary Survey	2333
	History Taking	2334
	Secondary Assessment	2335
	Reassessment	2337
	Pathophysiology, Assessment, and	
	Management of Complications Related	
	to Pregnancy	2337
	Substance Use Disorders in Pregnancy	2338
	Supine Hypotensive Syndrome	2338
	Cardiac Conditions	2338
	Hypertensive Disorders	2339
	Seizures	2340
	Diabetes	2340
	Respiratory Disorders	2340
	Hyperemesis Gravidarum	2340
	Renal Disorders	2341
	Rh Sensitization	2341

2341

Infections

9781284237498\_FMxx\_i\_xxii.indd 11

Stages of Labor	2347
Maternal and Fetal Responses to Labor	2348
Preparing for Delivery	2349
Assisting Delivery	2352
Postpartum Care	2355
Emergency Pharmacology in Pregnancy	2355
Magnesium Sulfate	2355
Calcium Chloride	2355
Valium	2355
Diphenhydramine	2355
Ondansetron	2355
Oxytocin	2355
Pathophysiology, Assessment, and Management	
of Complications of Labor	2356
Premature Rupture of Membranes	2356
Preterm Labor	2356
Fetal Distress	2356
Uterine Rupture	2357
Pathophysiology, Assessment, and Management	
of High-Risk Pregnancy Considerations	2357
Precipitous Labor and Birth	2357
Post-Term Pregnancy	2357
Meconium Staining	2357
Fetal Macrosomia	2357
Multiple Gestation	2358
Intrauterine Fetal Death	2358
Amniotic Fluid Embolism	2359
Amniotic Fluid Volume Problems	2359
Cephalopelvic Disproportion	2359
Pathophysiology, Assessment, and Management	
	2359
Cephalic Presentation	2360
Breech Presentations	2360
Shoulder Dystocia	2361
	2362
	2362
·	2362
	2362
,	2363
	2364
	2364
	2364
	2365
	2366
With Trauma	2366
Neonatal Care	2377
Introduction	2378
General Pathophysiology and Assessment	2378
Transition From Fetus to Newborn	2379
Arrival of the Newborn	2380
The Apgar Score	2383
Neonatal Resuscitation Algorithm	2384
	Maternal and Fetal Responses to Labor Preparing for Delivery Assisting Delivery Postpartum Care Emergency Pharmacology in Pregnancy Magnesium Sulfate Calcium Chloride Valium Diphenhydramine Ondansetron Oxytocin Pathophysiology, Assessment, and Management of Complications of Labor Premature Rupture of Membranes Preterm Labor Fetal Distress Uterine Rupture Pathophysiology, Assessment, and Management of High-Risk Pregnancy Considerations Precipitous Labor and Birth Post-Term Pregnancy Meconium Staining Fetal Macrosomia Multiple Gestation Intrauterine Fetal Death Amniotic Fluid Embolism Amniotic Fluid Embolism Amniotic Fluid Embolism Cephalopelvic Disproportion Pathophysiology, Assessment, and Management of Complications of Delivery Cephalic Presentation Breech Presentation Breech Presentation Breech Presentation Breech Presentation Schoulder Dystocia Nuchal Cord Prolapsed Umbilical Cord Prostpartum Complications Uterine Inversion Postpartum Depression Trauma and Pregnancy Pathophysiology and Assessment Considerations for the Fetus Related to Trauma Management of the Pregnant Patient With Trauma  Neonatal Care Introduction General Pathophysiology and Assessment Transition From Fetus to Newborn Arrival of the Newborn The Apgar Score



Specific Intervention and Resuscitation Steps

Drying and Stimulation







### xii Contents: Volume 2

Airway Management	2388	Pathophysiology, Assessment, and Management	
Circulation	2392	of Respiratory Emergencies	2455
Pharmacologic Interventions	2395	Respiratory Arrest, Distress, and Failure	2455
Family and Transport Considerations	2395	Upper Airway Emergencies	2457
Pathophysiology, Assessment, and Management		Lower Airway Emergencies	2461
of Specific Conditions	2397	Other Respiratory Conditions	2465
Apnea	2397	General Assessment and Management	2400
		· · · · · · · · · · · · · · · · · · ·	0.466
Assessment and Management	2397	of Respiratory Emergencies	2466
Bradycardia	2397	Cardiopulmonary Arrest	2477
Acidosis	2398	Pathophysiology, Assessment, and Management	
Pneumothorax Decompression	2398	of Shock	2477
Meconium-Stained Amniotic Fluid	2399	Hypovolemic Shock	2478
Low Blood Volume	2399	Distributive Shock	2483
Diaphragmatic Hernia	2399	Cardiogenic Shock	2484
Respiratory Distress and Cyanosis	2400	Pathophysiology, Assessment, and Management	
Assessment and Management	2400	of Cardiovascular Emergencies	2484
Respiratory Depression Secondary		Dysrhythmias	2484
to Opioids	2401	Heart Failure	2489
Premature and Low-Birth-Weight Infants	2401	General Assessment and Management	2-103
Seizures in the Newborn	2402		2492
		of Cardiovascular Emergencies	2492
Hypoglycemia	2404	Pathophysiology, Assessment, and Management	0.400
Vomiting	2406	of Neurologic Emergencies	2492
Diarrhea	2407	Altered Mental Status	2492
Neonatal Jaundice	2408	Seizures	2493
Pathophysiology, Assessment, and Management		Meningitis	2495
of Conditions Related to Thermoregulation	2408	Hydrocephalus	2496
Fever	2409	Traumatic Brain Injury	2498
Hypothermia	2410	Pathophysiology, Assessment, and Management	
Pathophysiology, Assessment, and		of Gastrointestinal Emergencies	2499
Management of Common Birth Injuries		Biliary Atresia	2499
in the Newborn	2410	Viral Gastroenteritis	2499
Pathophysiology, Assessment, and Management	2410	Appendicitis	2499
	2412	• •	2499
of Congenital Heart Disease		Ingestion of Foreign Bodies	
Pathophysiology	2412	Gastrointestinal Bleeding	2500
General Assessment and Management	2417	Intussusception	2500
		Meckel Diverticulum	2500
Pediatric Emergencies	2429	Pyloric Stenosis and Malrotation With	
_		Volvulus	2500
Introduction	2432	General Assessment and Management	
Developmental Stages	2433	of Gastrointestinal Emergencies	2500
Neonate and Infant	2433	Pathophysiology, Assessment, and Management	
Toddler	2434	of Endocrine Emergencies	2502
Preschool-Age Child	2435	Hyperglycemia	2502
School-Age Child (Middle Childhood)	2435	Hypoglycemia	2503
Adolescence	2436	Congenital Adrenal Hyperplasia	2503
Pediatric Anatomy, Physiology, and	2100	Panhypopituitarism	2504
Pathophysiology	2436	Inborn Errors of Metabolism	2504
The Head	2436		2304
		Pathophysiology, Assessment, and Management	
The Neck and Airway	2436	of Hematologic, Oncologic, and Immunologic	0505
The Respiratory System	2437	Emergencies	2505
The Cardiovascular System	2438	Sickle Cell Disease	2506
The Nervous System	2439	Bleeding Disorders	2506
The Abdomen and Pelvis	2440	Leukemia and Lymphoma	2507
The Musculoskeletal System	2440	Pathophysiology, Assessment, and Management	
The Chest and Lungs	2440	of Toxicologic Emergencies	2508
The Integumentary System	2441	Assessment of Toxicologic Emergencies	2508
Metabolic Differences	2441	Management of Toxicologic Emergencies	2509
Parents of III or Injured Children	2441	Pathophysiology, Assessment, and Management	
Pediatric Patient Assessment	2442	of Psychiatric and Behavioral Emergencies	2510
Scene Size-up	2442	Safety	2511
Primary Survey	2442	Assessment and Management of Psychiatric	∠∪11
History Taking	2442	and Behavioral Emergencies	2511
			Z011
Secondary Assessment	2451	Pathophysiology, Assessment, and Management	0544
Reassessment	2455	of Fever Emergencies	2511







	Child Abuse and Neglect	2513	Stroke	2558
	Risk Factors for Abuse	2513	Transient Ischemic Attack	2560
	Suspecting Abuse or Neglect	2513	Pathophysiology, Assessment, and Management	
	Assessment and Management of Abuse		of Neurologic Conditions	2560
	and Neglect	2514	Delirium	2560
	Sudden Unexpected Infant Death	2516	Dementia	2561
	Assessment and Management of SIDS	2516	Seizures	2563
	Brief Resolved Unexplained Event	2517	Pathophysiology, Assessment, and Management	
	Pathophysiology, Assessment, and Management		of GI Conditions	2563
	of Pediatric Trauma Emergencies	2517	Bowel Obstruction	2563
	Pathophysiology of Traumatic Injuries	2518	Biliary Diseases	2564
	Assessment and Management of Traumatic	0540	Peptic Ulcer Disease	2564
	Injuries	2518	GI Bleeding	2564
	Transport Considerations	2520	Pathophysiology, Assessment, and Management	0566
	History Taking and Secondary Assessment	2522	of Renal Conditions	2566
	Fluid Management	2522	Urinary Tract Infections	2566
	Pain Management	2523	Renal Failure Incontinence	2566 2567
	Pathophysiology, Assessment, and Management of Burns	2523	Pathophysiology, Assessment, and Management	2307
	Assessment and Management of Burns	2523	of Endocrine Conditions	2568
	Children With Special Health Care Needs	2524	Diabetic Disorders	2568
	Technology-Assisted Children	2524	Thyroid Disorders	2569
	Assessment and Treatment of Children	2024	Pathophysiology, Assessment, and Management	2309
	With Special Health Care Needs	2526	of Immunologic Conditions	2570
	Transport of Children With Special Health	2020	Pathophysiology, Assessment, and Management	2070
	Care Needs	2527	of Toxicologic Conditions	2570
	An Ounce of Prevention	2527	Polypharmacy and Medication Noncompliance	2570
	Emergency Medical Services for Children	2527	Pharmacokinetics	2571
	Prevention of Injuries	2527	Drug and Alcohol Use Disorders	2572
	. revenuen er mjanee	2027	Pathophysiology, Assessment, and Management	20,2
			of Psychological Conditions	2572
45	Geriatric Emergencies	2537	Pathophysiology, Assessment, and Management	
	Introduction	2539	of Integumentary Conditions	2573
	Geriatric Anatomy and Physiology	2541	Herpes Zoster	2573
			- 11 1	
	Changes in the Respiratory System	2541	Cellulitis	2574
	Changes in the Respiratory System Changes in the Cardiovascular System	2541 2542	Cellulitis Pressure Ulcers	2574 2574
	Changes in the Cardiovascular System	2542	Pressure Ulcers	
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System	2542 2543	Pressure Ulcers Pathophysiology, Assessment, and Management	2574 2574 2574
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System	2542 2543 2545 2546 2546	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions	2574 2574
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System	2542 2543 2545 2546 2546 2546	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management	2574 2574 2574 2575
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System	2542 2543 2545 2546 2546 2546 2546 2546	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies	2574 2574 2574 2575 2575
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes	2542 2543 2545 2546 2546 2546 2546 2546 2547	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma	2574 2574 2574 2575 2575 2576
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System	2542 2543 2545 2546 2546 2546 2546 2547 2548	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma	2574 2574 2574 2575 2575 2576 2578
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse	2574 2574 2574 2575 2575 2576 2578 2579
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma	2574 2574 2574 2575 2575 2576 2578
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse	2574 2574 2574 2575 2575 2576 2578 2579
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2548 2549 2551	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care	2574 2574 2574 2575 2575 2576 2578 2579 2580
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2548 2549 2551 2553	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges	2574 2574 2574 2575 2575 2576 2578 2579 2580
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2548 2549 2551	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction	2574 2574 2574 2575 2575 2576 2578 2579 2580
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management	2542 2543 2545 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b>
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions	2542 2543 2545 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges	2574 2574 2574 2575 2575 2576 2578 2579 2580
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Integumentary System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2554 2555 2555	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2554 2555 2555	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592 2593
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556 2556	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556 2556	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592 2593 2593
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions Acute Coronary Syndromes	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2555 2555 2556 2556 2556	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is Suspected	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592 2593 2593
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions Acute Coronary Syndromes Heart Failure	2542 2543 2545 2546 2546 2546 2546 2547 2548 2548 2549 2549 2551 2553 2554 2555 2555 2556 2556 2556 2556 2557 2557	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is Suspected Epidemiology of Abuse and Neglect	2574 2574 2574 2575 2575 2576 2578 2579 2580 <b>2589</b> 2590 2591 2591 2592 2593 2593 2594 2594
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions Acute Coronary Syndromes Heart Failure Dysrhythmias	2542 2543 2545 2546 2546 2546 2546 2546 2547 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556 2556 2557 2557	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is Suspected Epidemiology of Abuse and Neglect Definitions of Abuse and Neglect	2574 2574 2574 2575 2575 2576 2578 2579 2580 2590 2591 2591 2591 2592 2593 2593 2594 2594 2595
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions Acute Coronary Syndromes Heart Failure Dysrhythmias Hypertension	2542 2543 2545 2546 2546 2546 2546 2547 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556 2556 2557 2557 2557 2558	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is Suspected Epidemiology of Abuse and Neglect Definitions of Abuse and Neglect Recognizing Abuse or Neglect	2574 2574 2574 2575 2575 2576 2578 2579 2580 2590 2591 2591 2591 2592 2593 2593 2594 2594 2595 2596
	Changes in the Cardiovascular System Changes in the Nervous System Changes in the Digestive System Changes in the Renal System Changes in the Endocrine System Changes in the Immunologic System Changes in the Immunologic System Changes in the Integumentary System Homeostatic and Other Changes Changes in the Musculoskeletal System Geriatric Patient Assessment Scene Size-up Primary Survey History Taking Secondary Assessment Reassessment Pathophysiology, Assessment, and Management of Respiratory Conditions Pneumonia Chronic Obstructive Pulmonary Disease Asthma Pulmonary Embolism Pathophysiology, Assessment, and Management of Cardiovascular Conditions Acute Coronary Syndromes Heart Failure Dysrhythmias	2542 2543 2545 2546 2546 2546 2546 2546 2547 2548 2549 2549 2551 2553 2554 2554 2555 2555 2556 2556 2557 2557	Pressure Ulcers Pathophysiology, Assessment, and Management of Musculoskeletal Conditions Osteoporosis Arthritis Pathophysiology, Assessment, and Management of Geriatric Trauma Emergencies Pathophysiology of Trauma Assessment and Management of Trauma Elder Abuse End-of-Life Care  6 Patients With Special Challenges Introduction General Strategies for Patients With Special Challenges The Effects of Poverty on EMS and the Health Care System Health Disparities Homelessness Burden on the Health Care System Care of Patients When Abuse or Neglect Is Suspected Epidemiology of Abuse and Neglect Definitions of Abuse and Neglect	2574 2574 2574 2575 2575 2576 2578 2579 2580 2590 2591 2591 2591 2592 2593 2593 2594 2594 2595

**(** 







#### xiv **Contents: Volume 2**

Care of Patients With Terminal Illness	2600		Emergency Vehicle Stationing	2658
Advance Directives	2601		Mitigating Hazards Throughout the Call	2659
Care of Bariatric Patients	2601		En Route to the Scene	2659
Clinical Concerns for the Bariatric Patient	2602		Securing Equipment	2659
Operational Concerns for the Bariatric Patient	2603		Arrival at the Scene	2660
Care of Patients With Communicable Diseases	2603		Traffic Control	2660
Medical Technology in the Prehospital Setting	2604		Safe Patient Transport	2660
Tracheostomy Tubes	2604		Postrun Activities: Restocking, Cleaning,	
Long-Term Ventilators	2608		and Disinfection	2661
Ventricular Assist Devices	2609		Defensive Emergency Vehicle Driving	
Apnea Monitors	2609		Techniques	2662
Long-Term Vascular Access Devices	2610		Driver Characteristics	2663
Medication Infusion Pumps	2611		Safe Driving Practices	2663
Tube Feeding	2612		Emergency Vehicle Control	2668
Colostomy	2613		Braking	2668
Urostomy and Urinary Diversion	2613		Controlled Braking	2669
Urinary Catheterization	2613		Laws and Regulations	2669
Dialysis	2614		Air Medical Transport	2671
Surgical Drains and Devices	2617		Rotor-Wing Versus Fixed-Wing Aircraft	2672
Cerebrospinal Fluid Shunts	2617		Advantages of Using Aircraft Transport	2672
Medical Technology Used During Interfacility			Disadvantages of Using Aircraft Transport	2673
Transport	2618		Helicopter Medical Evacuation Operations	2673
Hemodynamic Monitoring	2619		Establishing a Landing Zone	2675
Intra-aortic Balloon Pumps	2620		Landing Zone Safety and Patient Transfer	2675
ICP Monitor	2621		Communicating With Other Agencies	2676
Doppler Ultrasonography Devices	2621		Special Considerations	2677
Care of Patients With Cognitive, Sensory,				
or Communication Impairment	2622	48	Incident Management and	
Developmental Disability	2622		Mass-Casualty Incidents	2685
Developmental Delay	2622		Introduction	2686
Down Syndrome	2623			2686
Intellectual Disability	2624		The National Incident Management System The Incident Command System	2688
Autism and Autism Spectrum Disorder	2624			2000
Mental/Emotional Impairment	2624		Incident Command System Roles and Responsibilities	2688
Hearing Impairment	2625		Communications and Information	2000
Visual Impairment	2627		Management	2692
Speech Impairment	2628		Mobilization and Deployment	2692
Paralysis, Paraplegia, and Quadriplegia	2629		EMS Response Within the Incident Command	2092
Trauma in Cognitively Impaired Patients	2630		System	2693
Other Notable Chronic Medical Conditions	2631		Preparedness	2693
Cancer	2631		Scene Size-up	2693
Cerebral Palsy	2632		Establishing Command	2694
Congenital Heart Disease in Adults	2633		Communications	2695
Cystic Fibrosis Multiple Sclerosis	2633		Medical Group	2695
'	2634		Triage Unit Leader	2697
Muscular Dystrophy	2635		Treatment Unit Leader	2697
Myasthenia Gravis	2635		Transportation Unit Leader	2697
Myelomeningocele (Spina Bifida) Poliomyelitis/Postpolio Syndrome	2636		Staging Area Manager	2698
Traumatic Brain Injury	2637		Physicians on Scene	2698
rraumatic Brain injury	2637		Rehabilitation Group Leader	2698
			Extrication and Special Rescue	2698
SECTION 10 Operations	26/0		Morgue Unit Leader	2699
SECTION 10 Operations	2649		Mass-Casualty Incidents	2699
_			Triage	2701
Transport Operations	2651		Triage Categories	2701
Introduction	2652		Triage Tags	2703
Emergency Vehicle Design	2653		START Triage	2704
Specialized Transport Vehicles	2654		JumpSTART Triage for Pediatric Patients	2705
Emergency Vehicle Equipment	2654		SALT Triage	2706
Checking the Emergency Vehicle	2655		Special Considerations During Triage	2706
Emergency Vehicle Staffing and Development	2657		Destination Decisions	2707
Emergency Vehicles and EMS Systems	2658		Critical Incident Stress Management	2708
System Status Management	2658		After-Action Reviews	2708
, <u>, , , , , , , , , , , , , , , , , , </u>				







ΧV

Vehicle Extrication and Special		51	Terrorism Response	2801
Rescue	2717		Introduction	2802
Introduction	2718		Terrorism Overview	2803
Rescue Training	2719		International Terrorism	2804
Guidelines for Rescue Operations	2720		Domestic Terrorism	2805
Steps in Special Rescue	2721		Motivations of Terrorists	2806
Preparation	2721		Paramedic Response to Terrorism	2807
Response	2721		Recognizing a Terrorist Event (Indicators)	2807
Arrival and Scene Size-up	2722		Response Actions	2809
Scene Stabilization	2723		Weapons of Mass Destruction Overview	2812
Access	2726		Chemical Agents	2813
Disentanglement	2726		Blister Agents (Vesicants)	2814
Removal	2726		Choking/Pulmonary Agents	2814
Transport	2727		Blood Agents (Cyanides)	2815
Vehicle Extrication	2727		Incapacitating Agents (Sedatives)	2816
	2/20		Long-Acting Anticoagulants (Blood	2010
Vehicle Anatomy and Structural	2720		Thinners)	2816
Components	2728		Poisonous Metals	2816
Alternative-Power Vehicles	2729			2816
Hazardous Materials	2731		Nerve Agents	
Hand Tools	2731		Organic Solvents	2818
Vehicle Stabilization	2732		Riot Control Agents	2818
Gaining Access to the Patient	2733		Toxic Alcohols	2819
Disentangling the Patient	2736		Vomiting Agents	2819
Additional Specialized Rescue Situations	2739		Biologic Agents	2819
Confined Spaces	2739		Viruses	2820
Trenches	2741		Bacteria	2821
Water	2742		Plague: Bubonic/Pneumonic	2823
Spinal Injuries in Submersion Incidents	2744		Biotoxins	2824
Rope Rescue	2746		Other Paramedic Roles During a Biologic	
Wilderness Search and Rescue	2746		Event	2826
Lost Person Search and Rescue	2747		Radiologic or Nuclear Devices	2826
Structure Fires	2747		Radiation	2827
Agricultural and Industrial Rescue	2748		Sources of Radiologic Material	2827
Tactical Emergency Medical Support	2749		Radiologic Dispersal Devices	2827
Patient Care	2751		Explosives and Incendiary Weapons	2829
Pain Management	2751		Package IEDs	2829
Medical Supplies	2751		Vehicle-Borne IEDs	2829
Patient Packaging	2751		Suicide Bombs	2830
Hazardous Materials	2761	52	Disaster Response	2839
Introduction	2762		Introduction	2840
	2762		Disaster Response Planning: Overview	2840
Regulations and Standards	2763		Phases of a Disaster Response Plan	2841
Paramedics and Hazmat Incidents	2764		Before the Event	2841
Scene Size-up	2/65		During the Event	2846
Identification of a Hazmat Incident	2766		After the Event	2850
Containers	2770		Types of Disasters	2852
Bulk Storage Vessels	2773		Natural Disasters	2852
Roadway Transport of Hazmat	2774		Human-Made Disasters	2863
Establishing Safety Zones	2778			
Personal Protective Equipment	2780	53	Crime Scene Awareness	2875
Contamination and Toxicology	2782			
Primary and Secondary Contamination	2782		Introduction	2876
Routes of Exposure	2782		Awareness	2876
Chemical Terms	2782		Paramedics Mistaken for Law Enforcement	
Toxicology Terms	2784		Personnel	2877
Decontamination and Treatment	2785		Body Armor	2877
Decontamination	2786		Indicators of Violence	2877
Mass Decontamination	2787		Standard Operating Procedures	2878
Technical Decontamination	2787		Highway and Rural Road Incidents	2879
Treatment of Patients Exposed to Hazmat	2789		EMS Vehicle Approach and Positioning	2879
Transport Considerations	2790		Approaching the Motor Vehicle	2880
Medical Monitoring and Rehabilitation	2791		Retreating From Danger	2882

•



49





### xvi Contents: Volume 2

Residential Incidents	2882	Using Evasive Tactics	2891
Warning Signs	2882	Using Concealment Techniques	2891
Approaching a Residence	2882	Self-Defense	2891
Entering a Residence	2882	Self-Defense in Armed Encounters	2892
Domestic Violence	2883	Crime Scenes	2892
Violence on the Streets	2884	Preserving Evidence	2893
Clandestine Drug Laboratories	2884		
Gangs	2884	Glossary: Volume 2	G-41
Mass Shootings, Active Shooters, and Scenes			
of Mass Violence	2886	Index: Volume 2	I-51
Hostage Situations	2888		
Personal Safety During a Shooting Incident	2889		
Using Cover	2889		







# **Skill Drills**

### **VOLUME 2**

kill Drill 31-1	Managing External Hemorrhage	1834	Skill Drill 44-2	Inserting a Nasopharyngeal	0.460
ikill Drill 31-2	Applying a Commercial Tourniquet (Combat Application Tourniquet)	1837	Skill Drill 44-3	Airway in a Pediatric Patient Performing One-Person Bag-Mask Ventilation on a	2468
skill Drill 31-3	Packing a Wound	1842		Pediatric Patient	2471
ikill Drill 31-4	Managing Internal Hemorrhage	1845	Skill Drill 44-4	Performing Pediatric ET Intubation	2473
skill Drill 35-1	Performing SMR of a Supine Adult Patient	2024	Skill Drill 44-5	Performing Pediatric IO Infusion	2481
kill Drill 35-2	Using a Scoop Stretcher	2029	Skill Drill 44-6	Performing SMR of a Child	2521
ikill Drill 35-3	Performing SMR of a Seated Adult Patient	2030	Skill Drill 44-7	Performing SMR of an Infant	2521
skill Drill 36-1	Needle Decompression	2000	Skill Drill 46-1	Cleaning a Tracheostomy Tube	2607
(Thoracentesis) of a Tension Pneumothorax	2071	Skill Drill 46-2	Catheterizing an Adult Male Patient	2614	
skill Drill 38-1	Performing a Motor Function and Sensory Exam	2132	Skill Drill 46-3	Catheterizing an Adult Female Patient	2615
skill Drill 40-1	Performing Two-Rescuer Adult CPR	2246	Skill Drill 49-1	Breaking Tempered Glass Using a Spring-Loaded Center	
kill Drill 40-2	Performing CPR on a Child	2249		Punch	2736
skill Drill 40-3	Performing Infant CPR	2250	Skill Drill 49-2	Stabilizing a Suspected Spinal Injury in the Water	2745
skill Drill 43-1	Intubating a Newborn	2391	Skill Drill 50-1	Using the ERG to Research	
skill Drill 43-2	Inserting an Orogastric Tube in the Newborn	2393		Materials	2767
skill Drill 44-1	Inserting an Oropharyngeal Airway in a Pediatric Patient	2467			

xvii







## **Acknowledgments**



The American Academy of Orthopaedic Surgeons and the Public Safety Group would like to acknowledge the editors, authors, and reviewers of previous editions of *Nancy Caroline's Emergency Care in the Streets* who were involved in the development of this textbook.

### **Series Editor**

#### Alfonso Mejia, MD, MPH, FAAOS

Program Director, Orthopedic Surgery Residency Program

Vice Head, Department of Orthopedic Surgery University of Illinois College of Medicine Medical Director

Tactical Emergency Medical Support Physician South Suburban Emergency Response Team Chicago, Illinois

### **Lead Editors**

#### Barbara Aehlert, MSEd, BSPA, RN

President Southwest EMS Education, Inc. Dallas, Texas

### **Bob Elling, MPA, EMT-P (ret.)**

Author, Educator, Advocate, and Paramedic Hernando, Florida

### **Authors**

### Barbara Aehlert, MSEd, BSPA, RN

Chapters 7, 13, 14, 15, 18 President Southwest EMS Education, Inc. Dallas, Texas

#### **Chuck Allias, MS, NRP**

Chapters 9, 45
Director of Emergency Services
Program Director
Indiana University of
Pennsylvania
Indiana, Pennsylvania

### Andrew Bartkus, JD, MSN, RN, NRP, CEN, CCRN, CFRN, Esg.

Chapter 28
Emergency Department
Director
Sandoval Regional Medical
Center
Rio Rancho, New Mexico

### Dave Bledsoe, NREMT-P, RN, LNC (ret.)

Chapters 4, 6 Lieutenant/Paramedic Orlando Fire Department Orlando, Florida

#### **Andrew G. Dubina, MD**

Chapter 38
Resident Physician
University of Maryland School
of Medicine
Department of Orthopaedics
Baltimore, Maryland

### Rommie L. Duckworth, MS, LP

Chapters 49, 50, 51, 53 Captain/EMS Coordinator Ridgefield Fire Department Ridgefield, Connecticut

xviii



### **Bob Elling, MPA, EMT-P (ret.)**

Chapters 2, 8, 11, 12, 40, 41
Author, Educator, Advocate, and
Paramedic
Hernando, Florida

### Wm. Travis Engel, DO, MSc, NRP, FP-C, CCP-C

Chapters 37, 42, 43, 44
Pediatric Critical Care Medicine
Fellow
Children's Mercy Hospital
Kansas City, Missouri

### Jason Ferguson, EdD, NRP

Chapters 17, 31
Associate Vice President
Central Virginia Community
College
Lynchburg, Virginia

### Seth Hawkins, MD, FACEP, FAEMS, MFAWM

Chapter 39
Assistant Professor of
Emergency Medicine,
Wake Forest University
Medical Director, Burke County
EMS and Burke County
Communications
Medical Director, Western
Piedmont Community College
Emergency Services Programs
Medical Director, North
Carolina State Parks
Chief, Appalachian Mountain
Rescue Team
Winston-Salem, North Carolina

#### **Matt Hunt, BSEd, EMT-P**

Chapters 1, 5 Paramedic Instructor Albany State University Albany, Georgia

#### Rhonda J. Hunt, MEd, NRP

Chapters 3, 25, 29, 32, 34, 35 EMS Program Director Assistant Professor Albany State University Albany, Georgia

#### Michael Kaduce, MPS, NRP

Chapters 20, 36, 46
EMT Program Director
UCLA Center for Prehospital
Care
David Geffen School of
Medicine
Los Angeles, California

### William J. Leggio, EdD, NRP

Appendix
Office of the Chief Medical
Officer
Austin, Texas

### Stephen J. Rahm, NRP

Chapter 16
Chief, Office of Clinical
Direction
Co-Chair, Centre for Emergency
Health Sciences
Spring Branch, Texas

### **Charles Sowerbrower, MEd,** NRP, NCEE, CCP-C

Chapter 21 Chairperson Sinclair Community College Dayton, Ohio

#### **Bryan Ware, BS, EMT-P**

Chapters 10, 19, 30, 33, 47, 48, 52 Fire Chief Beulah Fire Protection and Ambulance District Beulah, Colorado

### Katherine H. West, MSEd, RN, DICO-C

Chapter 27
Infection Control Consultant
Infection Control Emerging
Concepts
Palm Harbor, Florida

### Brittany Williams, DHSc, RRT-ACCS, NPS, AE-C, REMT-P

Chapters 13, 14, 22, 23, 24, 26, Appendix
Professor, Respiratory Care
Director, Clinical Education
Santa Fe College
Gainesville, Florida

### **Contributors**

### Andrew N. Pollak, MD, FAAOS

The James Lawrence Kernan Professor and Chairman Department of Orthopaedics University of Maryland School of Medicine Senior Vice President for Clinical Transformation and Chief of Orthopaedics University of Maryland Medical System Medical Director **Baltimore County Fire** Department Director, Shock Trauma Go Team Special Deputy US Marshal Baltimore, Maryland

#### Rebecca Ridenhour, PharmD

BJC-Progress West Hospital O'Fallon, Missouri

### **Reviewers**

#### Jonathan A. Alford, NRP

Center for Trauma and Critical Care Education, School of Medicine Virginia Commonwealth University Richmond, Virginia

#### Nick Baker, AASN, RN, EMT-P

Austin/Travis County EMS Austin, Texas

### Jeannett Banks, EdS, MEd, NRP

Children's Hospital of the King's Daughters Norfolk, Virginia

#### Ryan Batenhorst, MEd, NRP

Creighton University Omaha, Nebraska

### Alan M. Batt, PhD(c), MSc, CCP, PGCME, FHEA

Fanshawe College Ontario, Canada









#### **Edward L. Bays, BS, NRP**

Mountwest Community & Technical College Huntington, West Virginia

#### Mark A. Boisclair, MPA, NRP

Chattahoochee Valley Community College Phenix City, Alabama

#### Jason Brooks, EdD, NRP

University of South Alabama, Department of EMS Education Mobile, Alabama

### Chad Burkhart, AS, Paramedic

School of EMS New Windsor, New York

### Ted Chialtas, BA, Fire Captain/Paramedic

San Diego Fire-Rescue Department, Paramedic Program San Diego, California

<del>(�)</del>

### Sharon F. Chiumento, BSN, BS. EMT-P

Monroe Community College Rochester, New York

### Kevin T. Collopy, MHL, FP-C, NRP, CMTE

AirLink/VitaLink Critical Care Transport Novant Health New Hanover Regional Medical Center Wilmington, North Carolina

### Kent Courtney, Paramedic/ Firefighter

Essential Safety Training and Consulting Rimrock, Arizona

#### **Anthony Cuda, NRP**

Community College of Allegheny County Pittsburg, Pennsylvania

### **Kevin Curry, AS, NRP, CCEMTP**

United Training Center Lewiston, Maine

### Reuben Farnsworth, BS, NRP, CCP/CP-C

RockStar Education and Consulting Delta, Colorado

#### **David Fifer, MS, NRP, FAWM**

Eastern Kentucky University Paramedic Program Richmond, Kentucky

#### **Charles Foat, PhD, NRP**

Johnson County Community College Overland Park, Kansas

### Lori Gallian, BS, EMT-P

Summit Science Sacramento, California

#### Fidel O. Garcia, Paramedic

Professional EMS Education, LLC Grand Junction, Colorado

Dodnovil Collonfoldt II DS

### Rodney L. Geilenfeldt II, BS, EMT-P

Division Chief of Clinical Services Kootenai County EMS System Coeur d'Alene, Idaho

#### Craig Gesterling, BS, NRP

School of EMS St. Petersburg, Florida

### Jeffery D. Gilliard, MEd, NRP, CCEMTP, FPC

EMETSEEI Institute Rockledge, Florida

### Jamie O. Gray, BS, AAS, NRP, FF

Alabama Office of Emergency Medical Services Prattville, Alabama

### James E. Gretz, MBA, NRP, CCP-C

JeffSTAT–Thomas Jefferson University Hospital Philadelphia, Pennsylvania

### Kevin M. Gurney, MS, CCEMTP, I/C

Delta Ambulance Waterville, Maine

### Katie E. Hall, BA, NRP, CCP, IC

Roane State Community College Knoxville, Tennessee

#### Kirk Hallett. EMT-P

Richmond Ambulance Authority Richmond, Virginia

### Jennifer Hannigan, MEd, Paramedic, CIC

Fire Department of the City of New York Emergency Medical Services Bureau of Training Bayside, New York

### Anthony S. Harbour, MEd, BSN, RN, NRP

Southern Virginia EMS Roanoke, Virginia

### **Greg Helmuth, MA, NRP**

Hawkeye Community College Waterloo, Iowa

#### **Thomas Herron, AAS, NRP**

Roane State Community College Knoxville, Tennessee

#### Paul Hitchcock, NRP

Department of Homeland Security Herndon, Virginia

### Michele M. Hoffman, MSEd, RN, EMT

James City County Fire Department James City County, Virginia

#### **Suh Hughart, EMT-P**

San Marcos Hays County EMS San Marcos, Texas

#### Sandra Hultz, BS, NRP

Holmes Community College Ridgeland, Mississippi



### Joseph L. Hurlburt, BS, NREMT-P

Manton, Michigan

#### Darin (DJ) Jackson, MDiv, Paramedic

Asheville–Buncombe Technical Community College Asheville, North Carolina

#### **Adam Johnson, NRP**

Rhinelander Fire Department Oneida County Special Response Team Nicolet Area Technical College Northcentral Area Technical College Rhinelander, Wisconsin

### William Johnston, BA, AEMCA

Ottawa Paramedic Service Ottawa, Ontario, Canada

#### **Brian D. Katcher, NRP, FP-C**

PHI Air Medical Lord Fairfax Community College Front Royal, Virginia

#### Jared Kimball, MPS, NRP

Tulane Trauma Education New Orleans, Louisiana

### Timothy M. Kimble, BA, AAS, NRP, CEM

Washington Township Fire and Rescue Waynesboro, Pennsylvania LifeCare Medical Transports

### **Don Kimlicka, NRP, CCEMTP**

Fredericksburg, Virginia

Regional EMS Coordinator, State of Wisconsin DPH/DHS, Madison, Wisconsin Adjunct Faculty, Mid State Technical College Wisconsin Rapids, Wisconsin

### Mark A. King, MEMS, Paramedic/IC (ret.)

Kennebec Valley Community College Fairfield, Maine

### Blake E. Klingle, MS, RN, CEN, CCEMTP

Waukesha County Technical College Pewaukee, Wisconsin

### Karen (Keri) Wydner Krause, RN, EMT-P, CCRN

Lakeshore Technical College Cleveland, Wisconsin

### Jim Ladle, BS, FP-C, CCP-C (ret.)

South Jordan Fire Department University of Utah AirMed Salt Lake City, Utah

### **Tony Lipari, EMT-P**

Bolton Emergency Medical Services Bolton Landing, New York

### **Ricky Lyles, NRP**

Southside Virginia Community College Keysville, Virginia

### Monica Malec, MD

University of Chicago Chicago, Illinois

### Paul Mallon, BSN, RN, LP,

Austin/Travis County EMS Austin, Texas

### John Morrissey, BS, NREMT-P (ret.)

Clay, New York

### Patrick Murphy, BA, EMT-P, FP

Austin Travis County EMS Austin, Texas

#### Jim O'Connor

Columbus Division of Fire Columbus, Ohio Ohio Fire Academy Reynoldsburg, Ohio

#### Keito Ortiz, Paramedic, NYS CIC

Jamaica Hospital Medical Center, Level 1 Trauma Center Jamaica, New York

### Jose A. Perez, Paramedic, Certified Instructor Coordinator (CIC)

Fire Department of New York EMS Academy Bureau of Training Queens, New York

### Joyce M. Pettengill, AAS, NRP

Fayetteville Technical Community College Fayetteville, North Carolina

#### **Ian Pleet**

MedStar Simulation and Training Education Lab (SiTEL)

Washington, DC

### Alexander Price, BSN, RN, CEN

Sandoval Regional Medical Center Rio Rancho, New Mexico

### Ernest K. Ralston, PG, EMTP-T, CMAS, NAEMSP

Center for Asymmetric Emergency Medicine Centreville, Virginia

### **Kevin Ramdayal, Paramedic**

New York City Fire Department Borough of Manhattan Community College New York City, New York





### xxii Acknowledgments

### **Curtis A. Rhodes, NRP, CCEMTP**

Gordon Cooper Technology Center Shawnee, Oklahoma

#### Chris Rock, MSN, RN

City of Tacoma Fire Department Tacoma, Washington

#### Keith A. Sharisky, NRP

Aberdeen Fire Rescue, Advanced Care Ambulance Aberdeen, South Dakota

### Douglas Skinner, MPA, NRP, NCEE

SCS Safety Health and Security Associates LLC Leesburg, Virginia

#### Jeremy H. Smith, NRP

Joint Special Operations Medical Training Center Fort Bragg, North Carolina

### Scott A. Smith, MSN, APRN-CNP, ACNP-BC, NRP, I/C

Medical Education Solutions, LLC Portland, Maine

#### **Sara Sproule, CCEMTP**

<del>(�)</del>

Prince William County
Department of Fire and
Rescue
Woodbridge, Virginia

### **Robert Stanley, MPH, NRP**

School of EMS St. Petersburg, Florida

### Andrew W. Stern, MPA, MA, NRP, CCEMTP

Town of Colonie Emergency Medical Services Colonie, New York Hudson Valley Community College Troy, New York

### **Stephanie Stewart, DNP, APRN, CRNA**

Central Connecticut State University New Britain, Connecticut

### Jonathan C. Stone, MPA, NRP, FP-C

Utah Valley University Orem, Utah

### Frank Strange Jr, MS

Oklahoma State University Oklahoma City, Oklahoma

### Justin G. Tilghman, PhD, Paramedic, CEM

Lenoir Community College Kinston, North Carolina

### Laura Tipping-Wilhelm, MSN, BSN, APRN-C, CEN, CCRN, CAPA, CPAN

New Haven, Connecticut

### Scott Tomek, EdS, MA, FP-C, CCP-C

Allina Health EMS St. Paul, Minnesota

### Amy E. V. Trujillo, MA, NRP

Fielding Fire Department Fielding, Utah

#### **Brian Turner, RN, CCEMTP**

UnityPoint Health Princeton, Iowa

### Jerad Warlick, BS, NRP, FP-C

Oklahoma State University Oklahoma City, Oklahoma

### Thomas F. (Tom) Watson, AS, AAS, Paramedic

Thomas Nelson Community College Hampton, Virginia

### **Gregory West, EdD, JD, NRP**

Waukesha County Technical College Pewaukee, Wisconsin

### Michael H. Wilhelm, DNP, APRN, CRNA

UCONN Health–John Dempsey Hospital Farmington, Connecticut

### David Yarmesch, BSOL, AAS-EMS, CSSGB, EMSI, Paramedic

MetroHealth Medical Center Cleveland, Ohio

