

SECOND EDITION

EMERGENCY MEDICAL SERVICES

CLINICAL PRACTICE AND SYSTEMS OVERSIGHT

VOLUME 1: CLINICAL ASPECTS OF EMS

Editor-in-Chief

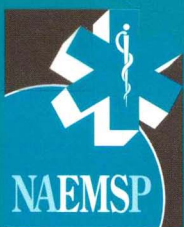
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Emergency Medical Services

Clinical Practice and Systems Oversight

Volume 1: Clinical Aspects of EMS

Second Edition

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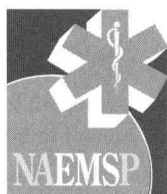
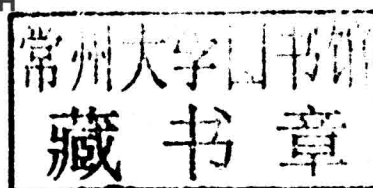
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Foreword

As this book is published, the National Association of EMS Physicians® has finished celebrating its 30th anniversary. This is a great sign that the association is maturing. This is our fifth edition of the textbook, and the previous editions have served as a key resource for EMS medical directors, fellowship directors, and managers. The association has grown in size, has an established and well-attended annual meeting, and serves as a key resource for the EMS community as a whole. As always, we remain focused on patient outcomes and providing the best possible patient care.

In other ways, this is just the beginning. This is the first edition of the textbook published since EMS has become a recognized medical subspecialty. This fact alone makes this

book a landmark edition. Within its pages, the reader will find the definitive reference for the core content in EMS. This book will serve as the foundation for our young specialty. The editors and authors who contributed to this work understand the key role this book plays in preparing our new subspecialists.

I want to thank Drs Cone, Brice, Delbridge, and Myers for their hard work as editors of this text. It is their passion for and incredible contributions to our specialty that made them the perfect choice for leading this endeavor.

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President, National Association
of EMS Physicians®

Preface

Since the earliest versions of this textbook in 1989, the subspecialty of EMS has evolved dramatically. In addition to increasing sophistication and application of expertise, EMS has developed to encompass a unique body of knowledge. Recognizing these features and an ongoing need to nurture the professionalism of those who are and might become committed to EMS, the American Board of Medical Specialties recognized EMS as a subspecialty in 2010. The American Board of Emergency Medicine administered the first certification examination in 2013, leading to the very first board-certified EMS subspecialists. The Accreditation Council for Graduate Medical Education has accredited 41 EMS fellowship programs as of this writing.

This second edition of *Emergency Medical Services: Clinical Practice and Systems Oversight* builds on the foundations of its predecessors, *EMS Medical Directors Handbook* (1989), *Prehospital Systems and Medical Oversight* (1994, 2002), and the first edition of this book in 2009. At the same time, planning this to be the primary textbook for those EMS fellowship programs, it is intended to be more concise and focused, reducing redundancy and making it an ideal source for reliable information. Within its pages is the core content thought to be relevant to EMS fellows and that which forms the basis for the certification examination. The Appendix shows this core content, previously published by the American Board of Emergency Medicine [1].

We are, of course, proud of this textbook's authors. They were careful to ensure that the right information is included in their

topic areas, meaning reliable and appropriately comprehensive. However, we are also indebted and most grateful to the authors and editors of the prior books noted above. They have served our subspecialty well by creating a foundation upon which we have been able to build a solid structure of unique knowledge, academic integrity, and clinical expertise. We share with the authors of this edition a sense of deep gratitude and sincere appreciation for the contributions made by authors of previous editions of this text. In many cases, their knowledge has been retained in this edition while in others their frameworks and underpinnings were used by the current authors as they updated content to reflect current best practices. To all who have contributed to this textbook, to all who contributed to prior versions, to all who commit parts of their professional lives to improving the delivery of EMS, and to all who will glean for themselves new knowledge through this textbook, we thank you!

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Reference

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Abbreviations

AAOS	American Academy of Orthopedic Surgeons	CISD	critical incident stress debriefing
AAP	American Academy of Pediatrics	CISM	critical incident stress management
ABEM	American Board of Emergency Medicine	CKD	chronic kidney disease
AC	assist control/acromioclavicular	CLIA	Clinical Laboratory Improvement Amendments
ACEP	American College of Emergency Physicians	CNS	central nervous system
ACF	alternative care facility	CO	carbon monoxide
ACLS	Advanced Cardiac Life Support	COPD	chronic obstructive pulmonary disease
ACPE	acute cardiogenic pulmonary edema	CPAP	continuous positive airway pressure
ACS	American College of Surgeons/acute coronary syndrome	CPP	coronary/cerebral perfusion pressure
ADHF	acute decompensated heart failure	CPR	cardiopulmonary resuscitation
AED	automated external defibrillator	CSF	cerebrospinal fluid
AEMS	Advocates for EMS	CSM	confined space medicine
AEMT	advanced emergency medical technician	CT	computed tomography
AGE	arterial gas embolism	DCS	decompression sickness
AHA	American Heart Association	DFI	drug-facilitated intubation
AICD	automatic implantable cardioverter defibrillator	DFSA	drug-facilitated sexual assault
AIS	abbreviated injury scale	DHEW	Department of Health, Education, and Welfare
AKI	acute kidney injury	DHHS	Department of Health and Human Services
ALOC	altered level of consciousness	DHS	Department of Homeland Security
ALS	Advanced Life Support	DKA	diabetic ketoacidosis
ALTE	apparent life-threatening event	DLS	dispatch life support
AMI	acute myocardial infarction	DMAT	disaster medical assistance team
AMS	altered mental status/acute mountain sickness/air medical services	DMORT	disaster mortuary response team
ANOVA	analysis of variance	DNR	do not resuscitate
ARC	American Red Cross	DOT	Department of Transportation
ASA	American Society of Anesthesiologists/American Stroke Association	DSMB	data and safety monitoring board
ASPR	Assistant Secretary of Preparedness and Response	DVT	deep vein thrombosis
ASTM	American Society for Testing and Materials	EAP	employee assistance program
ATA	atmosphere absolute	ECG	electrocardiogram
atm	atmosphere	ECLS	extracorporeal life support
AWLS	Advanced Wilderness Life Support	ECMO	extracorporeal membrane oxygenation
BAC	blood alcohol concentration	ED	emergency department
BBP	blood-borne pathogen	EEG	electroencephalogram
BiPAP	bilevel positive airway pressure	eGFR	estimated glomerular filtration rate
BIVAD	biventricular assist device	EMA	emergency management agency
BLS	Basic Life Support	EMAC	Emergency Management Assistance Compact
BMI	body mass index	EMD	emergency medical dispatch
BNP	B-type natriuretic peptide	EMR	emergency medical responder
BSA	body surface area	EMSC	Emergency Medical Services for Children
BVM	bag-valve-mask	EMT	emergency medical technician
CAD	coronary artery disease/computer-aided dispatch	EMT-A	emergency medical technician- ambulance
CAMTS	Commission on Accreditation of Medical Transport Systems	EMTALA	Emergency Medical Treatment and Active Labor Act
CDC	Centers for Disease Control and Prevention	EMT-I	emergency medical technician-intermediate
CDE	continuing dispatch education	EOC	emergency operations center
CERT	community emergency response team	EPA	Environmental Protection Agency
CHF	congestive heart failure	ESAR-VHP	Emergency System for Advanced Registration of Volunteer Health Professionals
CI	confidence interval	ESC	European Society of Cardiology
		ESF	emergency support function

ESRD	end-stage renal disease	KPI	key performance indicator
ETC	esophageal tracheal Combitube	LEOC	local emergency operations center
EtCO₂	end-tidal carbon dioxide	LLD	left lateral decubitus
ETI	endotracheal intubation	LMA	laryngeal mask airway
FAST	focused assessment with sonography in trauma	LVAD	left ventricular assist device
FCC	Federal Communications Commission	LZ	landing zone
FCS	Fireground Command System	MAP	mean arterial pressure
FDA	Food and Drug Administration	MCHB	Maternal and Child Health Bureau
FEMA	Federal Emergency Management Agency	MCI	mass casualty incident
FFP	fresh frozen plasma	MDI	metered dose inhaler
ffw	feet of freshwater	MI	myocardial infarction
FICEMS	Federal Interagency Committee on EMS	MOI	mechanism of injury
fsw	feet of seawater	MRC	Medical Reserve Corps
GABA	gamma-aminobutyric acid	MRSA	methicillin-resistant <i>Staphylococcus aureus</i>
GCS	Glasgow Coma Scale	MSDS	Material Safety Data Sheet
GI	gastrointestinal	MTA	medical threat assessment
HACE	high altitude cerebral edema	MUCC	Model Uniform Core Criteria
HAPE	high altitude pulmonary edema	MVC	motor vehicle collision
HBIG	hepatitis B immune globulin	NAEMSP	National Association of EMS Physicians
HBO	hyperbaric oxygen	NAEMT	National Association of EMTs
HBV	hepatitis B virus	NAEMSD	National Association of State EMS Directors
HCFA	Health Care Financing Administration	NAEMSO	National Association of State EMS Officials
HCP	health care provider	NAS-NRC	National Academy of Sciences National Research Council
HCV	hepatitis C virus	NCT	narrow-complex tachydysrhythmia
HEMS	helicopter EMS	NDMS	National Disaster Medical System
HF	hydrofluoric acid	NEDARC	National EMSC Data Analysis Resource Center
HIPAA	Health Insurance Portability and Accountability Act	NEMSIS	National EMS Information System
HIV	human immunodeficiency virus	NFDD	noise/flash diversionary device
HRSA	Health Resources and Services Administration	NFPA	National Fire Protection Association
HSP	Henoch-Schönlein purpura	NGO	non-governmental organization
IABP	intraaortic balloon pump	NHTSA	National Highway Traffic Safety Administration
IAP	incident action plan	NICU	neonatal intensive care unit
IBW	ideal body weight	NIH	National Institutes of Health
IC	incident commander	NIMS	National Incident Management System
ICD	implanted cardioverter-defibrillator	NIOSH	National Institute for Occupational Safety and Health
ICH	intracranial hemorrhage	NIPPV	non-invasive positive pressure ventilation
ICP	intracranial pressure	NKHS	non-ketotic hyperosmolar state
ICS	incident command system	NMDA	n-methyl-D-aspartate
ICU	intensive care unit	NMRT	national medical response team
IDLH	immediately dangerous to life and health	NNT	number needed to treat
I/E	inspiratory-to-expiratory	NREMT	National Registry of Emergency Medical Technicians
IED	improvised explosive device	NSAID	non-steroidal antiinflammatory drug
IJ	internal jugular	NSTEMI	non-ST-elevation MI
IL	interleukin	NVG	night vision goggles
IM	intramuscular	NVRT	National Veterinary Response Team
IMS	incident management system	OHCA	out-of-hospital cardiac arrest
IMSURT	international medical/surgical response team	OR	operating room/odds ratio
IN	intranasal	OSHA	Occupational Safety and Health Administration
IO	intraosseous	PAD	public access defibrillation
IOM	Institute of Medicine	PAI	prearrival instructions
IPE	immersion pulmonary edema	PALS	Pediatric Advanced Life Support
IPV	intimate partner violence	PASG	pneumatic antishock garment
IRB	institutional review board	PAT	Pediatric Assessment Triangle
ISS	injury severity score	PCI	percutaneous coronary intervention
ITD	impedance threshold device	PCR	patient care report
IV	intravenous	PD	peritoneal dialysis
JTTR	Joint Theater Trauma Registry	PDI	postdispatch instruction
JVD	jugular venous distension	PDSA	Plan-Do-Study-Act
KED	Kendrick Extrication Device		

PE	pulmonary embolus	SSC	secondary stroke center
PEA	pulseless electrical activity	SSM	system status management
PEEP	positive end-expiratory pressure	STEMI	ST-segment elevation myocardial infarction
PEL	permissible exposure limit	SVR	systemic vascular resistance
PEP	postexposure prophylaxis	SVT	supraventricular tachycardia
PFAST	prehospital FAST	SWAT	special weapons and tactics
PI	performance improvement	TAC	Technical Assistance Center
PID	pelvic inflammatory disease	TB	tuberculosis
PIO	public information officer	TBI	traumatic brain injury
PIP	peak inspiratory pressure	TBSA	total body surface area
PMCS	perimortem cesarean section	TBW	total body weight
POC	point of care	TCCC	tactical combat casualty care
POLST	Physician Orders for Life-Sustaining Treatment	TdP	torsades de pointes
PPE	personal protective equipment	TECC	Tactical Emergency Casualty Care
PRA	patient reception area	TEMS	tactical emergency medical support
PS	pressure support	TIA	transient ischemic attack
PSC	primary stroke center	TM	tympanic membrane
PSO	patient safety organization	TOA	tuboovarian abscess
PTSD	posttraumatic stress disorder	TOR	termination of resuscitation
PVC	premature ventricular contraction	t-PA	tissue plasminogen activator
QA	quality assurance	TQM	total quality management
QALY	quality-adjusted life-year	TTJV	transtracheal jet ventilation
QI	quality improvement	TV	tidal volume
QM	quality management	TXA	tranexamic acid
RCT	randomized controlled trial	US&R	urban search and rescue
REBOA	reverse endovascular balloon occlusion of the aorta	UTI	urinary tract infection
ROSC	return of spontaneous circulation	UXO	unexploded ordnance
RR	respiratory rate	VAD	ventricular assist device
RSA	rapid sequence airway	VF	ventricular fibrillation
RSI	rapid sequence intubation	VL	video laryngoscope
RSV	respiratory syncytial virus	VNS	vagus nerve stimulator
RTS	Revised Trauma Score	VOAD	Voluntary Organizations Active in Disaster
RVAD	right ventricular assist device	VoIP	voice over internet protocol
SABA	short-acting inhaled beta ₂ -agonist	VP	ventriculoperitoneal
SAEM	Society for Academic Emergency Medicine	VT	ventricular tachycardia
SAR	search and rescue	VTE	venous thromboembolism
SARS	severe acute respiratory syndrome	VZV	varicella zoster virus
SBP	systolic blood pressure	WCT	wide-complex tachydysrhythmia
SC	sternoclavicular	WEMS	wilderness EMS
SCA	sudden cardiac arrest	WEMT	wilderness EMT
SCBA	self-contained breathing apparatus	WFA	wilderness first aid
SGA	supraglottic airway	WFR	wilderness first responder
SIMV	synchronized intermittent mandatory ventilation	WHO	World Health Organization
SMS	Simplified Motor Scale/safety management system	WMD	weapon of mass destruction
SOG	standard operating guideline	WMS	Wilderness Medical Society
SRR	survival risk ratio	WPHEC	wilderness prehospital emergency care

About the companion website

This series is accompanied by a companion website:

www.wiley.com/go/cone/naemsp

The website includes:

- video clips
- interactive MCQs
- link to the EMS Examination Task Force, American Board of Emergency Medicine.

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