



Cardiovascular Emergencies

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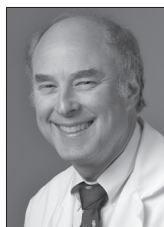
About the Editors



Amal Mattu, MD, FACEP. Since joining the faculty at the University of Maryland School of Medicine in 1996, Dr. Mattu has had a passion for teaching and writing about emergency cardiology. His commitment to teaching has earned him more than twenty teaching awards, including national awards from the American College of Emergency Physicians (ACEP) and local honors including the Teacher of the Year for the University of Maryland at Baltimore campus and the Maryland State Emergency Physician of the Year Award. He is a regular speaker at national and international conferences on topics pertaining to emergency cardiology. Dr. Mattu has authored or edited 16 textbooks in emergency medicine, including seven focused on emergency cardiology and electrocardiography. He is also the only emergency physician to serve as primary Guest Editor for *Cardiology Clinics*, which he has done twice. Dr. Mattu is currently a tenured professor, Vice Chair, and director of the Emergency Cardiology Fellowship for the Department of Emergency Medicine at the University of Maryland School of Medicine.



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Dedications

I would like to thank my wife, Sejal, for her constant support and encouragement; I thank my children, Nikhil, Eleena, and Kamran, for always reminding me of my proper priorities in life; I thank the residents and students at the University of Maryland School of Medicine for providing me the inspiration for the work I do every day; and finally, thanks to my colleagues and mentors, who continue to exemplify what I hope one day to become.

—Amal Mattu

I am most fortunate and am appreciative of many people—my parents, William and Joann Brady, for providing the opportunities; my wife, King Brady, for her support, patience, and love; my children, Lauren, Anne, Chip, and Katherine, for their love and inspiration; my chair, Robert O'Connor, MD, for his mentorship and leadership; and my colleagues in emergency medical care, both hospital- and prehospital-based, for their partnership in healthcare and dedication to the patient.

—William J. Brady

I would like to dedicate this work to my family, Adrienne, Ben, and Aaron, and to the thousands of emergency physicians whose efforts day and night provide care and comfort for our fellow human beings.

—Michael Jay Bresler

This book is dedicated to my parents for showing me how to live a life of integrity and devotion; to the love of my life, Avery, who is my greatest support and best friend; to my boys, Levi and Austin, who are my best buds and who motivate me to be the best that I can be; and to all of my many mentors in medicine who have challenged me to understand more about why we do what we do.

—Scott Silvers

For all those who let me teach the subtleties of ECG interpretation, medication effects on transmembrane potentials, and the evidence behind ACS risk stratification protocols...at 2 AM and feign to appear interested! I thank you for that gift.

—Sarah A. Stahmer

This text is dedicated to my wife, children, and parents for their support, love, and faith. I thank my colleagues at University of California San Francisco and at the American College of Emergency Physicians for their brilliance, fantastic attitude, and great friendship. I also thank the amazing staff at ACEP who made this all possible and finally, the amazing Amal Mattu, who continues to lead and inspire a generation of physicians.

—Jeffrey A. Tabas

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Foreword

Emergency physicians serve as front-line clinicians who are expected to evaluate, stabilize, and begin treatment whenever an emergency patient presents to the emergency department (ED). As the specialty of emergency medicine has evolved and matured, so have the expectations for the expertise of the emergency physician. This creates a very exciting but also a very challenging work environment.

Gone are the days when all patients with chest pain get admitted for observation, every patient who is critically ill is whisked to an ICU before the initiation of critical care or a cardiologist is routinely called to the ED for patients with an unusual or unstable rhythm. Physicians working in an ED are now expected to have a high level of sophisticated knowledge in all areas of emergency care, with cardiovascular emergencies being one of the most important.

Cardiovascular Emergencies by Mattu, Brady, Bresler, Silvers, Stahmer, and Tabas brings together experts in our specialty to create an authoritative text for emergency providers. It is a book by emergency physicians *for* emergency physicians. It is also an excellent resource for physicians training in any specialty who will see cardiovascular emergencies. Each of the editors is a renowned educator and they have carefully selected authors for each topic. The text's value is maximized by extremely clear ECGs and very high quality graphics and illustrations.

The best textbooks are broad enough to include all relevant information, but are focused on the core topics readers will need to develop expertise or to serve as a reference. The editors and authors drew on their many years of experience educating students, residents, and fellow physicians to create a comprehensive textbook of cardiovascular emergencies. They begin with a chapter on how to approach chest pain and follow with a chapter on the overt and subtle ECG signs of ischemia and infarction. The evolution of biomarkers as well as the "best" imaging study to evaluate patients for ischemia follows in separate chapters devoted to each. Up until a few years ago, only cardiologists performed cardiovascular ultrasound. Now emergency physicians are increasingly using ultrasound to evaluate the heart and great vessels for evidence of heart failure, tamponade, contractility, RV strain, and volume status; thus, a chapter is devoted to the ultrasound findings needed for acute diagnosis and treatment of cardiovascular emergencies. Finally, there is no emergency that is more central to emergency care than the treatment of an acute myocardial infarction. This text covers all facets of the acute therapy of both STEMI and NSTEMI.

Chapters are also devoted to the management of arrhythmias seen near daily in the ED, including wide and narrow complex tachycardias along with bradycardias and heart block. Critical care medicine and cardiology share a number of emergencies, and this text provides up-to-date management of acute decompensated heart failure, cardiogenic shock, cardiac arrest,

and post-cardiac arrest care, covering each with a detailed but succinct chapter. *Key Point* sections throughout all chapters highlight the most important concepts and clinical insights of the authors.

Other topics also covered in *Cardiovascular Emergencies* are syncope and hypertension, two very common entities, as well as less common but important conditions such as pulmonary hypertension, myocarditis, and pericarditis; complications due to implanted devices including pacemakers, AICDs, and LVADs; and cardiovascular emergencies in pregnant patients. Cardiac pharmacology, as it applies to emergent patients, and the use of the ED for observation are also presented. Because missing a cardiovascular emergency such as a myocardial infarction leads all other causes in dollars lost to malpractice claims paid, the final chapter is devoted to reducing malpractice risks.

Cardiovascular Emergencies is a book for anyone who will see a cardiovascular emergency. It is written and edited by expert emergency physicians and is a superb resource. All of us should be indebted to its editors and authors.

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Preface

Cardiovascular disease accounts for more deaths in the United States and most other first-world countries than any other cause. This number-one ranking has persisted for many years despite marked advances in preventive medicine, diagnostics, and therapeutics. Not only has this rank remained immobile, but the absolute number of deaths due to cardiac disease continues to rise. Most “experts” predict that this is not going to change in the near future. Therefore, if we in the health care field have any hope of changing these statistics, we must be optimally prepared to diagnose and treat patients when they present with acute cardiovascular conditions or complications.

The specialty of Emergency Medicine bears a great responsibility for the acute care of these patients. We must diagnose and initiate stabilizing treatment for patients with acute coronary syndromes, acute heart failure, pericarditis, myocarditis, arrhythmias, and many other conditions, and we are frequently the key providers who determine the prognosis of patients presenting with cardiac arrest. We are required to carry out these duties while working under significant time constraints; we are forced to make life-and-death decisions, often with minimal objective data; and we are often held to impossible standards of care by society and the legal profession.

The goal of this textbook is to facilitate the efficient and cutting-edge delivery of care to patients who present with acute cardiovascular conditions. To accomplish this goal, we brought together many of the brightest minds in Emergency Medicine from various institutions to collaborate and create best practices for emergency cardiovascular conditions. We believe we have formulated approaches to the workup and management that will optimize patient care.

In the pages that follow, we address many of the most common emergency cardiovascular conditions we face in Emergency Medicine as well as some conditions that are rising in import around the world. Initial chapters focus on the complicated evaluation and differential diagnosis of chest pain and modern approaches to “low-risk” chest pain. Acute coronary syndromes are covered in depth, and subsequent chapters address many of the complications associated with coronary artery disease, including acute heart failure, arrhythmias, and cardiogenic shock. Recent “hot topics” in the Emergency Medicine literature are addressed, including bedside echocardiography, observation units, cardiac arrest, and post-arrest care. Special populations are also discussed: oncologic patients, pregnant patients, transplant patients, patients with HIV, patients with pulmonary hypertension, and patients with implanted devices. A special chapter is devoted to issues related to malpractice.

In overseeing the development of this text, our goal has been to provide an easily understood, highly visual resource that is readable from cover to cover. Although this text might be considered a “bookshelf reference,” that designation is at odds with

our goal of cover-to-cover readability. We have tried to format the chapters for quick reference during everyday patient care.

We hope you enjoy reading this book and welcome any and all of your feedback. We would like to thank Linda Kesselring, copyeditor at University of Maryland, and Mary Anne Mitchell, copyeditor at ACEP, whose persistence and insight saw this project through to completion and excellence. We would also like to thank our families for their patience and understanding while we worked on this project, and we thank our colleagues, students, and residents, who have been a constant source of inspiration for our work. We would especially like to thank you, the readers, for your unwavering dedication and commitment to patient care.

Amal Mattu
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