

第10版

Braunwald 心脏病学

心血管内科学教科书

Braunwald's Heart Disease
A Textbook of Cardiovascular Medicine

英文影印版

上卷

主 编

Douglas L. Mann

Douglas P. Zipes

Peter Libby

Robert O. Bonow

This edition is for sale in P.R.China excluding Hong kong SAR and Taiwan. Sale and purchase of this book outside of these countries is illegal and punishable by law.



ELSEVIER



北京大学医学出版社

(第10版)

Braunwald 心脏病学

心血管内科学教科书

Braunwald's Heart Disease

A Textbook of Cardiovascular Medicine

英文影印版

上卷

Edited by

Douglas L. Mann, MD

Lewin Chair and Professor of Medicine, Cell Biology, and Physiology

Chief, Division of Cardiology

Washington University School of Medicine in St. Louis

Cardiologist-in-Chief

Barnes-Jewish Hospital

St. Louis, Missouri

Douglas M. Lipson, MD

Distinguished Professor

Professor Emeritus of Medicine, Pharmacology, and Toxicology

Director Emeritus, Division of Cardiology and the Krannert Institute of Cardiology

Indiana University School of Medicine
Indianapolis, Indiana

Peter Libby, MD

Mallinckrodt Professor of Medicine

Harvard Medical School

Chief, Cardiovascular Medicine Division

Brigham and Women's Hospital

Boston, Massachusetts

Robert O. Bonow, MD, MS

Max and Lilly Goldberg Distinguished Professor of Cardiology

Vice Chairman, Department of Medicine

Director, Center for Cardiac Innovation

Northwestern University Feinberg School of Medicine
Chicago, Illinois

Founding Editor and Online Editor

**Eugene Braunwald, MD, MD(Hon),
ScD(Hon), FRCP**

Distinguished Hersey Professor of Medicine

Harvard Medical School

Founding Chairman, TIMI Study Group

Brigham and Women's Hospital

Boston, Massachusetts

ELSEVIER
SAUNDERS



北京大学医学出版社

BRAUNWALD XINZANGBINGXUE——XINXUEGUAN NEIKEXUE JIAOKESHU (DI 10 BAN)

图书在版编目 (CIP) 数据

Braunwald心脏病学——心血管内科学教科书 (第10版) =
Braunwald's Heart Disease——A Textbook of Cardiovascular
Medicine: 第10版: 英文 / (美) 曼 (Mann,D.) 主编. — 影
印本. — 北京: 北京大学医学出版社, 2015.9

ISBN 978-7-5659-1183-5

I. ①B… II. ①曼… III. ①心脏病学—英文 IV. ①R541

中国版本图书馆CIP数据核字(2015)第184467号

北京市版权局著作权合同登记号: 图字: 01-2015-6153

ELSEVIER

Elsevier(Singapore) Pte Ltd.

3 Killiney Road

#08-01 Winsland House I

Singapore 239519

Tel: (65) 6349-0200

Fax: (65) 6733-1817

Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 2-Volume Set, 10/E
Copyright 2015,2012,2008, 2005, 2001, 1997, 1992, 1988, 1984, 1980 by Saunders, an imprint of Elsevier Inc.
ISBN-13:9781455751334

This reprint of Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 2-Volume Set, 10/E by Douglas Mann, Douglas Zipes, Peter Libby and Robert Bonow was undertaken by Peking University Medical Press and is published by arrangement with Elsevier (Singapore) Pte Ltd.

Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, 2-Volume Set, 10/E by Douglas Mann, Douglas Zipes, Peter Libby and Robert Bonow 由北京大学医学出版社进行影印, 并根据北京大学医学出版社与爱思唯尔 (新加坡) 私人有限公司的协议约定出版。

Copyright 2015 by Elsevier (Singapore) Pte Ltd. and Peking University Medical Press.

ISBN: 978-1-4557-5133-4

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from Elsevier (Singapore) Pte Ltd. and Peking University Medical Press. Details on how to seek permission, further information about Elsevier's permissions policies and arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at the website: www.elsevier.com/permissions.

This book and the individual contributions contained in it are protected under copyright by Elsevier (Singapore) Pte Ltd. and Peking University Medical Press. (other than as may be noted herein)

Online resources are not available with this reprint.

Notice

This publication has been carefully reviewed and checked to ensure that the content is as accurate and current as possible at time of publication. We would recommend, however, that the reader verify any procedures, treatments, drug dosages or legal content described in this book. Neither the author, the contributors, the copyright holder nor publisher assume any liability for injury and/or damage to persons or property arising from any error in or omission from this publication.

Published in China by Peking University Medical Press under special arrangement with Elsevier (Singapore) Pte Ltd. This edition is authorized for sale in the People's Republic of China only, excluding Hong Kong SAR, Macau SAR and Taiwan. Unauthorized export of this edition is a violation of the contract.

BRAUNWALD心脏病学——心血管内科学教科书 (第10版·上卷)

主 编: Douglas L.Mann, Douglas P.Zipes, Peter Libby, Robert O.Bonow

出版发行: 北京大学医学出版社

地 址: (100191) 北京市海淀区学院路38号 北京大学医学部院内

电 话: 发行部 010-82802230; 图书邮购 010-82802495

网 址: <http://www.pumppress.com.cn>

E-mail: booksale@bjmu.edu.cn

印 刷: 北京圣彩虹制版印刷技术有限公司

经 销: 新华书店

责任编辑: 高 瑾 责任印制: 李 啸

开 本: 889mm×1194mm 1/16 印张: 132.5 字数: 4074千字

版 次: 2015年9月第1版 2015年9月第1次印刷

书 号: ISBN 978-7-5659-1183-5

定 价: 790.00元 (上下卷)

版权所有, 违者必究

(凡属质量问题请与本社发行部联系退换)

(第10版)

Braunwald 心脏病学

心血管内科学教科书

Braunwald's Heart Disease

A Textbook of Cardiovascular Medicine

英文影印版

上 卷

To

Laura, Erica, Jonathan, and Stephanie

Joan, Debra, Jeffrey, and David

Beryl, Oliver, and Brigitte

Pat, Rob, and Sam

Contributors

**Keith D. Aaronson, MD, MS**

Professor of Internal Medicine, Division of Cardiovascular Medicine, University of Michigan Health System, Ann Arbor, Michigan
Mechanical Circulatory Support

William T. Abraham, MD

Professor of Internal Medicine, Physiology, and Cell Biology, Chair of Excellence in Cardiovascular Medicine, Director, Division of Cardiovascular Medicine, Deputy Director, The Davis Heart and Lung Research Institute, The Ohio State University, Columbus, Ohio
Devices for Monitoring and Managing Heart Failure

Michael A. Acker, MD

Chief, Division of Cardiovascular Surgery, Director, Penn Medicine Heart and Vascular Center, University of Pennsylvania Health System, Philadelphia, Pennsylvania
Surgical Management of Heart Failure

Michael J. Ackerman, MD, PhD

Windland Smith Rice Cardiovascular Genomics Research Professor, Professor of Medicine, Pediatrics, and Pharmacology, Director, Long QT Syndrome/Genetic Heart Rhythm Clinic, Director, Mayo Clinic Windland Smith Rice Sudden Death Genomics Laboratory, Mayo Clinic, Rochester, Minnesota
Genetics of Cardiac Arrhythmias

Elliott M. Antman, MD

Professor of Medicine, Associate Dean for Clinical/Translational Research, Harvard Medical School; Senior Investigator, TIMI Study Group, Brigham and Women's Hospital, Boston, Massachusetts
Critical Evaluation of Clinical Trials

Larry M. Baddour, MD

Professor of Medicine, Mayo Clinic, Rochester, Minnesota
Cardiovascular Infections

Aaron Baggish, MD

Cardiovascular Performance Program, Massachusetts General Hospital; Assistant Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Exercise and Sports Cardiology

C. Noel Bairey Merz, MD

Women's Guild Endowed Chair in Women's Health, Director, Barbara Streisand Women's Heart Center, Director, Preventive Cardiac Center; Director, Linda Joy Pollin Women's Healthy Heart Program; Professor of Medicine, Cedars-Sinai Medical Center, Los Angeles, California
Cardiovascular Disease in Women

Gary J. Balady, MD

Director, Non Invasive Cardiovascular Laboratories, Boston Medical Center; Professor of Medicine, Boston University School of Medicine, Boston, Massachusetts
Exercise Testing

Joshua A. Beckman, MD

Associate Professor of Medicine, Harvard Medical School; Cardiovascular Medicine Division, Brigham and Women's Hospital; Associate Medical Director, VasCore, Massachusetts General Hospital, Boston, Massachusetts
Anesthesia and Noncardiac Surgery in Patients with Heart Disease

Donald M. Bers, PhD

Distinguished Professor and Chair, Pharmacology, University of California Davis, Davis, California
Mechanisms of Cardiac Contraction and Relaxation

Michael A. Bettman, MD

Professor Emeritus of Radiology, Wake Forest University School of Medicine, Winston-Salem, North Carolina
The Chest Radiograph in Cardiovascular Disease

Deepak L. Bhatt, MD, MPH

Senior Investigator, TIMI Study Group, Executive Director, Interventional Cardiovascular Programs, Heart and Vascular Center, Brigham and Women's Hospital; Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Coronary Arteriography and Intracoronary Imaging; Percutaneous Coronary Intervention; Treatment of Noncoronary Obstructive Vascular Disease

William E. Boden, MD

Chief of Medicine, Albany Stratton Veterans Affairs Medical Center; Vice Chairman, Department of Medicine, Albany Medical Center; Professor of Medicine, Albany Medical College, Albany, New York
Stable Ischemic Heart Disease

Robert O. Bonow, MD, MS

Max and Lilly Goldberg Distinguished Professor of Cardiology, Vice Chairman, Department of Medicine, Director, Center for Cardiac Innovation, Northwestern University Feinberg School of Medicine, Chicago, Illinois
Appropriate Use Criteria: Echocardiography; Nuclear Cardiology; Cardiac Catheterization; Appropriate Use Criteria: Multimodality Imaging in Stable Ischemic Heart Disease and Heart Failure; Care of Patients with End-Stage Heart Disease; Valvular Heart Disease; Guidelines: Infective Endocarditis

Eugene Braunwald, MD, MD(Hon), ScD(Hon), FRCP

Distinguished Hersey Professor of Medicine, Harvard Medical School; Founding Chairman, TIMI Study Group, Brigham and Women's Hospital, Boston, Massachusetts
Non-ST Elevation Acute Coronary Syndromes

Alan C. Braverman, MD

Alumni Endowed Professor in Cardiovascular Diseases, Department of Medicine, Washington University School of Medicine in St. Louis, St. Louis, Missouri
Diseases of the Aorta

J. Douglas Bremner, MD

Professor of Psychiatry and Radiology, Director, Emory Clinical Neuroscience Research Unit, Emory University School of Medicine; Director, Mental Health Research, Atlanta Veterans Affairs Medical Center, Atlanta, Georgia
Psychiatric and Behavioral Aspects of Cardiovascular Disease

Julie E. Buring, MD

Professor of Medicine, Brigham and Women's Hospital; Professor of Epidemiology, Harvard Medical School; Harvard School of Public Health, Boston, Massachusetts
Risk Markers and the Primary Prevention of Cardiovascular Disease

Hugh G. Calkins, MD

Professor of Medicine, Director, Cardiac Arrhythmia Service, Director, Johns Hopkins Arrhythmogenic Right Ventricular Dysplasia Program, The Johns Hopkins Hospital, Baltimore, Maryland
Hypotension and Syncope

Christopher P. Cannon, MD

Cardiovascular Medicine Division, Brigham and Women's Hospital; Professor of Medicine, Harvard Medical School; Executive Director, Cardiometabolic Trials, Harvard Clinical Research Institute, Boston, Massachusetts
Approach to the Patient with Chest Pain; Non-ST Elevation Acute Coronary Syndromes

John M. Canty, Jr., MD

Albert and Elizabeth Rekate Professor of Medicine, Division of Cardiovascular Medicine, Western New York Veterans Affairs Healthcare System, University at Buffalo, Buffalo, New York
Coronary Blood Flow and Myocardial Ischemia

John D. Carroll, MD

Professor of Medicine, University of Colorado Denver, Denver, Colorado; Director of Interventional Cardiology and Co-Medical Director, Cardiac and Vascular Center, University of Colorado Hospital, Aurora, Colorado
Transcatheter Therapies for Structural Heart Disease in Adults

Augustin Castellanos, MD

Emeritus Professor of Medicine, University of Miami Miller School of Medicine, Miami, Florida
Cardiac Arrest and Sudden Cardiac Death

Ming Hui Chen, MD, MSC

Boston Children's Hospital and Dana Farber Cancer Institute, Director, Cardiovascular Health for Cancer Survivors; Assistant Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Cardiovascular Complications of Cancer Therapeutic Agents

Leslie T. Cooper, Jr., MD

Director, Gonda Vascular Center, Mayo Clinic, Rochester, Minnesota
Myocarditis

Mark A. Creager, MD

Director, Vascular Center, Brigham and Women's Hospital; Simon C. Fireman Scholar in Cardiovascular Medicine, Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Peripheral Artery Diseases

Charles J. Davidson, MD

Chief, Clinical Cardiology, Medical Director, Bluhm Cardiovascular Institute, Northwestern Memorial Hospital; Professor of Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois
Cardiac Catheterization

Stephen Devries, MD

Executive Director, Gaples Institute for Integrative Cardiology, Deerfield, Illinois; Associate Professor of Medicine, Division of Cardiology, Northwestern University, Chicago, Illinois
Integrative Approaches to the Management of Patients with Heart Disease

Neal W. Dickert, MD, PhD

Assistant Professor, Department of Medicine, Division of Cardiology, School of Medicine, Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia
Ethics in Cardiovascular Medicine

Vasken Dilsizian, MD

Professor of Medicine and Radiology, University of Maryland School of Medicine; Chief, Division of Nuclear Medicine, University of Maryland Medical Center, Baltimore, Maryland
Nuclear Cardiology; Appropriate Use Criteria: Multimodality Imaging in Ischemic Heart Disease and Heart Failure

Dirk J. Duncker, MD, PhD

Professor of Experimental Cardiology, Department of Cardiology, Erasmus University Medical Center, Rotterdam, The Netherlands
Coronary Blood Flow and Myocardial Ischemia

Ezekiel J. Emanuel, MD, PhD

Vice Provost for Global Initiatives, Diane V.S. Levy and Robert M. Levy University Professor, Chairperson, Department of Medical Ethics and Health Policy, University of Pennsylvania, Philadelphia, Pennsylvania
Ethics in Cardiovascular Medicine

Rodney H. Falk, MD

Director, Cardiac Amyloidosis Program, Brigham and Women's Hospital; Associate Clinical Professor of Medicine, Harvard Medical School, Boston, Massachusetts
The Dilated, Restrictive, and Infiltrative Cardiomyopathies

James C. Fang, MD

Professor of Medicine, Chief, Division of Cardiovascular Medicine, Executive Director, Cardiovascular Service Line, University of Utah Health Sciences Center, Salt Lake City, Utah
The History and Physical Examination: An Evidence-Based Approach

G. Michael Felker, MD, MHS

Associate Professor of Medicine, Division of Cardiology, Duke University School of Medicine, Durham, North Carolina
Diagnosis and Management of Acute Heart Failure

Stacy D. Fisher, MD

Director of Women's and Complex Heart Diseases, Medicine, Cardiology, and Pediatric Cardiology, University of Maryland Comprehensive Heart Center, Baltimore, Maryland
Cardiovascular Abnormalities in HIV-Infected Individuals

Lee A. Fleisher, MD

Robert D. Dripps Professor and Chair, Anesthesiology and Critical Care, Professor of Medicine, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania
Anesthesia and Noncardiac Surgery in Patients with Heart Disease

Thomas Force, MD

Professor of Medicine, Division of Cardiovascular Medicine, Vanderbilt University School of Medicine, Nashville, Tennessee
Cardiovascular Complications of Cancer Therapeutic Agents

William K. Freeman, MD

Professor of Medicine, Mayo Clinic College of Medicine,
Rochester, Minnesota
Cardiovascular Infections

J. Michael Gaziano, MD, MPH

Chief, Division of Aging, Brigham and Women's Hospital; Scientific
Director, Massachusetts Veterans Epidemiology Research and
Information Center, Veterans Administration Boston Healthcare
System; Professor of Medicine, Harvard Medical School, Boston,
Massachusetts
Global Burden of Cardiovascular Disease

Thomas A. Gaziano, MD, MSc

Assistant Professor, Harvard Medical School; Cardiovascular
Medicine Division, Brigham and Women's Hospital, Boston,
Massachusetts
Global Burden of Cardiovascular Disease

Jacques Genest, MD

Professor of Medicine, Cardiology, McGill University; Scientific
Director, Centre for Innovative Medicine, McGill University Health
Centre, Montreal, Quebec, Canada
Lipoprotein Disorders and Cardiovascular Disease

Robert E. Gerszten, MD

Director of Clinical and Translational Research, Massachusetts
General Hospital Institute for Heart, Vascular, and Stroke Care;
Professor of Medicine, Harvard Medical School; Senior Associate
Member, Broad Institute, Boston, Massachusetts
*Biomarkers, Proteomics, Metabolomics, and Personalized
Medicine*

Linda Gillam, MD, MPH

Chairperson, Department of Cardiovascular Medicine, Morristown
Medical Center, Atlantic Health System, Morristown, New Jersey
Echocardiography

Geoffrey S. Ginsburg, MD, PhD

Executive Director, Center for Personalized and Precision Medicine,
Duke University Health Systems; Director, Genomic Medicine,
Institute for Genome Sciences and Policy, Professor of Medicine,
Pathology and Biomedical Engineering, Duke University School
of Medicine, Durham, North Carolina
Personalized and Precision Cardiovascular Medicine

Robert P. Giugliano, MD, SM

Physician, Cardiovascular Medicine Division, Brigham and
Women's Hospital; Associate Professor of Medicine, Harvard
Medical School, Boston, Massachusetts
Non-ST Elevation Acute Coronary Syndromes

Ary L. Goldberger, MD

Professor of Medicine, Harvard Medical School; Director, Margaret
and H.A. Rey Institute for Nonlinear Dynamics in Medicine;
Associate Chief, Interdisciplinary Medicine and Biotechnology,
Beth Israel Deaconess Medical Center, Boston, Massachusetts
Electrocardiography

Samuel Z. Goldhaber, MD

Professor of Medicine, Harvard Medical School; Director,
Thrombosis Research Group; Senior Staff Physician,
Cardiovascular Medicine Division, Brigham and Women's
Hospital, Boston, Massachusetts
Pulmonary Embolism

Larry B. Goldstein, MD

Professor of Neurology and Director, Duke Stroke Center, Duke
University; Staff Neurologist, Durham Veterans Affairs Medical
Center, Durham, North Carolina
Prevention and Management of Ischemic Stroke

Sarah J. Goodlin, MD

Chief, Geriatrics, Portland Veterans Affairs Medical Center;
Associate Professor, Oregon Health and Science University,
Portland, Oregon
Care of Patients with End-Stage Heart Disease

William J. Groh, MD, MPH

Associate Professor of Medicine, Indiana University School of
Medicine, Indianapolis, Indiana
Neurologic Disorders and Cardiovascular Disease

Martha Gulati, MD, MS

Associate Professor of Medicine, Division of Cardiology, Associate
Professor of Clinical Public Health, Division of Epidemiology,
Sarah Ross Soter Chair, Women's Cardiovascular Health, Section
Director, Preventive Cardiology and Women's Cardiovascular
Health, The Ohio State University Wexner Medical Center,
Columbus, Ohio
Cardiovascular Disease in Women

Roger J. Hajjar, MD

Director, Cardiovascular Research Center, Icahn School of
Medicine at Mount Sinai, New York, New York
Cardiovascular Regeneration and Gene Therapy

Joshua M. Hare, MD

Louis Lemberg Professor of Medicine, Cardiovascular Division,
Director, Interdisciplinary Stem Cell Institute, University of Miami
Miller School of Medicine, Miami, Florida
Cardiovascular Regeneration and Gene Therapy

Gerd Hasenfuss, MD

Professor of Medicine, Chair, Department of Cardiology and
Pneumology, Chair, Heart Center, University of Goettingen;
Chair, Heart Research Center, DZHK (German Center of
Cardiovascular Research), Goettingen, Germany
Pathophysiology of Heart Failure

Ray E. Hershberger, MD

Professor of Medicine, Director, Division of Human Genetics,
Division of Cardiovascular Medicine, Section of Heart Failure
and Cardiac Transplantation, The Ohio State University Wexner
Medical Center, Columbus, Ohio
The Dilated, Restrictive, and Infiltrative Cardiomyopathies

L. David Hillis, MD

Professor and Chair, Internal Medicine, The University of Texas
Health Science Center, San Antonio, Texas
Chemical Cardiomyopathies

William E. Hopkins, MD

Associate Professor of Medicine, The University of Vermont;
Attending Cardiologist, Fletcher Allen Health Care, Burlington,
Vermont
Pericardial Diseases

Marc Humbert, MD, PhD

Professor of Respiratory Medicine, Service de Pneumologie, Hôpital
Bicêtre; Assistance, Publique Hôpitaux de Paris, Université
Paris-Sud, Paris, France
Pulmonary Hypertension

James L. Januzzi, Jr., MD

Professor of Medicine, Harvard Medical School; Roman W.
De Sanctis Endowed Distinguished Clinical Scholar, Division of
Cardiology, Massachusetts General Hospital, Boston,
Massachusetts
Clinical Assessment of Heart Failure

Mariell Jessup, MD

Associate Chief, Clinical Affairs, Division of Cardiovascular Medicine, Professor of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania
Surgical Management of Heart Failure

Sekar Kathiresan, MD

Associate Member, Broad Institute, Cambridge, Massachusetts; Associate Professor of Medicine, Harvard Medical School; Director, Preventive Cardiology, Massachusetts General Hospital, Boston, Massachusetts
Principles of Cardiovascular Genetics

Scott Kinlay, PhD

Director, Cardiac Catheterization Laboratory and Vascular Medicine, Veterans Affairs Boston Healthcare System, West Roxbury, Massachusetts; Co-Director, Vascular Diagnostic and Interventional Clinical and Research Program, Veterans Affairs Boston, Brigham and Women's Hospital; Associate Professor in Medicine, Harvard Medical School, Boston, Massachusetts
Coronary Arteriography and Intracoronary Imaging; Treatment of Noncoronary Obstructive Vascular Disease

Irwin Klein, MD

Professor of Medicine, New York University School of Medicine, New York, New York
Endocrine Disorders and Cardiovascular Disease

Kirk U. Knowlton, MD

Professor of Medicine, Division of Cardiology, Department of Medicine, University of California San Diego, La Jolla, California
Myocarditis

Harlan M. Krumholz, MD, SM

Harold H. Hines, Jr. Professor of Medicine, Epidemiology, and Public Health, Section of Cardiovascular Medicine and Robert Wood Johnson Foundation Clinical Scholars Program, Department of Medicine, Department of Health Policy and Management, School of Public Health, Yale University; Center for Outcomes Research and Evaluation, Yale-New Haven Hospital, New Haven, Connecticut
Clinical Decision Making in Cardiology

Raymond Y. Kwong, MD, MPH

Associate Professor of Medicine, Harvard Medical School; Director of Cardiac Magnetic Resonance Imaging, Cardiovascular Medicine Division, Brigham and Women's Hospital, Boston, Massachusetts
Cardiovascular Magnetic Resonance Imaging

Richard A. Lange, MD, MBA

Founding President and Dean, Paul L. Foster School of Medicine, Texas Tech University Health Sciences Center at El Paso, El Paso, Texas
Chemical Cardiomyopathies

Thomas H. Lee, MD

Chief Medical Officer, Press Ganey, Boston, Massachusetts
Guidelines: Pregnancy and Heart Disease

Daniel J. Lenihan, MD

Professor of Medicine, Division of Cardiovascular Medicine, Vanderbilt University, Nashville, Tennessee
Tumors Affecting the Cardiovascular System

Martin M. LeWinter, MD

Professor of Medicine and Molecular Physiology and Biophysics, Attending Physician, Cardiology, Fletcher Allen Health Care, Burlington, Vermont
Pericardial Diseases

Peter Libby, MD

Mallinckrodt Professor of Medicine, Harvard Medical School; Chief, Cardiovascular Medicine Division, Brigham and Women's Hospital, Boston, Massachusetts
Biomarkers, Proteomics, Metabolomics, and Personalized Medicine; The Vascular Biology of Atherosclerosis; Risk Markers and the Primary Prevention of Cardiovascular Disease; Systemic Hypertension: Management; Lipoprotein Disorders and Cardiovascular Disease; Peripheral Artery Diseases

Steven E. Lipshultz, MD

Schotanus Family Endowed Chair of Pediatrics, Professor and Chair, Carmen and Ann Adams Department of Pediatrics, Wayne State University School of Medicine; President, University Pediatricians; Pediatrician-in-Chief, Children's Hospital of Michigan, Detroit, Michigan
Cardiovascular Abnormalities in HIV-Infected Individuals

William C. Little, MD

Lehan Professor of Cardiology, Chair, Department of Medicine, University of Mississippi Medical Center, Jackson, Mississippi
Heart Failure with a Preserved Ejection Fraction

Douglas L. Mann, MD

Lewin Chair and Professor of Medicine, Cell Biology, and Physiology, Chief, Division of Cardiology, Washington University School of Medicine in St. Louis; Cardiologist-in-Chief, Barnes-Jewish Hospital, St. Louis, Missouri
Pathophysiology of Heart Failure; Clinical Assessment of Heart Failure; Management of Patients with Heart Failure with Reduced Ejection Fraction

Barry J. Maron, MD

Director, Hypertrophic Cardiomyopathy Center, Minneapolis Heart Institute Foundation, Minneapolis, Minnesota; Adjunct Professor of Medicine, Tufts University School of Medicine, Boston, Massachusetts; Adjunct Professor of Medicine, Mayo Clinic College of Medicine, Rochester, Minnesota
Hypertrophic Cardiomyopathy

Justin C. Mason, PhD, FRCP

Professor of Vascular Rheumatology, Imperial College London, London, United Kingdom
Rheumatic Diseases and the Cardiovascular System

Frederick A. Masoudi, MD, MSPH

Professor of Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado
Measurement and Improvement of Quality of Care: Relevance to Cardiovascular Clinical Practice

Kenneth L. Mattox, MD

Distinguished Service Professor, Baylor College of Medicine; Chief of Staff and Surgery, Ben Taub General Hospital, Houston, Texas
Traumatic Heart Disease

Laura Mauri, MD, MSc

Associate Professor of Medicine, Harvard Medical School; Director of Clinical Biometrics, Division of Cardiovascular Medicine Division, Brigham and Women's Hospital; Chief Scientific Officer, Harvard Clinical Research Institute, Boston, Massachusetts
Percutaneous Coronary Intervention

Bongani M. Mayosi, MBChB

Professor of Medicine, Groote Schuur Hospital and University, Cape Town, South Africa
Rheumatic Fever

Peter A. McCullough, MD, MPH

Consultant Cardiologist, Baylor University Medical Center, Dallas, Texas
Interface Between Renal Disease and Cardiovascular Illness

Darren K. McGuire, MD, MHSc

Professor of Internal Medicine, Internal Medicine/Cardiology, Dallas Heart Ball Chair for Research on Heart Disease in Women, The University of Texas Southwestern Medical Center, Dallas, Texas
Diabetes and the Cardiovascular System

Vallerie V. McLaughlin, MD

Professor of Medicine, Division of Cardiovascular Medicine, Director, Pulmonary Hypertension Program, University of Michigan Health System, Ann Arbor, Michigan
Pulmonary Hypertension

Jessica L. Mega, MD, MPH

TIMI Study Group, Brigham and Women's Hospital; Associate Professor of Medicine, Harvard Medical School, Boston, Massachusetts
ST-Elevation Myocardial Infarction: Management

John M. Miller, MD

Professor of Medicine, Indiana University School of Medicine; Director, Cardiac Electrophysiology Services, Indiana University Health, Indianapolis, Indiana
Diagnosis of Cardiac Arrhythmias; Therapy for Cardiac Arrhythmias

David M. Mirvis, MD

Professor, Department of Public Health, University of Tennessee, Knoxville, Tennessee
Electrocardiography

Fred Morady, MD

McKay Professor of Cardiovascular Disease, Professor of Medicine, University of Michigan Health System, Ann Arbor, Michigan
Atrial Fibrillation: Clinical Features, Mechanisms, and Management

Anthony P. Morise, MD

Director, Stress Cardiovascular Laboratory, West Virginia University Heart Institute; Professor of Medicine, West Virginia University School of Medicine, Morgantown, West Virginia
Exercise Testing

David A. Morrow, MD, MPH

Director, Levine Cardiac Intensive Care Unit, Brigham and Women's Hospital; Associate Professor of Medicine, Harvard Medical School, Boston, Massachusetts
ST-Elevation Myocardial Infarction: Pathology, Pathophysiology, and Clinical Features; ST-Elevation Myocardial Infarction: Management; Stable Ischemic Heart Disease

Dariusz Mozaffarian, MD, PhD

Co-Director, Program in Cardiovascular Epidemiology, Associate Professor of Medicine and Epidemiology, Cardiovascular Medicine Division, Brigham and Women's Hospital and Harvard Medical School; Departments of Epidemiology and Nutrition, Harvard School of Public Health, Boston, Massachusetts
Nutrition and Cardiovascular and Metabolic Diseases

Kiran Musunuru, MD, PhD, MPH

Associate Physician, Division of Cardiovascular Medicine Division, Brigham and Women's Hospital, Boston, Massachusetts; Assistant Professor, Department of Stem Cell and Regenerative Biology, Harvard University; Assistant Professor of Medicine, Harvard Medical School, Cambridge, Massachusetts
Principles of Cardiovascular Genetics

Robert J. Myerburg, MD

Professor of Medicine and Physiology, University of Miami Miller School of Medicine, Miami, Florida
Cardiac Arrest and Sudden Cardiac Death

Patrick T. O'Gara, MD

Professor of Medicine, Harvard Medical School; Director, Clinical Cardiology, Executive Medical Director, Shapiro Cardiovascular Center, Brigham and Women's Hospital, Boston, Massachusetts
The History and Physical Examination: An Evidence-Based Approach

Jeffrey E. Olgin, MD

Professor and Chief of Cardiology, Gallo-Chatterjee Distinguished Professor, University of California San Francisco, San Francisco, California
Specific Arrhythmias: Diagnosis and Treatment

Iacopo Olivetto, MD

Referral Center for Cardiomyopathies, Department of Cardiology, Careggi University Hospital, Florence, Italy
Hypertrophic Cardiomyopathy

Lionel H. Opie, MD, DPhil (Oxon), DSc

Emeritus Professor and Scholar, Hatter Cardiovascular Institute for Research in Africa, University of Cape Town and Groote Schuur Hospital, Cape Town, South Africa
Mechanisms of Cardiac Contraction and Relaxation

Catherine M. Otto, MD

J. Ward Kennedy-Hamilton Endowed Chair in Cardiology, Professor of Medicine, Director, Heart Valve Clinic, University of Washington School of Medicine, Seattle, Washington
Valvular Heart Disease

Francis D. Pagani, MD, PhD

Otto Gago MD Professor of Cardiac Surgery, University of Michigan Hospital and Health Systems, Ann Arbor, Michigan
Mechanical Circulatory Support

Ileana L. Piña, MD, MPH

Professor of Medicine, Epidemiology, and Population Health, Associate Chief for Academic Affairs/Cardiology, Albert Einstein College of Medicine; Staff, Heart Failure/Transplant, Montefiore Medical Center, Bronx, New York
Heart Disease in Varied Populations

Jeffrey J. Popma, MD

Director, Interventional Cardiology Clinical Services, Beth Israel Deaconess Medical Center; Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Coronary Arteriography and Intracoronary Imaging

Dorairaj Prabhakaran, MD, DM (Cardiology), MSc, FRCP, FNASc

Executive Director, Centre for Chronic Disease Control; Professor, Chronic Disease Epidemiology, Public Health Foundation of India; Director, Center of Excellence in Cardiometabolic Risk Reduction in South Asia, New Delhi, India
Global Burden of Cardiovascular Disease

Andrew N. Redington, MD

Head of Cardiology, Hospital for Sick Children; Professor of Paediatrics, University of Toronto, Toronto, Ontario, Canada
Congenital Heart Disease

Paul M Ridker, MD, MPH

Eugene Braunwald Professor of Medicine, Harvard Medical School; Division of Preventive Medicine, Brigham and Women's Hospital, Boston, Massachusetts
Biomarkers, Proteomics, Metabolomics, and Personalized Medicine; Risk Markers and the Primary Prevention of Cardiovascular Disease

Dan M. Roden, MD

Professor of Medicine and Pharmacology, Assistant Vice-Chancellor for Personalized Medicine, Vanderbilt University School of Medicine, Nashville, Tennessee
Drug Therapeutics and Personalized Medicine

Michael Rubart, MD

Assistant Professor of Pediatrics, Department of Pediatrics, Indiana University School of Medicine, Indianapolis, Indiana
Genesis of Cardiac Arrhythmias: Electrophysiologic Considerations

John S. Rumsfeld, MD, PhD

National Director of Cardiology, U.S. Veterans Health Administration; Professor of Medicine, University of Colorado Anschutz Medical Campus, Aurora, Colorado
Measurement and Improvement of Quality of Care: Relevance to Cardiovascular Clinical Practice

Marc S. Sabatine, MD, MPH

Chairman, TIMI Study Group, Physician, Cardiovascular Medicine Division, Brigham and Women's Hospital; Associate Professor of Medicine, Harvard Medical School, Boston, Massachusetts
Approach to the Patient with Chest Pain

Janice B. Schwartz, MD

Professor of Medicine, Professor of Bioengineering and Therapeutic Sciences, University of California San Francisco; Visiting Scientist, Jewish Home, San Francisco, California
Cardiovascular Disease in the Elderly

Benjamin M. Scirica, MD, MPH

Assistant Professor of Medicine, Harvard Medical School; Investigator, TIMI Study Group, Cardiovascular Medicine Division, Brigham and Women's Hospital, Boston, Massachusetts
ST-Elevation Myocardial Infarction: Pathology, Pathophysiology, and Clinical Features

Jeffrey F. Smallhorn, MBBS, FRACP, FRCP(C)

Professor of Pediatrics, University of Alberta, Edmonton, Alberta, Canada
Congenital Heart Disease

Scott D. Solomon, MD

Professor of Medicine, Harvard Medical School; Director, Noninvasive Cardiology, Brigham and Women's Hospital, Boston, Massachusetts
Echocardiography

Virend K. Somers, MD, PhD

Professor of Medicine and Consultant in Cardiovascular Diseases, Department of Cardiovascular Diseases, Mayo Clinic, Rochester, Minnesota
Sleep Apnea and Cardiovascular Disease; Cardiovascular Manifestations of Autonomic Disorders

Rakesh M. Suri, MD, DPhil

Professor of Surgery, Mayo Clinic College of Medicine, Rochester, Minnesota
Cardiovascular Infections

Charles D. Swerdlow, MD

Cardiac Electrophysiologist, Division of Cardiology, Cedars-Sinai Heart Institute, Cedars-Sinai Medical Center; Clinical Professor of Medicine, University of California Los Angeles, Los Angeles, California
Pacemakers and Implantable Cardioverter-Defibrillators

Allen J. Taylor, MD

Chief of Cardiology, Department of Medicine, MedStar Georgetown University Hospital and MedStar Washington Hospital Center; Professor of Medicine, Georgetown University, Washington, DC
Cardiac Computed Tomography

Anne L. Taylor, MD

John Lindenbaum Professor of Medicine/Cardiology, Vice Dean for Academic Affairs, Columbia University Medical Center, New York, New York
Heart Disease in Varied Populations

John R. Teerlink, MD

Professor of Medicine, University of California San Francisco; Director, Heart Failure and Clinical Echocardiography, Cardiology Section, San Francisco Veteran Affairs Medical Center, San Francisco, California
Diagnosis and Management of Acute Heart Failure

David J. Tester, BS

Associate Professor of Medicine, Senior Research Technologist II, Cardiovascular Diseases Division, Department of Medicine, Mayo Clinic, Rochester, Minnesota
Genetics Of Cardiac Arrhythmias

Judith Therrien, MD

Associate Professor, Department of Medicine, McGill University, Montreal, Quebec, Canada
Congenital Heart Disease

Paul D. Thompson, MD

Chief of Cardiology, Hartford Hospital, Hartford, Connecticut
Exercise-Based, Comprehensive Cardiac Rehabilitation; Exercise and Sports Cardiology

Peter I. Tsai, MD

Assistant Professor of Surgery, Division of Cardiothoracic Surgery, Michael E. DeBakey Department of Surgery, Baylor College of Medicine/Texas Heart Institute; Medical Director, Department of Cardiothoracic Surgery, Ben Taub General Hospital, Houston, Texas
Traumatic Heart Disease

James E. Udelson, MD

Chief, Division of Cardiology, The CardioVascular Center, Tufts Medical Center; Professor of Medicine and Radiology, Tufts University School of Medicine, Boston, Massachusetts
Nuclear Cardiology; Appropriate Use Criteria: Multimodality Imaging in Stable Ischemic Heart Disease and Heart Failure

Viola Vaccarino, MD, PhD

Wilton Looney Chair of Cardiovascular Research, Professor and Chair, Department of Epidemiology, Rollins School of Public Health; Professor, Department of Medicine, Emory University, Atlanta, Georgia
Psychiatric and Behavioral Aspects of Cardiovascular Disease

Ronald G. Victor, MD

Burns and Allen Professor of Medicine, Director, Hypertension Center of Excellence, Associate Director, Cedars-Sinai Heart Institute, Cedars-Sinai Medical Center, Los Angeles, California
Systemic Hypertension: Mechanisms and Diagnosis; Systemic Hypertension: Management

Matthew J. Wall, Jr., MD

Professor of Surgery, Baylor College of Medicine; Deputy Chief of Surgery, Ben Taub General Hospital, Houston, Texas
Traumatic Heart Disease

Paul J. Wang, MD

Professor of Medicine, Director, Arrhythmia Service, Stanford University, Stanford, California
Pacemakers and Implantable Cardioverter-Defibrillators

Carole A. Warnes, MD, FRCP

Professor of Medicine, Consultant in Cardiovascular Diseases and Internal Medicine, Pediatric Cardiology, Director of Adult Congenital Heart Disease Clinic, Mayo Clinic, Rochester, Minnesota
Pregnancy and Heart Disease

Gary D. Webb, MDCM

Director, Adolescent and Adult Congenital Heart Program, Cincinnati Children's Hospital Heart Institute, Cincinnati, Ohio
Congenital Heart Disease

John G. Webb, MD

McLeod Professor of Heart Valve Intervention, University of British Columbia; Director, Interventional Cardiology, St. Paul's Hospital, Vancouver, British Columbia, Canada
Transcatheter Therapies for Structural Heart Disease in Adults

Jeffrey I. Weitz, MD, FRCP(C)

Professor, Medicine and Biochemistry, McMaster University; Canada Research Chair in Thrombosis, Executive Director, Thrombosis and Atherosclerosis Research Institute, Hamilton, Ontario, Canada
Hemostasis, Thrombosis, Fibrinolysis, and Cardiovascular Disease

Walter R. Wilson, MD

Professor of Medicine, Mayo Clinic College of Medicine, Rochester, Minnesota
Cardiovascular Infections

Jackson T. Wright, MD, PhD

Professor of Medicine and Program Director, William T. Dahms MD Clinical Research Unit, Clinical and Translational Science Collaborative, Case Western Reserve University; Director, Clinical Hypertension Program, University Hospitals Case Medical Center, Cleveland, Ohio
Heart Disease in Varied Populations

Syed Wamique Yusuf, MD, MRCP

Associate Professor of Medicine, Department of Cardiology, The University of Texas MD Anderson Cancer Center, Houston, Texas
Tumors Affecting the Cardiovascular System

Stephen D. Wiviott, MD

Investigator, TIMI Study Group, Cardiovascular Medicine Division, Brigham and Women's Hospital; Associate Professor, Cardiovascular Medicine, Harvard Medical School, Boston, Massachusetts
Guidelines: Management of Patients with ST-Elevation Myocardial Infarction (STEMI)

Justina Wu, MD, PhD

Assistant Professor of Medicine, Harvard Medical School; Associate Director, Noninvasive Cardiology, Brigham and Women's Hospital, Boston, Massachusetts
Echocardiography

Michael R. Zile, MD

Charles Ezra Daniel Professor of Medicine, Division of Cardiology, Medical University of South Carolina; Chief, Division of Cardiology, Ralph H. Johnson Veterans Affairs Medical Center, Charleston, South Carolina
Heart Failure with a Preserved Ejection Fraction

Douglas P. Zipes, MD

Distinguished Professor, Professor Emeritus of Medicine, Pharmacology, and Toxicology, Director Emeritus, Division of Cardiology and the Krannert Institute of Cardiology, Indiana University School of Medicine, Indianapolis, Indiana
Genesis of Cardiac Arrhythmias: Electrophysiologic Considerations; Diagnosis of Cardiac Arrhythmias; Therapy for Cardiac Arrhythmias; Pacemakers and Implantable Cardioverter-Defibrillators; Specific Arrhythmias: Diagnosis and Treatment; Atrial Fibrillation: Clinical Features, Mechanisms, and Management; Hypotension and Syncope; Cardiovascular Disease in the Elderly; Neurologic Disorders and Cardiovascular Disease



Acknowledgments

Completing a textbook the size and complexity of *Braunwald's Heart Disease* clearly does not occur in a vacuum. The tenth edition owes a great deal to a great many individuals. First and foremost, we would like to thank Dr. Eugene Braunwald for continuing to provide sage counsel at all stages of planning, writing, and editing of this book. We also want to thank the incredibly supportive staff at Elsevier, who enabled the editors to make improvements to the content and visual design of the book as it was being compiled. In this regard, we would like to recognize several Elsevier staff members for their forbearance and indefatigable assistance: Dolores Meloni, executive content strategist, for her boundless energy and enthusiasm for this book; Anne Snyder, senior content development specialist, for everything all of the time; and Louise King, project manager, whose attention to detail and flexibility were measureless.

The editors are also grateful to our colleagues from all over the world who have offered insightful suggestions to improve *Heart Disease*. We particularly wish to acknowledge the following individuals who have provided important feedback on numerous chapters: Shabnam Madadi, MD, Cardiac Imaging Center, Shahid Rajaei Heart Center, Tehran, Iran; Azin Alizadehasl, MD, Rajaie Cardiovascular Medical and Research Center, Tehran, Iran; Arash Hashemi, MD, Erfan General Hospital, Tehran, Iran; Anita Sadeghpour, MD, Rajaie Cardiovascular Medical and Research Center, Tehran, Iran; Leili Pourafkari, MD, Razi Hospital, Tabriz, Iran; Banasiak Waldemar, MD, Centre for Heart Disease, Military Hospital, Wroclaw, Poland; Carlos Benjamín Alvarez, MD, PhD, Sacré Coeur Institute, Buenos Aires, Argentina; and Elias B. Hanna, MD, Division of Cardiology, Louisiana State University, New Orleans, Louisiana.

Preface to the Tenth Edition



The editors are pleased to present the tenth edition of *Braunwald's Heart Disease* as the latest update of a unique learning platform that aims to provide practitioners, physicians-in-training, and students at all levels with the critical tools to keep abreast of the rapidly changing scientific foundations and clinical advances in cardiovascular medicine. *Heart Disease* has been developed as a "living textbook" that will provide readers with the latest updates in the field in real time. To this end, the print version of the tenth edition, which has been revised extensively, is complemented by a new online version that is not only visually spectacular, but also contains audio, video, and additional written content not available in the textbook. Icons are placed strategically in the margins of the text of the print version to guide readers to the appropriate related online materials. In keeping with the rapid pace of advances in the field of cardiovascular medicine, the online version of *Heart Disease* is updated frequently with the results of late-breaking clinical trials, reviews of important new research publications, and updates on clinical practice authored by leaders in the field. These online supplements are selected and edited masterfully by Dr. Eugene Braunwald.

In preparing the preface for the tenth edition, we thought it appropriate to reflect back upon the prescient guiding principles that were articulated by Dr. Braunwald, in his Preface to the first edition of *Heart Disease* (1980).

"An attempt to summarize our present understanding of heart disease in a comprehensive textbook for the serious student of this subject is a formidable undertaking. A single text—even a long one—cannot adequately cover every aspect of a subject as extensive as heart disease. Since the early part of this century, clinical cardiology has had a particularly strong foundation in the basic sciences of physiology and pharmacology. More recently, the disciplines of molecular biology, genetics, developmental biology, biophysics, biochemistry, experimental pathology, and bioengineering have also begun to provide critically important information about cardiac function and malfunction. Although it was decided that Heart Disease was to be primarily a clinical treatise and not a textbook of fundamental cardiovascular science, an effort has been made to explain, in some detail, the scientific basis of cardiovascular diseases. To achieve this objective, the sciences fundamental to heart disease are in most cases presented in the chapters describing the various disease states and their treatment rather than in separate chapters. Although it is recognized that cardiovascular surgery has had an enormous impact on the management of patients with heart disease, the major emphasis in this book is on the rationale and indications for cardiac operations rather than on operative techniques per se."

The tenth edition of *Braunwald's Heart Disease* hews closely to the traditions established by the first and each subsequent edition of *Heart Disease*, by covering the entire spectrum of cardiovascular medicine, highlighting the latest advances in basic, translational, and clinical science, with an emphasis on conveying succinctly how this information informs both the prevention and the treatment, of cardiovascular disease. Twenty-seven of the 89 chapters in this edition are new, including three chapters covering topics that were not addressed in prior editions. We include 53 new authors, all of whom are highly accomplished and recognized in their respective disciplines. All chapters carried over from the ninth edition have been thoroughly updated and extensively revised. The tenth edition includes nearly 2600 figures, most of which are in full color, as well

as 600 tables. Moreover, the online content has been enhanced with 240 videos. As with previous editions, the tenth edition contains 21 updated practice guides, seven entirely new guidelines not in the ninth edition, and six appropriate use criteria, two of which are entirely new.

A detailed accounting of all of the changes in the new edition is not feasible within the narrow confines of this Preface. However, the editors would like to highlight several of the exciting changes in the tenth edition, beginning with an entirely new section on genetics and personalized medicine (Part II), which includes a chapter providing an overview of personalized cardiovascular medicine, followed by chapters on principles of cardiovascular genetics and drug therapeutics. A new chapter on biomarkers provides background and guidance on their use, development, and validation as clinically useful tools. The section on evaluation of the patient (Part III) has completely new chapters on echocardiography and exercise stress testing. Given the rapid advances in the field of heart failure, Part IV has been revised substantially, with new chapters and guidelines on the clinical assessment of heart failure, including the latest recommendations on biomarkers, the diagnosis and management of acute heart failure, and heart failure with a preserved ejection fraction, as well as the emerging area of cardiovascular regeneration and gene therapy. Part V, on arrhythmias, sudden death, and syncope has been updated and revised with chapters that review the remarkable advances in this discipline. The section on preventive cardiology (Part VI) features a new omnibus chapter on risk factors and the prevention of cardiovascular disease and a new chapter on comprehensive cardiac rehabilitation and the treatment of hypertension. Part VII focuses on atherosclerotic cardiovascular disease and includes new guidelines for percutaneous intervention and stable ischemic heart disease. There are new chapters on quality of care, cardiovascular disease in women, exercise and sports cardiology, integrated medicine, ethics, cardiooncology, perioperative management in non-cardiac and cardiac surgery, cardiovascular infections, and pulmonary hypertension (including new international guidelines). There are also important revised chapters on interventions for structural heart disease and valvular heart disease, including new guidelines for this important area. In recognition of the importance of genetics and the emerging role of personalized medicine, discussions of the genetic basis of specific diseases are now incorporated within the relevant chapters, rather than in separate chapters.

As noted at the outset, *Braunwald's Heart Disease* is the centerpiece of a much broader learning platform that includes a growing family of *Braunwald's Heart Disease* companion texts, which continues to expand and provide detailed expert content for the subspecialist across a broad range of cardiovascular conditions. These include: *Clinical Lipidology*, edited by Christie Ballantyne; *Clinical Arrhythmology and Electrophysiology*, authored by Ziad Issa, John Miller, and Douglas Zipes; *Diabetes in Cardiovascular Disease*, by Darren McGuire and Nikolaus Marx; *Heart Failure*, edited by Douglas L. Mann and Michael Felker; *Valvular Heart Disease*, by Catherine Otto and Robert Bonow; *Acute Coronary Syndromes*, by Pierre Théroux; *Preventive Cardiology*, by Roger Blumenthal, JoAnne Foody, and Nathan Wong; *Mechanical Circulatory Support*, by Robert Kormos and Leslie Miller; *Hypertension*, by Henry Black and William Elliott; *Cardiovascular Therapeutics*, by Elliott Antman and Marc Sabatine; and *Vascular Medicine*, by Mark Creager, Joshua Beckman, and Joseph Loscalzo. Additional companion texts will be forthcoming shortly, including *Cardiovascular Interventions* by Deepak Bhatt. Each of the companion texts, as well as *Heart Disease*, is complemented by an updated online version. As with previous editions

of *Heart Disease*, Dr. Leonard S. Lilly's *Braunwald's Heart Disease Review and Assessment* is available. There are also recent atlases on cardiovascular imaging, such as *Cardiovascular Magnetic Resonance* by Christopher Kramer and Gregory Hundley, *Cardiovascular Computed Tomography* by Allen Taylor, and *Nuclear Cardiology* by Ami Iskandrian and Ernest Garcia. Readers of *Heart Disease* can turn to the companions as a convenient source of information that follows the same guiding principles as the parent text.

The extent to which the tenth edition of *Braunwald's Heart Disease* proves useful to those who seek to broaden their knowledge base in an effort to improve outcomes for patients afflicted with

cardiovascular disease is a direct reflection of the many talented and dedicated individuals involved in the preparation of this edition. Without question, this book could not have become a reality were it not for their expertise, scholarship, and unswerving commitment to maintaining the standards of excellence established by Dr. Braunwald with the first edition.

Douglas L. Mann
Douglas P. Zipes
Peter Libby
Robert O. Bonow

Preface—Adapted from the First Edition



Cardiovascular disease is the greatest scourge affecting the industrialized nations. As with previous scourges—bubonic plague, yellow fever, and smallpox—cardiovascular disease not only strikes down a significant fraction of the population without warning but also causes prolonged suffering and disability in an even larger number. In the United States alone, despite recent encouraging declines, cardiovascular disease is still responsible for almost 1 million fatalities each year and more than half of all deaths; almost 5 million persons afflicted with cardiovascular disease are hospitalized each year. The cost of these diseases in terms of human suffering and material resources is almost incalculable. Fortunately, research focusing on the causes, diagnosis, treatment, and prevention of heart disease is moving ahead rapidly.

To provide a comprehensive, authoritative text in a field that has become as broad and deep as cardiovascular medicine, I chose to enlist the aid of a number of able colleagues. However, I hoped that my personal involvement in the writing of about half of the book

would make it possible to minimize the fragmentation, gaps, inconsistencies, organizational difficulties, and impersonal tone that sometimes plague multiauthored texts.

Since the early part of the twentieth century, clinical cardiology has had a particularly strong foundation in the basic sciences of physiology and pharmacology. More recently, the disciplines of molecular biology, genetics, developmental biology, biophysics, biochemistry, experimental pathology, and bioengineering have also begun to provide critically important information about cardiac function and malfunction. Although *Heart Disease: A Textbook of Cardiovascular Medicine* is primarily a clinical treatise and not a textbook of fundamental cardiovascular science, an effort has been made to explain, in some detail, the scientific bases of cardiovascular diseases.

Eugene Braunwald
1980

