

# Contents



## PART I FUNDAMENTALS OF CARDIOVASCULAR DISEASE

### 1 Global Burden of Cardiovascular Disease 1

Thomas A. Gaziano, Dorairaj Prabhakaran, and J. Michael Gaziano

### 2 Heart Disease in Varied Populations 21

Anne L. Taylor, Jackson T. Wright, and Ileana L. Piña

### 3 Ethics in Cardiovascular Medicine 29

Neal W. Dickert and Ezekiel J. Emanuel

### 4 Clinical Decision Making in Cardiology 35

Harlan M. Krumholz

### 5 Measurement and Improvement of Quality of Care: Relevance to Cardiovascular Clinical Practice 43

Frederick A. Masoudi and John S. Rumsfeld

### 6 Critical Evaluation of Clinical Trials 49

Elliott M. Antman

## PART II GENETICS AND PERSONALIZED MEDICINE

### 7 Personalized and Precision Cardiovascular Medicine 57

Geoffrey S. Ginsburg

### 8 Principles of Cardiovascular Genetics 64

Kiran Musunuru and Sekar Kathiresan

### 9 Drug Therapeutics and Personalized Medicine 75

Dan M. Roden

### 10 Biomarkers, Proteomics, Metabolomics, and Personalized Medicine 84

Peter Libby, Robert E. Gerszten, and Paul M. Ridker

## PART III EVALUATION OF THE PATIENT

### 11 The History and Physical Examination: An Evidence-Based Approach 95

James C. Fang and Patrick T. O'Gara

### 12 Electrocardiography 114

David M. Mirvis and Ary L. Goldberger

**Guidelines: Electrocardiography 152**

David M. Mirvis and Ary L. Goldberger

### 13 Exercise Testing 155

Gary J. Balady and Anthony P. Morise

**Guidelines: Exercise Electrocardiographic Testing 174**

Gary J. Balady and Anthony P. Morise

### 14 Echocardiography 179

Scott D. Solomon, Justina Wu, and Linda Gillam (illustrated by Bernard Bulwer)

**Appropriate Use Criteria: Echocardiography 252**

Scott D. Solomon and Robert O. Bonow

### 15 The Chest Radiograph in Cardiovascular Disease 261

Michael A. Bettmann

### 16 Nuclear Cardiology 271

James E. Udelson, Vasken Dilsizian, and Robert O. Bonow

**Appropriate Use Criteria: Nuclear Cardiology 316**

James E. Udelson, Vasken Dilsizian, and Robert O. Bonow

### 17 Cardiovascular Magnetic Resonance Imaging 320

Raymond Y. Kwong

**Appropriate Use Criteria: Cardiovascular Magnetic Resonance Imaging 338**

Raymond Y. Kwong

### 18 Cardiac Computed Tomography 341

Allen J. Taylor

**Appropriate Use Criteria: Cardiac Computed Tomography 359**

Allen J. Taylor

### 19 Cardiac Catheterization 364

Charles J. Davidson and Robert O. Bonow

**Appropriate Use Criteria: Diagnostic Cardiac Catheterization 386**

Robert O. Bonow and Charles J. Davidson

### 20 Coronary Arteriography and Intracoronary Imaging 392

Jeffrey J. Popma, Scott Kinlay, and Deepak L. Bhatt

**Appropriate Use Criteria: Multimodality Imaging in Stable Ischemic Heart Disease and Heart Failure 424**

James E. Udelson, Vasken Dilsizian, and Robert O. Bonow



PART IV HEART FAILURE

- 21 Mechanisms of Cardiac Contraction and Relaxation** 429  
*Lionel H. Opie and Donald M. Bers*
- 22 Pathophysiology of Heart Failure** 454  
*Gerd Hasenfuss and Douglas L. Mann*
- 23 Clinical Assessment of Heart Failure** 473  
*James L. Januzzi, Jr., and Douglas L. Mann*
- 24 Diagnosis and Management of Acute Heart Failure** 484  
*G. Michael Felker and John R. Teerlink*  
**Guidelines: The Hospitalized Patient with Heart Failure** 509  
*G. Michael Felker and John R. Teerlink*
- 25 Management of Patients with Heart Failure with Reduced Ejection Fraction** 512  
*Douglas L. Mann*  
**Guidelines: Management of Heart Failure with a Reduced Ejection Fraction** 540  
*Douglas L. Mann*
- 26 Devices for Monitoring and Managing Heart Failure** 547  
*William T. Abraham*  
**Guidelines: Cardiac Resynchronization Therapy and Implantable Cardioverter-Defibrillators for Heart Failure with a Reduced Ejection Fraction** 555  
*William T. Abraham*
- 27 Heart Failure with a Preserved Ejection Fraction** 557  
*Michael R. Zile and William C. Little*  
**Guidelines: Heart Failure with a Preserved Ejection Fraction** 574  
*Michael R. Zile and William C. Little*
- 28 Surgical Management of Heart Failure** 575  
*Mariell Jessup and Michael A. Acker*
- 29 Mechanical Circulatory Support** 590  
*Keith D. Aaronson and Francis D. Pagani*
- 30 Cardiovascular Regeneration and Gene Therapy** 600  
*Roger J. Hajjar and Joshua M. Hare*
- 31 Care of Patients with End-Stage Heart Disease** 611  
*Sarah J. Goodlin and Robert O. Bonow*

PART V ARRHYTHMIAS, SUDDEN DEATH, AND SYNCOPE

- 32 Genetics of Cardiac Arrhythmias** 617  
*David J. Tester and Michael J. Ackerman*

- 33 Genesis of Cardiac Arrhythmias: Electrophysiologic Considerations** 629  
*Michael Rubart and Douglas P. Zipes*
- 34 Diagnosis of Cardiac Arrhythmias** 662  
*John M. Miller and Douglas P. Zipes*  
**Guidelines: Ambulatory Electrocardiographic and Electrophysiologic Testing** 676  
*John M. Miller and Douglas P. Zipes*
- 35 Therapy for Cardiac Arrhythmias** 685  
*John M. Miller and Douglas P. Zipes*
- 36 Pacemakers and Implantable Cardioverter-Defibrillators** 721  
*Charles D. Swerdlow, Paul J. Wang, and Douglas P. Zipes*  
**Guidelines: Cardiac Pacemakers and Cardioverter-Defibrillators** 743  
*Charles D. Swerdlow, Paul J. Wang, and Douglas P. Zipes*
- 37 Specific Arrhythmias: Diagnosis and Treatment** 748  
*Jeffrey E. Olgin and Douglas P. Zipes*
- 38 Atrial Fibrillation: Clinical Features, Mechanisms, and Management** 798  
*Fred Morady and Douglas P. Zipes*  
**Guidelines: Atrial Fibrillation** 813  
*Fred Morady and Douglas P. Zipes*
- 39 Cardiac Arrest and Sudden Cardiac Death** 821  
*Robert J. Myerburg and Augustin Castellanos*
- 40 Hypotension and Syncope** 861  
*Hugh G. Calkins and Douglas P. Zipes*

PART VI PREVENTIVE CARDIOLOGY

- 41 The Vascular Biology of Atherosclerosis** 873  
*Peter Libby*
- 42 Risk Markers and the Primary Prevention of Cardiovascular Disease** 891  
*Paul M. Ridker, Peter Libby, and Julie E. Buring*  
**Guidelines: Management of Lipids** 931  
*Paul M. Ridker, Peter Libby, and Julie E. Buring*
- 43 Systemic Hypertension: Mechanisms and Diagnosis** 934  
*Ronald G. Victor*
- 44 Systemic Hypertension: Management** 953  
*Ronald G. Victor and Peter Libby*  
**Guidelines: Treatment of Hypertension** 977  
*Ronald G. Victor and Peter Libby*



- 45 Lipoprotein Disorders and Cardiovascular Disease** 980  
*Jacques Genest and Peter Libby*
- 46 Nutrition and Cardiovascular and Metabolic Diseases** 1001  
*Dariush Mozaffarian*
- 47 Exercise-Based, Comprehensive Cardiac Rehabilitation** 1015  
*Paul D. Thompson*
- 48 Integrative Approaches to the Management of Patients with Heart Disease** 1021  
*Stephen Devries*
- PART VII ATHEROSCLEROTIC CARDIOVASCULAR DISEASE**
- 49 Coronary Blood Flow and Myocardial Ischemia** 1029  
*John M. Canty, Jr., and Dirk J. Duncker*
- 50 Approach to the Patient with Chest Pain** 1057  
*Marc S. Sabatine and Christopher P. Cannon*
- 51 ST-Elevation Myocardial Infarction: Pathology, Pathophysiology, and Clinical Features** 1068  
*Benjamin M. Scirica and David A. Morrow*
- 52 ST-Elevation Myocardial Infarction: Management** 1095  
*Jessica L. Mega and David A. Morrow*  
**Guidelines: Management of Patients with ST-Elevation Myocardial Infarction** 1147  
*Stephen D. Wiviott*
- 53 Non-ST Elevation Acute Coronary Syndromes** 1155  
*Robert P. Giugliano, Christopher P. Cannon, and Eugene Braunwald*  
**Guidelines: Unstable Angina and Non-ST Elevation Myocardial Infarction** 1177  
*Robert P. Giugliano and Eugene Braunwald*
- 54 Stable Ischemic Heart Disease** 1182  
*David A. Morrow and William E. Boden*  
**Guidelines: Stable Ischemic Heart Disease** 1231  
*David A. Morrow and William E. Boden*
- 55 Percutaneous Coronary Intervention** 1245  
*Laura Mauri and Deepak L. Bhatt*  
**Guidelines: Percutaneous Coronary Intervention** 1262  
*Laura Mauri and Deepak L. Bhatt*
- 56 Transcatheter Therapies for Structural Heart Disease in Adults** 1269  
*John G. Webb and John D. Carroll*
- 57 Diseases of the Aorta** 1277  
*Alan C. Braverman*  
**Guidelines: Diseases of the Aorta** 1307  
*Alan C. Braverman*
- 58 Peripheral Artery Diseases** 1312  
*Mark A. Creager and Peter Libby*  
**Guidelines: Peripheral Artery Diseases** 1332  
*Mark A. Creager and Peter Libby*
- 59 Prevention and Management of Ischemic Stroke** 1336  
*Larry B. Goldstein*
- 60 Treatment of Noncoronary Obstructive Vascular Disease** 1347  
*Scott Kinlay and Deepak L. Bhatt*
- 61 Diabetes and the Cardiovascular System** 1365  
*Darren K. McGuire*  
**Guidelines: Diabetes and Heart Disease** 1386  
*Darren K. McGuire*
- PART VIII DISEASES OF THE HEART, PERICARDIUM, AND PULMONARY VASCULATURE BED**
- 62 Congenital Heart Disease** 1391  
*Gary D. Webb, Jeffrey F. Smallhorn, Judith Therrien, and Andrew N. Redington*
- 63 Valvular Heart Disease** 1446  
*Catherine M. Otto and Robert O. Bonow*  
**Guidelines: Management of Valvular Heart Disease** 1514  
*Robert O. Bonow and Catherine M. Otto*
- 64 Cardiovascular Infections** 1524  
*Larry M. Baddour, William K. Freeman, Rakesh M. Suri, and Walter R. Wilson*  
**Guidelines: Infective Endocarditis** 1548  
*Larry M. Baddour, William K. Freeman, Rakesh M. Suri, Walter R. Wilson, and Robert O. Bonow*
- 65 The Dilated, Restrictive, and Infiltrative Cardiomyopathies** 1551  
*Rodney H. Falk and Ray E. Hershberger*
- 66 Hypertrophic Cardiomyopathy** 1574  
*Barry J. Maron and Jacopo Olivetto*
- 67 Myocarditis** 1589  
*Leslie T. Cooper, Jr., and Kirk U. Knowlton*
- 68 Chemical Cardiomyopathies** 1603  
*Richard A. Lange and L. David Hillis*
- 69 Cardiovascular Complications of Cancer Therapeutic Agents** 1613  
*Ming Hui Chen and Thomas Force*

**70 Cardiovascular Abnormalities in HIV-Infected Individuals 1624***Stacy D. Fisher and Steven E. Lipshultz***71 Pericardial Diseases 1636***Martin M. LeWinter and William E. Hopkins***72 Traumatic Heart Disease 1658***Peter I. Tsai, Matthew J. Wall, Jr., and Kenneth L. Mattox***73 Pulmonary Embolism 1664***Samuel Z. Goldhaber***74 Pulmonary Hypertension 1682***Vallerie V. McLaughlin and Marc Humbert***75 Sleep Apnea and Cardiovascular Disease 1703***Virend K. Somers***PART IX CARDIOVASCULAR DISEASE IN SPECIAL POPULATIONS****76 Cardiovascular Disease in the Elderly 1711***Janice B. Schwartz and Douglas P. Zipes***77 Cardiovascular Disease in Women 1744***Martha Gulati and C. Noel Bairey Merz***78 Pregnancy and Heart Disease 1755***Carole A. Warnes***Guidelines: Pregnancy and Heart Disease 1767***Carole A. Warnes and Thomas H. Lee***79 Exercise and Sports Cardiology 1771***Paul D. Thompson and Aaron Baggish***80 Anesthesia and Noncardiac Surgery in Patients with Heart Disease 1779***Lee A. Fleisher and Joshua A. Beckman***PART X CARDIOVASCULAR DISEASE AND DISORDERS OF OTHER ORGANS****81 Endocrine Disorders and Cardiovascular Disease 1793***Irwin Klein***82 Hemostasis, Thrombosis, Fibrinolysis, and Cardiovascular Disease 1809***Jeffrey I. Weitz***83 Rheumatic Fever 1834***Bongani M. Mayosi***84 Rheumatic Diseases and the Cardiovascular System 1843***Justin C. Mason***85 Tumors Affecting the Cardiovascular System 1863***Daniel J. Lenihan and Syed Wamique Yusuf***86 Psychiatric and Behavioral Aspects of Cardiovascular Disease 1876***Viola Vaccarino and J. Douglas Bremner***87 Neurologic Disorders and Cardiovascular Disease 1890***William J. Groh and Douglas P. Zipes***88 Interface Between Renal Disease and Cardiovascular Illness 1909***Peter A. McCullough***89 Cardiovascular Manifestations of Autonomic Disorders 1931***Virend K. Somers*