CONTENTS

SECTION 1: CORONARY ARTERY DISEASE RISK FACTORS

1. Smokeless Tobacco and Cardiovascular Disease 3

Surender Deora, Kewal C Goswami

Pharmacokinetics of smokeless tobacco 5
Smokeless tobacco and cardiovascular risk factors 5
Smokeless tobacco and cardiovascular disease 6
Health policy implications 6

2. Alcohol and Coronary Artery Disease: Fact versus Fiction 8

JPS Sawhney, Kushal Madan

Understanding "standard drink" 8
Alcohol and cardiovascular mortality 8
Alcohol and coronary artery disease 8
Alcohol and cardiovascular medications 9
Possible mechanisms for coronary artery disease protection by alcohol 9
Drinking patterns and coronary heart disease 9
Influence of age and sex on cardiovascular effects of alcohol 9
The genetics of alcohol and cardiovascular disease 10
Points to consider from the past studies 10
Alcohol and Indian population 11
Detrimental effects of alcohol intake 11
A word of caution 11

3. Vitamin D and Cardiovascular Disease: Indian Perspective 13

Ramu Adela, Rajesh Khadgawat

Assessment of vitamin D nutritional status 13
Vitamin D nutritional status in the world and in India 13
Vitamin D and nonskeletal effects 14
Vitamin D and cardiovascular diseases 14
Mechanism of vitamin D and proposed cardioprotection 15
Vitamin D and cardiovascular disease: evidences from observational studies 15
Vitamin D and cardiovascular disease: evidences from interventional studies 17
Indian studies 17

4. Hormone Replacement Therapy and Cardiovascular Diseases 20

Geetha Subramanian, Aviraj Choudhary, Kamaldeep Bansal

Menopause-induced changes in cardiovascular functions 20
Effects of hormone replacement therapy on coronary heart disease risk 21
Clinical studies of hormone replacement therapy and coronary heart disease 21

SECTION 2: LIPIDS AND DIET

5. Cholesterol and Coronary Artery Disease Controversy 27

Rajiv Bajaj

Cholesterol and coronary artery disease controversy 27
Functions of cholesterol 28
Early research on cholesterol 29
Diet and health 30
Present and future 31

6. Indian Dyslipidemia: Challenges in Management 32

Saumitra Ray, Sumanta Chatterjee

Indian epidemiological studies on dyslipidemia 32
Association between lipid levels and risk of heart disease in India 33
Laboratory parameters assessment 34
Inadequate management of dyslipidemia in India 34
Indian guideline recommendation on dyslipidemia management 34
Cardiovascular risk stratification of Indian patient 35
Treatment goal according to ASCVD risk stratification 35
Cardiovascular disease prevention: lipid targets 35
Lowering of low-density lipoprotein reduces risk of cardiovascular events 36
Drugs for management of dyslipidemia 36
Drugs for management of hypertriglyceridemia 36
Familial hypercholesterolemia in India 37
Dyslipidemia in type 2 diabetes and metabolic syndrome 37
Dyslipidemia in acute coronary syndrome 37
Dyslipidemia in moderate-to-severe chronic kidney disease 37
Dyslipidemia and stroke prevention 37
Safety assessment during pharmacotherapy in dyslipidemia 37

7. Indian Diet and Coronary Artery Disease 39

Abhishek Gupta, MP Girish, Mohit D Gupta

Prevalence of disease—is there underestimation of actual problem? 39
Diet and coronary artery disease: evidence 39
Indian diet 39
Contaminated vegetarianism 40
Oil consumption 40
Fruit and vegetables in Indian diet—more productions but less consumption 41
Antioxidants—do they have any role in our diet? 42
Protein source—Indian food/cuisine is high in carbs, starch, and fat 42
Susceptibility of Indians 43
Preventive measures to reduce this epidemic 43

8. Edible Oils: What is Right and What is Wrong? 46

Sonia Arora, Vitull K Gupta, Meghna Gupta

Composition of fats 46
Trans fatty acids or partially hydrogenated fatty acids 47

Cholesterol 48
What are edible oils? 48
What is right and what is wrong oil? 48
Characteristics of different oils 49
Choosing the right oil 50
Why rotation or blending is needed? 50

9. Statins and Diabetes **53**
Rajeev Bagarhatta, Sohan K Sharma, Dinesh Gautam
Pathophysiology of dyslipidemia in diabetes 53
Management of dyslipidemia in diabetes 53
New onset diabetes with statin 55

10. Statin Intolerance: Guide to Management **57**
Mrinal K Das
Definitions of statin intolerance 57
Types of statin intolerance 57
Anecdotal data 58
Clinical features 58
Evaluation of statin intolerance 59
Management 60
Alternative agents 61
Indian experience with statin-induced muscle symptom 62

11. Nonfasting Lipid Levels: Clinical Relevance and Implications for Practice **66**
Ajay K Sinha, Vikas Singh, Narendra Kumar
Rationale for requirement of a fasting sample 66
Emergence of nonfasting levels measurement 66
Lipid component measurement 67

SECTION 3: DIABETES AND HEART

12. Diabetes and Cardiovascular Disease: Implications of Recent Cardiovascular Outcome trials with Newer Anti-diabetic Drugs for Cardiovascular Protection **73**
Prakash Deedwania
Background 73
Therapeutic strategies for control of cardiovascular disease in diabetes 74
Role of antidiabetic (hypoglycemic) medications in cardiovascular protection 75

13. Diabetes Classification New Dimensions **79**
Jugal Kishor Sharma, Amit Gupta
Diabetes classification: history 79
Diabetes classification: why do we need a new classification system? 79
New proposed classification of diabetes 80

14. Prevention of Coronary Artery Disease in Diabetes Mellitus **83**
Ranjan Modi, Sunil Modi
Lifestyle modification 83
Lipid-lowering therapy 84
Antithrombotic medications 86
Bariatric surgery 86
Future or what is in horizon 86

15. Diabetes and Coronary Artery Disease: Prevalence and Mechanisms **89**
Satyanarayan Routray, Dipak R Das
Prevalence of diabetes and coronary artery disease 89
Diabetes and coronary artery disease: mechanisms 90

16. Management of Diabetes in Heart Failure **95**
Shashank R Joshi
The problem 95
Screening for heart failure in type 2 diabetes mellitus 95
Glycemia control and heart failure: choice of antidiabetic therapies 96
Metformin 96
Sodium-glucose cotransporter 2 inhibitors 96
Dipeptidyl peptidase-4 inhibitors 97
Glucagon-like peptide-1 receptor agonists 97
Sulfonylureas 97
Thiazolidinediones 98
Insulin 98

SECTION 4: HYPERTENSION

17. Epidemiology of Hypertension in India: The Real Scenario **103**
Rajeev Gupta, Kiran Gaur
Systematic reviews of epidemiological studies 103
Association of hypertension with macrolevel risk factors 110

18. Primary Prevention of Hypertension **113**
Panniyammakal Jeemon, Dorairaj Prabhakaran
Classification of hypertension 113
The need for primary prevention of hypertension in India 113
Primary prevention 114
GAPS in knowledge and future research needs 116

19. Cutoff for Hypertension: Implications of 2017 Guidelines for Indian Patients **119**
Rajeev Narang, S Srikant
Other highlights 121

20. Initial Choice of Drugs in Uncomplicated Hypertension: Not Monotherapy Anymore but Combination **123**

C Venkata S Ram

Pharmacological treatment of hypertension 123
An abbreviated overview of drugs for initial combination therapy 125
Initial combination therapy not monotherapy is the answer for blood pressure control 126

21. Are ACE inhibitor and ARB Equal in Hypertension? **129**

SS Chatterjee, Arka Chatterjee

Mechanism of action 129
Efficacy in reducing blood pressure 129
Efficacy for surrogate clinical outcomes 130
Effects in select patient subsets 130
Adverse effects and patient compliance 131
Cost-effectiveness 131

22. Diuretics as Antihypertensive in Elderly **133**

Anunay Gupta, HS Isser

Issues with elderly population 133
Blood pressure goals and targets 133
Clinical trials in elderly population 134
Diuretics as first-line antihypertensive drug 135

23. Treating Resistant Hypertension: Stepwise Approach **137**

Binjo Vazhappilly, Julian Thottan, Mohanan Padinhare

Stepwise evaluation of resistant hypertension 137

24. Secondary Hypertension: When and How to Screen **142**

Anjan Lal Dutta, Soumik Chaudhuri

Who to screen? 142
What to do before screening for secondary hypertension? 143
Conditions requiring reevaluation, after starting antihypertensive therapy 143
Role of ambulatory 24-hour blood pressure monitoring 144
Role of echocardiography in secondary hypertension 144
How to screen? 144
Uncommon causes of secondary hypertension 146
When secondary hypertension may present as resistant hypertension 147

25. Managing Low Diastolic Blood Pressure in Elderly Hypertensive **150**

HK Chopra, AK Pancholia

Pathophysiology of the J-curve 150
Diastolic blood pressure control: how low is too low? Clinical trial evidences 151
Low diastolic blood pressure and atherosclerosis in elderly subjects 151
Isolated diastolic hypotension and incident heart failure in elderly 151

26. Ambulatory Blood Pressure Monitoring—When to Order and How to Interpret? 153
Rajan J Manjuran, Sulthan R Salih
History and relevance of ABPM 153
Procedure 153
Indications 154
Merits and drawbacks 157
Future directions 158

27. Home Blood Pressure Monitoring: Current Status 160
Vidyut Jain, Avani Jain
Review of literature 160

SECTION 5: CHRONIC CORONARY ARTERY DISEASE

28. Best Method for Risk Stratification in CAD—Anatomy, Physiology, or Both 167
Pawan K Sharma, Kewal C Goswami
Methods for risk stratification in CAD 167
Risk stratification using noninvasive methods 167
Risk stratification using invasive methods 169
Potential uses and limitations of the traditional syntax score 170

29. Screening for Coronary Artery Disease in Asymptomatic Adults 173
Pratap Chandra Rath, Md Abdul Azeez Asad
Rationale for screening 173
Screening tests 173
Anatomic (imaging) techniques 175
Other methods for the assessment of cardiovascular risk 176
Safety of screening tests 176

30. Optimal Medical Management for Chronic Stable Angina in 2018 179
Satyavan Sharma, Naresh D Munot
Lessons learnt from randomized trials 179
What constitutes optimal medical therapy? 180
Other drugs for angina 184

31. Beta-Blockers in Chronic Stable Coronary Artery Disease: Current Status 187
J Shiv Kumar, M Sitaram, Sajith Pavitran, G Nagarjuna
Incidence and prevalence 187
Pathophysiology of coronary artery disease 187
Pharmacotherapeutics of beta-blockers 188
Newer generations of beta-blockers 188
Adverse effects of beta-blockers 189
Guidelines for use of beta-blockers in angina 189

32. Revascularization in Chronic Stable Angina—Current Status **191**
Parneesh Arora, Upendra Kaul
Evidence from trials 191
Current approach to revascularization for SIHD 192
Indications for coronary angiography 192
Choice of revascularization PCI or coronary artery bypass grafting 192

33. Revascularization in Diabetes: Rational Choices in 2018 **198**
Rajiv Agarwal
Surgery or percutaneous coronary intervention 199
Freedom trial 199
Other randomized trials 199
Incomplete revascularization 200
Second-generation drug-eluting stents 200
Real world scenario 200
Registry data 200
Rational choice of revascularization strategy: evolving a consensus 200
New randomized trials needed 201
Comparison with medical therapy 201
Acute coronary syndromes 201
Type and duration of diabetes 201

34. Enhanced External Counterpulsation: Current Status **204**
Ashok Goyal
Enhanced external counterpulsion in coronary artery disease and heart failure treatment 204
Mechanism of action 205
Indications and contraindications 207
Enhanced external counterpulsion in extracardiac diseases 208

35. Cardiac Rehabilitation: The Road Less Travelled **210**
Satyendra Tewari, Raj Pratap Singh
Indications of cardiac rehabilitation 211
Inpatient cardiac rehabilitation 211
Barriers to cardiac rehabilitation in India 212

SECTION 6: ACUTE CORONARY SYNDROMES

36. Why Seek Vulnerable Coronary Plaques? **217**
Amir Ahmadi, Michael Valentine, Rick Chazal, Jagat Narula
What is a vulnerable plaque? 217
How is vulnerable plaque identified? 218
The quantitative extent of high-risk features 218
The number of adverse plaque characteristics 219
The evidence of plaque progression 219

37. Protecting Heart from Ischemia-Reperfusion Injury: Current Understanding **221**
Jabir Abdullakutty, Jimmy George
Mediators of myocardial reperfusion injury 221
Therapies to reduce ischemic injury 223
Reperfusion by primary percutaneous coronary intervention, thrombolysis, or both 223
Other therapies to reduce ischemic injury 223
Pharmacological interventions to reduce reperfusion injury 224

38. Risk Stratification in Unstable Angina/NSTEMI: A Current Approach **226**
Anoop Jain, CB Meena, Sahil Sareen
Epidemiology 226
Pathophysiology 226
Clinical and risk assessment 226
Noninvasive testing 228
Stratification of risk 228
Management 230

39. hs-cTroponin in Acute Coronary Syndrome: Current Status **235**
Amal K Banerjee
Clinical perspective 236
Clinical practice guidelines 236
Risk assessment and outcomes 237

40. Managing Acute Coronary Syndrome in Renal Dysfunction **240**
Parayoru K Asokan, Kailash K Goyal
Pathophysiology 240
Diagnosis of acute coronary syndrome in patients with renal dysfunction 240
Management 240

SECTION 7: ST-SEGMENT ELEVATION MYOCARDIAL INFARCTION

41. Burden and Outcome of STEMI in India **249**
Santanu Guha, Avik Karak
Preamble 249
Burden of cardiovascular diseases in India 249
Burden of cardiovascular disease risk factors 250
Determinants of cardiovascular disease in Indians 250
Epidemiology of STEMI in India 250
Outcome of STEMI 251

42. Choosing Fibrinolytics in STEMI: Economics over Efficacy? **256**
Mullasari S Ajit, Meenakshi MS
Importance of early revascularization 256
Pharmacoinvasive strategy 256

Fibrinolytic drugs—classification and comparison 257
Efficacy of fibrinolytics—based on trials 257
Choice of fibrinolytic in ST-elevation myocardial infarction 258

43. Routine PCI after IV Thrombolysis—Is it Ready for Prime Time? 260
Lekha Pathak, Ankur Jhavar
Strategy clock in STEMI 260
Treatment delay in STEMI 260
Reperfusion strategies 261

44. Revascularizing Nonculprit Artery in AMI: Uniform Strategy or Case-based Approach 265
Ranjit K Nath, Kewal C Goswami
Approach to the management of nonculprit lesions in STEMI 265

45. Improving Outcomes of Primary Percutaneous Coronary Intervention: Technical Aspects 271
Ambukeshwar Singh, Ayush Shukla, Nakul Sinha
Prehospital or patient preparation 271
Loading dose 271
Role of counseling 272
Angiography 272
Slow flow or no reflow 273
Deferred stenting 274

46. Late Presenters with STEMI: Which is the Best Strategy? 276
Soumitra Kumar
Risk stratification in latecomers after STEMI 276
Reperfusion PCI in latecomers with STEMI 277
Nonreperfusion options for late presenters with STEMI 278

47. Acute Coronary Syndrome in Elderly 281
Surender Deora, Kewal C Goswami
Challenges in elderly 281
Management 282
Medical management 282
Thrombolysis versus primary percutaneous coronary intervention 283
Cardiac rehabilitation 283

48. Right Ventricular Myocardial Infarction: An Update 286
Shishu Shankar Mishra, Biswaranjan Mishra
Definition 286
Incidence 286
Pathophysiology 286
Clinical presentation 287
Differential diagnosis 287

Management 289
Prognosis 290

49. Cardiogenic Shock in Myocardial Infarction: Optimal Approach 292
Siddharthan Deepti, Sandeep Singh
Definitions 292
Incidence, temporal trends, and etiologies 292
Outcomes 292
Management 293

50. Optimizing STEMI Care—Developing Regional Networks 298
Sabarirajan Sokkaiyan, Thomas Alexander
Magnitude of the problem 298
Developing regional STEMI networks—the STEMI India experience 299

SECTION 8: DUAL ANTIPLATELET THERAPY

51. Choice of Dual Antiplatelet Therapy in Acute Coronary Syndrome: Is There a Consensus? 305
Hiremath MS, Deore RA
Aspirin 306
Ticlopidine 306
Clopidogrel 306
Prasugrel 308
Ticagrelor 308

52. Optimal Duration of Dual Antiplatelet Therapy after Acute Coronary Syndrome: Current Status 311
Dhiman Kahali, Vivek Singh Rathore
Risk stratification tools for ischemia and bleeding risks 311
Type of P2Y12 inhibitor and timing of initiation 312
DAPT after percutaneous coronary intervention for ACS 313
DAPT in patients treated with CABG surgery for ACS 315
DAPT for patients with medically managed ACS 316
Resistance to drugs 317
Duration of DAPT after PCI in patients with peripheral artery disease 317

53. Switching Between DAPT Agents: The Right Strategy 320
Harinder K Bali, Hiteshi KC Chauhan
Dual antiplatelet therapy clinical conundrum unraveled 320
Switching modalities 322
Switching between various oral P2Y12 Inhibitors 322
Switching between oral and intravenous P2Y12 inhibitors 329
Platelet function testing and switching of P2Y12 inhibitors 332
The way forward: what is the right strategy to switch DAPT? 332

54. Management of Bleeding in Planned or Unplanned Surgery in a Patient on Dual Antiplatelet Therapy **336**
Sameer Dani
Dual antiplatelet therapy and pharmacology 336
Prevention of bleeding 337
Treatment of bleeding 339

SECTION 9: CORONARY INTERVENTION

55. History and Evolution of Coronary Intervention **345**
Dev B Pahlajani, Akshay Mehta
Arrival of coronary angiography 347
New devices 349
History of fractional flow reserve, intravascular ultrasound, and optical coherence tomography 350

56. Bifurcation Stenting: Optimal Strategy in 2018 **353**
Ashwin B Mehta, Nihar Mehta
Definitions and classifications 353
Anatomical considerations 353
Relation between sizes of vessels: Murray's law and finet's law 355
Plaque shift versus carina shift 355
Threatened side branch morphologies: Preventing side branch occlusion 355
Stenting strategy in bifurcation lesions—one or two stents? 356
Tips and tricks 359

57. Left Main Coronary Artery Stenting in 2018 **363**
DS Gambhir
Stenting versus bypass surgery for left main coronary artery disease 363
Very long-term follow-up after left main coronary artery stenting 365
Current guidelines for left main coronary artery stenting 365
Selection of left main bifurcation stenting strategy 365
Role of adjust devices 366
Personal experience 368

58. Current Update in the Treatment of Calcified Lesions **370**
Matthew I Tomey, Samin Sharma
Identification and classification of calcification 370
Patient and lesion selection 371
Wire selection 371
Modification of calcified lesions 371
Performance of atheroablation 373
Postatheroablation angioplasty and stenting 376
Comparative efficacy 376
Other devices 376

59. Protected Percutaneous Coronary Interventions: Treating the Complex Higher-risk Indicated Patients **379**
Mathew Samuel Kalarickal, Ramachandran Paramasivam
Complex high-risk indicated patients 379
CHIP PCI hospital 380
CHIP physician 380
Patient evaluation and procedure planning 380
Hemodynamic support devices 380
Post-procedure care 382
Current evidence 382

60. Ostial Coronary Lesions: Tips and Tricks for the Interventionist **384**
Pravesh Vishwakarma, Rishi Sethi
Morphology and histology 384
Diagnostic challenges 384
Selection of hardwares 385
Special techniques for ostial stent placement 388

61. Approach to Management of Chronic Total Occlusion **391**
Pravin K Goel, Roopali Khanna
Imaging of chronic total occlusion lesions 392
Predictors of chronic total occlusion-percutaneous coronary intervention success 392
Hybrid algorithm for chronic total occlusion-percutaneous coronary intervention 393
Chronic total occlusion-percutaneous coronary intervention techniques 393
Complications of chronic total occlusion-percutaneous coronary intervention 394

62. Hybrid Coronary Revascularization **396**
C Raghu
Benefits of coronary artery bypass grafting over percutaneous coronary intervention 396
Why percutaneous coronary intervention is preferred in practice? 396
In coronary artery bypass grafting, which is the preferred surgical conduit? 397
Which is better on-pump versus off-pump surgery? 397
Minimally invasive direct coronary artery bypass surgery 397
Robotic-assisted coronary artery bypass grafting 397
Endoscopic bypass grafting 397
Hybrid coronary revascularization 397
Hybrid outcomes 398

63. Should all Percutaneous Coronary Interventions be Radial Only? **400**
Tejas Patel, Surender Deora, Sanjay Shah
Background 400

64. Contemporary Coronary Stents: Implications for My Practice **404**
Neha Maddali, Kevin Marzo, Ramesh Daggubati
Design 405
Implications on clinical practice 407
Drug-eluting stent safety and efficacy in specific patient populations 408

65. Fractional Flow Reserve and Instantaneous Wave-free Ratio—Which Should Be the Gold Standard? 411

Nagendra Boopathy Senguttuvan, Nitish Naik, Kewal C Goswami

Fractional flow reserve 411
Advantages of fractional flow reserve 412
Clinical utility of fractional flow reserve 413
Case study 414
Instantaneous wave-free pressure ratio 416
Comparison of invasive physiological indices to noninvasive physiology measured by positron emission tomography 416
Hybrid approach 417
Standalone instantaneous wave-free ratio approach 417
Merits and demerits 417

66. Optical Coherence Tomography in Coronary Artery Disease: A Review 419

Ashwat S Dhillon, Leah Raj, Anil Kumar Mehra

Principles of optical coherence tomography 419
Preparation of imaging system and image acquisition 420
Optical coherence tomography interpretation in intracoronary imaging 420
Optical coherence tomography versus intravascular ultrasound 421
Correlation of optical coherence tomography with fractional flow reserve 422
Clinical utility of optical coherence tomography imaging 422
Stent selection (diameter and length) 423
Optimization after stent deployment 423

67. Stem Cells in Cardiovascular Disease: Is there an indication? 426

Vijay Iyer

Challenges in cell therapy 426
Cell types and mechanisms 427
Clinical trials with stem cells 427
Nonischemic dilated cardiomyopathy 431
Future directions in cell therapy and lessons learned 431

68. Future of Interventional Cardiology 433

VK Bahl, Dinkar Bhasin

Percutaneous mitral valve therapies 433

SECTION 10: INTERVENTION IN STRUCTURAL HEART DISEASE

69. TAVR: Indications and Limitations in Clinical Practice 443

Tarun Chakravarty, Matthias Raschpichler, Chinar Patel, Raj Makkar

Eligibility for transcatheter aortic valve replacement 443
Transcatheter aortic valve replacement for degenerative bioprosthetic aortic valves 444
Current generation commercially available transcatheter aortic valve 445
Indications for transcatheter aortic valve replacement 445
Limitations of transcatheter aortic valve replacement 445

70. Imaging for Transcatheter Aortic Valve Implantation: Practical Aspects **448**
Kinjal Banerjee, Nyal Borges, Parth Parikh, Samir Kapadia
Planning phase 448
Planning phase: procedural planning 449
Procedure phase 451
Postprocedure follow-up 452

71. Alcohol Ablation for HOCM: Progress over the Past Two Decades **455**
Hubert Seggewiss, Angelika Koljaja-Batzner
Historical development of percutaneous septal ablation 455
Indication for septal ablation 455
Technique of septal ablation 456
Acute results and complications 458
Follow-up results 459

72. Percutaneous Management of Paravalvular Leak: Patient Selection and Outcomes **462**
A Sreenivas Kumar, Ramakrishna Janapati
Etiology of paravalvular leak 462
Clinical diagnosis 462
Imaging 462
Indications for paravalvular leak closure 465
Devices for percutaneous paravalvular leak closure 465
Technique of transcatheter paravalvular leak closure 465
Outcomes and complications of paravalvular leak closure procedures 467
Medical therapy 467

73. Left Atrial Appendage Closure Device for Stroke Prevention in Atrial Fibrillation **468**
Balbir Singh
Existing options of stroke prevention in atrial fibrillation 468
Rationale for left atrial appendage occlusion 468
Identifying the right patient for device closure 469
Intolerance or contraindications to oral anticoagulant or new oral anticoagulants 469
Device implantation 470
Postprocedural treatment 470
Clinical trial results 470
Discussion 470

SECTION 11: CARDIAC IMAGING

74. Utility of Echo in Assessment and Management of Functional Mitral Regurgitation **475**
Gonzalo Luis Alonso Salinas, Marina Pascual Izco, José Luis Zamorano
Mechanism and etiology of mitral regurgitation 475

Ultrasound assessment of functional mitral regurgitation 475
Management of functional mitral regurgitation 479

75. Diastology Demystified **481**
Jagdish C Mohan, Vishwas Mohan, Madhu Shukla
Physiology of diastole 482
Factors contributing to diastole 482
Significance of diastolic function 483
Left atrial volume and diastolic function/dysfunction 488
Mitral inflow velocities 490
Mitral inflow measurements 491
Mitral inflow: acquisition and feasibility 491
Mitral annular velocities 492
Practical tips 494
Pulmonary vein flow and diastolic function 496
Acquisition of pulmonary vein flow signals 498
Pulmonary vein flow parameters 499
Mitral flow propagation by color M-mode 499
Longitudinal strain, rotation, and untwisting rate by acoustic speckle tracking 500
Diastolic stress test 500
The new guidelines on diastolic function 501

76. Echocardiographic Assessment of Right Ventricular Function **503**
K Tamilselvan, R Alagesan
Anatomical and physiological basis for right ventricular echocardiography 503
Right ventricular chamber dimensions assessment 503
Right ventricular anterior wall thickness assessment 504
Assessment of right ventricular hemodynamics 504
Assessment of right ventricular systolic function 506
Right ventricular myocardial performance index 506
Tissue doppler imaging of right ventricular 507
Right ventricular strain imaging 507
Assessment of right ventricular diastolic function 509
Right ventricular wall motion assessment 509
Transesophageal echocardiography 509

77. Longitudinal Strain Imaging: Is it a Clinical Tool? An Echocardiographic Appreciation **511**
G Vijayaraghavan, S Sivasankaran
Definition 511
Longitudinal strain 511
Speckle tracking for strain imaging 512
Longitudinal strain imaging protocol 512
Ejection fraction and global longitudinal strain 513
Ischemic heart disease and regional strain 513
Infiltrative diseases: amyloidosis 514
Left ventricular endomyocardial fibrosis 515
Hypertrophic cardiomyopathy 515

Left bundle branch, cardiac failure, and cardiac resynchronization therapy 515
Myocarditis 515
Strain imaging in rare situations 517
Limitations of strain imaging 518

78. Three-Dimensional Echocardiography—Current Indications 521
Hardeep K Grewal, Ravi R Kasliwal
Left ventricle assessment 521
Right ventricle assessment 524
Left atrial assessment 525
Three-dimensional strain of left ventricle 526
Left ventricle dyssynchrony analysis 526
Valve assessment 527
Transcatheter interventions for valvular heart disease 534

79. Intervention and Fusion Echocardiography 542
Shantanu P Sengupta
Problems during structural heart disease interventions 542
Understanding fusion imaging 542
Interatrial septal defect closure 543
Mitral valve interventions 545
Aortic valve interventions 545

80. Interpreting a Nuclear Stress Test 548
GN Mahapatra
Approach to interpretation 548

81. Myocardial Viability Assessment: How Do We Apply in Clinical Practice? 559
Nagendra Boopathy Senguttuvan, Kewal C Goswami
Energy and ischemia 559
Revascularization 560
Modalities of viability testing 560
Role of viability testing in the management of ischemic cardiomyopathy 563
Future direction 565

82. Computed Tomography Coronary Angiography—Essentials for Cardiologists 566
Priya Jagia, Arun Sharma
Conventional angiography or computed tomography coronary angiography 566

83. Current Indications for Cardiac Magnetic Resonance Imaging 572
Mona Bhatia, Shashank Jain
Technical aspects of cardiac MRI 572
Indications and applications 573
Future developments 579

SECTION 12: CARDIOVASCULAR PHARMACOLOGY

84. Newer Antianginals **583**
Kewal C Goswami, Anunay Gupta
Ranolazine 583
Nicorandil 584
Ivabradine 584
Trimetazidine 585
Fasudil 585
Allopurinol 586
Endothelin receptor blockers 586
Testosterone 586
High-dose statins 586
Molsidomine 587
Investigational drugs 587

85. Newer Antihypertensives **588**
TK Mishra
Newer drugs for hypertension 588
Emerging molecules 590
Future prospects 591

86. Newer Agents for Dyslipidemia **593**
Iyengar SS, Saleha N
Ezetimibe 593
Proprotein convertase subtilisin/kexin type 9 inhibitors 594
Inclisiran 595
Microsomal triglyceride transfer protein inhibitor: lomitapide 596
Antisense oligonucleotide against apolipoprotein B—mipomersen 596
Bempedoic acid 596
Gemcabene 596
CAT-2054 597
Novel drugs targeting high-density lipoprotein cholesterol 597
What are the recommendations of the medical societies on new nonstatin medications? 598
Safety of very low low-density lipoprotein cholestrol 599
Highest risk-highest benefit strategy 599

87. Choosing Between NOACS Wisely: Are They all the Same? **601**
Sandeep Bansal, Anunay Gupta
Pharmacokinetics and pharmacodynamics differences 601
Major differences in trials 602
Compliance 604

88. Newer Antihyperkalemic Drugs **606**
AK Pancholia
Clinical manifestations of hyperkalemia 606
Therapy for hyperkalemia 607

89. Drug Interactions in Cardiology **612**
Arunangshu Ganguly
Incidence 612
Mechanism of drug–drug interaction 612

90. Unsuspected Drug Toxicity in Cardiology Practice **620**
Ashish Tiwari, Sharad Chandra
Cardiotoxicity of cytotoxic drugs 620

SECTION 13: HEART FAILURE

91. Heart Failure in India **627**
Sandeep Seth, Karishma Landge
Heart failure in India is reaching epidemic proportions 627
Causes 627
Severity of disease 627
Tackling the problem in India 628

92. Biomarkers for Heart Failure: Current Role and Relevance **631**
Anunay Gupta, Ambuj Roy
Natriuretic peptides: B-type natriuretic peptide and N-terminal prohormone
B-type natriuretic peptide 631
Newer biomarkers 633

93. Practical Tips for using Beta-blockers, ACEI, ARBs, ARNI, Diuretics, Aldosterone Antagonists in Heart Failure **635**
Vijay Kumar Chopra, Sanjay Mittal
Beta-blockers 635
Angiotensin-converting enzyme inhibitor 636
Angiotensin receptor blockers 637
Angiotensin receptor neprilysin inhibitor 637
Diuretics 638
Aldosterone antagonists 638

94. HFpEF—How to Diagnose and Manage? **640**
Sanjeev Sanghvi, Swati Mahajan
Pathophysiology of HFpEF 640
Diagnosis of HFpEF 640
History and clinical examination 640

Investigations 642
Treatment 643

95. Heart Failure with Midrange Ejection Fraction—What is This? 647
Arup Dasbiswas
Clinical characteristics 647
Predictors and outcomes of heart failure with midrange ejection fraction 648

96. Monitoring Therapy in Heart Failure with Reduced Ejection Fraction 650
Soura Mookerjee
Trials of biomarker-guided therapy for heart failure 650
Multidisciplinary care approach to the management of heart failure patients 650
Remote monitoring of heart failure: tools and results 651

97. Stepwise Approach to Acute Decompensated Heart Failure 656
BP Singh, Ravi V Prasad, Nirav Kumar
Pathophysiology 656
Evaluation of the patient with acute decompensated heart failure 656
Relevant investigations 658
Management goals 658
Treatment of acute heart failure 658
Management of patients with cardiogenic shock 661

98. Advanced Heart Failure Therapies—An Overview 664
Rishi A Bhargava, Prafulla G Kerkar
Estimating prognosis in advanced heart failure 664
Advanced heart failure—treatment strategies 664
Advanced heart failure therapies—Indian scenario 669

99. Takotsubo Cardiomyopathy—An Update 671
Pintu Nahata
History 671
Diagnostic criteria 671
Epidemiology 671
Etiopathogenesis 671
Clinical features 672
Variant 673
Management 674
Prognosis 674

SECTION 14: SYNCOPE

100. Syncope: What is New? 679
Satish K Kaushik, Surendra K Chutani
The new or revised concepts 679

101. Tilt Table Testing in Syncope **682**
Surender Deora, Kewal C Goswami
Pathophysiology of vasovagal syncope 682
Head-up tilt test 682
Response to head-up tilt test 683
Indications 684
Complications and contraindications 684
Future prospects 684

102. Implantable and External Loop Recorders: Indications in My Practice **686**
Praloy Chakraborty
Patients with syncope 686
Patients with palpitations 688
Nonestablished indications 688

103. Sudden Death in Dilated Cardiomyopathy—What is New in 2018? **690**
Kamal K Sethi, Ashish K Govil
Pathophysiology of dilated cardiomyopathy 690
Role of drug therapy in sudden cardiac death 690
Role of implantable cardioverter defibrillator 691
Risk stratification 693

104. Orthostatic Hypotension **696**
Siddharthan Deepti, Kewal C Goswami
Definition 696
Epidemiology 696
Physiology of the normal orthostatic response 696
Etiology 698
Clinical presentation 700
Orthostatic testing and variants of orthostatic hypotension 700
Differential diagnosis 701
Management 701
Treatment 701

SECTION 15: ATRIAL FIBRILLATION

105. Stroke Prevention in Atrial Fibrillation: New Oral Anticoagulants **705**
Sharad Agrawal
Epidemiology of stroke in atrial fibrillation 705
Risk stratification tools in atrial fibrillation 705
Antithrombotic management of atrial fibrillation 706
Current recommendations for antithrombotic therapy in atrial fibrillation 708

106. Catheter Ablation of Atrial Fibrillation **710**
Dinkar Bhasin, Gautam Sharma
Advantages of maintaining sinus rhythm 710

Pathophysiology of atrial fibrillation 710
Indications for atrial fibrillation ablation 711
Technique for pulmonary vein isolation 711
Adjunctive ablation strategies 713
Complications of atrial fibrillation ablation 713
Outcomes 714

107. Postoperative Atrial Fibrillation: Clinical Correlates and Management 715
Krishnarpan Chatterjee, Naveen Garg
Incidence and time course 715
Pathogenesis 715
Clinical manifestations and diagnosis 716
Prevention of atrial fibrillation and complications 716
Management 718
Anticoagulation 718

108. Managing Antithrombotics after Percutaneous Coronary Intervention in Atrial Fibrillation: Current Recommendations 721
Sundeep Mishra
Why risk of thrombosis after percutaneous coronary intervention? 721
Why risk of stroke after onset of atrial fibrillation? 722
How to prevent thrombosis in patient undergoing percutaneous coronary intervention? 722
How to prevent stroke in a patient with atrial fibrillation? 724
How to balance risks and benefits in patient of atrial fibrillation undergoing percutaneous coronary intervention 727

109. Treatment of Atrial Fibrillation in Heart Failure: Is It Any Different? 732
Rajesh A Dhopeshwarkar
Goals of treatment in atrial fibrillation 732
Challenges in device management in patients with atrial fibrillation and heart failure 735

110. Managing Atrial Fibrillation in Acute Myocardial Infarction 736
Jayagopal P Balagopalan, Sarjun Basha
Predictors of atrial fibrillation in acute myocardial infarction 736
Management of atrial fibrillation in acute myocardial infarction 736

SECTION 16: VENTRICULAR ARRHYTHMIAS

111. Ventricular Arrhythmias in Acute Myocardial Infarction 741
Rajesh A Dhopeshwarkar, Rakesh Yadav, Kewal C Goswami
Types of ventricular arrhythmias 741
Mechanism and pathogenesis of ventricular arrhythmias after acute myocardial infarction 741
Predictors of sustained ventricular tachycardia and ventricular fibrillation 741
Management of ventricular arrhythmias 743

112. Ventricular Arrhythmias and Sudden Death: Problems and Opportunities in Clinical Practice **746**
Kapil Kumawat
Mechanisms of ventricular arrhythmias and sudden cardiac death 746
Epidemiology 747
Therapies for ventricular arrhythmias and sudden cardiac death 747
Devices for treatment of ventricular arrhythmias and sudden cardiac death 748
Prevention, prediction, and treatment of VAS and SCD in specific disorders 749

113. Electrocardiography Clues in a Sudden Cardiac Death Survivor **756**
Ranjan Modi, Aparna Jaswal
Structural heart disease 757
Ischemic heart disease 758
Nonstructural heart disease: inherited 758
Nonstructural heart disease: noninherited 764
Electrocardiography-based tests 765
Common forms of sudden cardiac death 765
Multiple risk markers: cumulative risk 766
Importance of dynamic monitoring 767

114. Premature Ventricular Complex: When and How to Ablate? **771**
Joseph Theodore, Raja Selvaraj
When do premature ventricular complexes need to be treated? 771
To treat or not to treat a premature ventricular complex 771
How to treat? 772
Technique of premature ventricular complex ablation 772
Ablation of premature ventricular complexes 774
Outcomes 774

115. Epicardial Ventricular Tachycardia: Recognition and Approach **775**
Maki Ono, Walid I Saliba, Oussama Wazni, Mandeep Bhargava
Preoperative assessment and recognition 775
Approach to access the pericardial space 777
Mapping and ablation 778
Complications 779

116. Cardiopulmonary Resuscitation: What's New? **783**
Nitin Modi, Sunil Sharma
2015 American heart association guideline update for cardiopulmonary resuscitation and emergency cardiovascular care 783

SECTION 17: CARDIAC IMPLANTABLE ELECTRONIC DEVICES

117. Improving Outcomes in Patients with Cardiac Resynchronization Therapy **791**
Rohit Malhotra
Patient selection 791
Preprocedure planning 794

118. CRT-D versus CRT-P—What should be the Standard of Care in Nonischemic Cardiomyopathy? 799
TS Kler, Avinash Verma
Burden of sudden cardiac death in NICM 799
CRT-D in NICM—lack of benefit is consistent 800
Is the trail design at fault? 802
So which NICM patient needs icd or CRT-D? 802

119. ICD in HFrEF—When are They not Needed? 804
Rajnish Sardana, Praloy Chakraborty
Early after myocardial infarction 804
Early after myocardial revascularization 805
Recent onset nonischemic cardiomyopathy 806

120. Leadless Pacemakers: Current Review and Future Directions 809
Vanita Arora
Potential complications with conventional pacing system 809
Animal studies and technological advancements 809
Current leadless cardiac pacemakers 810
How the algorithm functions 813

SECTION 18: CARDIAC SURGERY

121. Time to Embrace Total Arterial Revascularization 819
Ramakanta Panda, Sunil Vanzara
Reason for low atherosclerosis in arterial conduits 819
Types of arterial conduits 820
Indications and contraindications to use total arterial revascularization 820
Techniques of harvesting 821
Factors influencing graft patency 822
Comparative patency data of arterial grafts 823
Survival benefit 823
Discussion 825

122. Surgery in Acute Myocardial Infarction 831
Ganesh K Mani, Pramod K Sharma, Manju Mani
Coronary artery bypass surgery after failed PCI 831
Outcome of surgery within 6 hours 832
Optimal timing of coronary artery bypass surgery in acute myocardial infarction 832
Operative strategy (arrested or beating heart?) 833
Personal experience 833

123. Recent Advances in Coronary Artery Bypass Graft 836
OP Yadava
Minimally invasive CABG 837

Conduits—improving patency 837
On versus off-pump CABG 838
Hybrid myocardial revascularization 838
No option coronary artery disease 838
Quality initiatives 839
Miscellaneous 839

124. Redo Coronary Artery Bypass Grafting: Challenges and Outcomes 841
Ramakanta Panda, Muzil Munshi
Incidence 841
Patient risk profile 842
Indications 842
Preoperative evaluation and planning 843
Technical aspects and challenges associated with redo coronary artery bypass grafting 845

125. LVAD—Should Indians Borrow to Afford Them? 852
Sachin Talwar, Harsha V Niraghatam
Epidemiology 852
The Indian scenario 852
Protocol for management of heart failure in India 853
Heart transplantation versus VAD's for end stage heart failure 858
Pros and cons of LVADS in India 860

126. Heart Transplantation in India: Successes and Challenges 863
Balram Airan, Milind Hote
Successes 863
Challenges 866
Roadmap for the future 869

SECTION 19: STROKE

127. Atrial Fibrillation and Stroke: An Update 873
Rohit Bhatia, Rimpy Joseph
Epidemiology and global burden 873
Updated model for stroke mechanism in atrial fibrillation and concept of atrial cardiopathy 874
Atrial fibrillation detection in stroke 874
Stroke risk stratification scores 876
Are type of atrial fibrillation and duration of episodes predictive of stroke risk? 876
Serum biomarkers as predictors of stroke risk in atrial fibrillation? 877
Structural and functional markers of left atrial and left atrial appendage as stroke predictors in atrial fibrillation 877
Assessment of bleeding risk 878
Management strategies 878

128. Current Reperfusion Strategy in Acute Ischemic Stroke **887**
MV Padma Srivastava, Vishnu VY
Thrombolysis in acute ischemic stroke: "Time clock" 887
Recent advances in stroke thrombolysis 888
Next generation thrombolytic agent: tenecteplase 888
Endovascular therapy: "tissue clock" 889

129. Prevention of Stroke in Cardiac Patients **892**
Harsh Wardhan, Nitin Aggarwal
Definition of stroke and transient ischemic attack 892
Cardiac embolism and stroke 892
Stroke prevention in atrial fibrillation 893
Oral anticoagulants 894
Patent foramen ovale 895
Aortic arch disease 896
Myocardial infarction, left ventricular dysfunction, and heart failure 896
Dilated cardiomyopathy 897
Valvular heart disease 897

130. Stroke in Cath Lab **901**
Neeraj Parakh, Kewal C Goswami
Incidence 901
Mechanism and risk factors 901
Presentation 901
Evaluation 902
Treatment 902

SECTION 20: PERIPHERAL VASCULAR DISEASE

131. Varicose Veins: Interventional Approach **907**
Sanjeev Kumar, Vineeta Ojha
Anatomy and pathophysiology 907
Natural history 908
Classification 908
Indications for treatment 908
Treatment options for varicose veins 908
Interventional approach to management of varicose veins 909

132. Deep Vein Thrombosis: Controversies and Consensus **916**
Surender Deora, Kewal C Goswami
Evaluation and management of deep vein thrombosis 916

133. Renal Artery Stenosis: When and How to Intervene? **923**
George Joseph
Atherosclerotic renal artery stenosis 923

Fibromuscular dysplasia 927
Takayasu arteritis 928
Christian Medical College, Vellore Interventional Experience in Takayasu Arteritis Renal Artery Stenosis 929

134. Carotid Artery Stenting in 2018 **932**
Vivudh P Singh, Ranjan Modi, Atul Mathur
Management of carotid artery disease 932
Secondary prevention in asymptomatic patients 933
Tertiary prevention in recently symptomatic patients 934
Carotid artery stenosis versus carotid endarterectomy 935
Timing of interventions after onset of symptoms 935
Carotid artery stenting over carotid endarterectomy 936
Staged or synchronous bilateral carotid interventions 936
Carotid artery stenting technique 936
Complications 937
New aspects of 2017 guidelines added to the 2009 guidelines 939

135. Critical Limb Ischemia: Current Management **941**
Narendra N Khanna, Chukwudi Nwagbara, Suparna Rao
Epidemiology and risk factors 941
Pathophysiology of critical limb ischemia 941
Clinical features 942
Classification 942
Differential diagnosis of leg pain on exertion 942
Evaluation of critical limb ischemia 943
Treatment of critical limb ischemia 945

SECTION 21: WOMEN AND HEART DISEASE

136. Coronary Artery Disease in Women: Unfair Assessment and Outcomes **957**
Roopa Salwan
Risk factors for coronary artery disease 958
Pathophysiology of IHD in women 959
Assessment of ischemic heart disease in women 960
Clinical spectrum of ischemic heart disease 961
Indian data 962
Myocardial infarction with nonobstructive coronary arteries 962

137. Hypertension in Pregnancy—A Stepwise Approach **966**
Cherian Koshy, K Venugopal
Classification of hypertensive disorders in pregnancy 966
Grading of hypertension (NICE guidelines) 966
Management 966
Investigations 967
Chronic hypertension 968

Timing of termination of pregnancy 968
Postpartum hypertension 969
Indian data 969

138. Peripartum Cardiomyopathy 970

Abhishek Roy, Debabrata Roy

Physiology of normal pregnancy 970
Etiopathogenesis of peripartum cardiomyopathy 970
Clinical features 972
Diagnosis 972
Differential diagnosis 973
Management 973
Prognosis and follow-up 975
Counseling for future pregnancies 975

139. Mitral Stenosis in Pregnancy: The Last Straw on the Camel's Back! 978

AJ Swamy, Deepak Saha, Sarat Chandra

Prevalence and incidence in India 978
Hemodynamic changes in pregnancy 978
Hemodynamics during labor and delivery 978
Pathophysiology of mitral stenosis during pregnancy 979
Percutaneous balloon mitral valvuloplasty 980
Surgical mitral valvoplasty/mitral replacement 980

140. Heart Failure in Pregnancy 983

Kajal Ganguly, Anindya Mukherjee, Malay Acharya, Auriom Kar

Epidemiology 983
Physiology 983
Etiology and pathophysiology 983
Clinical presentation 985
Investigations 985
Differential diagnosis 985
Management principles 985
Treating reversible factors 986
Supportive measures 986
The mode of delivery 986
The puerperium and long-term management 986
Heart failure with preserved ejection fraction 987

SECTION 22: SYSTEMIC DISEASES AND HEART

141. Hypothyroidism and Heart 991

Niteen V Deshpande

Effects of thyroid hormone on cardiovascular system 991
Cardiovascular manifestations 993
Hypothyroidism and heart failure 993

Effect of heart disease on thyroid function 994
Treatment of hypothyroidism and heart 994

142. Cardiorenal Syndrome: Current Update 997
Dipak Sarma, Ritesh Kalwar
Definition 997
Classification 997
Link and pathophysiology 997
Biomarker in cardiorenal syndrome 998
Management 999

143. Anemia in Heart Failure 1002
Umesh C Samal, Harikrishnan S
Epidemiology of anemia and iron deficiency in heart failure 1002
Pathogenesis of anemia in heart failure 1002
Consequences of anemia and iron deficiency in heart failure 1002
How to diagnose iron deficiency? 1003
Treatment of anemia and iron deficiency 1003

144. When to Screen and How to Manage OSA in Cardiology Practice 1005
GC Khilnani, Pawan Tiwari
Extent of the problem 1005
Risk factors for obstructive sleep apnea 1005
Consequences and complications of obstructive sleep apnea 1006
Screening tools for obstructive sleep apnea 1006
Barriers in integrating OSA management in cardiology practice and solutions 1008
Diagnosis of obstructive sleep apnea 1008
Overview of management of obstructive sleep apnea 1009

SECTION 23: EMERGING ISSUES IN CARDIOLOGY

145. mCardiology: mHealth in Cardiology 1013
Ambuj Roy, Ajay S Vamadevan
Need for technology 1013

146. Telemonitoring in Cardiology 1017
Pramod Sagar Arsikere, Aditya Kapoor
Various applications of telecardiology

147. Executive Cardiac Checkup: Is it Really Needed? 1024
Brian Pinto, Neeraj A Desai
Computed tomography coronary calcium scoring 1025

148. Cardiology and Ethics: Mission Impossible? 1028
Raja Selvaraj, Jayaraman Balachander
Challenges specific to cardiology 1028

What can the cardiologist do? 1029
What should regulatory bodies do? 1030

SECTION 24: MISCELLANEOUS

149. Development of Cardiology and Interventions in India—An Insider's Glimpse **1033**
M Khalilullah
Implantable valves 1034
Left atrial appendage closure 1035
Interventional electrophysiology 1035

150. Evidence-based Medicine: Are Randomized Controlled Trials the Gold Standard? **1036**
Vitull K Gupta, Meghna Gupta, Varun Gupta
History of evidence-based medicine 1036
What is evidence-based medicine? 1036
Classification of evidence-based medicine 1037
Qualification of evidence 1037
Statistical measures in evidence-based medicine 1037
How do we actually practice evidence-based medicine?1037
Types of research study designs 1038
Limitations of evidence-based medicine 1038
Application of evidence-based medicine in developing countries like India 1038
Can evidence-based medicine be influenced? 1038
Pharma industry, research, and evidence-based medicine 1039
Are randomized controlled trials the gold standard? 1039

151. Erectile Dysfunction in a Cardiac Patient **1043**
Ranjit K Nath, Neil Bardoloi
Etiology 1043
Pathophysiologic basis of erectile dysfunction and cardiovascular disease 1043
Erectile dysfunction with established cardiovascular disease 1046
Erectile dysfunction and future cardiovascular events 1046
Erectile dysfunction with occult cardiovascular disease 1046
Workup for patients with erectile dysfunction and cardiovascular disease 1046
Management of erectile dysfunction and cardiovascular disease 1047

152. Noncardiac Surgery: How to "Clear" a Patient? **1050**
PC Manoria, Pankaj Manoria, Sharad Kumar Parashar
Ancillary preoperative cardiac testing: recommendations 1051
Elective noncardiac surgery in patients with prior percutaneous coronary intervention: timing and recommendations 1052
Anticoagulant therapy 1052
Preoperative evaluation in specific patients population: general considerations 1053
Perioperative arrhythmias 1053

153. How to Defend a Complaint in Cardiology **1055**

KK Aggarwal

Defense argument no. 1 1055
Defense argument no. 2 1055
Defense argument no. 3 1055
Defense argument no. 4 1055
Defense argument no. 5 1056
Defense argument no. 6 1056
Defense argument no. 7 1056
Defense argument no. 8 1056
Defense argument no. 9 1056
Defense argument no. 10 1056
Defense argument no. 11 1057
Defense argument no. 12 1057
Defense argument no. 13 1057
Defense argument no. 14 1057
Defense argument no. 15 1058
Defense argument no. 16 1058
Defense argument no. 17 1058
Defense argument no. 18 1058
Defense argument no. 19 1058
Defense argument no. 20 1059
Defense argument no. 21 1059
Defense argument no. 22 1059
Defense argument no. 23 1059
Defense argument no. 24 1059
Defense argument no. 25 1060
Defense argument no. 26 1060

154. Sports and Heart Diseases **1061**

Kewal C Goswami, Vikash Kumar, Nagendra Boopathy Senguttuvan

Types of exercise 1061
Cardiovascular response to exercise 1061
Benefits of exercise 1062
Risks of exercise 1062
Clinical problems in sports cardiology 1062
Screening abnormalities 1063

Index **1067**