

Contents

| | |
|---|-----------|
| DEDICATION | iii |
| CONTRIBUTORS | xxvi |
| CHAIRMAN'S NOTE | xxix |
| PREFACE | xxx |
| 1 Inpatient Care in Internal Medicine | 1 |
| Mark Thoelke, Eric Johnson, and Adam Meyer | |
| General Care of the Hospitalized Patient | 1 |
| Prophylactic Measures | 1 |
| Venous Thromboembolism Prophylaxis | 1 |
| Decubitus Ulcers | 2 |
| Other Precautions | 3 |
| Acute Inpatient Care | 3 |
| Chest Pain | 4 |
| Dyspnea | 4 |
| Acute Hypertensive Episodes | 5 |
| Fever | 5 |
| Pain | 6 |
| Altered Mental Status | 8 |
| Insomnia and Anxiety | 10 |
| Perioperative Medicine | 12 |
| Preoperative Cardiac Evaluation | 12 |
| Perioperative Anticoagulation and Antithrombotic Management | 17 |
| Perioperative Management of Specific Conditions | 19 |
| Hypertension | 19 |
| Pacemakers and ICDs | 20 |
| Pulmonary Disease and Preoperative Pulmonary Evaluation | 21 |
| Anemia and Transfusion Issues in Surgery | 24 |
| Liver Disease | 25 |
| Diabetes Mellitus | 27 |
| Adrenal Insufficiency and Corticosteroid Management | 29 |
| Chronic Renal Insufficiency and ESRD | 30 |
| Acute Renal Failure | 31 |

2 Nutrition Support 33

Dominic Reeds and Peter H. Yen

- Nutrient Requirements 33**
- Assessment of Nutritional Status 45**
- Enteral Nutrition 46**
- Parenteral Nutrition 50**
- Refeeding the Severely Malnourished Patient 54**

3 Preventive Cardiology 58

Angela L. Brown, Daniel S. Kim, Clare E. Moynihan, and Anne C. Goldberg

- Hypertension 58**
- Dyslipidemia 76**

4 Ischemic Heart Disease 89

Marc A. Sintek and Philip M. Barger

- Coronary Heart Disease and Stable Angina 89**
- Acute Coronary Syndromes, Unstable Angina, and Non–ST-Segment Elevation Myocardial Infarction 104**
- ST-Segment Elevation Myocardial Infarction 118**

5 Heart Failure and Cardiomyopathy 140

Shane J. LaRue and Justin M. Vader

Heart Failure 140

- General Principles 140**
- Diagnosis 142**
- Treatment of Heart Failure 144**
- Special Considerations 154**
- Acute Heart Failure and Cardiogenic Pulmonary Edema 154**

Cardiomyopathy 156

- Dilated Cardiomyopathy 156**
- Heart Failure with Preserved Ejection Fraction 157**
- Hypertrophic Cardiomyopathy 158**

- Restrictive Cardiomyopathy 161**
- Peripartum Cardiomyopathy 163**

6 Pericardial and Valvular Heart Disease 165

Jacob S. Goldstein and Brian R. Lindman

Pericardial Disease 165

- Acute Pericarditis 165**
- Constrictive Pericarditis 166**
- Cardiac Tamponade 168**

Valvular Heart Disease 169

- Mitral Stenosis 169**
- Aortic Stenosis 172**
- Mitral Regurgitation 175**
- Aortic Regurgitation 179**
- Prosthetic Heart Valves 183**

7 Cardiac Arrhythmias 185

Daniel H. Cooper and Mitchell N. Faddis

Tachyarrhythmias 185

- Approach to Tachyarrhythmias 185**
- Supraventricular Tachyarrhythmias 188**
- Atrial Fibrillation 191**
- Ventricular Tachyarrhythmias 204**

Bradyarrhythmias 212

Syncope 220

8 Critical Care 225

Catherine Chen, Vladimir Despotovic, and Marin H. Kollef

- Respiratory Failure 225**
- Noninvasive Oxygen Therapy 227**
- Airway Management and Tracheal Intubation 228**
- Mechanical Ventilation 232**
- Shock 239**

9 Obstructive Lung Disease 249

Jeffrey J. Atkinson, Junfang Jiao, and Mario Castro

Chronic Obstructive Pulmonary Disease 249

Asthma 262

10 Pulmonary Diseases 279

Murali Chakinala, Tonya D. Russell, Patrick Aguilar, Adrian Shifren, Andrea Loiselle, Alexander Chen, Ali Sadoughi, Allen Burks, Praveen Chenna, Brad Bemiss, and Daniel B. Rosenbluth

Pulmonary Hypertension 279

Obstructive Sleep Apnea–Hypopnea Syndrome 290

Interstitial Lung Disease 295

Solitary Pulmonary Nodule 304

Pleural Effusion 310

Hemoptysis 318

Cystic Fibrosis 324

11 Allergy and Immunology 332

Sean Brady, Junfang Jiao, Jennifer M. Monroy, and Andrew L. Kau

Adverse Drug Reactions 332

Anaphylaxis 335

Eosinophilia 340

Urticaria and Angioedema 346

Immunodeficiency 350

12 Fluid and Electrolyte Management 354

Anubha Mutneja, Steven Cheng, and Judy L. Jang

Fluid Management and Perturbations in Volume Status 354

The Euvolemic Patient 354

The Hypovolemic Patient 355

The Hypervolemic Patient 357

Disorders of Sodium Concentration 358

Hyponatremia 358

Hypernatremia 363

Potassium 367

Hypokalemia 367

Hyperkalemia 369

Calcium 371

Hypercalcemia 371

Hypocalcemia 374

Phosphorus 376

Hyperphosphatemia 377

Hypophosphatemia 378

Magnesium 379

Hypermagnesemia 379

Hypomagnesemia 380

Acid–Base Disturbances 381

Metabolic Acidosis 384

Metabolic Alkalosis 386

Respiratory Acidosis 387

Respiratory Alkalosis 388

13 Renal Diseases 389

Rajesh Rajan, Seth Goldberg, and Daniel W. Coyne

Evaluation of the Patient with Renal Disease 389**Acute Kidney Injury 391****Glomerulopathies 397****Minimal Change Disease 398****Membranous Nephropathy 399****Focal Segmental Glomerulosclerosis 399****Diabetic Nephropathy 400****Deposition Disorders/Dysproteinemias 400****Membranoproliferative Glomerulonephropathy 401****IgA Nephropathy/Henoch-Schönlein Purpura 402****Postinfectious Glomerulonephropathy 403****Lupus Nephritis 403****Pulmonary–Renal Syndromes 404****Polycystic Kidney Disease 405****Nephrolithiasis 406****Management of Chronic Kidney Disease 407**

Renal Replacement Therapies 411

- Approach to Dialysis 411
- Hemodialysis 412
- Peritoneal Dialysis 413
- Transplantation 415

14 Treatment of Infectious Diseases 416

Allison L. Nazinitsky, Stephen Y. Liang, and Nigar Kirmani

Principles of Therapy 416

Toxin-Mediated Infections 417

- Clostridium difficile* Infection 417
- Tetanus 418

Toxic Shock Syndrome 419

- Staphylococcal Toxic Shock Syndrome 420
- Streptococcal Toxic Shock Syndrome 420

Skin, Soft Tissue, and Bone Infections 420

- Purulent Skin and Soft Tissue Infections (Furuncles, Carbuncles, and Abscesses) 421
- Nonpurulent Skin and Soft Tissue Infections (Erysipelas and Cellulitis) 421
- Erysipelas 421
- Cellulitis 421
- Complicated Skin and Soft Tissue Infections 422
- Infected Decubitus Ulcers and Limb-Threatening Diabetic Foot Ulcers 422
- Necrotizing Fasciitis 422
- Anaerobic Myonecrosis (Gas Gangrene) 423
- Osteomyelitis 423

Central Nervous System Infections 425

- Meningitis 425
- Encephalitis 427
- Brain Abscess 428
- Neurocysticercosis 429

| | |
|--|------------|
| Cardiovascular Infections | 429 |
| Infective Endocarditis | 429 |
| Myocarditis | 434 |
| Pericarditis | 435 |
| Upper Respiratory Tract Infections | 436 |
| Pharyngitis | 436 |
| Epiglottitis | 437 |
| Rhinosinusitis | 437 |
| Influenza Virus Infection | 438 |
| Lower Respiratory Tract Infections | 439 |
| Acute Bronchitis | 439 |
| Community-Acquired Pneumonia | 440 |
| Lung Abscess | 441 |
| Tuberculosis | 442 |
| Gastrointestinal and Abdominal Infections | 445 |
| Peritonitis | 445 |
| Hepatobiliary Infections | 446 |
| Other Infections | 447 |
| Genitourinary Infections | 447 |
| Asymptomatic bacteriuria | 448 |
| Cystitis | 448 |
| Genitourinary Infections in Men | 451 |
| Catheter-Associated Urinary Tract Infection | 451 |
| Pyelonephritis | 452 |
| Systemic Mycoses and Atypicals | 452 |
| Candidiasis | 453 |
| Cryptococcosis | 453 |
| Histoplasmosis | 457 |
| Blastomycosis | 457 |
| Coccidioidomycosis | 457 |
| Aspergillosis | 458 |
| Sporotrichosis | 458 |
| Mucormycosis | 459 |
| Nocardiosis | 459 |
| Actinomycosis | 460 |
| Atypical (Nontuberculous) Mycobacteria | 460 |

| | |
|---|------------|
| Tick-Borne Infections | 460 |
| Lyme Borreliosis (Lyme Disease) | 461 |
| Rocky Mountain Spotted Fever | 461 |
| Ehrlichiosis and Anaplasmosis | 462 |
| Tularemia | 463 |
| Babesiosis | 463 |
| Mosquito-Borne Infections | 464 |
| Arboviral Meningoencephalitis | 464 |
| Malaria | 464 |
| Zoonoses | 465 |
| Cat-Scratch Disease (Bartonellosis) | 466 |
| Leptospirosis | 466 |
| Brucellosis | 467 |
| Bite Wounds | 467 |
| Animal Bites | 467 |
| Human Bites | 468 |
| Health Care–Associated Infections | 468 |
| Catheter-Related Bloodstream Infections | 469 |
| Hospital- and Ventilator-Associated Pneumonia | 470 |
| Methicillin-Resistant <i>Staphylococcus aureus</i> Infections | 471 |
| Vancomycin-Resistant <i>Enterococcus</i> Infections | 471 |
| Multidrug-Resistant Gram-Negative Infections | 471 |
| Emerging Infections and Bioterrorism | 472 |
| Anthrax | 472 |
| Smallpox | 473 |
| Plague | 473 |
| Botulism | 474 |
| Viral Hemorrhagic Fever | 475 |
| Severe Acute Respiratory Syndrome | 476 |
| Middle East Respiratory Syndrome | 476 |
| Pandemic, Avian, and Swine Influenza | 476 |
| Chikungunya | 477 |

15 Antimicrobials 478

David J. Ritchie, Matthew P. Crotty, and Nigar Kirmani

Antibacterial Agents 478

- Penicillins 478
- Cephalosporins 479
- Monobactams 481
- Carbapenems 482
- Aminoglycosides 482
- Vancomycin 484
- Fluoroquinolones 485
- Macrolide and Lincosamide Antibiotics 486
- Sulfonamides and Trimethoprim 487
- Tetracyclines 488

Antimicrobial Agents, Miscellaneous 489

- Colistin and Polymyxin B 489
- Dalbavancin 490
- Daptomycin 490
- Fosfomycin 490
- Oxazolidinones 491
- Metronidazole 492
- Nitrofurantoin 492
- Oritavancin 493
- Quinupristin/Dalfopristin 493
- Telavancin 493
- Tigecycline 494

Antimycobacterial Agents 494

- Isoniazid 494
- Rifamycins 495
- Pyrazinamide 495
- Ethambutol 496
- Streptomycin 496

Antiviral Agents 496

- Anti-Influenza Agents (Neuraminidase Inhibitors) 496
- Antiherpetic Agents 497
- Anticytomegalovirus Agents 497

Antifungal Agents 499

Amphotericin B 499

Azoles 499

Echinocandins 501

Miscellaneous 502

**16 Sexually Transmitted Infections,
Human Immunodeficiency Virus, and
Acquired Immunodeficiency Syndrome 503**

Caline Mattar, Rachel Presti, and Hilary E. L. Reno

Sexually Transmitted Infections, Ulcerative Diseases 503

Genital Herpes 503

Syphilis 503

Chancroid 507

Lymphogranuloma Venereum 507

Sexually Transmitted Infections, Vaginitis, and Vaginosis 508

Trichomoniasis 508

Bacterial Vaginosis 508

Vulvovaginal Candidiasis 508

Cervicitis/Urethritis 509

Pelvic Inflammatory Disease 509

HIV Type 1 510

Opportunistic Infections 518

Associated Neoplasms 524

Kaposi Sarcoma 524

Lymphoma 525

Cervical and Perianal Neoplasias 525

Sexually Transmitted Infections in Patients with HIV 526

Genital Herpes 526

Genital Warts 526

Syphilis 526

Additional Resources 526

17 Solid Organ Transplant Medicine 527

Rupinder Sodhi and Rowena Delos Santos

Solid Organ Transplant Basics 527

Graft Rejection 531

Acute Rejection, Kidney 531

Acute Rejection, Lung 531

Acute Rejection, Heart 532

Acute Rejection, Liver 533

Acute Rejection, Pancreas 533

Chronic Allograft Dysfunction 534

Complications 534

18 Gastrointestinal Diseases 538

C. Prakash Gyawali and Amit Patel

Gastrointestinal Bleeding 538

Dysphagia and Odynophagia 543

Nausea and Vomiting 544

Diarrhea 546

Constipation 548

Luminal Gastrointestinal Disorders 549

Gastroesophageal Reflux Disease 549

Esophageal Motor Disorders 553

Peptic Ulcer Disease 554

Inflammatory Bowel Disease 557

Functional Gastrointestinal Disorders 562

Acute Intestinal Pseudo-Obstruction (Ileus) 564

Pancreatobiliary Disorders 565

Acute Pancreatitis 565

Chronic Pancreatitis 567

Gallstone Disease 569

Other Gastrointestinal Disorders 570

Anorectal Disorders 570

Celiac Sprue 571

Diverticulosis and Diverticulitis 572

Gastroparesis 573

Ischemic Intestinal Injury 574

19 Liver Diseases 576

Maria Samuel, Kristen Singer, and Mauricio Lisker-Melman

Evaluation of Liver Disease 576

Viral Hepatitis 578

Hepatitis A Virus 578

Hepatitis B Virus 581

Hepatitis C 585

Other Hepatitis Viruses 588

Hepatitis D 588

Hepatitis E 589

Drug-Induced Liver Injury 589

Alcoholic Liver Disease 590

Immune-Mediated Liver Diseases 592

Autoimmune Hepatitis 592

Primary Biliary Cirrhosis 594

Primary Sclerosing Cholangitis 595

Complications of Cholestasis 597

Nutritional Deficiencies 597

Osteoporosis 597

Pruritus 598

Metabolic Liver Diseases 598

Hereditary Hemochromatosis 600

α_1 -Antitrypsin Deficiency 601

Miscellaneous Liver Disorders 602

Nonalcoholic Fatty Liver Disease 602

Ischemic Hepatitis 603

Hepatic Vein Thrombosis 604

Portal Vein Thrombosis 605

Fulminant Hepatic Failure 605

Cirrhosis 607

Portal Hypertension 607

Ascites 608

Spontaneous Bacterial Peritonitis 609

Acute Kidney Injury in Patients with Cirrhosis and Hepatorenal Syndrome 610

Hepatic Encephalopathy 612

Hepatocellular Carcinoma 613

Liver Transplantation 614**20 Disorders of Hemostasis and Thrombosis 616**

Kristen M. Sanfilippo, Brian F. Gage, Tzu-Fei Wang, and Roger D. Yusen

Hemostatic Disorders 616

Platelet Disorders 618

Thrombocytopenia 618

Immune Thrombocytopenia 618

Thrombotic Thrombocytopenic Purpura and Hemolytic-Uremic Syndrome 621

Heparin-Induced Thrombocytopenia 622

Posttransfusion Purpura 625

Gestational Thrombocytopenia 625

Thrombocytosis 626

Qualitative Platelet Disorders 627

Inherited Bleeding Disorders 628

Hemophilia A 628

Hemophilia B 629

von Willebrand Disease 630

Acquired Coagulation Disorders 631

Vitamin K Deficiency 631

Liver Disease 632

Disseminated Intravascular Coagulation 632

Acquired Inhibitors of Coagulation Factors 633

Venous Thromboembolic Disorders 634

Approach to Venous Thromboembolism 634

21 Hematologic Disorders and Transfusion Therapy 647

Amy Zhou, Tom Regenbogen, Ronald Jackups, and Morey Blinder

Anemia 647

Anemia Introduction 647

Anemias Associated with Decreased Red Blood Cell Production 649

Iron Deficiency Anemia 649

Thalassemia 652

Sideroblastic Anemias 654

Macrocytic/Megaloblastic Anemia 654

Anemia of Chronic Renal Insufficiency 656

Anemia of Chronic Disease 658

Anemia in Cancer Patients 658

Anemia Associated with HIV Disease 659

Aplastic Anemia 659

Anemias Associated with Increased Red Blood Cell Destruction 661

Anemias Associated with Increased Erythropoiesis 661

Sickle Cell Disease 662

Glucose-6-Phosphate Dehydrogenase Deficiency 665

Autoimmune Hemolytic Anemia 666

Drug-Induced Hemolytic Anemia 667

Microangiopathic Hemolytic Anemia 667

White Blood Cell Disorders 668

Leukocytosis and Leukopenia 668

Platelet Disorders 669

Bone Marrow Disorders 669

Myelodysplastic Syndrome 669

Myeloproliferative Disorders 669

Monoclonal Gammopathies 671

Monoclonal Gammopathy of Unknown Significance 671

Multiple Myeloma 672

Waldenström Macroglobulinemia 672

Amyloidosis 673

Transfusion Medicine 673

22 Cancer 678

Siddhartha Devarakonda, Daniel Morgensztern, and Ramaswamy Govindan

Approach to the Cancer Patient 678

Lung Cancer 683

Breast Cancer 685

Head and Neck Cancer 687

Sarcoma 689

Gastrointestinal Malignancies 690

Esophageal Cancer 690

Gastric Cancer 691

Colorectal Cancer 691

Pancreatic Cancer 693

Hepatocellular Carcinoma 694

Genitourinary Malignancies 695

Renal Cancer 695

Bladder Cancer 696

Prostate Cancer 697

Testicular Cancer and Germ Cell Tumors 698

Gynecologic Malignancies 699

Cervical Cancer 699

Endometrial Cancer 700

Ovarian Cancer 701

Cancer of Unknown Primary 702

Melanoma 702

Central Nervous System Tumors 704

Hematologic Malignancies 705

Myelodysplastic Syndrome 705

Acute Myeloid Leukemia 706

Acute Lymphoblastic Leukemia 709

Chronic Myeloid Leukemia 710

Chronic Lymphocytic Leukemia 711

Hairy Cell Leukemia 712

Hodgkin Lymphoma 713

- Non-Hodgkin Lymphoma 714**
- Multiple Myeloma 717**
- Principles of Stem Cell Transplantation 718**

Oncologic Emergencies 719

- Febrile Neutropenia 719**
- Tumor Lysis Syndrome 722**
- Malignant Hypercalcemia 723**
- Malignant Spinal Cord Compression 723**
- Superior Vena Cava Syndrome 724**
- Hyperleukocytosis with Leukostasis 724**
- Brain Metastases with Increased Intracranial Pressure 725**

Management of Treatment Toxicities 725

- Nausea 725**
- Diarrhea 726**

Supportive Care: Complications of Cancer 726

- Cancer Pain 726**
- Bone Metastasis 727**
- Pleural Effusion 728**
- Fatigue 728**
- Anorexia and Cachexia 729**

23

Diabetes Mellitus and Related Disorders 730

Cynthia J. Herrick and Janet B. McGill

- Diabetes Mellitus 730**
- Diabetes Mellitus in Hospitalized Patients 733**
- Diabetic Ketoacidosis 735**
- Hyperosmolar Hyperglycemic State 738**
- Type 1 Diabetes 739**
- Type 2 Diabetes 742**

Chronic Complications of Diabetes Mellitus 748

- Diabetic Retinopathy 749**
- Diabetic Nephropathy 750**
- Diabetic Neuropathy 751**

Macrovascular Complications of Diabetes Mellitus 752

Coronary Heart Disease 752

Peripheral Vascular Disease 753

Miscellaneous Complications 754

Erectile Dysfunction 754

Hypoglycemia 755

24 Endocrine Diseases 758

William E. Clutter

Disorders of the Thyroid Gland 758

Evaluation of Thyroid Function 758

Hypothyroidism 760

Hyperthyroidism 762

Euthyroid Goiter and Thyroid Nodules 766

Disorders of Adrenal Function 767

Adrenal Failure 767

Cushing Syndrome 769

Incidental Adrenal Nodules 770

Disorders of Anterior Pituitary Function 771

Hypopituitarism 773

Hyperprolactinemia 774

Acromegaly 775

Metabolic Bone Disease 776

Osteomalacia 776

Paget Disease 777

25 Arthritis and Rheumatologic Diseases 779

Zarmeena Ali, María González-Mayda, and Tiphonie Vogel

Basic Approach to the Rheumatic Diseases 779

Infectious Arthritis and Bursitis 782

Septic Bursitis 784

Lyme Disease 784

Crystal-Induced Synovitis 785

Rheumatoid Arthritis 788

Osteoarthritis 794
Spondyloarthropathies 795
Ankylosing Spondylitis 795
Arthritis of Inflammatory Bowel Disease 796
Reactive Arthritis 796
Psoriatic Arthritis 797
Systemic Lupus Erythematosus 798
Systemic Sclerosis 800
Raynaud Phenomenon 802
Necrotizing Vasculitis 802
Polymyalgia Rheumatica 803
Cryoglobulin Syndromes 806
Polymyositis and Dermatomyositis 806

26 Medical Emergencies 808

Rebecca Bavolek, Evan Schwarz, and Jason Wagner

Airway Emergencies 808

Emergent Airway Management 808
Emergent Airway Adjuncts 808
Pneumothorax 809

Heat-Induced Injury 812

Heat Exhaustion 812
Heat Syncope 812
Heat Stroke 813

Cold-Induced Illness 815

Chilblains 815
Immersion Injury (Trench Foot) 815
Frostnip (Superficial Frostbite) 815
Deep Frostbite 816
Hypothermia 816

Overdoses 819

Overdose, General 819
Acetaminophen 820
Opioids 821
Salicylates 822



27 Neurologic Disorders 824

Robert C. Bucelli and Beau M. Ances

Alterations in Consciousness 824

Alzheimer Disease 830

Seizures 832

Multiple Sclerosis 838

Cerebrovascular Disease 839

Headache 849

Head Trauma 852

Acute Spinal Cord Dysfunction 854

Parkinson Disease 857

Neuromuscular Disease 859

Guillain-Barré Syndrome 859

Myasthenia Gravis 863

Other Neuromuscular Disorders 866

Neuromuscular Disorders with Rigidity 867



28 Toxicology 869

S. Eliza Halcomb, Evan Schwarz, and Michael E. Mullins

Overdoses 869

Overdose, General 869

Acetaminophen 873

Colchicine 877

Nonsteroidal Anti-Inflammatory Drugs 879

Opioids 880

Salicylates 881

Anticonvulsants 884

Phenytoin and Fosphenytoin 884

Carbamazepine/Oxcarbazepine 886

Lamotrigine 887

Levetiracetam 888

Valproic Acid 888

Antidepressants 889

Monoamine Oxidase Inhibitors 889

Tricyclic Antidepressants 892