

# CONTENTS

## SECTION I Introduction to Medicine

### 1 Introduction to Medicine, 2

Edward J. Wing, Fred J. Schiffman

## SECTION II Cardiovascular Disease

### 2 Structure and Function of the Normal Heart and Blood Vessels, 4

Nicole L. Lohr, Ivor J. Benjamin

### 3 Evaluation of the Patient With Cardiovascular Disease, 10

James Kleczka, Noura M. Dabbouseh

### 4 Diagnostic Tests and Procedures in the Patient With Cardiovascular Disease, 24

Esseim Sharma, Alan R. Morrison

### 5 Heart Failure and Cardiomyopathy, 43

Daniel J. Levine, Hyeon-Ju Ryoo Ali, Rayan Yousefzai

### 6 Congenital Heart Disease, 55

Scott Cohen, Michael G. Earing

### 7 Valvular Heart Disease, 64

Christopher Song

### 8 Coronary Heart Disease, 77

David E. Lewandowski, Michael P. Cinequegrani

### 9 Cardiac Arrhythmias, 99

Marcie G. Berger, Jason C. Rubenstein, James A. Roth

### 10 Pericardial and Myocardial Disease, 123

Jennifer L. Strande

### 11 Other Cardiac Topics, 131

Jennette Dawn Abbott, Sena Kilic

### 12 Vascular Diseases and Hypertension, 139

Thomas Sperry, Wanpen Vongpatanasin

## SECTION III Pulmonary and Critical Care Medicine

### 13 Lung in Health and Disease, 162

Sharon Rounds, Debasree Banerjee, Eric J. Gartman

### 14 General Approach to Patients With Respiratory Disorders, 165

Michael Raymond Goggins, Brian Casserly, Eric J. Gartman

### 15 Evaluating Lung Structure and Function, 169

Patrick Koo, F. Dennis McCool, Jigme Michael Sethi

### 16 Obstructive Lung Diseases, 185

Zoe G.S. Vazquez, Matthew D. Jankowich, Debasree Banerjee

### 17 Interstitial Lung Diseases, 199

Abhinav Kumar Misra, Matthew D. Jankowich, Barry S. Shea

### 18 Pulmonary Vascular Diseases, 216

Christopher J. Mullin, James R. Klinger

### 19 Disorders of the Pleura, Mediastinum, and Chest Wall, 221

Eric J. Gartman, F. Dennis McCool

### 20 Respiratory Failure, 227

Andrew E. Foderaro, Abhinav Kumar Misra

### 21 Transitions in Care From Pediatric to Adult Providers for Individuals With Pulmonary Disease, 234

Kate E. Powers, Debasree Banerjee, Robin L. McKinney

## SECTION IV Preoperative and Postoperative Care

### 22 Preoperative and Postoperative Care, 240

Kim A. Eagle, Kwame Dapaah-Afriyie, Arkadiy Finn

## SECTION V Renal Disease

### 23 Renal Structure and Function, 251

Orson W. Moe, Javier A. Neyra

### 24 Approach to the Patient With Renal Disease, 258

Rajiv Agarwal

### 25 Fluid and Electrolyte Disorders, 268

Biff F. Palmer

### 26 Glomerular Diseases, 282

Sanjeev Sethi, An S. De Vries, Fernando C. Fervenza

### 27 Major Nonglomerular Disorders of the Kidney, 298

Nilum Rajora, Shani Shastri, Pooja Koolwal, Ramesh Saxena

### 28 Vascular Disorders of the Kidney, 312

Abdallah Geara, Jeffrey S. Berns

### 29 Acute Kidney Injury, 324

Mark A. Perazella, Jeffrey M. Turner

### 30 Chronic Kidney Disease, 334

T. Alp Ikizler, Anna Marie Burgner, Beatrice P. Concepcion

## SECTION VI Gastrointestinal Disease

### 31 Common Clinical Manifestations of Gastrointestinal Disease: Abdominal Pain, 343

Charles M. Bliss, Jr.

### 32 Common Clinical Manifestations of Gastrointestinal Disease: Gastrointestinal Hemorrhage, 347

Waihong Chung, Abbas Rupawala

### 33 Common Clinical Manifestations of Gastrointestinal Disease: Malabsorption, 351

Brisas M. Flores, Sharneel K. Wasan

### 34 Common Clinical Manifestations of Gastrointestinal Disease: Diarrhea, 358

Ronan Farrell, Sean Fine

### 35 Endoscopic and Imaging Procedures, 363

Andrew Canakis, Christopher S. Huang

### 36 Esophageal Disorders, 370

Harlan Rich, Zilla Hussain, Neal D. Dharmadhikari

### 37 Diseases of the Stomach and Duodenum, 379

Alma M. Guerrero Bready, Akwi W. Asombang, Steven F. Moss

### 38 Inflammatory Bowel Disease, 392

Talha A. Malik, Michael F. Picco, Francis A. Farrye

### 39 Diseases of the Pancreas, 402

David R. Lichtenstein, Pushpak Taunk

## SECTION VII Diseases of the Liver and Biliary System

### 40 Laboratory Tests in Liver Diseases, 417

Michael B. Fallon, Ester Little

### 41 Jaundice, 420

Mohanad T. Al-Qaisi, Mashal Batheja, Michael B. Fallon

- 42 Acute and Chronic Hepatitis, 426**  
Nayan M. Patel, Jen Jung Pan, Michael B. Fallon
- 43 Acute Liver Failure, 434**  
Anil Seetharam, Michael B. Fallon
- 44 Cirrhosis of the Liver and Its Complications, 437**  
Shivang Mehta, Michael B. Fallon
- 45 Disorders of the Gallbladder and Biliary Tract, 448**  
Stacie A. F. Vela, Michael B. Fallon

## SECTION VIII Hematologic Disease

- 46 Hematopoiesis and Hematopoietic Failure, 457**  
Eunice S. Wang, Nancy Berliner
- 47 Clonal Disorders of the Hematopoietic Stem Cell, 470**  
Eunice S. Wang, Nancy Berliner
- 48 Disorders of Red Blood Cells, 489**  
Ellice Wong, Michal G. Rose, Nancy Berliner
- 49 Clinical Disorders of Granulocytes and Monocytes, 501**  
Ellice Wong, Michal G. Rose, Nancy Berliner
- 50 Disorders of Lymphocytes, 506**  
Iris Isufi, Stuart Seropian
- 51 Normal Hemostasis, 522**  
Lauren Shevell, Alfred I. Lee
- 52 Disorders of Hemostasis: Bleeding, 530**  
Aric Parnes
- 53 Disorders of Hemostasis: Thrombosis, 550**  
Rebecca Zon, Nathan T. Connell

## SECTION IX Oncologic Disease

- 54 Cancer Biology, 563**  
Andre De Souza, Wafik S. El-Deiry
- 55 Cancer Epidemiology, 571**  
Gary H. Lyman, Nicole M. Kuderer
- 56 Principles of Cancer Therapy, 577**  
Davendra P.S. Sohal, Alok A. Khorana
- 57 Lung Cancer, 583**  
Zoe G.S. Vazquez, Jason M. Aliotta, Christopher G. Azzoli
- 58 Gastrointestinal Cancers, 589**  
Khaldoun Almhana
- 59 Genitourinary Cancers, 595**  
Andre De Souza, Benedito A. Carneiro, Anthony Mega, Timothy Gilligan
- 60 Breast Cancer, 601**  
Mary Anne Fenton, Rochelle Strenger
- 61 Gynecological Cancer, 607**  
Christina Bandera, Tarra B. Evans, Don Dizon
- 62 Other Solid Tumors (Head and Neck, Sarcomas, Melanoma, Unknown Primary), 615**  
Christopher G. Azzoli, Ariel E. Birnbaum, Maria Constantinou, Thomas A. Ollila
- 63 Complications of Cancer and Cancer Treatment, 620**  
Pamela Egan, Ari Pelcovits, John Reagan

## SECTION X Endocrine Disease and Metabolic Disease

- 64 Hypothalamic-Pituitary Axis, 626**  
Diana Maas, Jenna Sarvaideo
- 65 Thyroid Gland, 635**  
Theodore C. Friedman

- 66 Adrenal Gland, 645**  
Theodore C. Friedman
- 67 Male Reproductive Endocrinology, 657**  
Glenn D. Braunstein
- 68 Diabetes Mellitus, Hypoglycemia, 662**  
Robert J. Smith
- 69 Obesity, 678**  
Osama Hamdy, Marwa Al-Badri
- 70 Malnutrition, Nutritional Assessment, and Nutritional Support in Adult Patients, 686**  
Thomas R. Ziegler
- 71 Disorders of Lipid Metabolism, 692**  
Russell Bratman, Geetha Gopalakrishnan

## SECTION XI Women's Health

- 72 Women's Health Topics, 701**  
Vidya Gopinath, Yael Tarshish, Kelly McGarry

## SECTION XII Men's Health

- 73 Men's Health Topics, 714**  
Niels V. Johnsen, Douglas F. Milam, Joseph A. Smith, Jr.

## SECTION XIII Diseases of Bone and Bone Mineral Metabolism

- 74 Normal Physiology of Bone and Mineral Homeostasis, 729**  
Clemens Bergwitz, John J. Wysolmerski
- 75 Disorders of Serum Minerals, 739**  
Emily M. Stein, Yi Liu, Elizabeth Shane
- 76 Metabolic Bone Diseases, 748**  
Marcella D. Walker, Thomas J. Weber
- 77 Osteoporosis, 757**  
Susan L. Greenspan, Mary P. Kotlarczyk

## SECTION XIV Musculoskeletal and Connective Tissue Disease

- 78 Approach to the Patient With Rheumatic Disease, 767**  
Niveditha Mohan
- 79 Rheumatoid Arthritis, 771**  
Larry W. Moreland, Rayford R. June
- 80 Spondyloarthritis, 778**  
Douglas W. Lienesch
- 81 Systemic Lupus Erythematosus, 783**  
Sonia Manocha, Tanmayee Bichile, Susan Manzi
- 82 Systemic Sclerosis, 794**  
Anna Papazoglou, Robyn T. Domsic
- 83 Systemic Vasculitis, 801**  
Kimberly P. Liang, Kelly V. Liang
- 84 Crystal Arthropathies, 807**  
Pooja Bhadbhade, Ghaith Noaiseh
- 85 Osteoarthritis, 813**  
Joanne S. Cunha, Zuhal Arzomand, Philip Tsoukas
- 86 Nonarticular Soft Tissue Disorders, 818**  
Niveditha Mohan
- 87 Rheumatic Manifestations of Systemic Disorders and Sjögren's Syndrome, 822**  
Andreea Coca, Ghaith Noaiseh

## SECTION XV Infectious Disease

- 88 Host Defenses Against Infection, 830**  
*Richard Bungiro, Edward J. Wing*
- 89 Laboratory Diagnosis of Infectious Diseases, 842**  
*Kimberle Chapin*
- 90 Fever and Febrile Syndromes, 848**  
*Maria D. Mileno*
- 91 Bacteremia and Sepsis, 858**  
*Russell J. McCulloh, Steven M. Opal*
- 92 Infections of the Central Nervous System, 865**  
*Su N. Aung, Allan R. Tunkel*
- 93 Infections of the Head and Neck, 882**  
*David Kim, Roberto Cortez, Tareq Kheirbek*
- 94 Infections of the Lower Respiratory Tract, 887**  
*John R. Lonks, Edward J. Wing*
- 95 Infections of the Heart and Blood Vessels, 895**  
*Raul Macias Gil, Cheston B. Cunha*
- 96 Acute Bacterial Skin and Skin Structure Infections, 903**  
*Sajeet Handa*
- 97 Intraabdominal Infections, 910**  
*Eric Benoit*
- 98 Infectious Diarrhea, 916**  
*Anewura Kwara*
- 99 Infections Involving Bone and Joints, 922**  
*Jerome Larkin*
- 100 Urinary Tract Infections, 925**  
*Abdullah Chahin, Steven M. Opal*
- 101 Health Care–Associated Infections, 929**  
*Paul G. Jacob, Thomas R. Talbot*
- 102 Sexually Transmitted Infections, 935**  
*Philip A. Chan, Susan Cu-Uvin*
- 103 Human Immunodeficiency Virus Infection, 944**  
*Joseph Metmowlee Garland, Timothy Flanigan, Edward J. Wing*
- 104 Infections in the Immunocompromised Host, 963**  
*Dimitrios Farmakiotis, Ralph Rogers*
- 105 Infectious Diseases of Travelers: Protozoal and Helminthic Infections, 973**  
*Jessica E. Johnson, Rebecca Reece*

## SECTION XVI Neurologic Disease

- 106 Neurologic Evaluation of the Patient, 981**  
*Frederick J. Marshall*
- 107 Disorders of Consciousness, 986**  
*Leah Dickstein, Paul M. Vespa*
- 108 Disorders of Sleep, 992**  
*Sagarika Nallu, Selim R. Benbadis*
- 109 Cortical Syndromes, 997**  
*Sinéad M. Murphy, Timothy J. Counihan*
- 110 Dementia and Memory Disturbances, 1001**  
*Frederick J. Marshall*
- 111 Major Disorders of Mood, Thoughts, and Behavior, 1007**  
*Jeffrey M. Lyness, Jennifer H. Richman*

## 112 Autonomic Nervous System Disorders, 1013

*William P. Cheshire, Jr.*

## 113 Headache, Neck and Back Pain, and Cranial Neuralgias, 1017

*Shane Lyons, Timothy J. Counihan*

## 114 Disorders of Vision and Hearing, 1025

*Eavan Mc Govern, Timothy J. Counihan*

## 115 Dizziness and Vertigo, 1033

*Jonathan Cahill*

## 116 Disorders of the Motor System, 1037

*Ruth B. Schneider, Adolfo Ramirez-Zamora, Christopher G. Tarolli*

## 117 Congenital, Developmental, and Neurocutaneous Disorders, 1048

*Kristin A. Seaborg, Jennifer M. Kwon*

## 118 Cerebrovascular Disease, 1056

*Mitchell S. V. Ekind*

## 119 Traumatic Brain Injury and Spinal Cord Injury, 1069

*Geoffrey S.F. Ling, Jeffrey J. Bazarian*

## 120 Epilepsy, 1073

*Andrew S. Blum*

## 121 Central Nervous System Tumors, 1087

*Bryan J. Bonder, Lisa R. Rogers*

## 122 Demyelinating and Inflammatory Disorders, 1092

*Anne Haney Cross*

## 123 Neuromuscular Diseases: Disorders of the Motor Neuron and Plexus and Peripheral Nerve Disease, 1101

*Carlayne E. Jackson, Ratna Bhavaraju-Sanka*

## 124 Muscle Diseases, 1111

*Johanna Hamel, Jeffrey M. Statland*

## 125 Neuromuscular Junction Disease, 1122

*Emma Cifaloni*

## SECTION XVII Geriatrics

### 126 The Aging Patient, 1126

*Laura A. Previll, Mitchell T. Heflin, Harvey Jay Cohen*

## SECTION XVIII Palliative Care

### 127 Palliative Care, 1141

*Brandon J. Wilcoxson, Erin M. Denney-Koelsch, Robert G. Holloway*

## SECTION XIX Alcohol and Substance Use

### 128 Alcohol and Substance Use, 1151

*Richard A. Lange, Joaquin E. Cigarroa*

## APPENDIX Coronavirus Disease 2019 (COVID-19), 1166

*Edward J. Wing*

Index, 1174

# VIDEO CONTENTS

## 3 Evaluation of the Patient With Cardiovascular Disease

*James Kleczka, Noura M. Dabbouseh*

**Audio 3.1: Ebstein Abnormalities**

**Audio 3.2: Mitral Valve Prolapse**

## 4 Diagnostic Tests and Procedures in the Patient With Cardiovascular Disease

*Eman Sharma, Alan R. Morrison*

**Video 4.1: 3D Echocardiographic Imaging**

**Video 4.2: Color Doppler Imaging**

**Video 4.3: Dynamic Contrast Echocardiographic Image**

**Video 4.4: Transesophageal Echocardiography**

**Video 4.5: Cardiac Single-Photon Emission Computed Tomography Imaging**

**Video 4.6: Dynamic Cardiac MRI Image**

**Video 4.7: ECG-Gated Dynamic CT Imaging**

## 35 Endoscopic and Imaging Procedures

*Andrew Canakis, Christopher S. Huang*

**Video 35.1: Capsule Endoscopy of the Normal Small Intestine**

**Video 35.2: Capsule Endoscopy Video of an Actively Bleeding Vascular Ectasia**

**Video 35.3: Capsule Endoscopy Image and Video of an Ulcerated Small Intestinal Tumor**

## 37 Diseases of the Stomach and Duodenum

*Alma M. Guerrero Bready, Akwi W. Asombang, Steven F. Moss*

**Video 37.1: Esophagastroduodenoscopy (EGD)**

## 39 Diseases of the Pancreas

*David R. Lichtenstein, Pushpak Taunk*

**Video 39.1: ERCP for Gallstone Pancreatitis With Sphincterotomy and Common Bile Duct Stone Extraction**

## 45 Disorders of the Gallbladder and Biliary Tract

*Stacie A. F. Vela, Michael B. Fallon*

**Video 45.1: Endoscopic Ultrasound of Large Gallbladder Stone**

**Video 45.2: Sphincterotomy**

## 65 Thyroid Gland

*Theodore C. Friedman*

**Video 65.1: Thyroid Examination**

## 115 Dizziness and Vertigo

*Jonathan Cahill*

**Video 115.1: Gaze-Evoked Nystagmus**

**Video 115.2: Unidirectional, Peripheral Vestibular Spontaneous Pattern of Nystagmus**

**Video 115.3: Nystagmus of Posterior Canal Benign Paroxysmal Positional Vertigo**