

# Contents

## SECTION 1 Introduction to Ultrasonography

### 1 Point-of-Care for Critical Care Ultrasonography 2

Paul H. Mayo, Seth J. Koenig, and Gisela I. Banauch

## SECTION 2 Neurological Procedures

### 2 Neurologic Multimodal Monitoring 9

Raphael A. Carandang, Susanne Muehlschlegel, Wiley R. Hall, and Craig M. Lilly

### 3 Cerebrospinal Fluid Aspiration 38

Firas Kaddouh, Gisela I. Banauch, Susanne Muehlschlegel, Paul H. Mayo, and John P. Weaver

## SECTION 3 Airway and Respiratory Procedures

### 4 Airway Management and Endotracheal Intubation 55

J. Matthias Walz and Stephen O. Heard

### 5 Tracheostomy 85

Christine L. Bielick, Scott E. Kopec, Timothy A. Ernhoff, Paul H. Mayo, and Seth J. Koenig

### 6 Lung Ultrasonography 102

Pierre Kory, Navitha Ramesh, Paul H. Mayo, Seth J. Koenig, and Craig M. Lilly

### 7 Thoracentesis 115

Gisela I. Banauch, Seth J. Koenig, Paul H. Mayo, Mark M. Wilson, Richard S. Irwin, and Craig M. Lilly

### 8 Chest Tube Insertion and Care 129

Ulises Torres, Joshua Scurllock, and Seth J. Koenig

### 9 Discontinuation of Mechanical Ventilation 143

Nicholas A. Smyrniotis, Richard S. Irwin, and Rolf D. Hubmayr

## SECTION 4 Cardiac Procedures

### 10 Echocardiography for the Evaluation of Shock and Cardiac Arrest 161

Bruce Greenberg, Abduljabbar A. Dheyab, Paul H. Mayo, and Seth J. Koenig

### 11 Critical Care Echocardiography 188

Brian Buchanan, Robert Arntfield, and Paul H. Mayo

### 12 Resuscitation From Shock Following Hemorrhage 199

Jacob A. Quick, Donald H. Jenkins, John B. Holcomb, Stephen L. Barnes, and Seth J. Koenig

### 13 Mechanical Complications of Myocardial Infarction 220

Christos Galatas, Annabel A. Chen-Tournoux, and Seth J. Koenig

### 14 Pericardiocentesis 232

Peeyush Grover, Craig S. Smith, Paul H. Mayo, and Seth J. Koenig

## Contents

- 15 Temporary Cardiac Pacing 248**  
Brendan Merchant, Seth T. Dahlberg, and Seth J. Koenig
- 16 Pulmonary Artery Catheters 258**  
Harvey S. Reich
- 17 Management of Implantable Pacemakers, Defibrillators, and Cardiac Resynchronization Devices and Cardiac Devices in the ICU 285**  
Melanie Maytin

## SECTION 5 Vascular and Hematological Procedures

- 18 Arterial Line Placement and Care 303**  
Michael Hill, Carlos Martinez-Balzano, and Scott E. Kopec
- 19 Central Venous Catheters 320**  
Andrew H. Moraco, Scott E. Kopec, and Craig M. Lilly
- 20 Venous Thromboembolism and Associated Prothrombotic Disorders in the Intensive Care Unit 343**  
Eric Christenson, Abduljabbar A. Dheyab, and Seth J. Koenig
- 21 Therapeutic Apheresis: Technical Considerations and Indications in Critical Care 385**  
Laura S. Connelly-Smith, Theresa A. Nester, Michael Hill, Ari Nalbandian, and Craig M. Lilly

## SECTION 6 Gastrointestinal and Abdominal Procedures

- 22 Endoscopic Placement of Feeding Tubes 402**  
Lena M. Napolitano
- 23 Gastrointestinal Endoscopy 412**  
Samuel Y. Han, Randall S. Pellish, David R. Cave, and Wahid Y. Wassef
- 24 Gastroesophageal Balloon Tamponade for Acute Variceal Hemorrhage 424**  
Marie T. Pavini, Juan Carlos Puyana, and Paul H. Mayo
- 25 Paracentesis and Diagnostic Peritoneal Lavage 433**  
Lena M. Napolitano, Paul H. Mayo, and Seth J. Koenig
- 26 Ultrasound-Guided Procedures in the ICU 447**  
Abhinav Agrawal, Vivek Murthy, and Seth J. Koenig

## SECTION 7 Genitourinary Procedures

- 27 Renal Replacement Therapy in the ICU 456**  
Ari Nalbandian, Matthew Joseph Trainor, Matthew Niemi, Pang-Yen Fan, Michael Hill, and Craig M. Lilly
- 28 Ultrasonography for the Evaluation of the Urinary System 477**  
Paul H. Mayo and Seth J. Koenig

## SECTION 8 Peripheral Procedures

- 29 Aspiration of the Knee and Synovial Fluid Analysis 484**  
Padmanaidu Karnam, Bonnie J. Bidinger, and Deborah M. Demarco

**SECTION 9 Patient Comfort During Procedures**

**30 Anesthesia for Bedside Procedures 494**

Mark Dershwitz

**31 Therapeutic Paralysis 506**

Khaldoun Faris

**Index 517**