

a LANGE medical book

**Morgan & Mikhail's**

# Clinical Anesthesiology

F I F T H E D I T I O N

## **John F. Butterworth IV, MD**

*Professor and Chairman  
Department of Anesthesiology  
Virginia Commonwealth University School of Medicine  
VCU Health System  
Richmond, Virginia*

## **David C. Mackey, MD**

*Professor  
Department of Anesthesiology and Perioperative Medicine  
University of Texas M.D. Anderson Cancer Center  
Houston, Texas*

## **John D. Wasnick, MD, MPH**

*Steven L. Berk Endowed Chair for Excellence in Medicine  
Professor and Chair  
Department of Anesthesia  
Texas Tech University Health Sciences Center  
School of Medicine  
Lubbock, Texas*



Medical

New York Chicago San Francisco Lisbon London Madrid Mexico City  
Milan New Delhi San Juan Seoul Singapore Sydney Toronto

# Contents

Chapter Authors v | Contributors vii  
Research and Review ix | Foreword xi | Preface xiii

## 1 The Practice of Anesthesiology 1

### SECTION I

## Anesthetic Equipment & Monitors

### 2 The Operating Room Environment 9

*Charles E. Cowles, MD*

### 3 Breathing Systems 29

### 4 The Anesthesia Machine 43

### 5 Cardiovascular Monitoring 87

### 6 Noncardiovascular Monitoring 123

### SECTION II

## Clinical Pharmacology

### 7 Pharmacological Principles 143

### 8 Inhalation Anesthetics 153

### 9 Intravenous Anesthetics 175

### 10 Analgesic Agents 189

### 11 Neuromuscular Blocking Agents 199

### 12 Cholinesterase Inhibitors & Other Pharmacologic Antagonists to Neuromuscular Blocking Agents 223

### 13 Anticholinergic Drugs 233

### 14 Adrenergic Agonists & Antagonists 239

### 15 Hypotensive Agents 255

### 16 Local Anesthetics 263

### 17 Adjuncts to Anesthesia 277

### SECTION III

## Anesthetic Management

### 18 Preoperative Assessment, Premedication, & Perioperative Documentation 295

### 19 Airway Management 309

### 20 Cardiovascular Physiology & Anesthesia 343

### 21 Anesthesia for Patients with Cardiovascular Disease 375

### 22 Anesthesia for Cardiovascular Surgery 435

### 23 Respiratory Physiology & Anesthesia 487

### 24 Anesthesia for Patients with Respiratory Disease 527

### 25 Anesthesia for Thoracic Surgery 545

### 26 Neurophysiology & Anesthesia 575

### 27 Anesthesia for Neurosurgery 593

### 28 Anesthesia for Patients with Neurologic & Psychiatric Diseases 613

- 29 Renal Physiology & Anesthesia 631**
- 30 Anesthesia for Patients with Kidney Disease 653**
- 31 Anesthesia for Genitourinary Surgery 671**
- 32 Hepatic Physiology & Anesthesia 691**  
*Michael Ramsay, MD, FRCA*
- 33 Anesthesia for Patients with Liver Disease 707**  
*Michael Ramsay, MD, FRCA*
- 34 Anesthesia for Patients with Endocrine Disease 727**
- 35 Anesthesia for Patients with Neuromuscular Disease 747**
- 36 Anesthesia for Ophthalmic Surgery 759**
- 37 Anesthesia for Otorhinolaryngologic Surgery 773**
- 38 Anesthesia for Orthopedic Surgery 789**  
*Edward R. Mariano, MD, MAS*
- 39 Anesthesia for Trauma & Emergency Surgery 805**  
*Brian P. McGlinch, MD*
- 40 Maternal & Fetal Physiology & Anesthesia 825**  
*Michael A. Frölich, MD, MS*
- 41 Obstetric Anesthesia 843**  
*Michael A. Frölich, MD, MS*
- 42 Pediatric Anesthesia 877**
- 43 Geriatric Anesthesia 907**
- 44 Ambulatory, Nonoperating Room, & Office-Based Anesthesia 919**

## SECTION IV

## Regional Anesthesia & Pain Management

- 45 Spinal, Epidural, & Caudal Blocks 937**
- 46 Peripheral Nerve Blocks 975**  
*Sarah J. Madison, MD and Brian M. Ilfeld, MD, MS*
- 47 Chronic Pain Management 1023**  
*Richard W. Rosenquist, MD and Bruce M. Vrooman, MD*
- 48 Perioperative Pain Management & Enhanced Outcomes 1087**  
*Francesco Carli, MD, MPhil and Gabriele Baldini, MD, MSc*

## SECTION V

## Perioperative & Critical Care Medicine

- 49 Management of Patients with Fluid & Electrolyte Disturbances 1107**
- 50 Acid-Base Management 1141**
- 51 Fluid Management & Blood Component Therapy 1161**
- 52 Thermoregulation, Hypothermia, & Malignant Hyperthermia 1183**
- 53 Nutrition in Perioperative & Critical Care 1193**
- 54 Anesthetic Complications 1199**
- 55 Cardiopulmonary Resuscitation 1231**  
*Martin Giesecke, MD and Srikanth Hosur, MBBS, MD*
- 56 Postanesthesia Care 1257**
- 57 Critical Care 1277**
- 58 Safety, Quality, & Performance Improvement 1325**