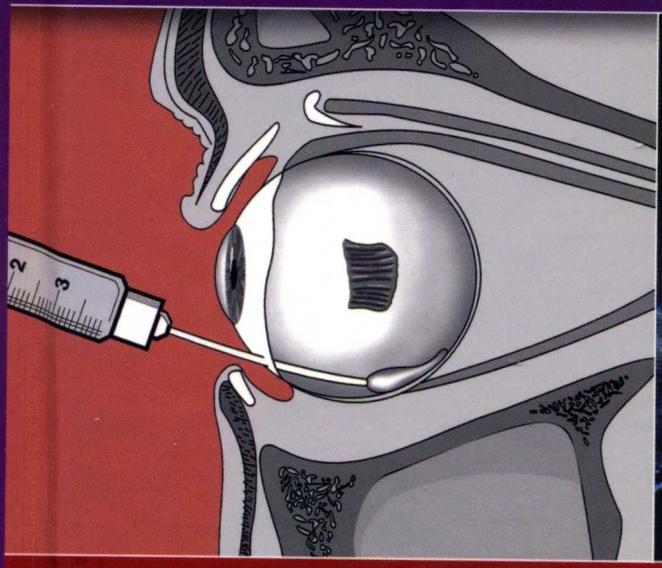
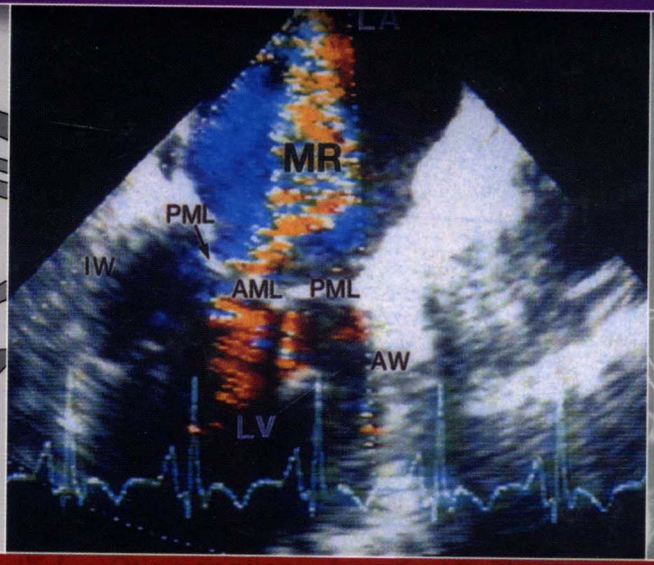
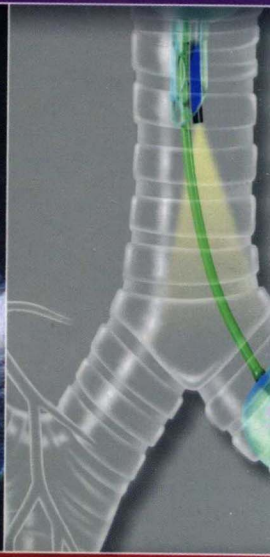
Clinical Anesthesia

Paul G. Barash • Bruce F. Cullen • Robert K. Stoelting







Fifth Edition

LIPPINCOTT WILLIAMS & WILKINS

CLINICAL ANESTHESIA

FIFTH EDITION

Edited By

Paul G. Barash, MD

Professor, Department of Anesthesiology
Yale University School of Medicine
Attending Anesthesiologist
Yale–New Haven Hospital
New Haven, Connecticut

Bruce F. Cullen, MD

Professor, Department of Anesthesiology
University of Washington School of Medicine
Attending Anesthesiologist
Harborview Medical Center
Seattle, Washington

Robert K. Stoelting, MD

Emeritus Professor and Chair, Department of Anesthesia
Indiana University School of Medicine
Indianapolis, Indiana

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THIS EDITION OF CLINICAL ANESTHESIA IS DEDICATED TO THE MEMORY AND SPIRIT OF DANIEL BERNARD BARASH

CONTRIBUTING AUTHORS

Stephen E. Abram, MD
Professor
Department of Anesthesiology
Medical College of Wisconsin
Staff Anesthesiologist
Froedtert Memorial Hospital
Milwaukee, Wisconsin

J. Jeffrey Andrews, MD
Professor and Vice-Chair for Education
Department of Anesthesiology
University of Alabama School of Medicine
Birmingham, Alabama

Douglas R. Bacon, MD, MA
Professor of Anesthesiology and Medical History
Mayo Clinic College of Medicine
Consultant Anesthesiologist
Mayo Clinic
Rochester, Minnesota

Robert L. Barkin, MBA, PharmD, FCP
Rush University Medical College
Clinical Pharmacologist
Rush Pain Center
Chicago, Illinois
Clinical Pharmacologist
The Rush North Shore Pain Center
Skokie, Illinois

Audrée A. Bendo, MD
Professor and Vice Chair for Education
Department of Anesthesiology
State University of New York
Downstate Medical Center
Brooklyn, New York

Christopher M. Bernards, MD
Virginia Mason Medical Center
Clinical Professor
Department of Anesthesiology
University of Washington
Staff Anesthesiologist
Seattle, Washington

Arnold J. Berry, MD, MPH
Professor
Department of Anesthesiology
Emory University
Staff Anesthesiologist
Emory University Hospital
Atlanta, Georgia

Frederic A. Berry, MD
Professor Emeritus of Pediatrics and Anesthesiology
Department of Anesthesiology
The University of Virginia
Charlottesville, Virginia

David R. Bevan, MB
Professor and Chair
Department of Anesthesia
University of Toronto
Anesthesiologist-in-Chief
University Health Network
Toronto, Ontario, Canada

Barbara W. Brandom, MD
Professor
Department of Anesthesiology
University of Pittsburgh
Attending Physician
Department of Anesthesiology
Children's Hospital of Pittsburgh
Pittsburgh, Pennsylvania

Ferne R. Braverman, MD
Professor
Department of Anesthesiology
Director, Section of Obstetric Anesthesiology
Yale University School of Medicine
New Haven, Connecticut

Russell C. Brockwell, MD
Associate Professor
University of Alabama School of Medicine
Chief of Anesthesiology Birmingham Veterans Affairs Medical Center
Birmingham, Alabama

Levon M. Capan, MD
Professor of Anesthesiology
Department of Anesthesiology
New York University School of Medicine
Associate Director
Department of Anesthesiology
Bellevue Hospital Center
New York, New York

Barbara A. Castro, MD
Associate Professor of Anesthesiology and Pediatrics
University of Virginia School of Medicine
University of Virginia Health System
Charlottesville, Virginia

Frederick W. Cheney, Jr., MD
Professor and Chair
Department of Anesthesiology
University of Washington School of Medicine
Attending Anesthesiologist
University of Washington Medical Center
Seattle, Washington

Barbara A. Coda, MD
Clinical Associate Professor
Department of Anesthesiology
University of Washington School of Medicine
Seattle, Washington
Staff Anesthesiologist
McKenzie Anesthesia Group
McKenzie-Willamette Hospital
Springfield, Oregon

Edmond Cohen, MD
Professor of Anesthesiology
The Mount Sinai School of Medicine
Director of Thoracic Anesthesia
The Mount Sinai Medical Center
New York, New York

James E. Cottrell, MD
Professor and Chairman
Department of Anesthesiology
State University of New York
Downstate Medical Center
Brooklyn, New York

Joseph P. Cravero, MD
Associate Professor of Anesthesiology
Dartmouth Hitchcock Medical Center
Lebanon, New Hampshire

C. Michael Crowder, MD, PhD
Associate Professor of Anesthesiology and Molecular Biology/Pharmacology
Washington University School of Medicine
Attending Anesthesiologist
Division of Neuroanesthesia
Barnes-Jewish Hospital
St. Louis, Missouri

Marie Csete, MD, PhD
Associate Professor and John E. Steinhaus Professor of Anesthesiology
Emory University
Director, Liver Transplant Anesthesiology
Department of Anesthesiology
Emory University Hospital
Atlanta, Georgia

Anthony J. Cunningham, MD
Professor/Clinical Vice Dean
Department of Anaesthesia
Royal College of Surgeons in Ireland
Consultant and Professor
Department of Anaesthesia
Beaumont Hospital
Dublin, Ireland

Jacek B. Cywinski, MD
Department of General Anesthesiology
The Cleveland Clinic Foundation
Cleveland, Ohio

Steven Deem, MD
Associate Professor of Anesthesiology and Medicine (Adjunct, Pulmonary and Critical Care)
University of Washington
Harborview Medical Center
Seattle, Washington

Stephen F. Dierdorf, MD
Professor
Department of Anesthesia
Medical University of South Carolina
Charleston, South Carolina

François Donati, PhD, MD, FRCPC
Professor
Department of Anesthesiology
University of Montreal
Staff Anesthesiologist
Hospital Maisonneuve-Rosemont
Montreal, Quebec, Canada

John C. Drummond, MD, FRCPC
Professor of Anesthesiology
University of California, San Diego
Staff Anesthesiologist
VA Medical Center, San Diego
La Jolla, California

Thomas J. Ebert, MD, PhD
Professor
Department of Anesthesiology
Medical College of Wisconsin
Staff Anesthesiologist
VA Medical Center
Milwaukee, Wisconsin

Jan Ehrenwerth, MD
Professor
Department of Anesthesiology
Yale University School of Medicine
Attending Anesthesiologist
Yale–New Haven Hospital
New Haven, Connecticut

John H. Eichhorn, MD
Professor
Department of Anesthesiology
University of Kentucky College of Medicine
Department of Anesthesiology
UK Chandler Medical Center
Lexington, Kentucky

James B. Eisenkraft, MD
Professor of Anesthesiology
Mount Sinai School of Medicine
Attending Anesthesiologist
The Mount Sinai Hospital
New York, New York

John E. Ellis, MD
Professor
Department of Anesthesia and Critical Care
Pritzker School of Medicine
The University of Chicago
Section Chief
Anesthesia for Vascular, Thoracic, and General Surgery
University of Chicago Hospitals
Chicago, Illinois

Alex S. Evers, MD
Henry E. Mallinckrodt Professor and Chairman
Department of Anesthesiology
Washington University School of Medicine
Anesthesiologist-in-Chief
Barnes-Jewish Hospital
St. Louis, Missouri

Lynne R. Ferrari, MD
Associate Professor of Anesthesiology
Harvard Medical School
Medical Director, Perioperative Services
Department of Anesthesia, Perioperative and Pain Medicine
Children's Hospital
Boston, Massachusetts

Mieczyslaw Finster, MD
Professor of Anesthesiology and Obstetrics and Gynecology
Columbia University College of Physicians and Surgeons
New York Presbyterian Hospital
New York, New York

Jeffrey E. Fletcher, PhD
Clinical Publications Lead
Medical Communications
AstraZeneca
Wilmington, Deleware

J. Sean Funston, MD
Assistant Professor
Department of Anesthesiology
University of Texas Medical Branch
Galveston, Texas

Steven I. Gayer, MD, MBA
Associate Professor
Departments of Anesthesiology and Ophthalmology
University of Miami Miller School of Medicine
Director of Anesthesia Services
Bascom Palmer Eye Institute
Miami, Florida

Kathryn Glas, MD
Assistant Professor
Department of Anesthesiology
Associate Director
Cardiothoracic Anesthesiology
Director, Intra-Operative Echo Service
Emory University School of Medicine
Atlanta, Georgia

Alexander W. Gotta, MD
Emeritus Professor of Anesthesiology
State University of New York
Downstate Medical Center
Brooklyn, New York

John Hartung, PhD
Associate Editor
Journal of Neurosurgical Anesthesiology
State University of New York
Brooklyn, New York

Tara M. Hata, MD
Associate Professor
Department of Anesthesia
University of Iowa
Roy J. and Lucille A. Carver College of Medicine
University of Iowa Hospitals and Clinics
Iowa City, Iowa

Laurence M. Hausman, MD
Assistant Professor
Department of Anesthesiology
Mount Sinai School of Medicine
Vice Chair, Academic Affiliations
Department of Anesthesiology
Mount Sinai Hospital
New York, New York

Thomas K. Henthorn, MD
Professor and Chair
Department of Anesthesiology
University of Colorado Health Sciences Center
Denver, Colorado

Simon C. Hillier, MB, ChB
Associate Professor
Department of Anesthesia
Indiana University School of Medicine
Staff Anesthesiologist
Riley Hospital for Children
Indianapolis, Indiana

Terese T. Horlocker, MD
Professor
Departments of Anesthesiology and Orthopedics
Mayo Clinic College of Medicine
Rochester, Minnesota

Robert J. Hudson, MD, FRCPC
Clinical Professor
Department of Anesthesiology and Pain Medicine
University of Alberta
Attending Anesthesiologist
University of Alberta Hospitals
Edmonton, Alberta, Canada

Anthony D. Ivankovitch, MD
Professor and Chair
Department of Anesthesiology
Rush University Medical Center
Chicago, Illinois

Joel O. Johnson, MD, PhD
Professor and Chair
Department of Anesthesiology
University of Missouri-Columbia Hospitals and Clinics
Columbia, Missouri

Raymond S. Joseph Jr., MD
Staff Anesthesiologist
Virginia Mason Medical Center
Seattle, Washington

Zeev N. Kain, MD, MBA
Professor and Executive Vice-Chairman
Department of Anesthesiology
Yale University School of Medicine
Anesthesiologist-in-Chief
Yale–New Haven Children's Hospital
New Haven, Connecticut

Ira S. Kass, MD
Professor
Departments of Anesthesiology, Physiology, and Pharmacology
Downstate Medical Center
Brooklyn, New York

Jonathan D. Katz, MD
Clinical Professor of Anesthesiology
Yale University School of Medicine
New Haven, Connecticut

Brian S. Kaufman, MD
Associate Professor
Departments of Anesthesiology, Medicine, and Neurosurgery
New York University School of Medicine
Co-Director, Critical Care
Tisch Hospital
New York, New York

Charbel A. Kenaan, MD
Chief Resident in Anesthesiology
Department of Anesthesiology, Perioperative Medicine, and Pain Management
Jackson Memorial Hospital
University of Miami Miller School of Medicine
Miami, Florida

Donald A. Kroll, MD, PhD
Staff Anesthesiologist
Veterans Affairs Medical Center
Biloxi, Mississippi

Carol L. Lake, MD, MBA, MPH
CEO
Verefi Technologies, Inc.
Elizabethtown, Pennsylvania

Noel W. Lawson, MD
Professor
Department of Anesthesiology
University of Missouri-Columbia
Staff Anesthesiologist
University of Missouri-Columbia Hospitals and Clinics
Columbia, Missouri

Wilton C. Levine, MD
Instructor in Anesthesia
Harvard Medical School
Department of Anesthesia and Critical Care
Massachusetts General Hospital
Boston, Massachusetts

Jerrold H. Levy, MD
Professor and Deputy Chair of Research
Department of Anesthesiology
Emory University School of Medicine
Director of Cardiothoracic Anesthesiology
Emory Healthcare
Atlanta, Georgia

Adam D. Lichtman, MD
Assistant Professor of Anesthesiology
Department of Anesthesiology
Weill Cornell Medical Center
New York Presbyterian Hospital
New York, New York

J. Lance Lichtor, MD
Professor
Department of Anesthesia
University of Iowa
Iowa City, Iowa

Spencer S. Liu, MD
Clinical Professor of Anesthesiology
Department of Anesthesiology
University of Washington
Staff Anesthesiologist
Department of Anesthesiology
Virginia Mason Medical Center
Seattle, Washington

Richard L. Lock, MD
Associate Professor
Department of Anesthesiology
University of Kentucky College of Medicine
University of Kentucky Chandler Medical Center
Lexington, Kentucky

David A. Lubarsky, MD, MBA
Emanuel M. Papper Professor and Chair
Department of Anesthesiology, Perioperative Medicine, and Pain Management
University of Miami Miller School of Medicine
Chief of Service
Department of Anesthesiology
Jackson Memorial Hospital
Miami, Florida

Timothy R. Lubenow, MD
Professor of Anesthesiology
Rush Medical College
Director, Section of Pain Medicine
Department of Anesthesiology
Rush University Medical Center
Chicago, Illinois

Srinivas Mantha, MD
Professor of Anesthesiology
Department of Anesthesiology and Intensive Care
Sub-Dean, Nizam's Institute of Medical Sciences
Hyberabad, India

Joseph P. Mathew, MD
Associate Professor
Department of Anesthesiology
Chief, Division of Cardiothoracic Anesthesia
Duke University Medical Center
Durham, North Carolina

Michael S. Mazurek, MD
Assistant Professor of Clinical Anesthesia
Department of Anesthesia
Indiana University School of Medicine
Staff Anesthesiologist
Riley Hospital for Children
Indianapolis, Indiana

Kathryn E. McGoldrick, MD
Professor and Chair
Department of Anesthesiology
New York Medical College
Director
Department of Anesthesiology
Westchester Medical Center
Valhalla, New York

Roger S. Mecca, MD
Chairman
Department of Anesthesiology
Danbury Hospital
Danbury, Connecticut
Clinical Associate Professor of Anesthesiology
New York Medical College
New York, New York

Sanford M. Miller, MD
Clinical Associate Professor
New York University School of Medicine
Assistant Director of Anesthesiology
Bellevue Hospital Center
New York, New York

Terri G. Monk, MD, MS
Professor
Department of Anesthesiology
Duke University Medical Center
Faculty, Department of Anesthesia
VA Hospital
Durham, North Carolina

John R. Moyers, MD
Professor
Department of Anesthesia
University of Iowa
Roy J. and Lucille A. Carver College of Medicine
University of Iowa Hospitals and Clinics
Iowa City, Iowa

Michael F. Mulroy, MD
Clinical Professor
Department of Anesthesiology
University of Washington School of Medicine
Staff Anesthesiologist
Department of Anesthesiology
Virginia Mason Medical Center
Seattle, Washington

Stanley Muravchick, MD, PhD
Professor
Department of Anesthesia
University of Pennsylvania School of Medicine
Vice Chair for Clinical Operations
Department of Anesthesia
Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania

Glenn S. Murphy, MD
Assistant Professor
Department of Anesthesiology
Feinberg School of Medicine
Northwestern University
Director, Cardiac Anesthesia
Department of Anesthesiology
Evanston Northwestern Healthcare
Evanston, Illinois

Michael J. Murray, MD, PhD
Professor and Chair
Department of Anesthesiology
Mayo Clinic College of Medicine
Jacksonville, Florida

Steven M. Neustein, MD
Associate Professor
Department of Anesthesiology
Mount Sinai School of Medicine
Attending Anesthesiologist
Mount Sinai Hospital
New York, New York

Cathal Nolan, MB
Lecturer in Anaesthesia
Department of Anaesthesia
Beaumont Hospital
Royal College of Surgeons in Ireland
Dublin, Ireland

Babatunde O. Ogunnaike, MD
Associate Professor
Director of Anesthesia Surgical Services
Parkland Memorial Hospital
Department of Anesthesiology and Pain Management
University of Texas Southwestern Medical Center
Dallas, Texas

Jerome F. O'Hara, Jr., MD
Associate Professor
Head, Section of Urological Anesthesiology
Department of General Anesthesiology
Cleveland Clinic Foundation
Cleveland, Ohio

Charles W. Otto, MD, FCCM
Professor of Anesthesiology
Associate Professor of Medicine
University of Arizona College of Medicine
Director of Critical Care Medicine
Department of Anesthesiology
Arizona Health Sciences Center
Tucson, Arizona

Nathan Leon Pace, MD, MStat
Professor
Department of Anesthesiology
University of Utah
Staff Anesthesiologist
University of Utah Health Sciences Center
Salt Lake City, Utah

Charise T. Petrovitch, MD
Professor of Anesthesiology
George Washington University
Washington, DC

Mihai V. Podgoreanu, MD
Assistant Professor
Department of Anesthesiology
Duke University Medical Center
Durham VA Hospital
Durham, North Carolina

Karen L. Posner, PhD
Research Associate Professor
Department of Anesthesiology
University of Washington
Seattle, Washington

Donald S. Prough, MD
Professor and Chair
Department of Anesthesiology
University of Texas Medical Branch
Galveston, Texas

J. David Roccaforte, MD
Assistant Professor
Department of Anesthesiology
New York University
Co-Director, SICU
Bellevue Hospital Center
New York, New York

Michael F. Roizen, MD
Professor and Chairman
Division of Anesthesiology, Critical Care Medicine, and Comprehensive Pain Management
Cleveland Clinical Foundation
Cleveland, Ohio

Gladys Romero, MD
Visiting Assistant Professor
Department of Anesthesiology and Pain Management
University of Texas Southwestern Medical Center
Dallas, Texas

Stanley H. Rosenbaum, MD
Professor of Anesthesiology, Internal Medicine, and Surgery
Vice Chairman for Academic Affairs
Department of Anesthesiology
Yale University School of Medicine
Director of Perioperative and Adult Anesthesia
Yale–New Haven Hospital
New Haven, Connecticut

Henry Rosenberg, MD
Professor of Anesthesiology
Mount Sinai School of Medicine
New York, New York
Director
Department of Medical Education and Clinical Research
Saint Barnabas Medical College
Livingston, New Jersey

Meg A. Rosenblatt, MD
Associate Professor
Department of Anesthesiology
Director of Orthopedic and Regional Anesthesia
Mount Sinai School of Medicine
New York, New York

William H. Rosenblatt, MD
Professor of Anesthesia and Surgery
Yale University School of Medicine
Attending Physician
Department of Anesthesiology
Yale–New Haven Hospital
New Haven, Connecticut

Carl E. Rosow, MD, PhD
Professor
Department of Anaesthesia
Harvard Medical School
Anesthetist
Department of Anesthesia and Critical Care
Massachusetts General Hospital
Boston, Massachusetts

Nyamkhishig Sambuughin, PhD
Senior Biologist
Clinical Neurogenetics Unit
National Institute of Neurological Disorders and Stroke
National Institute of Health
Bethesda, Maryland

Alan C. Santos, MD, MPH
Chairman of Anesthesiology
Ochsner Clinic Foundation
New Orleans, Louisiana

Jeffrey J. Schwartz, MD
Associate Professor
Department of Anesthesiology
Yale University School of Medicine
Attending Physician
Yale–New Haven Hospital
New Haven, Connecticut

Margaret L. Schwarze, MD
Clinical Associates
Vascular Surgery
University of Chicago
Chicago, Illinois

Harry A. Seifert, MD, MSCE
Adjunct Assistant Professor of Clinical Anesthesiology
Department of Anesthesiology and Critical Care
Children's Hospital of Philadelphia
Adjunct Assistant Professor of Epidemiology
Department of Biostatistics and Epidemiology
University of Pennsylvania School of Medicine
Philadelphia, Pennsylvania

Aarti Sharma, MD
Assistant Professor
Department of Anesthesiology
Assistant Director of Pediatric Anesthesia
Weill Cornell Medical Center
New York Presbyterian Hospital
New York, New York

Nikolaos Skubas, MD
Assistant Professor
Department of Anesthesiology
Weill Cornell Medical Center
New York Presbyterian Hospital
New York, New York

Hugh M. Smith, MD, PhD
Resident
Department of Anesthesiology
Mayo Clinic College of Medicine
Mayo Clinic
Rochester, Minnesota

Karen J. Souter, MBBS, MSc, FRCA
Assistant Professor
Department of Anesthesia
University of Washington Medical Center
Seattle, Washington

M. Christine Stock, MD, FCCM, FACP
James E. Eckenhoff Professor and Chair
Department of Anesthesiology
Feinberg School of Medicine
Northwestern University
Chicago, Illinois

Christer H. Svensén, MD, PhD, DEAA, MBA
Associate Professor
Department of Anesthesiology
University of Texas Medical Branch
Galveston, Texas

Stephen J. Thomas, MD
Topkin-Van Poznak Professor and Vice-Chair
Department of Anesthesiology
Weill Medical College of Cornell University
New York Presbyterian Hospital
New York, New York

Miriam M. Treggiari, MD, MPH
Associate Professor
Department of Anesthesiology
University of Washington School of Medicine
Harborview Medical Center
Seattle, Washington

Jeffery S. Vender, MD, FCCM, FCCP
Professor
Department of Anesthesiology
Feinberg School of Medicine
Northwestern University
Chairman
Department of Anesthesiology
Evanston Northwestern Healthcare
Evanston, Illinois

J. Scott Walton, MD
Associate Professor
Department of Anesthesia
Medical University of South Carolina
Charleston, South Carolina

Mark A. Warner, MD
Professor and Chair
Department of Anesthesiology
Mayo Clinic College of Medicine
Rochester, Minnesota

Denise J. Wedel, MD
Professor of Anesthesiology
Mayo Clinic College of Medicine
Rochester, Minnesota

Paul F. White, PhD, MD, FANZCA
Professor and Holder of the Margaret Milam McDermott Distinguished Chair
Department of Anesthesiology and Pain Management
University of Texas Southwestern Medical Center
Dallas, Texas

Charles W. Whitten, MD
Professor and Vice President of Resident Affairs
M.T. "Pepper" Jenkins Professor in Anesthesiology
Department of Anesthesiology and Pain Management
University of Texas Southwestern Medical Center
Dallas, Texas

Scott W. Wolf, MD
Assistant Professor
Department of Anesthesiology
University of Texas Medical Branch
Galveston, Texas

James R. Zaidan, MD, MBA
Professor and Chair
Department of Anesthesiology
Associate Dean for GME
Emory University School of Medicine
Atlanta, Georgia

PREFACE

Transformation in the delivery of patient care, combined with changes in education, is the new paradigm for anesthesiology in the 21st century. Minimizing costs while improving efficiency and enhancing patient safety are the goals of contemporary anesthesia practice. To ensure that practitioners have incorporated the most-up-to-date information in their practice, certifying and licensing authorities have mandated continual education and testing both at the trainee and at the practicing anesthesiologist level. These changes are coupled with the need for ongoing innovation as the anesthesiologist continues to be challenged to adapt clinical management to new surgical procedures and technologies. These developments are an extension of the observation we made in the first edition of *Clinical Anesthesia*: "The major achievements of modern surgery would not have taken place without the accompanying vision of the pioneers in anesthesiology."

Anesthesiology is recognized as the specialty that has done the most to ensure patient safety. Despite these advances, the specialty's own leadership, in addition to outside agencies, has mandated further improvement. No longer does the anesthesiologist have the luxury of admitting the patient to the hospital a day or more before the surgical procedure and of performing a leisurely workup and preoperative assessment. In the ambulatory surgery unit, for example, the patient may be available only minutes before the operation, and decisions must be made immediately as to adequacy of the preanesthetic evaluation and treatment plan. In the inpatient setting, care is perceived as being even more fragmented. For example, the health care professional performing the preoperative evaluation may not be the caregiver in the operating room. In the operating room, where costs can reach $40 to $50 per minute, "production pressure" has been noted to get "the case going." This occurs in a setting of diminished resources, equipment, drugs, and personnel, with the simultaneous requirement to improve patient safety in the OR. Thus, the anesthesiologist must have information immediately available for the appropriate integration of care in the preincision period. In fact, the American Board of Anesthesiology, in its *Booklet of Information,* emphasizes the importance of this facet of clinical management by stating, "The ability to independently acquire and process information in a timely manner is central to assure individual responsibility for all aspects of anesthesiology care."

Simultaneous with these clinical requirements are significant changes in the educational process for trainees and established practioners. Responsibility and accountability for one's education have increased. Certifying boards use a framework, such as Maintenance of Certification in Anesthesiology (MOCA), to ensure that the practitioner is current in aspects of patient care. This concept is based on lifelong learning, assessment of professional standing, assessment of clinical practice performance, and a written examination testing cognitive expertise. These changes require a significant shift in the manner in which textbooks present knowledge. With the advent of electronic publishing, clinicians cannot rely solely on a single textbook to supply the "answers" to a clinical conundrum or a board recertification question. As a result, *Clinical Anesthesia* remains faithful to its original goal: *To develop a textbook that supports efficient and rapid acquisition of knowledge.* However, to meet this objective, the editors have also developed a multifaceted, systematic approach to this target. *Clinical Anesthesia* serves as the foundation and reference source for the other educational tools in the Clinical Anesthesia series: *The Handbook of Clinical Anesthesia, Clinical Anesthesia for the PDA, Review of Clinical Anesthesia,* and *The Lippincott Interactive Anesthesia Library on CD-ROM* (LIAL). Each of these provides a bridge to clinical care and education.

To recognize these requirements, in this the first edition of *Clinical Anesthesia* of the 21st century, we have totally redesigned the textbook, from its cover to chapter format and inclusion of new and relevant material. To enhance access to information, as well as align chapters with contemporary educational goals, each chapter starts with a detailed outline and Key Points. To meet the realities of the world we live in, we have added new chapters on disaster preparedness and weapons of mass destruction, genomics, obesity (bariatric surgery), and office-based anesthesia. We have encouraged contributors to develop clinically relevant themes and prioritize various clinical options considered by many the definitive strength of previous editions. In addition, each contributor emphasizes applicable areas of importance to patient safety. On occasion, redundancy between chapters may exist. We have made every effort to reduce repetition or even disagreement between chapters. Different approaches to a clinical problem also represent the realities of consultant-level anesthesia practice, however, so this diversity in approach remains in certain instances.

Finally, we wish to express our gratitude to the individual authors whose hard work, dedication, and timely submissions have expedited the production of the fifth edition. In addition, we acknowledge the contributions of colleagues and readers for their constructive comments. We also thank our secretaries, Gail Norup, Ruby Wilson and Deanna Walker, each of whom gave unselfishly of their time to facilitate the editorial process. We would also like to take this opportunity to recognize the continuing support of Lippincott Williams & Wilkins. It was more than 25 years ago that Lewis Reines, the former CEO of J.B. Lippincott, recognized the need for a major American anesthesiology textbook focused on education and clinical care. Throughout the intervening years, he has been a trusted colleague, an advisor, and, most importantly, a friend. In addition, we have been blessed with executive editors who have made singular contributions to the success of *Clinical Anesthesia*: Susan Gay, Mary Kay Smith, and Craig Percy. The enduring commitment to excellence in medical publishing continues from Lippincott Williams & Wilkins with Brian Brown, Senior Acquisitions Editor, and David Murphy, Production Manager, with the assistance of Grace Caputo, Project Director, Dovetail Content Solutions, and Chris Miller, Project Manager, TechBooks.

Paul G. Barash, MD
Bruce F. Cullen, MD
Robert K. Stoelting, MD

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SECTION I INTRODUCTION TO ANESTHESIA PRACTICE

CHAPTER 1 ■ THE HISTORY OF ANESTHESIA

HUGH M. SMITH AND DOUGLAS R. BACON

KEY POINTS

1. Anesthesiology is a young specialty historically, especially when compared to surgery or internal medicine.
2. Discoveries in anesthesiology have taken decades to build upon the observations and experiments of many people, and in some instances we are still searching. For example, the ideal volatile anesthetic has yet to be discovered.
3. Regional anesthesia is the direct outgrowth of a chance observation by an intern who would go on to become a successful ophthalmologist.
4. Pain medicine began as an outgrowth of regional anesthesia.
5. Much of our current anesthesia equipment is the direct result of anesthesiologists being unhappy with and needing better tools to properly anesthetize patients.
6. Many safety standards have been established through the work of anesthesiologists who were frustrated by the status quo.
7. Organizations of anesthesia professionals have been critical in establishing high standards in education and proficiency, which in turn has defined the specialty.
8. Respiratory critical care medicine started as the need by anesthesiologists to use positive pressure ventilation to help polio victims.
9. Surgical anesthesia, and physician specialization in its administration, has allowed for increasingly complex operations to be performed on increasingly ill patients.

Surgery without adequate pain control may seem cruel to the modern reader, yet this was the common practice throughout most of history. While anesthesia is considered a relatively new field, surgery predates recorded human history. Human skull trephinations occurred as early as 10,000 BC, with archaeologic evidence of post-procedure bone infection and healing, proving these primitive surgeries were performed on living humans. Juice from coca leaves may have been dribbled onto the scalp wound but the recipient of these procedures was almost certainly awake while a hole was bored into his or her skull with a sharp flake of volcanic glass. This was a unique situation in anesthesia; there are no other instances in which both the operator and his patient share the effects of the same drug.

In contemporary practice, we are prone to forget the realities of pre-anesthesia surgery. Fanny Burney, a well-known literary artist from the early nineteenth century, described a mastectomy she endured after receiving a "wine cordial" as her sole anesthetic. As seven male assistants held her down, the surgery commenced: "When the dreadful steel was plunged into the breast-cutting through veins-arteries-flesh-nerves-I needed no injunction not to restrain my cries. I began a scream that lasted unintermittently during the whole time of the incision—& I almost marvel that it rings not in my Ears still! So excruciating was the agony. Oh Heaven!—I then felt the knife racking against the breast bone-scraping it! This performed while I yet remained in utterly speechless torture."[1] Burney's description reminds us that it is difficult to overstate the impact of