

## Civetta, Taylor, & Kirby CRITICAL CARE

Fourth Edition

ANDREA GABRIELLI A. JOSEPH LAYON MIHAE YU

## FOURTH EDITION

# CIVETTA, TAYLOR, & KIRBY'S CRITICAL CARE



Acquisitions Editor: Brian Brown
Managing Editor: Nicole Dernoski
Project Manager: Rosanne Hallowell
Manufacturing Manager: Kathleen Brown
Marketing Manager: Angella Panetta
Design Coordinator: Teresa Mallon
Cover Designer: Larry Didona
Production Services: Aptara, Inc.

Fourth Edition © 2009 by Lippincott Williams & Wilkins, a Wolters Kluwer Business 530 Walnut Street Philadelphia, PA 19106 LWW.com

Third Edition © 1997 by Lippincott-Raven. Second and First Editions © 1992, 1988 by J. B. Lippincott Company.

All rights reserved. This book is protected by copyright. No part of this book may be reproduced in any form or by any means, including photocopying, or utilizing by any information storage and retrieval system without written permission from the copyright owner, except for brief quotations embodied in critical articles and reviews.

Printed in the United States

#### Library of Congress Cataloging-in-Publication Data

Civetta, Taylor, & Kirby's critical care / edited by Andrea Gabrielli, A. Joseph Layon, Mihae Yu. — 4th ed.

p.; cm.

Rev. ed. of: Critical care / [edited by] Joseph M. Civetta, Robert W. Taylor, Robert R. Kirby. 3rd ed. c1997.

Includes bibliographical references and index.

ISBN 978-0-7817-6869-6 (alk. paper)

1. Critical care medicine. I. Gabrielli, Andrea. II. Layon, A. Joseph. III. Yu, Mihae. IV. Civetta, Joseph M. V. Taylor, Robert W. (Robert Wesley), 1949— VI. Kirby, Robert R. VII. Critical care. VIII. Title: Civetta, Taylor, and Kirby's critical care. IX. Title: Critical care.

[DNLM: 1. Critical Care. 2. Intensive Care Units. WX 218 C582 2009]

RC86.7.C69 2009

616.02'8—dc22

2008040424

Care has been taken to confirm the accuracy of the information presented and to describe generally accepted practices. However, the authors, editors, and publisher are not responsible for errors or omissions or for any consequences from application of the information in this book and make no warranty, expressed or implied, with respect to the currency, completeness, or accuracy of the contents of the publication. Application of this information in a particular situation remains the professional responsibility of the practitioner.

The authors, editors, and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accordance with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new or infrequently employed drug.

Some drugs and medical devices presented in this publication have Food and Drug Administration (FDA) clearance for limited use in restricted research settings. It is the responsibility of health care providers to

ascertain the FDA status of each drug or device planned for use in their clinical practice.

The publishers have made every effort to trace copyright holders for horrowed material.

The publishers have made every effort to trace copyright holders for borrowed material. If they have inadvertently overlooked any, they will be pleased to make the necessary arrangements at the first opportunity. To purchase additional copies of this book, call our customer service department at (800) 638-3030 or fax orders to (301) 223-2320. International customers should call (301) 223-2300.

Visit Lippincott Williams & Wilkins on the Internet at LWW.com. Lippincott Williams & Wilkins customer service representatives are available from 8:30 am to 6 pm, EST.

## CIVETTA, TAYLOR, & KIRBY'S CRITICAL CARE

## Edited by

## Andrea Gabrielli, MD, FCCM

Professor of Anesthesiology and Surgery
Division of Critical Care Medicine
Section Head, NeuroCritical Care
University of Florida College of Medicine;
Medical Director, Cardiopulmonary Service and Hyperbaric Medicine
Shands Hospital at the University of Florida
Gainesville, Florida

## A. Joseph Layon, MD, FACS

Professor of Anesthesiology, Surgery, and Medicine Chief, Division of Critical Care Medicine University of Florida College of Medicine; Medical Director, Surgical Critical Care Shands Hospital at the University of Florida; Medical Director, Gainesville Fire Rescue Service Gainesville, Florida

## Mihae Yu, MD, FACS

Professor of Surgery
University of Hawaii John A. Burns School of Medicine
Vice Chair of Education of
University of Hawaii Surgical Residency Program
Program Director of Surgical Critical Care Fellowship Program
Director of Surgical Intensive Care,
The Queen's Medical Center
Honolulu, Hawaii

To the memory of my father, Pietro:
He would have been proud to see the results of my efforts.
To my dear mother Giuliana for her unconditional support.
To my brother Marco, the *real* smart guy of the family.
To my students, friends, and colleagues world wide.
To our patients:
Our inspiration for compassionate care.
—Andrea Gabrielli

To my children Maria, Nicolas, and Daniel—who teach me about unconditional love and humility.

To my best friend and partner Susana E. Picado—who taught me to be better.

To my green-eyed kid sister Serena M. Layon, 1954–2008—who taught me that suffering and dignity were reconcilable.

To those for whom I am honored to care.

To those who struggle for justice and peace—as Brecht noted, these are irreplaceable

—A. Joseph Layon

To my Dad, General Jae Hung Yu & the Seventh Division for their sacrifices and changing history for the better.

To my Mom, the late Esang Yoon who was the wind beneath our wings.

To the late Dr. Thomas J. Whelan Jr. who continues to mentor me in the practice of Surgery and Code of conduct.

To Joe and Judy Civetta who sparked my continuing love for Critical Care and being the guiding light for all Peepsters.

And to my daughter Pearl (&CD) who has the Master Key to All...

—Mihae Yu

## ■ CONTRIBUTING AUTHORS

#### Patricia L. Abbitt, MD

Professor of Radiology and Section Chief, Body Imaging Department of Radiology University of Florida College of Medicine Gainesville, Florida

#### Steven G. Achinger, MD

Texas Diabetes Institute University Center for Community Heath Dialysis West San Antonio, Texas

#### Gareth Adams, MD

Department of Neurosurgery Baylor College of Medicine Ben Taub General Hospital Houston, Texas

#### Olufemi Akindipe, MD

Assistant Professor Division of Pulmonary and Critical Care Medicine Department of Medicine University of Florida College of Medicine Gainesville, Florida

#### Serge Alpandari, MD, MSc

Infectious Diseases and Infection Control Senior Physician Intensive Care Unit Hopital G. Chatiliez Tourcoing, France

#### Adrian Alvarez, MD

Staff Anesthesiologist
Department of Anesthesiology
Hospital de Clinicas, General San Martin
Faculty of Medicine, University of Buenos Aires
Ciudad Autonoma de Buenos Aires, Argentina

#### Marcelo Amato, MD

Faculdade de Medicina Universidade de São Paulo São Paulo, Brazil

#### Giuditta Angelini

Assistant Professor of Anesthesiology and Medicine University of Wisconsin-Madison School of Medicine and Public Health Madison, Wisconsin

## Djillali Annane, MD, PhD

Professor in Medicine
General Intensive Care Unit
University of Versailles Saint Quentin, UniverSud Paris
Versailles
Chief
General Intensive Care Unit
Raymond Poincaré Hospital–Assistance
Publique Hôpitaux de Paris
Garches, France

#### Massimo Antonelli, MD

Professor
Department of Anesthesiology and Intensive Care
Università Cattolica del Sacro Cuore
Chief
Department of Anesthesiology and Intensive Care
Policlinico-Universitario—A. Gemelli
Rome, Italy

#### Veena B. Antony, MD

Professor of Medicine, Molecular Genetics and Microbiology Department of Medicine, College of Medicine University of Florida Chief, Division of Pulmonary Critical Care and Sleep Medicine Department of Medicine University of Florida Shands Hospital Gainesville, Florida

#### Lennox K. Archibald, MD, FRCP, DTM&H

Hospital Epidemiologist Department of Medicine, Division of Infectious Diseases College of Medicine, University of Florida Shands Hospital at the University of Florida Gainesville, Florida

#### Juan Carlos Ayus, MD, FACP, FASN

Director of Clinical Research Nephrology Renal Consultants of Houston Houston, Texas

#### Keri A. Baacke, MD

Maternal Fetal Medicine Fellow University of Florida Department of Maternal Fetal Medicine Gainesville, Florida

#### Mariona Badia, MD, PhD

Associate Professor
Department de Medicina
Universidad de Lleida
Intensive Care Unit
Hospital Universitario Arnau de Vilanova
Lleida, Spain

## Sean M. Bagshaw, MD, MSc, FRCPC

Department of Intensive Care and Department of Medicine Austin & Hospital Melbourne, Victoria, Australia

#### Michael J. Banner, PhD

Professor Department of Anesthesiology University of Florida College of Medicine Gainesville, Florida

## Philip S. Barie, MD, MBA, FCCM, FACS

Professor of Surgery Chief of Division of Critical Care and Trauma Department of Surgery Weill Cornell Medical College New York, New York

#### Cody B. Barnett, MD

Assistant Clinical Professor University of South Alabama College of Medicine Internal Medicine Center Mobile, Alabama

#### Claudia L. Barthold, MD

Assistant Professor/Assistant Residency Director Emergency Medicine University of Nebraska Assistant Medical Director Nebraska Regional Poison Center Nebraska Medical Center Omaha, Nebraska

#### Robert H. Bartlett, MD

Professor of Surgery, Emeritus Department of Surgery University of Michigan Ann Arbor, Michigan

#### Miho K. Bautista, MD

Staff Physician
Geriatric Research, Education, and Clinical Center
North Florida / South Georgia Veterans Health System
Clinical Assistant Professor
Division of Career Development and Education;
Department of Aging & Geriatrics
University of Florida College of Medicine
Gainesville, Florida

#### Maher A. Baz, MD

Associate Professor of Medicine Department of Medicine University of Florida Medical Director, Lung Transplant Program Shands Hospital Gainesville, Florida

#### Elizabeth Cordes Behringer, MD

Anesthesiologist-Intensivist
Department of Anesthesiology
Cedars Sinai Medical Center
Los Angeles, California
Clinical Professor of Anesthesiology
University of California, Irvine
Orange, California

#### Giuseppe Bello, MD

Research Fellow Department of Anesthesiology and Intensive Care Università Cattolica del Sacro Cuore Senior Staff Department of Anesthesiology and Intensive Care Policlinico Universitario—A. Gemelli Rome, Italy

## Rinaldo Bellomo, MBBS, MD, FRACP, FJFICM

Professor
Division of Medicine
Melbourne University
Director of Research
Department of Intensive Care
Austin Hospital
Melbourne, Australia

#### Howard Belzberg, MD, FCCM

Associate Professor of Surgery
University of Southern California
School of Medicine
Chief of Critical Care
Los Angeles County – USC Medical Center
Los Angeles, California

#### Jeffrey A. Bennett, MD

Assistant Professor of Neuroradiology Department of Radiology University of Florida Gainesville, Florida

#### Eugene V. Beresin, MD

Professor
Department of Psychiatry
Harvard Medical School
Director of Child and Adolescent Psychiatry
Residency Training
Department of Psychiatry and Child Psychiatry Services
Massachusetts General Hospital
Boston, Massachusetts

#### Ira M. Bernstein, MD

Professor and Vice Chair for Obstetrics
Department of Obstetrics and Gynecology
University at Vermont College of Medicine
Attending Physician and Director of Maternal Fetal Medicine
Women's Health Care Service
Fletcher Allen Health Care
Burlington, Vermont

#### Rebecca J. Beyth, MD

Physician Researcher
Geriatric Research, Education, and Clinical Center
North Florida / South Georgia Veterans Health System
Associate Professor and Chief
Division of Career Development and Education;
Department of Aging and Geriatrics
University of Florida College of Medicine
Gainesville, Florida

#### Indermeet S. Bhullar, MD

Director of Trauma ICU Department of Surgery Sacred Heart Hospital Pensacola, Florida

#### Luca M. Bigatello, MD

Associate Professor of Anesthesia Harvard Medical School Director, Critical Care Department of Anesthesia and Critical Care Massachusetts General Hospital Boston, Massachusetts

#### Umberto Bivona, PhD

Psychologist Consultant Post-Coma Unit IRCCS Santa Lucia Foundation Rome, Italy

#### Thomas J. J. Blanck, MD, PhD

Professor and Chairman
Department of Anesthesiology
Professor, Physiology and Neuroscience
New York University
Chairman
Department of Anesthesiology
NYU Medical Center
New York, New York

#### Paul B. Blanch, BA, RRT

Courtesy Assistant Department of Anesthesiology University of Florida College of Medicine, Shands Hospital Equipment Specialist Department of Respiratory Care Gainesville, Florida

#### Thomas P. Bleck, MD, FCCM

Professor of Neurology, Neurological Surgery, and Medicine, and Vice-Chairman for Academic Programs Northwestern University Feinberg School of Medicine Chicago, Illinois The Ruth Cain Ruggles Chairman Department of Neurology Evanston Northwestern Healthcare Evanston, Illinois

#### Ernest F. J. Block, MD, MBA

Clinical Associate Professor of Surgery Department of Surgery University of Florida Gainsville, Florida Director, Trauma Services Department of Surgical Education Orlando Regional Medical Center Orlando, Florida

#### Eric L. Bloomfield, MD

Assistant Professor of Anesthesiology Mayo Clinic College of Medicine Rochester, Minnesota

#### Karen L. Booth, MD

Clinical Assistant Professor Department of Pediatrics Stanford University Attending Pediatric Cardiologist Department of Pediatrics Lucile Packard Children's Hospital Palo Alto, California

#### Karen Bordson, DO

Research Instructor, Volunteer Faculty
Department of Obstetrics and Gynecology
The University of Kansas School of Medicine
Kansas City, Kansas
Staff Physician
Department of Obstetrics and Gynecology
North Kansas City, Missouri

#### Adrien Bougle, MD

Fellow in Anesthesiology and Critical Care Medicine University of Versailles Saint Quentin, UniverSud Paris Versaille, Garches, France

#### Philip Boysen, MD

Professor of Anesthesiology and Medicine Executive Associate Dean for Graduate Medical Education The University of North Carolina at Chapel Hill Chapel Hill, North Carolina

#### John F. Burke, MD

Professor of Surgery
Department of Surgery
Harvard Medical School
Chief, Trauma, Emergency Surgery, and Surgical Critical Care
Department of Surgery
Massachusetts General Hospital
Boston, Massachusetts

#### Frederick M. Burkle, Jr., MD, MPH, DTM

Senior Fellow Harvard Humanitarian Initiative Harvard University Cambridge, Massachusetts

#### James E. Calvin, Jr., MD

James B. Herrick Professor of Medicine Rush University Section Director, Section of Cardiology Department of Medicine Rush University Medical Center Chicago, Illinois

#### Morgan Camp, MD

Resident
Department of Radiology - College of Medicine - University
of Florida
Gainesville, Florida

#### William G. Cance, MD

Professor Department of Surgery University of Florida Gainesville, Florida

#### Lawrence J. Caruso, MD

Associate Professor Department of Anesthesiology and Surgery University of Florida Associate Chief Division of Critical Care Medicine Shands Hospital Gainesville, FL

#### Salvatore Cassese, MD

Resident in Cardiology Division of Cardiology Federico II University Naples, Italy

#### Jorge H. Castro, MD

Surgical Critical Care Clinical Fellow Critical Care Department University of Pittsburgh/ UPMC Pittsburgh, Pennsylvania

#### Iuan C. Cendan, MD

Assistant Professor Department of Surgery University of Florida Gainesville, Florida

#### Cherylee W. J. Chang, MD, FACP

Associate Clinical Professor
Departments of Medicine and Surgery
University of Hawaii at Manoa, John A. Burns
School of Medicine
Medical Director
Neuroscience Institute/Neurocritical Care
The Queen's Medical Center
Honolulu, Hawaii

#### Michael D. Christian, MD, FRCPC

Lecturer
Department of Medicine
University of Toronto
Attending Physician
Critical Care & Intectious Diseases
Mount Sinai Hospital & University Health Network
Toronto, Canada

#### Marianne E. Cinat, MD, FACS

Associate Professor of Surgery University of California Irvine Medical Center Orange, California

#### Maria Paola Ciurli, PhD

Senior Staff Member Post-Coma Unit Department of Neuropsychological Diagnosis and Therapy Rome, Italy

#### Cornelius I. Clancy, MD

Associate Professor of Medicine Director, Mycology Research Unit Department of Medicine University of Pittsburgh Staff Physician Department of Medicine VA Medical Center Pittsburgh, Pennsylvania

#### Michael Coburn, MD

Vice Chairman and Residency Program Director Scott Department of Urology Baylor College of Medicine Chief of Urology, Ben Taub General Hospital Houston, Texas

#### Jonathan B. Cohen, MD

Anesthesiology / Critical Care Medicine Tampa General Hospital Tampa, Florida

#### Giorgio Conti, MD

Rome, Italy

Associate Professor Department of Anesthesiology and Intensive Care Università Cattolica del Sacro Cuore Chief Paediatric Intensive Care Unit Policlinico Universitario—A. Gemelli

#### Jamie B. Conti, MD, FACC, FHRS

Professor and Interim Chief Division of Cardiovascular Medicine Department of Medicine Director Clinical Cardiac Electrophysiology University of Florida Gainesville, Florida

#### Timothy J. Coons, RRT, MBA

Director, Cardiopulmonary and Neurological Services Shands Hospital at the University of Florida Gainesville, Florida

#### Mark S. Cooper, BM, BCh, PhD

Senior Lecturer in Endocrinology Division of Medical Sciences University of Birmingham Consultant Endocrinologist Department of Medicine University Hospital Birmingham Birmingham, United Kingdom

#### C. Clay Cothren, MD, FACS

Assistant Professor of Surgery
Department of Surgery
University of Colorado School of Medicine
Program Director
Trauma and Acute Care Surgery
Department of Surgery
Denver Health Medical Center
Denver, Colorado

#### Douglas B. Coursin, MD

Professor Departments of Anesthesiology and Internal Medicine University of Wisconsin School of Medicine and Public Health University of Wisconsin Hospitals and Clinics Madison, Wisconsin

#### Claudia Crimi, MD

Research Fellow Department of Anaesthesia and Critical Care Harvard Medical School Boston, Massachusetts

## Ettore Crimi, MD

Resident in Anesthesia Department of Anesthesia and Critical Care Massachusetts General Hospital, Harvard Medical School Boston, Massachusetts

#### Kristina Crothers, MD

Assistant Professor Section of Pulmonary and Critical Care Department of Internal Medicine Yale University School of Medicine Staff Physician Yale New Haven Hospital New Haven, Connecticut

#### Gohar H. Dar, MD

Staff
Departments of Cardiothoracic Anesthesiology
and Critical Care Medicine
Cleveland Clinic
Cleveland, Ohio

Department of Medicine and Physical Medicine

#### Rabih O. Darouiche, MD

VA Distinguished Service Professor

and Rehabilitation
Baylor College of Medicine
Staff Physician
Department of Medicine and Spinal Cord Injury Care Lines
Michael E. Debakey Veterans Affairs Medical Center
Houston, Texas

#### Elizabeth Lee Daugherty, MD, MPH

Fellow Division of Pulmonary and Critical Care Medicine Department of Medicine Johns Hopkins University School of Medicine Baltimore, Maryland

#### David A. Decker, MD

Vascular Neurology Fellow Department of Neurology University of Florida College of Medicine McKnight Brain Institute Gainesville, Florida

#### Harakh V. Dedhia, MBBS, FACP, FCCP, FCCM

Professor
Department of Medicine and Anesthesiology
Section of Pulmonary—CCM
West Virginia University Health Science Center
Medical Director, Medical ICU and Respiratory Care
Department of Medicine
West Virginia University Hospital
Morgantown, West Virginia

#### Giuseppe De Luca, MD, PhD

Assistant Professor Clinical and Experimental Medicine Eastern Piedmont University Chief Interventional Cardiology, Clinical Cardiology Ospedale Maggiore Della Carita Novara, Italy

#### Leonardo De Luca, MD

Medical Staff Department of Cardiovascular Sciences European Hospital Rome, Italy

#### Demetrios Demetriades, MD, PhD, FACS

Professor of Surgery and Emergency Medicine, Director of Trauma and Surgical Intensive Care Unit Los Angeles County - USC Medical Center University of Southern California School of Medicine Los Angeles, California

#### Clifford S. Deutschman, MS, MD, FCCM

Professor of Anesthesiology and Critical Care and Surgery Department of Anesthesiology and Critical Care University of Pennsylvania School of Medicine Attending Physician, Surgical Critical Care Service Department of Anesthesiology and Critical Care Hospital of the University of Pennsylvania Philadelphia, Pennsylvania

#### Hector D. Dini, MD

Staff Department of Anesthesia Hospital Britanico de Buenos Aires Buenos Aires, Argentina

#### Jack A. Di Palma, MD

Professor and Director Division of Gastroenterology University of South Alabama College of Medicine Mobile, Alabama

#### Karen E. Doucette, MD, MSc

Assistant Professor Division of Infectious Diseases, Department of Medicine University of Alberta Edmonton, Alberta, Canada

#### Ionathan D. Dreier, MD

Anesthesia Critical Care Fellow Department of Anesthesia and Critical Care Medicine University of South Florida College of Medicine Tampa, Florida

#### David J. Dries, MSE, MD

Assistant Medical Director Surgical Care Health Partners Medical Group University of Minnesota Minneapolis, Minnesota

#### Quan-Yang Duh, MD

Professor
Department of Surgery
University of California, San Francisco
Attending Surgeon
Department of Surgery
VA Medical Center
San Francisco, California

#### Stephanie H. Dunlap, DO

Medical Director, Heart Transplant Program Rush University Medical Center Chicago, Illinois

#### Herbert L. DuPont, MD

Director, Center for Infectious Diseases
The University of Texas-Houston School of Public Health
Chief, Internal Medicine
St. Luke's Episcopal Hospital
Vice-Chairman, Department of Medicine
Baylor College of Medicine
Houston, Texas

#### Soumitra Eachempati, MD, FACS

Department of Surgery and Public Health Weill Cornell Medical College New York Presbyterian Hospital New York, New York

#### Rodney K. Edwards, MD, MS

Associate Director Phoenix Perinatal Associates Obstetrix Medical Group Phoenix, Arizona

#### A. Ahsan Ejaz, MD

Clinical Associate Professor Division of Nephrology, Hypertension & Transplantation University of Florida Director of Inpatient Nephrology Services Division of Nephrology, Hypertension, and Transplantation UF & Shands Hospital Gainesville, Florida

#### Elamin M. Elamin, MD, MSx, FACP, FCCP

Associate Professor Anesthesiology Department University of Florida Associate Professor Department of Anesthesiology Shands Hospital Gainesville, FL

## Timothy C. Fabian, MD, FACS

Harwell Wilson Professor and Chairman Department of Surgery University of Tennessee Health Science Center Memphis, Tennessee

## Samir Fakhry, MD, FACS

Professor of Surgery
Department of Surgery
Virginia Commonwealth University, Inova Campus
Chief, Trauma and Surgical Critical Care
Department of Trauma Services
Inova Fairfax Hospital
Falls Church, Virginia

#### Kevin J. Farrell, MD

Assistant Professor of Surgery Department of Surgery Emory University School of Medicine Atlanta, Georgia

#### Robert J. Feezor, MD

Assistant Professor Division of Vascular Surgery and Endovascular Therapy Department of Surgery University of Florida College of Medicine Gainsville, Florida

#### Joseph Feldschuh, MD, FACC

Clinical Associate Professor Emeritus

Departments of Medicine and Pathology New York Medical College New York, New York Attending Departments of Medicine and Cardiology Montefiore Hospital and Medical Center Bronx, New York

#### Niall D. Ferguson, MD, FRCPC, MSc

Assistant Professor
Department of Medicine & Interdepartmental
Division of Critical Care Medicine
University of Toronto
Research Director
Department of Critical Care Medicine
University Health Network
Toronto, Ontario, Canada

#### Sebastian Fernandez-Bussy, MD

Clinical Assistant Professor Lung Transplant Program University of Florida Gainesville, Florida

#### Joseph Ferreira BS, CPTC, CTOP II

Director of Clinical Operations Life Alliance Organ Recovery Agency University of Miami Miller School of Medicine Miami, Florida

#### Henry E. Fessler, MD

Associate Professor
Department of Pulmonary and Critical Care Medicine
Johns Hopkins School of Medicine
Director, Fellowship Training Program in
Pulmonary and Critical Care
Department of Medicine
Johns Hopkins Hospital
Baltimore, Maryland

#### Rhonda S. Fishel, MD, MBA, FACS

Associate Professor of Surgery Department of Surgery Johns Hopkins School of Medicine Associate Chief of Surgery Director of Surgical Critical Care Department of Surgery Sinai Hospital of Baltimore Baltimore, Maryland

#### Jay A. Fishman, MD

Associate Professor
Department of Medicine
Harvard Medical School
Director
Transplant Infectious Disease Program
Associate Director, Transplant Center
Infectious Disease Division
Massachusetts General Hospital
Boston, Massachusetts

#### Kathleen E. Fitzgerald, RN, BSN

Staff Nurse, Surgical ICU Shands Hospital at the University of Florida Gainesville, Florida

## Timothy C. Flynn, MD

Professor of Surgery Department of Surgery Senior Associate Dean University of Florida College of Medicine Gainesville, Florida

#### Rita Formisano, MD, PhD

Director of Neuro-Rehabilitation Department Post-Coma Unit I.R.C.C.S. Santa Lucia Foundation Rome, Italy

#### Cory M. Franklin, MD

Retired Director of the Division of Critical Care Cook County Hospital (Stroger) Chicago, Illinois

#### Michael A. Frölich, MD, MS

Associate Professor Department of Anesthesiology University of Alabama at Birmingham Birmingham, Alabama

#### Brian Fuehrlein, PhD

MD PhD Student College of Medicine and Department of Biomedical Engineering University of Florida Gainesville, Florida

#### W. Craig Fugate, MD

Director Florida Division of Emergency Management State of Florida Tallahassee, Florida

#### Andrea Gabrielli, MD, FCCM

Professor of Anesthesiology and Surgery
Division of Critical Care Medicine
Section Head, NeuroCritical Care
University of Florida College of Medicine;
Medical Director, Cardiopulmonary Service and Hyperbaric
Medicine
Shands Hospital at the University of Florida
Gainesville, Florida

#### Robert Peter Gale, MD

Counselor International Bone Marrow Transplant Registry University of Wisconsin Milwaukee, Wisconsin

#### George D. Garcia, MD

Trauma Surgery and Surgical Critical Care Fellow University of Miami -Jackson Memorial Hospital The DeWitt Daughtry Family Department of Surgery Division of Trauma, Surgical Critical Care & Burns Leonard M. Miller School of Medicine Miami, Florida

#### A. Joseph Garcia, MD

Senior Staff Physician
Departments of Emergency Medicine and
Critical Care Medicine
Henry Ford Hospital
Detroit, Michigan

#### Cynthia Wilson Garvan, PhD

Research Assistant Professor Division of Biostatistics College of Medicine University of Florida Gainesville, Florida

#### Achille Gaspardone, MD, Mphil

Aggregate Professor of Cardiology Department of Medicine Tor Vergata University Chief Division of Cardiology Ospedale S. Eugenio Rome, Italy

#### Georges A. Ghacibeh, MD

Northeast Regional Epilepsy Group Hackensack, New Jersey

#### Dany E. Ghannam, MD

Fellow
Department of Infectious Diseases
UT/MD Anderson Cancer Center
Houston, Texas
Fellow
Department of Critical Care Medicine
Stanford University of Medicine
Stanford, CA

#### Lewis R. Goldfrank, MD

Professor and Chair, Department of Emergency Medicine New York University School of Medicine New York, New York

#### Shankar P. Gopinath, MD

Department of Neurosurgery Baylor College of Medicine Ben Taub General Hospital Houston, Texas

#### Dietrich Gravenstein, MD

Associate Professor of Anesthesiology Department of Anesthesiology University of Florida College of Medicine Associate Professor Department of Anesthesiology Shands Hospital at the University of Florida Gainesville, Florida

#### J. S. Gravenstein, MD

Graduate Research Professor, Emeritus Department of Anesthesiology University of Florida College of Medicine Gainesville, Florida

#### David M. Greer, MD, MA

Asssistant Professor of Neurology Department of Neurology, Neurocritical Care and Stroke Group Massachusetts General Hospital Boston, Massachusetts

#### Jeffrey S. Groeger, MD

Professor
Department of Medicine
Weill Medical College of Cornell University
Chief, Urgent Care Service
Department of Medicine
Memorial Sloan Kettering Cancer Center
New York, New York

#### Jonathan Haft, MD

Department of Surgery University of Michigan Health System Ann Arbor, Michigan

#### Stephen B. Hanauer, MD

Professor
Department of Medicine and Clinical Pharmacology
University of Chicago
Chief
Gastroenterology, Heptalogy and Nutrition
University of Chicago Medical Center
Chicago, Illinois

#### Ikram U. Haque, MD

Assistant Professor Department of Pediatrics University of Florida College of Medicine Attending Physician Shands Children's Hospital at the University of Florida Gainesville, Florida

#### Cathleen Harris, MD

Assistant Professor Department of Obstetrics and Gynecology University of Vermont Fletcher Allen Health Care Burlington, Vermont

#### Holger H. Hasselbring, MD

Dr.Med. And Chairman

Department of Anesthesiology and Critical Care Medicine

Teaching Hospital of Ruhr-University

Director

Department of Anesthesiology and Critical Care Medicine

Augusta-Kranken-Anstalt

Bochum, Germany

#### Kevin W. Hatton, MD

Fellow Division of Critical Care Medicine Department of Anesthesiology University of Florida College of Medicine Gainesville, Florida

#### George Hatzakis, MSc, PhD

Division of Trauma and Critical Care Los Angeles County - USC Medical Center Los Angeles, California

#### William Hayden, MD

Professor of Pediatric Intensive Care Unit Rush University School of Medicine Chicago, Illinois

#### Stephen O. Heard, MD

Professor
Departments of Anesthesiology and Surgery
University of Massachusetts Medical School
Chairman
Department of Anesthesiology
UMass Memorial Medical Center
Worcester, Massachusetts

#### Bryce A. Heese, MD, MA

Assistant Professor Department of Pediatrics University of Florida Department of Pediatrics Shands Hospital Gainesville, Florida

#### Marcelo E. Heinig, MD

Professor

Division of Nephrology, Hypertension and Transplantation University of Florida College of Medicine Gainesville, Florida

#### Alan W. Hemming, MD, MSc

Department of Surgery
University of Florida
Chief
Division of Transplantation & Hepatobiliary Surgery
Department of Surgery
Shands at the University of Florida
Gainesville, Florida

#### Dean R. Hess, PhD, RRT

Associate Professor Department of Anesthesia Harvard Medical School Assistant Director Department of Respiratory Care Massachusetts General Hospital Boston, Massachusetts

#### Zoltan G. Hevesi, MD

Associate Professor Department of Anesthesiology and Surgery University of Wisconsin Director of Transplant Anesthesiology Department of Anesthesiology and Surgery University of Wisconsin Hospital and Clinics Madison, Wisconsin

#### Thomas L. Higgins, MD, MBA

Professor of Medicine; Assistant Professor of Anesthesia Departments of Medicine and Anesthesiology Tufts University School of Medicine Boston, Massachusetts Chief, Critical Care Division Critical Care/Department of Medicine Baystate Medical Center Springfield, Massachusetts

#### Hao Chih Ho, MD

Assistant Professor Department of Surgery University of Hawaii Medical Director Trauma Division The Queen's Medical Center Honolulu, Hawaii

#### Jamie Hochman, MS, CRT

Systems Administrator Sinai Hospital of Baltimore Baltimore, Maryland

#### Maureane Hoffman, MD, PhD

Professor
Department of Pathology
Duke University
Director
Blood Bank and Hematology Laboratories
Durham VA Medical Center
Durham, North Carolina

#### Brian L. Hoh, MD

Assistant Professor Department of Neurological Surgery University of Florida College of Medicine Gainesville, Florida

#### M. Barbara Honnebier, MD, PhD

Pediatric and Adult Plastic and Reconstructive Surgery Cranio-Maxillo-Facial Surgery The Queens' Medical Center and Kapiolani Medical Center for Women and Children Honolulu, Hawaii

#### Charles W. Hoopes, MD

Assistant Professor Department of Surgery University of California, San Francisco Section Chief Cardiopulmonary Transplantation University of California, San Francisco San Francisco, California

#### Ramona O. Hopkins, PhD

Chair, Psychology Department
Associate Professor, Psychology and Neuroscience
Psychology Department
Brigham Young University
Provo, Utah
Department of Critical Care Medicine
Pulmonary and Critical Care Division
Intermountain Medical Center
Murray, Utah
Department of Critical Care Medicine
Pulmonary and Critical Care Medicine
Pulmonary and Critical Care Division
LDS Hospital
Salt Lake City, Utah

#### David B. Hoyt, MD, FACS

Professor and Chair Department of Surgery University of California, Irvine Chief of Surgery Department of Surgery University of California, Irvine Medical Center Orange, California

#### Laurence Huang, MD

Professor
Department of Medicine
University of California, San Francisco
Chief, AIDS Chest Clinic
Department of Medicine, HIV/AIDS Division
and Division of Pulmonary and Critical Care Medicine
San Francisco General Hospital
San Francisco, California

#### Thomas S. Huber, MD, PhD

Professor of Surgery Department of Surgery University of Florida College of Medicine Shands Hospital–The University of Florida Gainesville, Florida

#### Ahamed H. Idris, MD

Professor of Surgery and Medicine Department of Surgery University of Texas Southwestern Medical Center at Dallas Senior Attending Physician Emergency Medicine Parkland Memorial Hospital Dallas, Texas

#### Steven R. Insler, DO

Staff Anesthesiologist and Critical Care Physician Departments of Cardiac Anesthesia and Critical Care Medicine The Cleveland Clinic Foundation Cleveland, Ohio

#### Felicia A. Ivascu, MD

Trauma Surgery and Surgical Critical Care Fellow University of Miami -Jackson Memorial Hospital The DeWitt Daughtry Family Department of Surgery Division of Trauma, Surgical Critical Care & Burns Leonard M. Miller School of Medicine Miami, Florida

#### James C. Jackson, PsyD

Division of Allergy/Pulmonary/Critical Care Medicine Center for Health Services Research Department of Psychiatry Vanderbilt University School of Medicine Nashville, Tennessee

#### J. Michael Jaeger, PhD, MD

Department of Anesthesiology Division of Critical Care Medicine Co-Medical Director, TCV-PO University of Virginia Health System Charlottesville, Virginia

#### Sridivya Jaini, MD, MS

Jacobi Medical Center Department of Medicine Bronx, New York

#### Michael A. Jantz, MD, FCCP

Associate Professor of Medicine Department of Pulmonary, Critical Care, and Sleep Medicine University of Florida Associate Professor of Medicine Pulmonary, Critical Care, and Sleep Medicine Shands Hospital Gainesville, Florida

#### Edgar J. Jimenez, MD, FCCM

Associate Professor
Department of Medicine
University of Florida and Florida State University
Director, Medical Critical Care
Critical Care Medicine
Orlando Regional Medical Center
Orlando, Florida

#### Aaron Joffee, MD

Clinical Assistant Professor of Medicine University of Wisconsin School of Medicine and Public Health Madison, Wisconsin

#### Raja Kandaswamy, MD

Associate Professor
Department of Transplant Surgery
University of Minnesota
Transplant and General Surgeon
Department of Transplant Surgery
University of Minnesota Medical Center, Fairview
Minneapolis, Minnesota

#### Scott R. Karlan, MD

Assistant Clinical Professor of Surgery Department of Surgery University of California, Los Angeles Associate Director of Trauma Department of Surgery Cedars-Sinai Medical Center Los Angeles, California

#### Paraskevi A. Katsaounou, MD

Lecturer in Pulmonary Medicine Department of Critical Care and Pulmonary Services University of Athens Medical School Evangelismos Hospital Athens, Greece

#### Eileen H. Kim, MIA, MD

Post-Doctoral Fellow
Phoebe R. Berman Bioethics Institute
Johns Hopkins University
Baltimore, Maryland
Attending Physician
Critical Care Medicine
Mercy Hospital of Philadelphia
Philadelphia, Pennsylvania

#### Robin D. Kim, MD

Assistant Professor of Surgery Division of Transplantation & Hepatobiliary Surgery University of Florida College of Medicine Gainesville, Florida

#### Craig S. Kitchens, MD Professor of Medicine

Department of Medicine University of Florida Associate Chief of Staff (Education) Medical Service Malcolm Randall VA Medical Center Gainesville, Florida

#### Orlando C. Kirton, MD, FACS, FCCM, FCCP

Professor of Surgery/Associate Program
Director Integrated General Surgery Residency
Program
Vice Chairman, Department of Surgery
University of Connecticut, School of Medicine
Farmington, Connecticut

#### Charles T. Klodell, MD

Assistant Professor Department of Surgery University of Florida Gainesville, Florida

#### Marin H. Kollef, MD

Professor of Medicine
Department of Pulmonary and Critical Care Medicine
Washington University School of Medicine
Director
Medical Intensive Care Unit
Barnes-Jewish Hospital
St. Louis, Missouri

#### Meghavi S. Kosboth, DO

Clinical Fellow Division of Rheumatology and Clinical Immunology University of Florida Gainesville, Florida

#### Andreas H. Kramer, MD, FRCPC

Assistant Professor Departments of Critical Care and Clinical Neurosciences University of Calgary Calgary, Alberta, Canada

#### Christopher J. Krebs, MD

Neuroradiology Fellow Department of Radiology University of Florida College of Medicine Gainesville, Florida

#### Anand Kumar, MD

Associate Professor of Medicine
Departments of Medicine, Medical Microbiology
and Pharmacology/Therapeutics
University of Manitoba, Winnipeg, MB Canada
Department of Medicine
University of Medicine and Dentistry, New Jersey
Camden, New Jersey
Attending Physician
Department of Critical Care Medicine
Health Sciences Centre/St. Boniface Hospital
Winnipeg, Manitoba, Canada

#### Aseem Kumar, PhD

Associate Professor Canada Research Chair in Biomolecular Science Laurentian University Department of Chemistry and Biochemistry Sudbury, Ontario, Canada

#### Franco Laghi, MD

Professor of Medicine
Department of Pulmonary and Critical Care Medicine
Loyola University of Chicago, Stritch School of Medicine
Maywood, Illinois
Staff Physician
Pulmonary and Critical Care Medicine
Edward Hines Jr. VA Hospital
Hines, Illinois

#### A. Joseph Layon, MD, FACS

Professor of Anesthesiolosy, Surgery, and Medicine Chief, Division of Critical Care Medicine University of Florida College of Medicine; Medical Director, Surgical Critical Care Shands Hospital at the University of Florida; Medical Director, Gainesville Fire Rescue Service Gainesville, Florida

#### Aimée C. LeClaire, PharmD

Clinical Assistant Professor College of Pharmacy University of Florida Clinical Pharmacy Specialist, Surgical Critical Care Department of Pharmacy Shands at the University of Florida Gainesville, Florida

#### Marc Leone, MD, PhD

Departement d'Anesthesie et de Reanimation Centre Hospitalier Universitaire Nord Chemin des Bourrely, France

## Olivier Y. Leroy, MD

Chief Intensive Care Unit Hopital Guy Chatiliez Tourcoing, France

#### David M. Levi, MD

Associate Professor
Department of Surgery
University of Miami
Surgeon
Department of Surgery
UM/Jackson Memorial Medical Center
Miami, Florida

#### John G. Lieb, II, MD

Fellow in Gastroenterology Division of Gastroenterology Department of Medicine University of Florida Gainesville, Florida

#### Jack J. M. Ligtenberg, MD

Internist-Intensivist
Intensive & Respiratory Care Unit (ICB)
University Medical Center Groningen (UMCG)
Netherlands

#### John Paul M. Longphre, MD, MPH

Chief Resident
Division of Occupational and Environmental Medicine
Duke University
Durham, North Carolina
Associate Medical Director
Workcare, Inc. and Workplace Group, LLC
Greensboro, North Carolina

#### Lawrence Lottenberg, MD, FACS

Associate Professor of Surgery and Anesthesiology Department of Surgery University of Florida College of Medicine Trauma Medical Director Acute Care Surgery Shands Hospital at the University of Florida Gainesville, Florida

#### Michele A. Lorand, MD, FAAP

Chair, Division of Child Protective Services Department of Pediatrics John H. Stroger, Jr. Hospital of Cook County Chicago, Illinois

#### Harrinarine Madhosingh, MD

Clinical Assistant Professor,
Division of Infectious Diseases
Department of Medicine
University of Florida
Gainesville, Florida

#### John W. Mah, MD

Assistant Professor
Department of Surgery
University of Connecticut School of Medicine
Medical Director, Surgical ICU
Department of Surgery/Critical Care
Hartford Hospital
Hartford, Connecticut

#### Michael E. Mahla, MD

Professor of Anesthesiology & Neurosurgery Department of Anesthesiology University of Florida College of Medicine Gainesville, Florida

#### Patrick T. Mailloux, DO

Assistant Professor of Medicine
Department of Medicine
Tufts University School of Medicine
Boston, Massachusetts
Attending Physician/Intensivist
Critical Care Division/Department of Medicine
Baystate Medical Center
Springfield, Massachusetts

#### Elizabeth Manias RN, M.Pharm, NNursStud, PhD

Associate Professor and Associate Head of Research Training Equity and Staff Development Coordinator School of Nursing and Social Work The University of Melbourne Carlton, Victoria, Australia

#### Edward M. Manno, MD

Associate Professor Department of Neurology Mayo Clinic Medical Director Neurological Intensive Care Unit Saint Mary's Hospital Rochester, Minnesota

#### Daniel R. Margulies, MD, FACS

Director of Trauma and Surgical Critical Care Department of Surgery Cedars-Sinai Medical Center Los Angeles, California

#### Paul E. Marik, MD, FCCm, FCCP

Professor of Medicine Chief, Division of Pulmonary and Critical Care Medicine Thomas Jefferson University Philadelphia, Pennsylvania

#### John J. Marini, MD

Director of Translational Research HealthPartners Research Foundation Professor of Medicine University of Minnesota Minneapolis, Minnesota