

Anesthesiology Critical Care

BOARD REVIEW

Edited by

George W. Williams,

Navneet Kaur Grewal, Marc J. Popovich

ANESTHESIOLOGY CRITICAL CARE BOARD REVIEW

ANESTHESIOLOGY CRITICAL CARE BOARD REVIEW

EDITED BY

George W. Williams, MD, FASA, FCCM, FCCP

ASSOCIATE PROFESSOR OF ANESTHESIOLOGY AND CRITICAL CARE MEDICINE
VICE CHAIR FOR CRITICAL CARE MEDICINE
PROGRAM DIRECTOR, ANESTHESIOLOGY CRITICAL CARE MEDICINE FELLOWSHIP
MEDICAL CO-DIRECTOR, SURGICAL INTENSIVE CARE UNIT
LYNDON B. JOHNSON GENERAL HOSPITAL
HOUSTON, TX, USA

CO-EDITORS

Navneet Kaur Grewal, MD

ASSISTANT PROFESSOR OF ANESTHESIOLOGY AND CRITICAL CARE MEDICINE
ASSISTANT PROGRAM DIRECTOR, ANESTHESIOLOGY CRITICAL CARE
MEDICINE FELLOWSHIP PROGRAM
DIRECTOR OF EDUCATION, MEDICAL/SURGICAL AND
CARDIOVASCULAR INTENSIVE CARE UNITS
MEMORIAL HERMANN SOUTHWEST HOSPITAL
HOUSTON, TX, USA

Marc J. Popovich, MD, FCCM

HELMUT F CASCORBI PROFESSOR AND CHAIR, DEPARTMENT OF ANESTHESIOLOGY

AND PERIOPERATIVE MEDICINE

CASE WESTERN RESERVE UNIVERSITY SCHOOL OF MEDICINE

UNIVERSITY HOSPITALS CLEVELAND MEDICAL CENTER

CLEVELAND, OH, USA





Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and certain other countries.

Published in the United States of America by Oxford University Press 198 Madison Avenue, New York, NY 10016, United States of America.

© Oxford University Press 2020

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, by license, or under terms agreed with the appropriate reproduction rights organization. Inquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above.

You must not circulate this work in any other form and you must impose this same condition on any acquirer.

CIP data is on file at the Library of Congress ISBN 978-0-19-090804-1

This material is not intended to be, and should not be considered, a substitute for medical or other professional advice. Treatment for the conditions described in this material is highly dependent on the individual circumstances. And, while this material is designed to offer accurate information with respect to the subject matter covered and to be current as of the time it was written, research and knowledge about medical and health issues is constantly evolving and dose schedules for medications are being revised continually, with new side effects recognized and accounted for regularly. Readers must therefore always check the product information and clinical procedures with the most up-to-date published product information and data sheets provided by the manufacturers and the most recent codes of conduct and safety regulation. The publisher and the authors make no representations or warranties to readers, express or implied, as to the accuracy or completeness of this material. Without limiting the foregoing, the publisher and the authors make no representations or warranties as to the accuracy or efficacy of the drug dosages mentioned in the material. The authors and the publisher do not accept, and expressly disclaim, any responsibility for any liability, loss or risk that may be claimed or incurred as a consequence of the use and/or application of any of the contents of this material.

1 3 5 7 9 8 6 4 2

Printed by Sheridan Books, Inc., United States of America

To God who makes all things possible.

To my beautiful wife and best friend, Erin.

To Eden, Emeri, and Gabriel, who bring immeasurable joy to our lives.

CONTENTS

Preface	ix
Contributors	xi
1. Central Nervous System	1
Robert Brown	
2. Obstetric Critical Care	19
Marc J. Popovich	
3. Hematology and Oncology	24
Talia K. Ben-Jacob, Danielle L. Behrens, and Christopher P. Potestio	
4. Gastroenterology	43
Naveen Kukreja	
5. Trauma and Disaster Management	60
Joshua Person and Lillian S. Kao	
6. Critical Care Review: Burns	78
James M. Cross, Tonya C. George, and Todd F. Huzar	
7. Sedation, Pain Management, and Pharmacology	87
Sophie Samuel and Jennifer Cortes	
8. Endocrinology	100
Navneet Kaur Grewal and George W. Williams	
9. Immunology and Infectious Diseases	106
Joti Juneja Mucci	
10. Statistics, Ethics, and Management	115
George W. Williams	
11. Pulmonology	124
Ted Lytle and Marc J. Popovich	
12. Cardiovascular I: Physiology and Management	133
Linda W. Young	
13. Cardiovascular II: Mechanical Support and Resuscitation	148
John C. Klick	
14. Renal Acid-Base	165
Olakunle Idowu	
15. Procedures	179
Navneet Kaur Grewal	
16. Nutrition	188
George W. Williams	
Index	197

PREFACE

The Anesthesiology Critical Care Board Review was forged as a concept rooted in working to prepare critical care fellow physicians to take and be successful on the American Board of Anesthesiology Critical Care Certification Examination (ABACCCE). This goal is important because it speaks to our purpose as clinicians and educators in preparing the next generation of anesthesiologist intensivists. In my time as a program director (which functionally started in 2011), I found there to be a paucity of materials suited for and tailored to physicians preparing for the examination—in particular, a perioperative and wide-ranging examination such as the ABACCCE. I experienced this myself when I was a recent fellow graduate. As editors of this book, we sought to do everything in our power to prevent others from an anxiety-laden experience resulting from minimal opportunities to practice for a critical care examination with questions written by authors that shared a background in anesthesiology.

It is our hope that, after reading this book, our audience would have learned something new, been able to identify their strengths and weaknesses, and gain a perspective of factual content that is important for a successful clinician and leader in the intensive care unit. The editors and authors put a great deal of effort toward making the questions challenging yet fair, as well as thorough yet straightforward, for the reader. This book was created with the perspective and passion of educators from across the country who hope to make the process of board preparation less stressful and more productive.

Each chapter has been written by an author who actively provides care within the domain of the chapter. Additionally,

the editors have endeavored to make the format and style of the questions consistent with an examination's level of difficulty. This book would not have been possible without the hard work of my mentor Dr. Popovich and my partner Dr. Grewal; in this effort, we have generated a lasting partnership focused on education, and they have my thanks. The resulting product is a collective effort of our team, of which I am proud to be a member.

Please allow me to express my gratitude to the physicians and mentors that made this book possible: Dr. Howard Nearman, my chairman during my residency who as an anesthesiologist intensivist inspired me to work as hard as I could to be emulate his example as a compassionate physician and effective leader; my residency program codirectors Dr. Matthew Norcia (another intensivist) and Dr. David Wallace, who strongly encouraged me to pursue a career in critical care; the program director of my fellowship, Dr. Marc Popovich (co-editor), who taught me how to be confident and thorough as an intensivist and provided me with the skills to create and lead a new critical care division at a new institution; my parents, who always insisted that I give 100% effort to everything that I do; my patients, who give me the privilege of caring for them in their darkest hours and who, to this day, teach me something new in my experience of lifelong learning; and finally, my beautiful and incredibly supportive wife and our three children, who sacrificed nights and weekends together to allow this book to come to fruition.

George W. Williams, MD, FASA, FCCM, FCCP

CONTRIBUTORS

Danielle L. Behrens, DO

Assistant Professor of Medicine Cooper Medical School of Rowan University Attending Physician Division of Hematology/Oncology Department of Medicine MD Anderson/Cooper Cancer Center Cooper University Hospital Camden, NJ, USA

Talia K. Ben-Jacob, MD, MSc

Division Chief of Critical Care Medicine Department of Anesthesiology Cooper University Hospital Assistant Professor of Anesthesiology Cooper Medical School of Rowan University Camden, NJ, USA

Robert Brown, MD

Assistant Professor Department of Neurosurgery University of Texas Houston Health Science Center Houston, TX, USA

Jennifer Cortes, PharmD, BCPS, BCCCP

Medical ICU/Respiratory ICU Clinical Pharmacy Specialist Department of Pharmacy Services Memorial Hermann-Texas Medical Center Houston, TX, USA

James M. Cross, MD, FACS

Professor of Surgery McGovern Medical School at UT Health Medical Director John S. Dunn Burn Center Memorial Hermann-Texas Medical Center Houston, TX, USA

Tonya C. George, PhD, PAC

Physician Assistant Dallas, TX, USA

Navneet Kaur Grewal, MD

Assistant Professor of Anesthesiology and Critical Care Medicine

Assistant Program Director, Anesthesiology Critical Care Medicine Fellowship Program

Director of Education, Medical/Surgical and Cardiovascular Intensive Care Units

Memorial Hermann Southwest Hospital Houston, TX, USA

Todd F. Huzar, MD, FACS

Associate Professor Department of Surgery McGovern Medical School/UT Health Houston, TX, USA

Olakunle Idowu, MD

Assistant Professor
Department of Anesthesiology and Perioperative Medicine
Department of Critical Care and Respiratory Care
University of Texas MD Anderson Cancer Center
Houston, TX, USA

Lillian S. Kao, MD, MS

Professor Department of Surgery McGovern Medical School at UT Health Houston, TX, USA

John C. Klick, MD

Associate Professor Penn State University College of Medicine Division Chief, Cardiothoracic Anesthesiology Department of Anesthesiology and Perioperative Medicine Penn State Milton S. Hershey Medical Center Hershey, PA, USA

Naveen Kukreja, MD

Assistant Professor Department of Anesthesiology University of Colorado Denver, CO, USA

Ted Lytle, MD

Medical Director

Cardiothoracic Intensive Care University Hospitals Cleveland Medical Center Section Chief Critical Care

Section Cinei Citical Care

Harrington Heart and Vascular Institute University Hospitals Cleveland Medical Center

Associate Chief Medical Officer

University Hospitals Cleveland Medical Center

Assistant Professor

Department of Anesthesiology Case Western Reserve University Cleveland, OH, USA

Joti Juneja Mucci, MD

Assistant Professor

Case Western Reserve University School of Medicine Medical Director Surgical Intensive Care Unit Program Director Anesthesiology Critical Care Fellowship Department of Anesthesiology and Perioperative Medicine

University Hospitals Cleveland Medical Center

Cleveland, OH, USA

Joshua Person, MD

Assistant Professor of Surgery
Division of Acute Care Surgery
Department of Surgery
University of Texas McGovern Medical School at Houston
Houston, TX, USA

Marc J. Popovich, MD, FCCM

Helmut F Cascorbi Professor and Chair Department of Anesthesiology and Perioperative Medicine Case Western Reserve University School of Medicine University Hospitals Cleveland Medical Center Cleveland, OH, USA

Christopher P. Potestio, MD

Assistant Professor of Anesthesiology Cooper Medical School of Rowan University Attending Physician Division of Critical Care Department of Anesthesiology Cooper University Hospital Camden, NJ, USA

Sophie Samuel, PharmD, BCPS, BCCCP

Critical Care Clinical Specialist, Neurosciences Department of Pharmacy Services Memorial Hermann-Texas Medical Center Houston, TX, USA

George W. Williams, MD, FASA, FCCM, FCCP

Associate Professor of Anesthesiology and Critical
Care Medicine
Vice Chair for Critical Care Medicine
Program Director, Anesthesiology Critical Care
Medicine Fellowship
Medical Co-Director, Surgical Intensive Care Unit
Lyndon B. Johnson General Hospital
Houston, TX, USA

Linda W. Young, MD, MS

Critical Care Intensivist Anesthesiologist Critical Care Medicine Halifax Health Daytona Beach, FL, USA

ANESTHESIOLOGY CRITICAL CARE BOARD REVIEW