

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

Consultancies: Audis Bethea (Carolinas/Virginias Chapter of the Society of Critical Care Medicine's Executive Board); Allison E. Burnett (Anticoagulation Forum, National Certification Board for Anticoagulation); Kathleen Chester: Consultancies (Wolters Kluwer); Nancy Nix (BMS); Daniel R. Touchette (Institute for Clinical and Economic Review, Monument Analytics);

Stock Ownership: Linda A. Park (Johnson and Johnson)

Royalties: Allison E. Burnett (Wolters Kluwer);

Grants: Audis Bethea (Charleston Area Medical Center Foundation); Brittany D. Bissell (ASHP Foundation); Danielle R. Burghardt (National Institute of Health); Daniel R. Touchette (Institute for Clinical and Economic Review); Toby C. Trujillo (CSL Behring)

Honoraria: Allison E. Burnett (National Conference for Nurse Practitioners); Douglas Jennings (Novartis Pharmaceuticals); Nancy Nix (Coherus); Marcus Patrick (West Virginia Advanced Practice Nursing Conference); Hannah E. Pope (Chiesi); Ryan Rodriguez Honoraria: ACCP

Other:

Nothing to disclose: Susan Alu, Jennifer L. Cole, Ryan J. Feldman, Rita Gayed, Jaime Robenolt Gray, John M. Hammer, Jennifer M. Jarvis, Christopher Lam, Cynthia Lee, Abbie Leino, Mary M. Looby, Daniel Majerczyk, Carleton B. Maxwell, James T. Miller, Justin Muir, Mikayla Muzzey, Steven H. Nakajima, Scott D. Nei, David Nickerson, Kate Oltrogge Pape, Mona K. Patel, Dennis Parker, Jr., Kristen Rau, Preeyaporn Sarangarm. Haseeb Sattar, Kevin Sowinski, Joanna L. Stollings, Heather M. Teufel, Richard M. Williams, Abigail M. Yancey, Lisa Hall Zimmerman

ROLE OF BPS: The Board of Pharmacy Specialties (BPS) is an autonomous division of the American Pharmacists Association (APhA). To maintain its strict, independent standards for certification, BPS does NOT endorse or provide review information, preparatory courses, or study guides for Board Certification Examinations. The Board, through its specialty councils, is responsible for specialty examination content, administration, scoring, and all other aspects of its certification programs. BPS is totally separate and distinct from ACCP. PSAP has been approved by BPS for use in BCPS recertification. Information about the BPS recertification process is available [online](#).

Questions regarding BPS specialty recertification should be directed to:

[Board of Pharmacy Specialties](#)
2215 Constitution Avenue NW
Washington, DC 20037
(202) 429-7591

CRITICAL AND URGENT CARE I PANEL

Series Editors:

John E. Murphy, Pharm.D., FCCP, FASHP

Professor Emeritus
University of Arizona College of Pharmacy
Tucson, Arizona

Mary Wun-Len Lee, Pharm.D., FCCP, BCPS

Vice President and Special Assistant to the President
Midwestern University
Professor of Pharmacy Practice
Chicago College of Pharmacy
Downers Grove, Illinois

Faculty Panel Chair:

Lisa Hall Zimmerman, Pharm.D., FCCP, FCCM, BCPS, BCNSP, BCCCP

Clinical Pharmacist Specialist, Emergency Medicine
Department of Pharmaceutical Services
Beaumont Health
Royal Oak, Michigan
Adjunct Assistant Professor of Pharmacy Practice
Wayne State University
Eugene Applebaum College of Pharmacy and
Health Sciences
Detroit, Michigan

Stroke

Authors

Steven H. Nakajima, Pharm.D., BCCCP

Clinical Pharmacist, Emergency Medicine
Department of Pharmacy
New Hanover Regional Medical Center
Wilmington, North Carolina

Katleen Wyatt Chester, Pharm.D., BCCCP, BCGP

Clinical Pharmacist Specialist – Neurocritical Care
Marcus Stroke and Neuroscience Center
Grady Health System
Atlanta, Georgia

Reviewers

Dennis Parker, Jr., Pharm.D.

Associate Professor Clinical Specialist Neurointensive Care
Eugene Applebaum College of Pharmacy and Health
Sciences/Detroit Receiving Hospital
Detroit, Michigan

Abigail M. Yancey, Pharm.D., FCCP, BCPS

Professor
Department of Pharmacy Practice
St. Louis College of Pharmacy
St. Louis, Missouri

Marcus Patrick, Pharm.D., BCPS

MICU Pharmacist/Formulary Management
Department of Clinical Pharmacy
Hershel “Woody” Williams VA Medical Center
Huntington, West Virginia

Trauma and Neurologic Critical Care

Authors

Audis Bethea, Pharm.D., BCPS, BCCCP

Clinical Pharmacist
Acute Care Pharmacy Services
UK HealthCare, Good Samaritan Hospital
Lexington, Kentucky

Jennifer M. Jarvis, Pharm.D., BCPS

Clinical Pharmacy Specialist – Critical Care
Department of Pharmacy Services
Ascension St. Mary’s Hospital
Saginaw, Michigan

Reviewers

Danielle R. Burghardt, Pharm.D., BCCCP

Clinical Pharmacy Specialist
Department of Pharmacy
University of Michigan Health System
Ann Arbor, Michigan

Haseeb Sattar, Pharm.D., M.Phil, Ph.D., BCPS, Pg. Cert Internal Medicine

Assistant Professor of Internal Medicine
Department of Clinical Medicine
Chengdu University of Chinese Medicine
Chengdu, Sichuan China

The American College of Clinical Pharmacy and the authors thank the following individuals for their careful review of the Critical and Urgent Care I chapters:

Mary Wun-Len Lee, Pharm.D., FCCP, BCPS

Vice President and Special Assistant to the President
Midwestern University
Professor of Pharmacy Practice
Chicago College of Pharmacy
Downers Grove, Illinois

Jeffrey T. Sherer, Pharm.D., MPH, BCPS, BCGP

Clinical Professor
Department of Pharmacy Practice
and Translational Research
University of Houston College of Pharmacy
Houston, Texas

CRITICAL AND URGENT CARE II PANEL

Series Editors:

John E. Murphy, Pharm.D., FCCP, FASHP

Professor Emeritus
University of Arizona College of Pharmacy
Tucson, Arizona

Mary Wun-Len Lee, Pharm.D., FCCP, BCPS

Vice President and Special Assistant to the President
Midwestern University
Professor of Pharmacy Practice
Chicago College of Pharmacy
Downers Grove, Illinois

Faculty Panel Chair:

Lisa Hall Zimmerman, Pharm.D., FCCP, FCCM, BCPS, BCNSP, BCCCP

Clinical Pharmacist Specialist, Emergency Medicine
Department of Pharmaceutical Services
Beaumont Health
Royal Oak, Michigan
Adjunct Assistant Professor of Pharmacy Practice
Wayne State University
Eugene Applebaum College of
Pharmacy and Health Sciences
Detroit, Michigan

Pulmonary Embolus and DVT

Authors

John M. Hammer, Pharm.D., MBA, BCPS, DPLA

Clinical Pharmacist Specialist Medical Critical Care
PGY1 Residency Program Director
Atrium Health's Carolinas Medical Center
Division of Pharmacy
Charlotte, North Carolina

Carleton B. Maxwell, Pharm.D., BCPS, FNPhA

Clinical Pharmacy Manager
Atrium Health's Carolinas Medical Center
Division of Pharmacy
Charlotte, North Carolina

Reviewers

Linda A. Park, Pharm.D., BCPS

Clinical Pharmacy Specialist - Critical Care Medicine
Department of Pharmacy Services
Detroit Receiving Hospital and University Health Center
Detroit Medical Center
Detroit, Michigan

Daniel Majerczyk, Pharm.D., BCPS, BC-ADM, CACP

Assistant Professor of Clinical Sciences
Department of Clinical Sciences

Roosevelt University College of Pharmacy
Clinical Pharmacy Specialist
Department of Family Medicine
Loyola Medicine
Schaumburg, Illinois

Heparin Dosing, Monitoring, and Reversal

Authors

Allison E. Burnett, Pharm.D., Ph.C., CACP

Antithrombosis Stewardship Pharmacist
Inpatient Pharmacy Department
University of New Mexico Hospital
Albuquerque, New Mexico

Preeyaporn Sarangarm, Pharm.D., BCPS, BCCCP

Emergency Medicine/Critical Care Clinical Lead and Pharmacy Supervisor
PGY2 Residency Program Director
Department of Pharmacy
University of New Mexico Hospital
Albuquerque, New Mexico

Reviewers

Toby C. Trujillo, Pharm.D., FCCP, FAHA, BCPS-AQ Cardiology

Associate Professor
University of Colorado Skaggs School of Pharmacy and
Pharmaceutical Science
Aurora, Colorado

Christopher Lam, Pharm.D., BCPS

Clinical Pharmacist
Department of Pharmacy
Huntington Hospital
Pasadena, California

The American College of Clinical Pharmacy and the authors thank the following individuals for their careful review of the Critical and Urgent Care II chapters:

Judy Cheng, Pharm.D., MPH, FCCP, BCPS (AQ Cardiology)

Professor and Interim Chair of Pharmacy Practice
Department of Pharmacy Practice
MCPHS University
Clinical Pharmacy Specialist
Department of Pharmacy
Brigham and Women's Hospital
Boston, Massachusetts

Lisa C. Hutchison, Pharm.D., MPH, FCCP, BCPS, BCGP

Professor
Pharmacy Practice
University of Arkansas for Medical Sciences
Little Rock, Arkansas

CRITICAL AND URGENT CARE III PANEL

Series Editors:

John E. Murphy, Pharm.D., FCCP, FASHP

Professor Emeritus
University of Arizona College of Pharmacy
Tucson, Arizona

Mary Wun-Len Lee, Pharm.D., FCCP, BCPS

Vice President and Special Assistant to the President
Midwestern University
Professor of Pharmacy Practice
Chicago College of Pharmacy
Downers Grove, Illinois

Faculty Panel Chair:

Lisa Hall Zimmerman, Pharm.D., FCCP, FCCM, BCPS, BCNSP, BCCCP

Clinical Pharmacist Specialist, Emergency Medicine
Department of Pharmaceutical Services
Beaumont Health
Royal Oak, Michigan
Adjunct Assistant Professor of Pharmacy Practice
Wayne State University
Eugene Applebaum College of
Pharmacy and Health Sciences
Detroit, Michigan

Pain, Agitation, and Delirium

Author

Mary M. Looby, Pharm.D., BCPS, BCCCP

Critical Care Clinical Pharmacy Specialist
Department of Pharmacy
Inova Fairfax Medical Campus
Falls Church, Virginia

Reviewers

Joanna Stollings, Pharm.D., FCCP, FCCM, BCPS, BCCCP

MICU Clinical Pharmacy Specialist
Vanderbilt University Medical Center
Department of Pharmacy
Nashville, Tennessee

Jennifer L. Cole, Pharm.D., FCCP, BCPS, BCCCP

Clinical Pharmacy Specialist
Department of Pharmacy
Veterans Healthcare System of the Ozarks
Fayetteville, Arkansas

Smoke Inhalation and Toxic Exposure

Authors

Kate Oltrogge Pape, Pharm.D., BCPS, BCCCP

Clinical Pharmacy Specialist – Burn/Trauma/Surgery
University of Iowa Health Care, Department
of Pharmaceutical Care
Clinical Assistant Professor
University of Iowa College of Pharmacy
Iowa City, Iowa

Ryan Feldman, Pharm.D., BCPS, DABAT

Emergency Medicine Clinical Pharmacy Specialist
Department of Pharmacy
Froedtert & The Medical College of Wisconsin
Clinical Toxicologist
Wisconsin Poison Center
Children's Hospital of Wisconsin
Clinical Assistant Professor
School of Pharmacy
The Medical College of Wisconsin
Milwaukee, Wisconsin

Reviewers

Rita Gayed, Pharm.D., BCCCP

Critical Care Pharmacist Specialist - Burn Center
PGY-2 Critical Care Pharmacy Residency Program Director
Department of Pharmacy and Medical Nutrition
Grady Health System
Atlanta, Georgia

David Nickerson, Pharm.D., BCPS

Senior Pharmacist
Department of Pharmacy
Brigham and Women's Hospital
Boston, Massachusetts

Endocrine Emergencies

Authors

Jaime Robenolt Gray, Pharm.D., BCCCP

Clinical Pharmacy Specialist, Surgical Critical Care
Critical Care Residency Program Director
Department of Pharmacy
Hospital of the University of Pennsylvania
Philadelphia, Pennsylvania

Heather Rouse Teufel, Pharm.D., BCCCP

Clinical Pharmacy Specialist – Emergency Medicine
Department of Pharmacy
Penn Medicine Chester County Hospital
West Chester, Pennsylvania

CRITICAL AND URGENT CARE IV PANEL

Series Editors:

John E. Murphy, Pharm.D., FCCP, FASHP

Professor Emeritus
University of Arizona College of Pharmacy
Tucson, Arizona

Mary Wun-Len Lee, Pharm.D., FCCP, BCPS

Vice President and Special Assistant to the President
Midwestern University
Professor of Pharmacy Practice
Chicago College of Pharmacy
Downers Grove, Illinois

Faculty Panel Chair:

Lisa Hall Zimmerman, Pharm.D., FCCP, FCCM, BCPS, BCNSP, BCCCP

Clinical Pharmacist Specialist, Emergency Medicine
Department of Pharmaceutical Services
Beaumont Health
Royal Oak, Michigan
Adjunct Assistant Professor of Pharmacy Practice
Wayne State University
Eugene Applebaum College of Pharmacy and
Health Sciences
Detroit, Michigan

Statistics in Practice Chair:

Curtis E. Haas, Pharm.D., FCCP

Director of Pharmacy
University of Rochester Medical Center
Rochester, New York

Interactive Case: Anticoagulation for Unique Situations

Authors

Scott D. Nei, Pharm.D., BCPS, BCCCP

Cardiovascular Surgery ICU Pharmacist
Department of Pharmacy
Mayo Clinic Rochester
Rochester, Minnesota

Hannah E. Pope, Pharm.D., MHA, BCPS

Cardiac ICU Clinical Pharmacy Specialist
Department of Pharmacy
Barnes-Jewish Hospital
Saint Louis, Missouri

Reviewers

Douglas Jennings, Pharm.D., FCCP, FAHA, FACC, FHFSa, BCPS

Assistant Clinical Professor of Pharmacy Sciences
Columbia University School of Nursing
Affiliate Clinical Faculty
St. John College of Pharmacy and Health Sciences
New York, New York

Mikayla Muzzey, Pharm.D., MBA, BCPS

Clinical Pharmacist
Department of Pharmacy
North Kansas City Hospital
Kansas City, Missouri

Interactive Case: Anesthesia and Ventilator Management

Authors

Mona K. Patel, Pharm.D., BCCCP

Clinical Pharmacy Manager, Surgical Intensive Care Unit
Department of Pharmacy
New York Presbyterian Hospital/
Columbia Irving Medical Center
New York, New York

Justin Muir, Pharm.D., BCCCP

MICU Clinical Pharmacy Manager
Department of Pharmacy
New York Presbyterian Hospital/Columbia
Irving Medical Center
New York, New York

Reviewers

James T. Miller, Pharm.D., BCCCP

Clinical Pharmacy Specialist – Surgical Critical Care
Department of Pharmacy Services
Michigan Medicine
Adjunct Clinical Assistant Professor
University of Michigan College of Pharmacy
Ann Arbor, Michigan

**Richard Michael Williams, Pharm.D., MS,
Pharm.D., FASCP, BCPS**

Clinical Associate Professor of Pharmacy
LIU A&M Schwartz College of Pharmacy
*Affiliate Assistant Clinical Professor of
Clinical Pharmacy Practice*
St. John's University College of Pharmacy and
Allied Health Professions
*Affiliate Associate Professor for the Department
of Pharmacy Practice*
Touro College of Pharmacy
New York, New York

Kristen Rau, Pharm.D., BCPS

Clinical Staff Pharmacist
Ascension St. Elizabeth Hospital
Appleton, Wisconsin

Statistics in Practice: Comparing Three or More Groups

Authors

Daniel R. Touchette, Pharm.D., MA, FCCP

Professor
*Director of Graduate Studies, MS Comparative
Effectiveness Program*
Pharmacy Systems, Outcomes and Policy
University of Illinois at Chicago
Chicago, Illinois

Ryan Rodriguez, Pharm.D., BCPS

Clinical Assistant Professor
Drug Information Specialist
Department of Pharmacy Practice
University of Illinois at Chicago
Chicago, Illinois

Reviewers

Kevin M. Sowinski, Pharm.D., FCCP

Professor
Department of Pharmacy Practice
Purdue University, College of Pharmacy
Adjunct Professor
Department of Medicine
Indiana University, School of Medicine
Indianapolis, Indiana

Nancy M. Nix, Pharm.D., BCPS, BCOP

Pharmacy Oncology Specialist Coordinator
Ballad Health
Johnson City, Tennessee

Abbie D. Leino, Pharm.D., MS, BCPS

Specialty Practice Pharmacist
Department of Pharmacy
The Ohio State University Wexner Medical Center
Columbus, Ohio

The American College of Clinical Pharmacy and the authors
thank the following individuals for their careful review of the
Critical and Urgent Care IV features:

Judy Cheng, Pharm.D., MPH, FCCP, BCPS (AQ Cardiology)

Professor and Interim Chair of Pharmacy Practice
Department of Pharmacy Practice
MCPHS University
Clinical Pharmacy Specialist
Department of Pharmacy
Brigham and Women's Hospital
Boston, Massachusetts

Lynn Kassel, Pharm.D., BCPS

Associate Professor of Clinical Sciences
Department of Clinical Sciences
Drake University College of Pharmacy & Health Sciences
Des Moines, Iowa
Acute Care Pharmacist
MercyOne West Des Moines Hospital
West Des Moines, Iowa

Ralph H. Raasch, Pharm.D., FCCP, BCPS

Associate Professor of Pharmacy (retired)
Division of Practice Advancement and Clinical Education
Eshelman School of Pharmacy
The University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Reviewers

Brittany D. Bissell, Pharm.D., Ph.D., BCCCP

Clinical Pharmacist
Medical Intensive Care Unit
University of Kentucky
Lexington, Kentucky
Cynthia Lee, Pharm.D., MS, BCPS
Clinical Assistant Professor
Clinical and Administrative Pharmacy Services
Howard University College of Pharmacy
Washington, D.C.

Susan Alu, Pharm.D., BCPS, BC-ADM, CPH

Deputy Chief Pharmacist
Federal Medical Center Fort Worth
Federal Bureau of Prisons,
Fort Worth, Texas
The American College of Clinical Pharmacy and the
authors thank the following individuals for their careful
review of the Critical and Urgent Care III chapters:

H. Gwen Bartlett, Pharm.D., BCPS, BCCCP, BCCP

Clinical Pharmacist
Northern Light Eastern Maine Medical Center
Bangor, Maine

Joseph S. Bubalo, Pharm.D., BCPS, BCOP

Oncology Clinical Pharmacy Specialist
Assistant Professor of Medicine
Oregon Health and Science University Hospital and Clinics
Portland, Oregon

Anne L. Hume, Pharm.D., FCCP, BCPS

Professor of Pharmacy
Department of Pharmacy Practice
University of Rhode Island
Kingston, Rhode Island
Adjunct Professor of Family Medicine
Alpert School of Medicine at Brown University
Providence, Rhode Island