

Applied Therapeutics

The Clinical Use of Drugs

SEVENTH EDITION

Mary Anne Koda-Kimble
Lloyd Yee Young

Associate Editors
Wayne A. Kradjan
B. Joseph Guglielmo

Applied Therapeutics: THE CLINICAL USE OF DRUGS

Edited By

Mary Anne Koda-Kimble, PharmD

Professor and Dean
TJ Long Chair in Chain Pharmacy Practice
School of Pharmacy
University of California at San Francisco
San Francisco, California

Lloyd Yee Young, PharmD

Professor and Chair
Department of Clinical Pharmacy
TA Oliver Endowed Chair in Clinical Pharmacy, School of Pharmacy
University of California, San Francisco
San Francisco, California

Assistant Editors

Wayne A. Kradjan, PharmD

Dean and Professor
Oregon State University
College of Pharmacy
Corvallis, Oregon

B. Joseph Guglielmo, PharmD

Professor, Division of Clinical Pharmacy
School of Pharmacy
University of California at San Francisco
San Francisco, California



LIPPINCOTT WILLIAMS & WILKINS

A Wolters Kluwer Company

Philadelphia • Baltimore • New York • London
Buenos Aires • Hong Kong • Sydney • Tokyo

Editor: Daniel Limmer
Managing Editor: Matthew J. Hauber
Marketing Manager: Anne Smith
Production Editor: Paula C. Williams
Compositor: Graphic World, Inc.
Printer: Courier

Copyright © 2001 Lippincott Williams & Wilkins

351 West Camden Street
Baltimore, Maryland 21201-2436 USA

530 Walnut Street
Philadelphia, Pennsylvania 19106-3621 USA

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 utilized by any information storage and retrieval system without written permission from the copyright owner.

The publisher is not responsible (as a matter of product liability, negligence, or otherwise) for any injury resulting from any material contained herein. This publication contains information relating to general principles of medical care which should not be construed as specific instructions for individual patients. Manufacturers' product information and package inserts should be reviewed for current information, including contraindications, dosages, and precautions.

Printed in the United States of America

First Edition, 1975	Fourth Edition, 1988
Second Edition, 1978	Fifth Edition, 1992
Third Edition, 1983	Sixth Edition, 1995

Library of Congress Cataloging-in-Publication Data

Applied therapeutics: The clinical use of drugs / edited by Mary Anne Koda-Kimble, Lloyd Yee Young ; assistant editors, Wayne A. Kradjan, B. Joseph Guglielmo.— 7th ed.
p. ; cm.

Includes bibliographical references and index.

ISBN 0-7817-3137-2

1. Chemotherapy. 2. Pharmacology. I. Koda-Kimble, Mary Anne.

[DNLM: 1. Drug Therapy. WB 330 A651 2001]

RM262 .A65 2001

615.5'8—dc21

00-048146

The publishers have made every effort to trace the 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) 824-7390**. International customers should call **(301) 714-2324**.

Visit Lippincott Williams & Wilkins on the Internet: <http://www.LWW.com>. Lippincott Williams & Wilkins customer service representatives are available from 8:30 am to 6:00 pm, EST, Monday through Friday, for telephone access.

01 02 03 04 05
1 2 3 4 5 6 7 8 9 10

Preface to the Seventh Edition

The last chapter for the seventh edition of Applied Therapeutics, Inc. (ATI) has been delivered to the publisher and we celebrate its completion. The dedication of our authors, editors, reviewers, and publisher has been remarkable and very much appreciated. Although the work on this edition now comes to a gradual close, we see much work awaiting all of us as we observe a health care system under considerable stress. Shortages of nurses, pharmacists, and other health care providers interface with remarkable new technologies, increased costs, and decreased access to care. The roles of the disadvantaged and the underserved continue to increase at a time of remarkable economic growth over the past decade. Meanwhile, health care strives to find better approaches to manage escalating costs, to enhance the quality of care provided, and to meet and exceed rising customer expectations. Systems to guarantee safety and freedom from errors (including medication errors) are urgently needed as our rapidly growing elderly populations increasingly access health care.

The future of health care ultimately resides in the next generation of practitioners. We need to recruit the best and the brightest to health care and we need to prepare them to meet the challenges of tomorrow. Our understanding of diseases has improved, new drugs are available, and we eagerly await the result of continuing research in fields such as neurochemical biology, genetics, genomics, medicine, and public health. We hope this edition shares sufficient thought processes to assist students in the formulation of the problem-solving skills needed to integrate present and future knowledge about its appropriate drug use.

All chapters in this edition have been revised and updated to reflect our changing knowledge of drugs and the application of this knowledge to the therapy of patients. As in previous editions, we have encouraged our authors to present patient cases that stimulate the reader to integrate and apply therapeutic principles to the specific patient. In this text, we have striven to provide students and practitioners with a glimpse into the minds of clinicians who are assessing and solving therapeutic problems so that they too can begin to develop their own set of problem-solving skills.

The authors have drawn much information from their clinical experiences. *It remains the responsibility of every practitioner to evaluate the appropriateness of a particular opinion in the context of the actual clinical situation and with due consideration of any new developments in the field. Although the authors have been careful to recommend therapies that are in agreement with current standards and responsible literature, we recommend the student or practitioner consult several appropriate information sources when dealing with new and unfamiliar drugs.*

B. Joseph Guglielmo
Mary Anne Koda-Kimble
Wayne A. Kradjan
Lloyd Yee Young

October 2000

Preface to the Sixth Edition

As this sixth edition of *Applied Therapeutics* goes to press, unprecedented change is occurring in the delivery of health care. Managed care increasingly dictates how care will be delivered; hospitals are closing or consolidating as the number of admissions diminish and patient stays become more abbreviated; primary care providers are taking center stage, while specialists struggle to find their niche; wellness and prevention programs intended to keep patients out of health care systems are growing; and medical information systems are beginning to provide “outcomes” information for large populations. Drugs comprise approximately 7% to 9% of the total health costs and are considered by many to be one of the most cost-effective modes of treatment. Nevertheless, because drug benefits are often “carved out” of the medical reimbursement, benefit managers tend to treat these agents as commodities. Price and efficient delivery are often foremost on the minds of decision makers even though neither guarantees the desired therapeutic outcome.

This text amply demonstrates the complexity of pharmaceutical care. A good therapeutic outcome relies on the appropriate selection, use, and evaluation of drug therapy and requires thoughtful attention to the individual characteristics of the patient. As the managed care system produces an increasing number of therapeutic guidelines and clinical pathways, we urge clinicians to keep a watchful eye for the exception to the rule and to continually incorporate new data from the literature into their thinking.

Many changes have been made to this sixth edition. As in past editions, we have urged our authors to present cases which stimulate the reader to integrate and apply therapeutic principles to the specific patient described. Generous feedback from our readers caused us to expand substantially the oncology, psychiatric, derma-

tology, drug abuse, pediatric, and geriatric sections. New chapters addressing a problem-oriented approach to drug therapy and biotechnology have been added as well. For our readers outside of the United States, equivalent international units have been added, where appropriate, to the end of each case history. In addition, commonly abbreviated terms are spelled out on first usage to help familiarize practitioners with standard terminology. All chapters have been revised and updated, many of them substantially, to reflect changes in the field. We believe we have upgraded the quality of the text significantly through the critical reviews and guidance of our section editors.

Ultimately, we have added more at a time when the health care world cries for less. Nevertheless, we feel this is justified as drug therapy becomes more complex and patients previously treated in hospitals are cared for in intermediate-care facilities, the home, and other ambulatory settings. We continue to abide by the philosophies and principles set forth in the prefaces of our first and fifth editions: to provide students and practitioners with a glimpse into the minds of clinicians who are assessing and solving therapeutic problems on a daily basis so that they too can begin modeling their own problem-solving skills. The “Update Sections” we have included at the end of some chapters reaffirm our commitment to bring you a text that is as current as possible. As always, we welcome and value your comments so that we can continue to improve our product.

Lloyd Yee Young
Mary Anne Koda-Kimble

August 1995

Preface to the First Edition

In the past decade, new roles for the pharmacist have emerged. More and more frequently the pharmacist is placed in increasingly responsible positions within the health care delivery system. In this capacity (s)he is able to have a significant influence on the quality of health care delivered to the patient. M. Silverman and P. Lee have skillfully assessed the current and future role of the pharmacist in *Pills, Profits and Politics*.¹

"... It is the pharmacist who can play a vital role in assisting physicians to prescribe rationally, who can help see to it that the right drug is ordered for the right patient at the right time, in the right amounts and with due consideration of costs and that the patient knows how, when and why to use both prescription and non-prescription products.

It is the pharmacist who has been most highly trained as an expert in drug products, who has the best opportunity to keep up-date on developments in this field and who can serve both physician and patient as a knowledgeable advisor. It is the pharmacist who can take a key part in preventing drug misuse, drug abuse and irrational prescribing."

Many schools of pharmacy have made substantial curriculum changes to prepare their graduates for these responsibilities. Although traditional pharmacy courses have imparted factual information about drugs, they have not enabled the students to apply these facts to the drug therapy of patients. Similarly, traditional pharmacology and medical text books do not provide the professional with sufficient information to make a judgment regarding the selection and dosing of a particular product for a specific patient. To arrive at this decision, the clinician must consider a number of patient factors, including age, renal and hepatic function, concurrent disease states and medications and allergies. (S)he must also consider drug product factors, including bioavail-

ability, pharmacokinetics, efficacy, toxicity, risk to benefit ratio, and cost.

We have found that students who have most difficulty in *integrating* and *applying* the multiple components of their education to formulate the safest, most rational drug regimen for a given patient. We have also observed that although the student is able to enumerate the adverse effects on a drug, (s)he is unable to recognize or monitor for these effects should they occur in his/her patient.

This text is an outgrowth of the clinical pharmacy courses taught at the University of California and at Washington State University. The major objective of these courses is to enable the student to practice effectively in the clinical setting. Lectures on the pathophysiology and medical management of disease states are supplemented with conferences where students are challenged with drug therapy questions frequently asked by physicians and by case histories which require drug therapy assessment and the selection of appropriate alternatives. The objective of these conferences and this text is to enable the student to identify relevant factors in drug treatment, such as the probability of whether or not a specific drug is responsible for a patient's symptoms; the clinical significance of a drug interaction; why a specific drug is not achieving therapeutic blood levels; the dose for a patient with multiple disease states.

The success of the conference portion of our courses was a major determinant of the format used for this text; case histories which simulate the actual practice situations and frequently asked therapeutic questions are followed by well-referenced responses.

The authors have drawn much information from their clinical experiences. *It remains the responsibility of every practitioner to evaluate the appropriateness of a particular opinion in the context of the actual clinical situation and with due considerations of any new developments in the field.* Although the authors have been careful to recommend dosages that are in agreement with current standards and responsible literature, we suggest the student or practitioner consult several appropriate information sources when dealing with new and unfamiliar drugs.

¹Silverman, M. and Lee, PR.: *Pills, Profits and Politics*, University of California Press, Berkeley, 1975, p. 192.

Acknowledgments to Seventh Edition

We are deeply indebted to the many dedicated people who have given of themselves to complete the seventh edition of this book. As always, we are grateful to our contributing authors who struggled not only with deadlines and format, but also with significant changes in the management of our publication team. We thank the section editors for their truly remarkable support as they edited chapters, assisted authors, and assisted us in the changeover from Applied Therapeutics, Inc. to Lippincott Williams & Wilkins (LWW). More specifically, thank you to section editors Brian K. Alldredge (Neurologic Disorders), Jeffrey N. Baldwin (Substance Abuse), Ann Bolinger-Churukian (Pediatrics), Thomas J. Comstock (Renal Disorders), Allan J. Ellsworth (Dermatologic Disorders), Beverly J. Holcombe (Nutrition), Celeste M. Lindley (Neoplastic Disorders), Mark D. Watanabe and Patrick R. Finley (Psychiatric Disorders), and Bradley R. Williams (Geriatric Therapy).

Thank you to everyone on the ATI team (Diane Ellis, Tami Martin, Steven Naught, Nannette Naught, Nancy Trogstad, Linda Young) and to the new LWW team (Donna Balado, Shannon Benner, Matt Hauber, Lofton Montgomery, Dan Limmer). We are especially grateful for the understanding and long-suffering patience of our spouses (Deter, Don, Carolyn, and Linda), respectively; our adult children; and now our grandchildren.

B. Joseph Guglielmo
Mary Anne Koda-Kimble
Wayne A. Kradjan
Lloyd Yee Young

October 2000

Notice to Reader

Drug therapy information is constantly evolving. Our ever-changing knowledge and experience with drugs and the continual development of new drugs necessitates changes in treatment and drug therapy. The editors, authors, and publisher of this work have made every effort to ensure the information provided herein was accurate at the time of publication. *It remains the responsibility of every practitioner to evaluate the appropriateness of a*

particular opinion or therapy in the context of the actual clinical situation and with due consideration of any new developments in the field. Although the authors have been careful to recommend dosages that are in agreement with current standards and responsible literature, the student or practitioner should consult several appropriate information sources when dealing with new and unfamiliar drugs.

Contributors

Steven R. Abel, PharmD

Professor and Head, Department of Pharmacy Practice
Purdue University School of Pharmacy and Pharmacal Sciences
West Lafayette, Indiana

Brian K. Alldredge, PharmD

Professor of Clinical Pharmacy, Clinical Professor of Neurology,
Departments of Clinical Pharmacy and Neurology
Northern California Comprehensive Epilepsy Center
University of California, San Francisco
San Francisco, California

J. V. Anandan, PharmD, BCPS

Adjunct Associate Professor, College of Pharmacy and Allied Health
Professions
Wayne State University;
Assistant Director of Pharmacy
Henry Ford Hospital
Detroit, Michigan

Laura E. Arrigoni, PharmD

Clinical Assistant Professor, Department of Pharmacy, Harborview
Medical Center
University of Washington
Seattle, Washington

Sara Grimsley Augustin, PharmD, BCPP

Assistant Professor of Pharmacy Practice
Mercer University Southern School of Pharmacy
Atlanta, Georgia

Francesca T. Aweeka, PharmD

Associate Clinical Professor of Pharmacy, Division of Clinical Pharmacy
University of California, San Francisco
San Francisco, California

Neeta Bahal O'Mara, PharmD, BCPS

Clinical Pharmacist
Dialysis Clinics, Inc.
North Brunswick, New Jersey

Jeffrey N. Baldwin, PharmD

Associate Professor of Pharmacy Practice and Pediatrics
Colleges of Pharmacy and Medicine
University of Nebraska Medical Center
Omaha, Nebraska

Andrew D. Barnes, PharmD

Clinical Pharmacist, Cardiothoracic Surgery
University of Washington Medical Center;
Clinical Assistant Professor, School of Pharmacy
University of Washington
Seattle, Washington

David T. Bearden, PharmD

Assistant Professor, Department of Pharmacy Practice
Albany College of Pharmacy
Albany, New York

William H. Benefield Jr., PharmD, BCPP, FASCP

Clinical Pharmacologist
San Antonio State School;
Clinical Assistant Professor of Pharmacology
The University of Texas Health Science Center at San Antonio;
Clinical Assistant Professor of Pharmacy
The University of Texas at Austin
San Antonio, Texas

Paul M. Beringer, PharmD

Associate Professor of Clinical Pharmacy, Department of Clinical
Pharmacy
USC School of Pharmacy
Los Angeles, California

Shaun E. Berning, PharmD

Clinical Pharmacy Coordinator
Mycobacterial Disease Service;
Assistant Clinical Faculty Member, Department of Medicine
National Jewish Medical and Research Center
Denver, Colorado

Nicholas Blanchard, PharmD, MEd

Assistant Professor of Pharmacy Practice, College of Pharmacy
Washington State University
Pullman, Washington

Ann M. Bolinger, PharmD

Associate Professor of Clinical Pharmacy, Department of Clinical
Pharmacy, School of Pharmacy
University of California, San Francisco
San Francisco, California

C. A. Bond, PharmD

Professor and Associate Dean, School of Pharmacy
Texas Tech University Health Sciences Center at Amarillo
Amarillo, Texas

Mary C. Borovicka, PharmD, BCPP

Assistant Professor
University of Maryland School of Pharmacy;
Clinical Pharmacist, Spring Grove Hospital Center
University of Maryland
Baltimore, Maryland

Laurie L. Briceland, PharmD

Professor of Pharmacy Practice
Albany College of Pharmacy
Albany, New York

Donald F. Brophy, PharmD, BCPS

Assistant Professor, Departments of Pharmacy and Internal Medicine,
Medical College of Virginia
Virginia Commonwealth University
Richmond, Virginia

Glen R. Brown, PharmD

Pharmacy Department
St. Paul's Hospital
Vancouver, British Columbia, Canada

Jill S. Burkiewicz, PharmD

Assistant Professor, Department of Pharmacy Practice, Chicago College of Pharmacy
Midwestern University, Advocate Health Centers
Chicago, Illinois

Keith D. Campagna, PharmD

Associate Professor
Auburn University School of Pharmacy;
Clinical Associate Professor, University of Alabama School of Medicine
University of Alabama
Montgomery, Alabama

Betsy A. Carlisle, PharmD, CDE

Clinical Education Consultant
Pfizer Incorporated
Lake Bluff, Illinois

Barry L. Carter, PharmD

Professor, Division of Clinical and Administrative Pharmacy, College of Pharmacy and Department of Family Medicine, College of Medicine
University of Iowa
Iowa City, Iowa

Chris P. Chalmers, PharmD

Clinical Liaison
Roche Laboratories Inc.;
Clinical Instructor
University of Washington, School of Pharmacy
Seattle, Washington

Jennifer C. Y. Chan, PharmD

Clinical Assistant Professor, College of Pharmacy
The University of Texas at Austin;
Clinical Associate Professor of Pediatrics and Clinical Assistant Professor of Pharmacology
The University of Texas Health Science Center
San Antonio, Texas

Stanley W. Chapman, MD

Director Infectious Diseases
University of Mississippi Medical Center;
Professor of Medicine, Associate Professor of Microbiology,
Vice Chairman, Department of Medicine
University of Mississippi
Jackson, Mississippi

Steven W. Chen, PharmD

Assistant Professor of Clinical Pharmacy
University of Southern California;
Faculty-in-Residence
Cedars-Sinai Medical Center
Los Angeles, California

Michael F. Chicella, PharmD

Assistant Professor, Clinical Pharmacy Practice
Auburn University;
Adjunct Assistant Professor, Pediatrics
University of South Alabama
Mobile, Alabama

Moses S. S. Chow, PharmD, FCP, FCCP

Professor and Director, School of Pharmacy, Faculty of Medicine
The Chinese University of Hong Kong
Shatin, Hong Kong

Tom B. Christian, RPh, BCPS

Staff Pharmacist, Pharmacy Department
Southwest Washington Medical Center
Vancouver, Washington

Alice M. Clark, PhD

Director
National Center for Natural Products Research;
Frederick A. P. Barnard Distinguished Professor of Pharmacognosy
University of Mississippi
University, Mississippi

John D. Cleary, PharmD

Associate Professor of Clinical Pharmacy
University of Mississippi Medical Center, School of Pharmacy,
Department of Clinical Pharmacy Practice
Jackson, Mississippi

Thomas J. Comstock, PharmD

Associate Professor, Departments of Pharmacy and Internal Medicine
Virginia Commonwealth University
Richmond, Virginia

Robin L. Corelli, PharmD

Associate Clinical Professor, Department of Clinical Pharmacy
University of California, San Francisco
San Francisco, California

Judy L. Curtis, PharmD, BCPP, FASHP

Assistant Professor, Department of Pharmacy Practice and Science
University of Maryland School of Pharmacy;
Director of Pharmacy Services
Rosewood Center
Baltimore, Maryland

Phuong-Anh (Baxi) Dang-Vu, PharmD

Clinical Pharmacist, Solid Organ Transplant Surgery
University of Washington Medical Center;
Clinical Instructor
University of Washington School of Pharmacy
Seattle, Washington

Larry H. Danziger, PharmD

Professor of Pharmacy Practice, College of Pharmacy, Department of Pharmacy Practice,
Associate Vice Chancellor for Research
University of Illinois at Chicago
Chicago, Illinois

Catherine E. Dennehy, PharmD

Assistant Clinical Professor, Department of Pharmacy
University of California, San Francisco
San Francisco, California

Suzanne P. Dix, PharmD, BCOP

BMT Clinical Specialist, Oncology and Hematology Associates
Saint Luke's Hospital of Kansas City
Kansas City, Missouri

Betty J. Dong, PharmD

Professor of Clinical Pharmacy and Clinical Professor of Family and Community Medicine, Departments of Clinical Pharmacy and Family and Community Medicine, Clinical Pharmacist, Thyroid Clinic
University of California, San Francisco
San Francisco, California

Andrew J. Donnelly, PharmD, MBA

Assistant Director of Pharmacy, Clinical Pharmacist, Operating Room/Anesthesiology
Rush-Presbyterian-St. Luke's Medical Center;
Assistant Professor, College of Health Sciences
Rush University;
Adjunct Clinical Associate Professor, Chicago College of Pharmacy
Midwestern University;
Clinical Assistant Professor
University of Illinois at Chicago College of Pharmacy
Chicago, Illinois

Julie A. Dopheide, PharmD, BCPP

Associate Professor of Clinical Pharmacy, Psychiatry and the Behavioral Sciences, USC Schools of Pharmacy and Medicine
University of Southern California
Los Angeles, California

Vicky J. Dudas, PharmD

Assistant Clinical Professor of Pharmacy, School of Pharmacy
University of California, San Francisco
San Francisco, California

Babette S. Duncan, PharmD, BCPS

Senior Director, Clinical Services
Advance Paradigm Clinical Services
Hunt Valley, Maryland;
Clinical Assistant Professor
University of Maryland School of Pharmacy
Baltimore, Maryland

Robert E. Dupuis, PharmD, BCPS

Clinical Associate Professor, School of Pharmacy, Division of Pharmacotherapy
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Allan Ellsworth, PharmD, BCPS

Professor of Pharmacy and Family Medicine, Schools of Pharmacy and Medicine
University of Washington
Seattle, Washington

Martha P. Fankhauser, MS

Clinical Associate Professor, Department of Pharmacy Practice and Sciences
University of Arizona College of Pharmacy
Tucson, Arizona

Patrick R. Finley, PharmD, BCPP

Associate Clinical Professor, Department of Clinical Pharmacy
University of California, San Francisco;
Clinical Consultant
Kaiser Permanente of Northern California
San Francisco, California

Rebecca S. Finley, PharmD

Associate Professor and Chair, Department of Pharmacy Practice and Pharmacy Administration
Associate Dean, Philadelphia College of Pharmacy
University of the Sciences in Philadelphia
Philadelphia, Pennsylvania

Douglas N. Fish, PharmD, BCPS

Associate Professor of Pharmacy, Department of Pharmacy Practice
University of Colorado School of Pharmacy;
Clinical Pharmacist, Medical/Surgical Intensive Care Units
University Hospital
Denver, Colorado

John Flaherty, PharmD

Clinical Professor of Pharmacy, Department of Clinical Pharmacy
University of California, San Francisco;
Clinical Sciences Liaison
Gilead Sciences
San Francisco, California

Robin H. Fuerst, PharmD

Clinical Pharmacy Coordinator
St. Joseph Regional Medical Center
Lewiston, Idaho;
Adjunct Clinical Faculty
Washington State University
Pullman, Washington

Teri L. Gabel, PharmD, BCPP

Drug Therapy Consultants
Omaha, Nebraska

Steven P. Gelone, PharmD

Associate Professor of Pharmacy, Pharmacy Practice Department
School of Pharmacy;
Assistant Professor of Medicine, Section of Infectious Diseases, Department of Medicine
School of Medicine;
Clinical Pharmacist in Infectious Diseases, Temple University Health System
Temple University
Philadelphia, Pennsylvania

Barry E. Gidal, PharmD

Assistant Professor, School of Pharmacy and Department of Neurology
Division of Neurology
University of Wisconsin
Madison, Wisconsin

Jeffery A. Goad, PharmD, BCPS

Assistant Professor of Clinical Pharmacy, Department of Pharmacy
University of Southern California School of Pharmacy
Los Angeles, California

Julie A. Golembiewski, PharmD

Clinical Assistant Professor of Pharmacy, Adjunct Assistant Professor of Anesthesiology
University of Michigan Health System
Ann Arbor, Michigan

William C. Gong, PharmD, FASHP

Associate Professor of Clinical Pharmacy, Director, Residency and Fellowship Training
University of Southern California, School of Pharmacy
Los Angeles, California

Mildred D. Gottwald, PharmD

Assistant Clinical Professor, Department of Clinical Pharmacy
University of California, San Francisco;
Medical Scientific Associate
Novartis Pharmaceuticals
San Francisco, California

B. Joseph Guglielmo, PharmD

Professor and Vice Chair, Department of Clinical Pharmacy, School of Pharmacy
University of California, San Francisco
San Francisco, California

Emily B. Hak, PharmD

Associate Professor, Department of Clinical Pharmacy
The University of Tennessee, Memphis
Memphis, Tennessee

Thomas G. Hall, PharmD, BCPS

Manager of Clinical Services, Department of Pharmacy
Barnes-Jewish Hospital;
Associate Professor of Pharmacy Practice
Saint Louis College of Pharmacy
Saint Louis, Missouri

Jennifer L. Hardman, PharmD

Clinical Associate Professor, Department of Pharmacy Practice
University of Illinois at Chicago
Chicago, Illinois

Fotini K. Hatzopoulos, PharmD

Assistant Director, Clinical Pharmacy Services
Hospital Pharmacy Services;
Clinical Associate Professor, Department of Pharmacy Practice,
College of Pharmacy
University of Illinois at Chicago Medical Center
Chicago, Illinois

David W. Henry, MS, BCOP, FASHP

Associate Professor and Pharmacy Specialist in Pediatric
Hematology/Oncology
Department of Pharmacy Practice
University of Kansas Medical Center
Kansas City, Kansas

Beverly J. Holcombe, PharmD, BCNSP

Clinical Specialist, Nutrition Support, Department of Pharmacy
University of North Carolina Hospitals;
Clinical Associate Professor, School of Pharmacy
University of North Carolina
Chapel Hill, North Carolina

Mark T. Holdsworth, PharmD

Assistant Professor, College of Pharmacy
University of New Mexico
Albuquerque, New Mexico

Eileen G. Holland, PharmD, BCPS

Medical Science Manager
Bristol-Myers Squibb Company
Brownsburg, Indiana

Curtis D. Holt, PharmD

Assistant Clinical Professor, Director, Clinical Research Program,
Dumont-UCLA Transplant Center
Division of Liver and Pancreas Transplantation
UCLA Medical Center
Los Angeles, California

Joanna Q. Hudson, PharmD, BCPS

Assistant Professor, Department of Clinical Pharmacy
The University of Tennessee, Memphis
Memphis, Tennessee

Gail S. Itokazu, PharmD

Clinical Assistant Professor of Pharmacy in Medicine
University of Illinois at Chicago;
Division of Infectious Diseases
Cook County Hospital
Chicago, Illinois

Timothy J. Ives, PharmD, MPH

Associate Professor of Pharmacy, School of Pharmacy
Clinical Associate Professor of Family Medicine, School of Medicine
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

George S. Jaresko, PharmD

Assistant Professor, Clinical Pharmacy, School of Pharmacy
University of Southern California
Los Angeles, California

Lucia K. Jim, PharmD

Associate Professor of Pharmacy and Vice Chairwoman, Department
of Clinical Pharmacy
King Saud University College of Pharmacy;
Clinical Pharmacist, Hematology and Oncology
King Khalid University Hospital
Riyadh, Kingdom of Saudi Arabia

Curtis A. Johnson, PharmD

Professor of Pharmacy and Medicine
University of Wisconsin, Madison
Madison, Wisconsin

James W. Jones, PharmD

Assistant Clinical Professor, Department of Pediatrics and College
of Pharmacy
The Ohio State University
Columbus, Ohio

Paul W. Jungnickel, PhD

Associate Professor, Pharmacy Practice
Associate Dean for Academic and Student Affairs, Auburn University
School of Pharmacy
Auburn University
Auburn University, Alabama

Rachel L. Kleiman-Wexler, PharmD

Director of Pharmacy, Sapir Medical Center
Meir Hospital
Kfar Saba, Israel

Mary Anne Koda-Kimble, PharmD

Professor and Dean, TJ Long Chair in Chain Pharmacy Practice,
School of Pharmacy
University of California, San Francisco
San Francisco, California

Peter J.S. Koo, PharmD

Pharmacist Specialist, Pain Management, Associate Clinical Professor
of Pharmacy, Department of Clinical Pharmacy
University of California, San Francisco
San Francisco, California

Karen A. Kostiuk-Bikhazi, PharmD

Assistant Clinical Professor of Pharmacy, School of Pharmacy
University of California, San Francisco
San Francisco, California

Wayne A. Kradjan, PharmD

Dean and Professor, College of Pharmacy
Oregon State University
Corvallis, Oregon

Donna M. Kraus, PharmD

Pediatric Clinical Pharmacist, Associate Professor of Pharmacy Practice
Departments of Pharmacy Practice and Pediatrics, Colleges of Pharmacy
and Medicine
University of Illinois at Chicago
Chicago, Illinois

Lyle K. Laird, PharmD, BCPP

Medical Science Manager in Neuroscience
Bristol-Myers Squibb Company;
Adjoint Associate Professor, School of Pharmacy
University of Colorado Health Science Center
Denver, Colorado

Alan H. Lau, PharmD, FCCP

Professor, Department of Pharmacy Practice, College of Pharmacy
University of Illinois at Chicago
Chicago, Illinois

Celeste Lindley, PharmD, FCCP, FASHP

Associate Professor of Pharmacy, Clinical Associate Professor
of Medicine
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Rex S. Lott, PharmD

Associate Professor, Department of Pharmacy Practice & Administrative
Science, College of Pharmacy
Idaho State University;
Mental Health Clinical Pharmacist
Boise Veterans Affairs Medical Center
Boise, Idaho

Raymond C. Love, PharmD, BCPP, FASHP

Vice Chair and Associate Professor, Department of Pharmacy Practice
& Science, School of Pharmacy
University of Maryland
Baltimore, Maryland

Andrew D. Luber, PharmD

Executive Director
Pacific Oaks Research;
Clinical Pharmacy Specialist—HIV/Infectious Diseases
Pacific Oaks Medical Group
Beverly Hills, California

Helen L. Lucia, MD

Professor of Pathology
Saba University School of Medicine
Saba, Netherlands Antilles

Hilary D. Mandler, PharmD

Senior Medical Science Manager, Infectious Diseases
Bristol-Myers Squibb
Cherry Hill, New Jersey

Tamara A. Marek-Thompson, PharmD

Private Practice
Fort Morgan, Colorado

Patricia A. Marken, PharmD, BCPP, FCCP

Chair and Associate Professor of Pharmacy Practice, School of Pharmacy
Associate Professor of Psychiatry, Schools of Medicine
University of Missouri, Kansas City
Kansas City, Missouri

James W. McAuley, PhD

Assistant Professor of Pharmacy Practice and Administration
Assistant Professor of Neurology
The Ohio State University
Columbus, Ohio

Dayna L. McCauley, PharmD, BCOP

Practice Administrator
Long Island Gynecologic Oncologists, PC
Smithtown, New York

James P. McCormack, PharmD

Associate Professor, Faculty of Pharmaceutical Sciences
University of British Columbia
Vancouver, British Columbia, Canada

James M. McKenney, PharmD

Professor Emeritus
Virginia Commonwealth University;
President
National Clinical Research
Richmond, Virginia

S. Troy McMullin, PharmD, BCPS

Clinical Pharmacist, Critical Care, Department of Pharmacy
Barnes-Jewish Hospital
Saint Louis, Missouri

Robert J. Michocki, PharmD

Professor, Pharmacy Practice and Science, Clinical Professor Family
Medicine
University of Maryland Schools of Pharmacy and Medicine
Baltimore, Maryland

Robert K. Middleton, PharmD

Clinical Coordinator, Department of Pharmacy
Beebe Medical Center
Lewes, Delaware

Milap C. Nahata, PharmD

Charles H. Kimberly Professor of Pharmacy and Chair, Division
of Pharmacy Practice and Administration, College of Pharmacy;
Professor of Pediatrics, College of Medicine
Ohio State University and Children's Hospital
Columbus, Ohio

Jean M. Nappi, PharmD, FCCP, BCPS

Professor and Vice Chair, Department of Pharmacy Practice
Medical University of South Carolina
Charleston, South Carolina

Paul G. Nolan Jr., PharmD, FCCP, FASHP

Professor, College of Pharmacy, Department of Pharmacy Practice
Clinical Scientist, Sarver Heart Center
Cardiovascular Clinical Pharmacist, University Medical Center
University of Arizona
Tucson, Arizona

Cindy L. O'Bryant, PharmD

Assistant Professor
University of Colorado Health Sciences Center, School of Pharmacy
Denver, Colorado

Ali J. Olyaei, PharmD, BCPS

Assistant Professor of Medicine and Nursing, Division of Nephrology,
Hypertension and Clinical Pharmacology
Instructor of Surgery, Division of Liver and Pancreas Transplantation/
Hepatobiliary Surgery
Transplant Clinical Specialist, Department of Pharmacy Services
Oregon Health Sciences University
Portland, Oregon

Frank P. Paloucek, PharmD

Clinical Associate Professor, Director Residency Programs,
Diplomate American Board Applied Toxicology,
Adjunct Assistant Professor of Emergency Medicine
University of Illinois at Chicago
Chicago, Illinois

Louise Parent-Stevens, PharmD, BCPS

Clinical Assistant Professor, Department of Pharmacy Practice
College of Pharmacy, University of Illinois at Chicago
Chicago, Illinois

Jennifer Tran Pham, PharmD, BCPS

Neonatal Clinical Pharmacist, Clinical Assistant Professor
University of Illinois at Chicago College of Pharmacy, Department
of Pharmacy Practice
Chicago, Illinois

Ralph H. Raasch, PharmD

Associate Professor
University of North Carolina at Chapel Hill School of Pharmacy
Chapel Hill, North Carolina

John M. Rabkin, MD

Associate Professor of Medicine, Director, Liver/Pancreas Transplantation
Oregon Health Sciences University
Portland Veterans Affairs Medical Center
Portland, Oregon

Sana Rikabi-Sukkari, PharmD

Clinical Pharmacist, Hematology (Oncology) Palliative Care,
Pharmacy Department, Joseph Brant Memorial Hospital
Burlington, Ontario, Canada

Marjorie D. Robinson, PharmD

Assistant Professor, Pharmacy Practice, Clinical Coordinator Infectious Diseases—AIDS
Nova Southeastern University College of Pharmacy
Fort Lauderdale, Florida

Carol J. Rollins, RD, PharmD, BCNSP

Coordinator, Nutrition Support Service, University Medical Center,
Department of Pharmacy Services
Clinical Associate Professor, College of Pharmacy
University of Arizona
Tucson, Arizona

Ronald J. Ruggiero, PharmD

Clinical Professor, Department of Clinical Pharmacy and Department of Obstetrics, Gynecology, and Reproductive Sciences
The University of California San Francisco National Center of Excellence in Women's Health
Pharmacist Specialist in Women's Health, Department of Pharmaceutical Services
University of California, San Francisco
San Francisco, California

Rosalie Sagraves, PharmD

Dean and Professor of Pharmacy Practice, College of Pharmacy
University of Illinois at Chicago
Chicago, Illinois

Jan Sahai, PharmD

Team Leader, HIV Oncology and Hepatitis
Glaxo Wellcome
Mississauga, Ontario, Canada

Joseph J. Saseen, PharmD, BCPS

Assistant Professor, Pharmacy and Family Medicine, Schools of Pharmacy and Medicine
University of Colorado Health Sciences Center
Denver, Colorado

Larry D. Sasich, PharmD, MPH

Pharmacist
Public Citizen's Health Research Group
Washington, District of Columbia

Terry L. Seaton, PharmD, FCCP, BCPS

Associate Professor, Division of Pharmacy Practice
Saint Louis College of Pharmacy
Saint Louis, Missouri

Timothy H. Self, PharmD

Professor of Clinical Pharmacy
University of Tennessee
Memphis, Tennessee

Richard D. Shell, MD

Assistant Professor of Pediatrics
The Ohio State University and Children's Hospital, Department of Pulmonary Medicine, Children's Hospital
Columbus, Ohio

Jay D. Sherr, PharmD, BCPP

Assistant Professor
University of Maryland, School of Medicine, Maryland Psychiatric Research Center
Baltimore, Maryland

Stacy Shifflett Shord, PharmD

Oncology Pharmacotherapy Fellow, School of Pharmacy
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Pamela A. Simon, PharmD, BCPS

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

Candace J. Smith-Scott, PharmD

Associate Clinical Professor
St. John's University College of Pharmacy & Allied Health Professions
Clinical Pharmacy Practice Department of Clinical Pharmacy
Jamaica, New York

Suelyn J. Sorensen, PharmD, BCPS

Clinical Pharmacist
Indiana University Hospital of Clarian Health;
Assistant Professor of Pharmacy Practice
Butler University College of Pharmacy and Health Sciences
Indianapolis, Indiana

Anne P. Spencer, PharmD, BCPS

Assistant Professor of Pharmacy Practice, College of Pharmacy
Medical University of South Carolina
Charleston, South Carolina

Steven W. Stanislav, PharmD, BCPP

Clinical Associate Professor, Pharmacy Practice Division, College of Pharmacy
The University of Texas at Austin;
Clinical Pharmacologist
Austin State School
Austin, Texas

Deborah A. Stanley, PharmD, PhC, BCPP

Clinical Pharmacy Services Coordinator and Clinical Psychopharmacology Specialist
Las Vegas Medical Center
Las Vegas, New Mexico;
Clinical Assistant Professor, College of Pharmacy
University of New Mexico
Albuquerque, New Mexico

Glen L. Stimmel, PharmD

Professor of Clinical Pharmacy and Psychiatry, Schools of Pharmacy and Medicine
University of Southern California
Los Angeles, California

Elaine C. Taylor, PharmD

Clinical Assistant Professor
University of Texas at Austin College of Pharmacy;
University of Texas at El Paso Cooperative Pharmacy Program
El Paso, Texas

John F. Thompson, PharmD, FCP

Adjunct Associate Professor of Pharmacy Practice
University of Southern California
Los Angeles, California

Imad M. Treish, PharmD

Adjunct Assistant Professor, Division of Pharmacotherapy, School of Pharmacy
University of North Carolina at Chapel Hill
Chapel Hill, North Carolina

Toby C. Trujillo, PharmD, BCPS

Cardiovascular Pharmacotherapy Specialist
Beth Israel Deaconess Medical Center;
Assistant Professor of Clinical Pharmacy
Massachusetts College of Pharmacy and Health Sciences
Boston, Massachusetts

Candy Tsourounis, PharmD

Assistant Clinical Professor, Acting Director, Drug Information Analysis
Service, School of Pharmacy
University of California, San Francisco
San Francisco, California

Carla L. Van Den Berg, PharmD

Assistant Professor, School of Pharmacy
University of Colorado Health Sciences Center
Denver, Colorado

Mark D. Watanabe, PharmD, PhD, BCPP

Clinical Pharmacist Specialist in Psychiatry
Alameda County Behavioral Health Care Services;
Assistant Clinical Professor, Clinical Pharmacy
University of California, San Francisco
Oakland, California

William A. Watson, PharmD, DABAT, FAACT

Professor (Clinical) and Managing Director
South Texas Poison Center;
Department of Surgery
University of Texas Health Science Center at San Antonio
San Antonio, Texas

C. Wayne Weart, PharmD, BCPS, FASHP

Professor and Chair, Department of Pharmacy Practice
Associate Professor, Department of Family Medicine
Medical University of South Carolina
Charleston, South Carolina

Timothy E. Welty, PharmD, BCPS

Associate Professor of Pharmacy Practice, McWhorter School
of Pharmacy
Samford University;
Clinical Pharmacy Specialist
The Kirklin Clinic
Birmingham, Alabama

C. Michael White, PharmD

Assistant Professor of Pharmacy Practice
University of Connecticut School of Pharmacy
Storrs, Connecticut;
Co-Director, Arrhythmia and Cardiovascular Pharmacology Research
Hartford Hospital Drug Information Center
Hartford, Connecticut

Dennis M. Williams, PharmD, BCPS

Associate Professor, Division of Pharmacotherapy
University of North Carolina
Chapel Hill, North Carolina

Bradley R. Williams, PharmD

Associate Professor, Clinical Pharmacy and Clinical Gerontology,
Schools of Pharmacy and Gerontology
University of Southern California
Los Angeles, California

Ann K. Wittkowsky, PharmD

Clinical Associate Professor
University of Washington School of Pharmacy;
Director of Anticoagulation Services
Clinical Pharmacist, Cardiology
University of Washington Medical Center
Seattle, Washington

Annie Wong-Beringer, PharmD

Associate Professor of Pharmacy Practice, College of Pharmacy
Western University of Health Sciences
Pomona, California

Veronica S.L. Young, PharmD

Clinical Assistant Professor, College of Pharmacy
University of Texas at Austin;
Assistant Director, Drug Information Service
University of Texas Health Science Center at San Antonio
San Antonio, Texas

Lloyd Y. Young, PharmD

Professor and Chair, Department of Clinical Pharmacy
Thomas A. Oliver Endowed Chair in Clinical Pharmacy,
School of Pharmacy
University of California, San Francisco
San Francisco, California

Abby B. Zangwill, PharmD

Associate Clinical Professor, Department of Clinical Pharmacy,
School of Pharmacy
University of California at San Francisco
San Francisco, California

Wendy Zerngast, MD, PharmD

University of Washington School of Medicine
Seattle, Washington

Contents

Preface to the Seventh Edition	v
Preface to the Sixth Edition	vi
Preface to the First Edition	vii
Acknowledgments to Seventh Edition	viii
Notice to Reader	viii
Contributors	ix

I. GENERAL PRINCIPLES 1-1

1. Assessment of Therapy and Pharmaceutical Care	1-1	Wayne A. Kradjan, Mary Anne Koda-Kimble, Lloyd Y. Young, B. Joseph Guglielmo
2. Interpretation of Clinical Laboratory Tests	2-1	Eileen G. Holland, Lloyd Y. Young
3. Herbs and Nutritional Supplements	3-1	Cathi Dennehy, Candy Tsourounis
4. Anaphylaxis and Drug Allergies	4-1	Paul M. Beringer, Robert K. Middleton
5. Managing Acute Drug Toxicity	5-1	William A. Watson, Frank Paloucek

II. GENERAL CARE 6-1

6. Nausea and Vomiting	6-1	Celeste Lindley
7. Pain	7-1	Elaine C. Taylor, Peter J. S. Koo
8. Perioperative Care	8-1	Andrew J. Donnelly, Julie A. Golembiewski
9. Acid-Base Disorders	9-1	S. Troy McMullin, Thomas G. Hall, Rachel L. Kleiman-Wexler
10. Fluid and Electrolyte Disorders	10-1	Alan H. Lau

III. CARDIAC AND VASCULAR DISORDERS 11-1

Wayne A. Kradjan, Section Editor

11. Dyslipidemias	11-1	James M. McKenney
-------------------	------	-------------------

xvi

12. Essential Hypertension	12-1	Joseph J. Saseen, Barry L. Carter
13. Peripheral Vascular Disorders	13-1	Anne P. Spencer, C. Wayne Weart
14. Thrombosis	14-1	Ann K. Wittkowsky
15. Ischemic Heart Disease: Anginal Syndromes	15-1	Toby C. Trujillo, Paul E. Nolan
16. Myocardial Infarction	16-1	Jean M. Nappi
17. Heart Failure	17-1	Wayne A. Kradjan
18. Cardiac Arrhythmias	18-1	Moses S. S. Chow, C. Michael White
19. Hypertensive Emergencies	19-1	Robert Michocki
20. Shock	20-1	Chris P. Chalmers, Andrew D. Barnes, Laura E. Arrigoni

IV. PULMONARY DISORDERS 21-1

Wayne A. Kradjan, Section Editor

21. Asthma	21-1	Timothy H. Self
22. Chronic Obstructive Pulmonary Disease	22-1	Wayne A. Kradjan, Dennis M. Williams
23. Acute and Chronic Rhinitis	23-1	Pamela A. Simon
24. Drug-Induced Pulmonary Disorders	24-1	Phuong-Anh (Baxi) Dang-Vu, Wendy Zerngast

V. GASTROINTESTINAL DISORDERS 25-1

Wayne A. Kradjan, Section Editor

25. Upper Gastrointestinal Disorders	25-1	Candace Smith-Scott
26. Inflammatory Bowel Disease	26-1	Babette S. Duncan
27. Alcoholic Cirrhosis	27-1	Ali J. Olyaei, John M. Rabkin
28. Adverse Effects of Drugs on the Liver	28-1	Curtis Holt, Lucia K. Jim

VI. RENAL DISORDERS 29-1*Thomas J. Comstock, Section Editor***29. Acute Renal Failure 29-1***Donald F. Brophy***30. Chronic Renal Failure 30-1***Joanna Q. Hudson, Curtis A. Johnson***31. Renal Dialysis 31-1***Thomas J. Comstock***32. Dosing of Drugs in Renal Failure 32-1***Francesca T. Aweeka***33. Solid Organ Transplantation 33-1***Robert E. Dupuis***VII. NUTRITION ISSUES 34-1***Beverly J. Holcombe, Section Editor***34. Adult Enteral Nutrition 34-1***Carol J. Rollins***35. Adult Parenteral Nutrition 35-1***Beverly J. Holcombe***VIII. DERMATOLOGIC DISORDERS 36-1***Allan J. Ellsworth, Section Editor***36. Dermatotherapy 36-1***T. A. Marek-Thompson, C. A. Bond***37. Acne 37-1***Terry L. Seaton***38. Psoriasis 38-1***Allan Ellsworth***39. Photosensitivity and Burns 39-1***Timothy J. Ives***IX. ARTHRITIC DISORDERS 40-1****40. Gout and Hyperuricemia 40-1***Lloyd Y. Young, Keith D. Campagna***41. Rheumatic Disorders 41-1***Steven W. Chen, William C. Gong***42. Connective Tissue Disorders: The Clinical Use of Corticosteroids 42-1***William C. Gong***X. WOMEN'S HEALTH 43-1****43. Contraception 43-1***Ronald J. Ruggiero***44. Obstetrics 44-1***Fotini K. Hatzopoulos, Rosalie Sagraves, Jennifer L. Hardman***45. Teratogenicity and Drugs in Breast Milk 45-1***Veronica S.L. Young***46. Gynecologic Disorders 46-1***Rosalie Sagraves, Louise Parent-Stevens, Jennifer L. Hardman***XI. ENDOCRINE DISORDERS 47-1****47. Thyroid Disorders 47-1***Betty J. Dong***48. Diabetes Mellitus 48-1***Mary Anne Koda-Kimble, Betsy A. Carlisle***XII. EYE DISORDERS 49-1****49. Eye Disorders 49-1***Steven R. Abel, Suellen Sorensen***XIII. NEUROLOGIC DISORDERS 50-1***Brian Alldredge, Section Editor***50. Headache 50-1***Brian K. Alldredge***51. Parkinson's Disease 51-1***Mildred D. Gottwald, Barry E. Gidal, John Flaherty***52. Seizure Disorders 52-1***Rex S. Lott, James W. McAuley***53. Cerebrovascular Disorders 53-1***Timothy E. Welty***XIV. INFECTIOUS DISEASES 54-1***B. Joseph Guglielmo, Section Editor***54. Principles of Infectious Diseases 54-1***B. Joseph Guglielmo***55. Antimicrobial Prophylaxis for Surgical Procedures 55-1***Laurie L. Briceland, B. Joseph Guglielmo***56. Central Nervous System Infections 56-1***Vicky Dudas, John F. Flaherty***57. Endocarditis 57-1***Annie Wong-Beringer***58. Respiratory Tract Infections 58-1***Steven P. Gelone, George S. Jaresko***59. Tuberculosis 59-1***Shaun E. Berning***60. Infectious Diarrhea 60-1***Larry H. Danziger, Gail S. Itokazu, David T. Bearden***61. Intra-Abdominal Infections 61-1***Jill S. Burkiewicz, Karen A. Kostiuk-Bikhazi***62. Urinary Tract Infections 62-1***Douglas N. Fish, Jan Sahai*

63. Sexually Transmitted Diseases 63-1

Jeffery A. Goad

64. Osteomyelitis/Septic Arthritis 64-1

Ralph H. Raasch

65. Traumatic Skin and Soft-Tissue Infections 65-1

James P. McCormack, Glen Brown

66. Infections in Neutropenic Patients 66-1

Hilary D. Mandler

67. Pharmacotherapy of Human Immunodeficiency Virus Infection 67-1

Andrew D. Luber

68. Opportunistic Infections (OIs) in HIV Patients 68-1

Marjorie D. Robinson

69. Fungal Infections 69-1

John D. Cleary, Stanley W. Chapman, Alice Clark, Helen Lucia

70. Viral Infections 70-1

Milap C. Nahata, Neeta Bahal O'Mara

71. Viral Hepatitis 71-1

Curtis D. Holt, Robin L. Corelli

72. Parasitic Infections 72-1

J. V. Anandan

73. Tick-Borne Disease 73-1

Tom Christian

XV. PSYCHIATRIC DISORDERS 74-1

Mark D. Watanabe and Patrick R. Finley, Section Editors

74. Anxiety Disorders 74-1

Sara Grimsley Augustin

75. Sleep Disorders 75-1

Julie A. Dopheide, Glen L. Stimmel

76. Schizophrenia 76-1

Patricia A. Marken, Steven W. Stanislaw

77. Mood Disorders I: Major Depressive Disorders 77-1

Patrick R. Finley, Lyle K. Laird, William H. Benefield, Jr.

78. Mood Disorders II: Bipolar Disorders 78-1

Raymond C. Love, Mary C. Borovicka

79. Psychiatric Disorders in Children, Adolescents, and People with Developmental Disabilities 79-1

Judy L. Curtis, Jay D. Sherr

80. Secondary Neuropsychiatric Disorders 80-1

Deborah A. Stanley, Steven W. Stanislaw

81. Eating Disorders 81-1

Martha P. Fankhauser

XVI. SUBSTANCE ABUSE 82-1

Jeffrey N. Baldwin, Section Editor

82. Psychoactive Substance Use Disorders 82-1

Jeffrey N. Baldwin, Teri L. Gabel

83. Alcohol Abuse 83-1

Paul W. Jungnickel

XVII. HEMATOPOIETIC DISORDERS 84-1

84. Anemias 84-1

Carla Van Den Berg, Cindy O'Bryant

85. Drug-Induced Blood Disorders 85-1

Larry D. Sasich, Sana R. Sukkari

XVIII. NEOPLASTIC DISORDERS 86-1

Celeste Lindley, Section Editor

86. Neoplastic Disorders and Their Treatment: General Principles 86-1

Celeste Lindley, Stacy Shifflett Shord, Rebecca S. Finley

87. Adverse Effects of Chemotherapy 87-1

Celeste Lindley, Rebecca S. Finley, Stacy Shifflett Shord

88. Hematologic Malignancies 88-1

*Adult: Rebecca Finley, Imad M. Treish, Celeste Lindley
Pediatric: Mark T. Holdsworth*

89. Solid Tumors 89-1

*Adult: Celeste Lindley, Rebecca Finley
Pediatric: David W. Henry*

90. Hematopoietic Cell Transplantation 90-1

Suzanne P. Dix, Dayna L. McCauley

XIX. PEDIATRICS 91-1

Ann M. Bolinger, Section Editor

91. Pediatric Considerations 91-1

Ann M. Bolinger, C. Y. Jennifer Chan, Abby B. Zangwill

92. Neonatal Therapy 92-1

Donna M. Kraus, Jennifer Tran Pham

93. Immunizations 93-1

Ann M. Bolinger, C. Y. Jennifer Chan

94. Pediatric Infectious Diseases 94-1

Nicholas Blanchard

95. Pediatric Nutrition 95-1

Michael F. Chicella, Emily B. Hak

96. Cystic Fibrosis 96-1

James W. Jones, Richard Shell

XX. GERIATRIC THERAPY 97-1

Bradley R. Williams, Section Editor

97. Geriatric Drug Use 97-1

Robin H. Fuerst

98. Geriatric Dementias 98-1

Bradley R. Williams

99. Geriatric Urologic Disorders 99-1

John F. Thompson

Drug Index DI-1

Index I-1