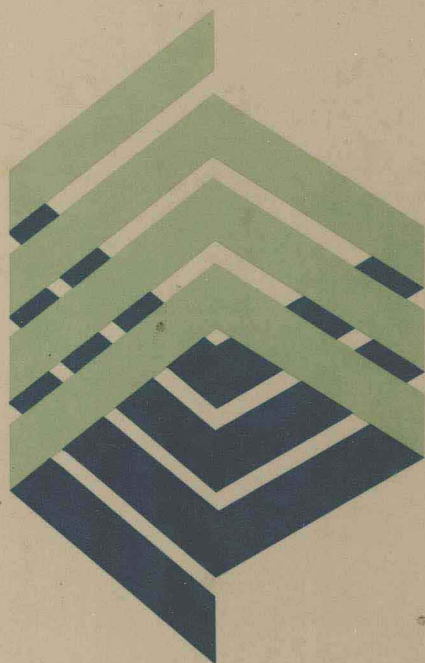


---

010291  
C.O.C.C. BOOKSTORE  
USED BOOK  
A \$33.70

# CLINICAL PHARMACOLOGY AND NURSING

---



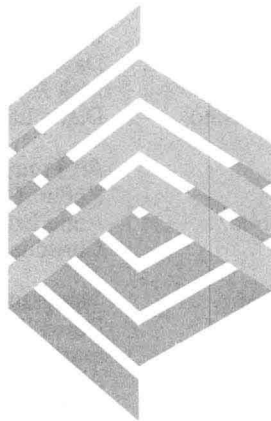
CHAROLD L. BAER  
BRADLEY R. WILLIAMS

---

---

# CLINICAL PHARMACOLOGY AND NURSING

---



---

**Charold L. Baer, RN, PhD**  
Professor, Department of Adult Health  
and Illness, Oregon Health Sciences  
University, School of Nursing, Portland,  
Oregon

**Bradley R. Williams, PharmD**  
Assistant Professor of Clinical Pharmacy  
and Clinical Gerontology, University of  
Southern California, Schools of  
Pharmacy and Gerontology, Los Angeles,  
California

---

SPRINGHOUSE PUBLISHING COMPANY  
Springhouse Corporation  
Springhouse, Pennsylvania

# STAFF

## CLINICAL STAFF

---

### Director, Nursing Textbooks

Minnie B. Rose, RN, BSN, MEd

### Consultant

Helene Nawrocki, RN, MSN Candidate

### Clinical Editors

Joanne DaCunha, RN, BS

Barbara McVan, RN

Diane Schweisguth, RN, BSN, CEN, CCRN

### Advisory Board

Kathleen G. Andreoli, DSN, FAAN, Vice-President, Nursing Affairs and The John L. and Helen Kellogg Dean of the College of Nursing, Rush-Presbyterian-St. Luke's Medical Center/Rush University, Chicago

Elnora D. Daniel, RN, EdD, FAAN, Dean, School of Nursing, Hampton (Va.) University

Kathleen Dracup, RN, DNSc, CCRN, FAAN, Associate Professor, School of Nursing, University of California, Los Angeles

Rhetaugh G. Dumas, RN, PhD, FAAN, Dean, School of Nursing, University of Michigan, Ann Arbor

Elizabeth Grossman, RN, EdD, FAAN, Dean, Indiana University School of Nursing, Indianapolis

Evelyn R. Hayes, RN, PhD, Associate Professor, University of Delaware, College of Nursing, Newark

Mary D. Naylor, PhD, FAAN, Associate Dean and Director of Undergraduate Studies, University of Pennsylvania School of Nursing, Philadelphia

## PUBLICATION STAFF

---

### Executive Director, Editorial

Stanley Loeb

### Executive Director, Creative Services

Jean Robinson

### Design

John Hubbard (art director), Stephanie Peters (associate art director), Lynn Foulk, Julie Carleton Barlow, Mary Stangl

### Editing

Diana Potter, Richard Stull, Nancy Priff, Leslie Brennan

### Copy Editing

David Moreau (manager), Edith McMahon (supervisor), Nick Anastasio, Keith de Pinho, Mary Durkin, Diane Labus, Doris Weinstock, Debra Young

### Art Production

Robert Perry (manager), Mark Marcin, Loretta Caruso, Anna Brindisi, Donald Knauss, Robert Wieder, Christina McKinley, Christopher Buckley

### Typography

David Kosten (manager), Diane Paluba (assistant manager), Nancy Wirs, Brenda Mayer, Joyce Rossi-Biletz, Alicia Dempsey, Mary T. Madden

### Manufacturing

Deborah Meiris (manager), T.A. Landis, Lisa Weiss

### Production Coordination

Susan Hopkins Rodzewich, Vikky Person

The drug selections, dosages, and procedures in this textbook are based on research and current recommendations by medical and nursing authorities. These selections and dosages comply with currently accepted standards although they cannot be considered conclusive. For each patient, any drug or dosage recommendation must be considered in conjunction with clinical data and the latest package-insert information. This is particularly essential with new drugs. The authors and the publisher disclaim responsibility for any untoward effects caused by these suggested selections and dosages or from the reader's misinterpretation of this information.

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Springhouse Corporation for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$00.00 per copy, plus \$.75 per page, is paid directly to CCC, 27 Congress St., Salem, MA 01970. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Service is 087434137X/88 \$00.00 + \$.75.

© 1988 by Springhouse Corporation. All rights reserved. No part of this book may be used or reproduced in any manner whatsoever without written permission except for brief quotations embodied in critical articles and reviews. Printed in the United States of America. For information write Springhouse Corporation, 1111 Bethlehem Pike, Springhouse, Pa. 19477.

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

Clinical pharmacology and nursing.

Includes bibliographies and index.

1. Pharmacology. 2. Nursing. I. Baer, Charold Lee Morris, 1946- . II. Williams, Bradley R.

[DNLM: 1. Drug Therapy—nurses' instruction.

2. Pharmacology, Clinical—nurses' instruction. QV 38 C6413]

RM301.C53 1988 615'.1 87-26744

ISBN 0-87434-137-X

# CONTRIBUTORS

- Steven R. Abel**, PharmD, RPh, Assistant Director of Pharmacy, Clinical and Educational Services, Indiana University Hospitals, Indianapolis
- Kathleen G. Andreoli**, DSN, FAAN, Vice President, Nursing Affairs and The John L. and Helen Kellogg Dean of the College of Nursing, Rush-Presbyterian-St. Luke's Medical Center/Rush University, Chicago
- Charold L. Baer**, RN, PhD, Professor, Department of Adult Health and Illness, Oregon Health Sciences University, School of Nursing, Portland
- Naomi R. Ballard**, RN, MA, MS, Associate Professor, Department of Adult Health and Illness, Oregon Health Sciences University, School of Nursing, Portland
- Carol L. Beck**, PharmD, RPh, Assistant Professor of Pharmacy Practice, North Dakota State University, College of Pharmacy, Fargo
- Rebecca E. Boehne**, RN, MSN, Assistant Professor, Adult Health and Illness, Oregon Health Sciences University, School of Nursing, Portland
- Karna Bramble**, RN, MS, CGNP, Assistant Professor of Nursing, California State University, Department of Nursing, Long Beach
- Barbara Gross Braverman**, RN, MSN, CS, Instructor of Psychiatry and Clinical Nurse Specialist, Medical College of Pennsylvania, Philadelphia
- Linda P. Brown**, RN, PhD, Assistant Professor, University of Pennsylvania, School of Nursing, Philadelphia
- Kathleen C. Byington**, RN, MSN, Pediatric Clinical Specialist, Vanderbilt Children's Hospital, Vanderbilt University, Nashville, Tenn.
- James D. Carlson**, PharmD, RPh, Associate Director, Pharmacology Research and Clinical Studies Institute, Fargo, N.D.
- Bruce C. Carlstedt**, BSc, PhD, RPh, Associate Professor of Clinical Pharmacy, Purdue University, School of Pharmacy and Pharmacal Sciences, West Lafayette, Ind.
- Vivian Hayes Churness**, RN, DNSc, Assistant Professor, University of Southern California, Department of Nursing, Los Angeles
- Teresa Lyon Coluccio**, RN, MN, Clinical Nurse Specialist, Oncology, Providence Medical Center, Seattle
- Carol Solomon Dalglish**, RN, MSN, Clinical Specialist, Center for Fertility and Reproductive Research; and Adjunct Faculty, School of Nursing, Vanderbilt University, Nashville, Tenn.
- N. Michael Davis**, MS, RPh, Coordinator, Drug Information Center, University of Miami; Jackson Memorial Medical Center, Miami
- Robin Donohoe Dennison**, RN, MSN, CS, Cardiopulmonary Nursing Consultant and President, Continuing Education for Health Professionals, Inc., Huntington, W. Va.
- Patricia A. Diehl**, RN, BSN, MA, Associate Professor, West Virginia University, School of Nursing, Morgantown
- Laura D'Oria**, PharmD, Assistant Professor of Pharmacy Practice, University of Arkansas for Medical Sciences, College of Pharmacy; and Clinical Coordinator, Arkansas Children's Hospital, Department of Pharmacy, Little Rock
- Belle Erickson**, RN, MS, Assistant Professor, Villanova (Pa.) University, College of Nursing
- Carmel A. Esposito**, RN, MSN, Medical-Surgical Chairperson, Ohio Valley Hospital, School of Nursing, Steubenville
- Janet M. Farahmand**, RN, MSN, EdD, Assistant Professor, Widener University, School of Nursing, Chester, Pa.
- C. Cecil Fuselier**, MSc, RPh, Associate Professor of Pharmacy Practice, University of Arkansas for Medical Sciences, College of Pharmacy, Little Rock
- Corre J. Garrett**, RN, EdD, CCRN, Assistant Professor, East Carolina University, School of Nursing, Greenville, N.C.
- Anna Gawlinski**, RN, MSN, CCRN, Cardiovascular Clinical Nurse Specialist, University of California Medical Center, Los Angeles
- Martin R. Giannamore**, PharmD, RPh, Clinical Pharmacist, Grant Medical Center, Columbus
- Richard K. Gibson**, RN, MN, JD, CCRN, Clinical Nurse Specialist, Veterans Administration Medical Center, San Diego
- Barbara Given**, RN, PhD, FAAN, Director of Nursing Graduate Program, College of Nursing, Michigan State University, East Lansing
- Dean E. Goldberg**, PharmD, Assistant Professor of Pharmacy Practice, University of Minnesota, College of Pharmacy, Minneapolis
- Mary Elizabeth Greipp**, RN, MSN, EdD, Assistant Professor of Nursing, Rutgers University, Camden (N.J.) College of Arts and Sciences
- Kathleen Whittaker Groves**, RN, MS, Instructor II, Johns Hopkins Hospital, Baltimore
- Bridget A. Haupt**, PharmD, Assistant Director of Pharmacy, Temple University Hospital; and Assistant Professor of Clinical Pharmacy, Temple University, College of Pharmacy, Philadelphia
- David W. Hawkins**, PharmD, Associate Professor and Assistant Dean, University of Georgia, College of Pharmacy, Athens
- Marcia J. Hill**, RN, MSN, Manager, Dermatologic Therapeutics, Methodist Hospital, Houston
- Phyllis G. Hummel**, RN, MSN, Chairman, Department of Nursing, North Dakota State University, Fargo
- Sande Jones**, RNC, MS, Inservice Education Coordinator, Mount Sinai Medical Center, Miami Beach
- Lynne Kreutzer-Baraglia**, RN, MS, Assistant Professor, West Suburban College of Nursing, Oak Park, Ill.
- Eileen Hayes Lantier**, RN, MSN, Assistant Professor, Syracuse (N.Y.) University, College of Nursing
- Jan L. Lee**, RN, MN, CS, Adjunct Assistant Professor of Nursing, University of Southern California, Department of Nursing, Los Angeles
- Colleen Lucas**, RN, MN, CNS, Medical-Surgical Clinical Nurse Specialist, Good Samaritan Hospital and Medical Center, Portland



- Brenda L. Lyon**, RN, DNS, Associate Professor of Nursing, School of Nursing; and Chairperson, Graduate Department of Nursing Adults with Biodissonance, Indiana University, Indianapolis
- Mary Y. Ma**, PharmD, Antimicrobial Clinical Pharmacist, Veteran Administration West Los Angeles Medical Center; and Associate Clinical Professor of Pharmacy, University of Southern California, Los Angeles
- Meredith Ann McCord**, RN, MS, Assistant Professor, Oregon Health Sciences University, School of Nursing, Portland
- Barbara L. MacDermott**, RN, MS, Associate Professor and Assistant Dean, Syracuse (N.Y.) University, College of Nursing
- Sara Lynn Machowsky**, RN, MS, Clinical Administrator, Ophthalmic Pavilion, Easton, Pa.
- Gary Milavetz**, PharmD, RPh, Assistant Professor of Pharmacy, University of Iowa, College of Pharmacy, Iowa City
- Rita Short Monahan**, RN, MSN, EdD, Assistant Professor, Oregon Health Sciences University, School of Nursing, at Easton Oregon State College, LaGrande
- John Nagelhout**, RN, PhD, CRNA, Assistant Professor of Anesthesia and Pharmacology, Wayne State University, Detroit; and Clinical Nurse Anesthetist, Detroit Receiving Hospital
- Brenda Marion Nevidjon**, RN, MSN, Manager, Cancer Program, Providence Medical Center, Seattle
- Patricia O'Leary**, RN, MSN, Assistant Professor, East Carolina University, School of Nursing, Greenville, N.C.
- Nina Hubej Olesinski**, RN, MSN, Clinical Nurse Consultant, Ophthalmology and Otolaryngology, University of Illinois Hospital, Chicago; and Faculty, University of Illinois, Chicago
- Keith M. Olsen**, PharmD, Assistant Professor of Pharmacy Practice, University of Arkansas for Medical Sciences, College of Pharmacy, Little Rock
- C. Lynne Ostrow**, RN, MS, EdD, Associate Professor, West Virginia University, School of Nursing, Morgantown
- Karen P. Padrick**, RN, MN, Doctoral Student, Oregon Health Sciences University, School of Nursing, Portland
- Patricia Peschman**, RN, MS, Clinical Nurse Specialist, Renal and Gastrointestinal, Abbott Northwestern Hospital, Minneapolis
- Larry A. Pfeifer**, BSPH, RPh, LT. COMMANDER U.S. PUBLIC HEALTH SERVICE, Chief, Pharmacy Services, Gillis W. Long Hansen's Disease Center, Carville, La.
- Colleen S. Pfeiffer**, RN, MS, CCRN, Doctoral Candidate, University of Illinois at Chicago Medical Center, School of Nursing
- David Pipher**, PharmD, Assistant Director of Pharmacy, Western Psychiatric Institute and Clinic, Pittsburgh
- Beverly A. Post**, RN, MS, CIC, Infection Control Coordinator, Louis A. Weiss Memorial Hospital, Chicago
- Carol B. Pugh**, PharmD, Assistant Professor of Clinical Pharmacy, Philadelphia College of Pharmacy and Science
- Mark C. Pugh**, PharmD, Clinical Pharmacist, Thomas Jefferson University Hospital, Philadelphia
- Frances W. Quinless**, RN, PhD, CCRN, Chairperson, Department of Nursing Education, University of Medicine & Dentistry of New Jersey, School of Health Related Professions, Newark
- Ann Ziegler Sedore**, RN, MA, Associate Professor, Syracuse (N.Y.) University, College of Nursing
- Thomas R. Simpson**, PharmD, RPh, Director of Pharmacy, Humana Hospital, Huntington Beach, Calif.
- Lillian Sklaver**, PharmD, Clinical Coordinator of Pharmacy Services, St. Francis Hospital, Miami Beach
- Gary D. Smith**, PharmD, RPh, Clinical Pharmacist, Minneapolis Children's Health Center
- Brenda M. Splitz**, RN, MSN, GNP, Clinical Coordinator, Nurse Practitioner Program, George Washington University Medical Center, Washington, D.C.
- Joseph F. Steiner**, PharmD, RPh, Professor of Clinical Pharmacy, University of Wyoming College of Health Sciences, Wyoming Family Practice Residency Program, Casper
- Susan B. Stillwell**, RN, MSN, CCRN, Instructor, Arizona State University, College of Nursing, Tempe
- Margot T. Stock**, RN, MSN, Instructor, East Carolina University, School of Nursing, Greenville, N.C.
- David M. Stuart**, BSPH, PhD, Professor of Clinical Pharmacy, Ohio Northern University, College of Pharmacy, Ada
- Catherine M. Todd**, RN, MS, Assistant Professor, Villanova (Pa.) University, College of Nursing
- Paul J. Vitale**, PharmD, Assistant Director of Pharmacy and Clinical Services, The Anne Arundel General Hospital, Annapolis, Md.
- Bradford G. Wallenberg**, PharmD, RPh, Assistant Professor of Clinical Pharmacy, South Dakota State University, College of Pharmacy, Brookings
- Margaret Wallhagen**, RN, MSN, Doctoral Candidate, University of Washington, School of Nursing, Seattle
- Lisa J. Woodard**, BSPH, MPH, RPh, Clinical Staff Pharmacist, Providence Medical Center, Seattle

- Brenda L. Lyon**, RN, DNS, Associate Professor of Nursing, School of Nursing; and Chairperson, Graduate Department of Nursing Adults with Biodissonance, Indiana University, Indianapolis
- Mary Y. Ma**, PharmD, Antimicrobial Clinical Pharmacist, Veteran Administration West Los Angeles Medical Center; and Associate Clinical Professor of Pharmacy, University of Southern California, Los Angeles
- Meredith Ann McCord**, RN, MS, Assistant Professor, Oregon Health Sciences University, School of Nursing, Portland
- Barbara L. MacDermott**, RN, MS, Associate Professor and Assistant Dean, Syracuse (N.Y.) University, College of Nursing
- Sara Lynn Machowsky**, RN, MS, Clinical Administrator, Ophthalmic Pavilion, Easton, Pa.
- Gary Milavetz**, PharmD, RPh, Assistant Professor of Pharmacy, University of Iowa, College of Pharmacy, Iowa City
- Rita Short Monahan**, RN, MSN, EdD, Assistant Professor, Oregon Health Sciences University, School of Nursing, at Easton Oregon State College, LaGrande
- John Nagelhout**, RN, PhD, CRNA, Assistant Professor of Anesthesia and Pharmacology, Wayne State University, Detroit; and Clinical Nurse Anesthetist, Detroit Receiving Hospital
- Brenda Marion Nevidjon**, RN, MSN, Manager, Cancer Program, Providence Medical Center, Seattle
- Patricia O'Leary**, RN, MSN, Assistant Professor, East Carolina University, School of Nursing, Greenville, N.C.
- Nina Hubej Olesinski**, RN, MSN, Clinical Nurse Consultant, Ophthalmology and Otolaryngology, University of Illinois Hospital, Chicago; and Faculty, University of Illinois, Chicago
- Keith M. Olsen**, PharmD, Assistant Professor of Pharmacy Practice, University of Arkansas for Medical Sciences, College of Pharmacy, Little Rock
- C. Lynne Ostrow**, RN, MS, EdD, Associate Professor, West Virginia University, School of Nursing, Morgantown
- Karen P. Padrick**, RN, MN, Doctoral Student, Oregon Health Sciences University, School of Nursing, Portland
- Patricia Peschman**, RN, MS, Clinical Nurse Specialist, Renal and Gastrointestinal, Abbott Northwestern Hospital, Minneapolis
- Larry A. Pfeifer**, BSPH, RPh, LT. COMMANDER U.S. PUBLIC HEALTH SERVICE, Chief, Pharmacy Services, Gillis W. Long Hansen's Disease Center, Carville, La.
- Colleen S. Pfeiffer**, RN, MS, CCRN, Doctoral Candidate, University of Illinois at Chicago Medical Center, School of Nursing
- David Pipher**, PharmD, Assistant Director of Pharmacy, Western Psychiatric Institute and Clinic, Pittsburgh
- Beverly A. Post**, RN, MS, CIC, Infection Control Coordinator, Louis A. Weiss Memorial Hospital, Chicago
- Carol B. Pugh**, PharmD, Assistant Professor of Clinical Pharmacy, Philadelphia College of Pharmacy and Science
- Mark C. Pugh**, PharmD, Clinical Pharmacist, Thomas Jefferson University Hospital, Philadelphia
- Frances W. Quinless**, RN, PhD, CCRN, Chairperson, Department of Nursing Education, University of Medicine & Dentistry of New Jersey, School of Health Related Professions, Newark
- Ann Ziegler Sedore**, RN, MA, Associate Professor, Syracuse (N.Y.) University, College of Nursing
- Thomas R. Simpson**, PharmD, RPh, Director of Pharmacy, Humana Hospital, Huntington Beach, Calif.
- Lilliam Sklaver**, PharmD, Clinical Coordinator of Pharmacy Services, St. Francis Hospital, Miami Beach
- Gary D. Smith**, PharmD, RPh, Clinical Pharmacist, Minneapolis Children's Health Center
- Brenda M. Splitz**, RN, MSN, GNP, Clinical Coordinator, Nurse Practitioner Program, George Washington University Medical Center, Washington, D.C.
- Joseph F. Steiner**, PharmD, RPh, Professor of Clinical Pharmacy, University of Wyoming College of Health Sciences, Wyoming Family Practice Residency Program, Casper
- Susan B. Stillwell**, RN, MSN, CCRN, Instructor, Arizona State University, College of Nursing, Tempe
- Margot T. Stock**, RN, MSN, Instructor, East Carolina University, School of Nursing, Greenville, N.C.
- David M. Stuart**, BSPH, PhD, Professor of Clinical Pharmacy, Ohio Northern University, College of Pharmacy, Ada
- Catherine M. Todd**, RN, MS, Assistant Professor, Villanova (Pa.) University, College of Nursing
- Paul J. Vitale**, PharmD, Assistant Director of Pharmacy and Clinical Services, The Anne Arundel General Hospital, Annapolis, Md.
- Bradford G. Wallenberg**, PharmD, RPh, Assistant Professor of Clinical Pharmacy, South Dakota State University, College of Pharmacy, Brookings
- Margaret Wallhagen**, RN, MSN, Doctoral Candidate, University of Washington, School of Nursing, Seattle
- Lisa J. Woodard**, BSPH, MPH, RPh, Clinical Staff Pharmacist, Providence Medical Center, Seattle

# 

- Steven R. Abel**, PharmD, RPh, Assistant Director of Pharmacy, Clinical and Educational Services, Indiana University Hospitals, Indianapolis
- Stephen C. Adams**, BS, PharmD, RPh, Coordinator of Drug Information Services, St. Luke's Episcopal Hospital and Texas Heart Institute, Houston
- Robert J. Anders**, PharmD, Cardiovascular Research Fellow, University of Illinois at Chicago, Department of Pharmacy Practice, College of Pharmacy
- Wendy L. Baker**, RN, MS, CCRN, Trauma Clinical Nurse Specialist, Vanderbilt University Hospital, Nashville, Tenn.
- Alan D. Barreuther**, PharmD, RPh, Clinical Associate Professor, University of Arizona, College of Pharmacy, Tucson; and Supervisor, Drug Information, Tucson Medical Center
- Shirley K. Bell**, RN, MSN, EdD, Assistant Professor, Ohio State University, College of Nursing, Columbus
- Joy Boarini**, RN, MSN, ET, Clinical Nurse Specialist and Program Director, ET Nursing Education Program, Abbott Northwestern Hospital, Minneapolis
- Ruth Ann Lindsey Bowen**, RN, MS, Lecturer, Texas Woman's University, College of Nursing, Denton
- Alan J. Braverman**, PharmD, Scientific Project Administrator, Smith Kline & French Laboratories, Philadelphia
- Gerald G. Briggs**, BPharm, Clinical Pharmacist, Women's Hospital, Memorial Medical Center; and Assistant Clinical Professor of Pharmacy, University of California, Long Beach
- Karen E. Burgess**, RN, MSN, Neuroscience Clinical Nurse Specialist, Huntington Memorial Hospital, Pasadena, Calif.
- Bruce C. Carlstedt**, BSPH, PhD, RPh, Associate Professor of Clinical Pharmacy, Purdue University, West Lafayette, Ind.
- Barry L. Carter**, PharmD, Assistant Professor, University of Iowa, College of Pharmacy, Iowa City
- Vivian Hayes Churness**, RN, DNSc, Assistant Professor, Department of Nursing, University of Southern California, Los Angeles
- Bruce D. Clayton**, PharmD, RPh, Professor and Chairman, Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock
- Michael R. Cohen**, MS, RPh, Director of Pharmacy, Quakertown (Pa.) Community Hospital
- Susan E. Costello**, RN, MSEd, DNSc, Nursing Education and Research Director, Georgetown University Hospital, Washington, D.C.
- Linda Crosby**, RN, MSN, Program Director, Nurse Recovery Program, Tampa Area Hospital Council, Tampa, Fla.
- Judith Hopfer Deglin**, PharmD, RPh, Assistant Clinical Professor, University of Connecticut, School of Pharmacy, Storrs
- Jeffrey C. Delafuente**, MS, RPh, Associate Professor of Pharmacy and Medicine, University of Florida, Colleges of Pharmacy and Medicine, Gainesville
- Janet K. Dickerson**, RN, Research Assistant III, University of Arizona, College of Medicine, Tucson
- Grace Ann Ehlke**, RN, DNSc, Assistant Professor, George Mason University, Department of Nursing, Fairfax, Va.
- Alexander M. Gilderman**, PharmD, Assistant Professor of Clinical Pharmacy, University of Southern California, School of Pharmacy, Los Angeles
- Edward J. Haas**, PharmD, Director of Drug Information Services, University of Maryland Medical System, Department of Pharmacy Services, Baltimore
- Joe E. Haberle**, BSPH, PhD, RPh, Professor and Director, Division of Pharmacy, St. Louis College of Pharmacy
- Clare Hastings**, RN, MS, Director of Marketing and Communications, National Institutes of Health, Nursing Department, Clinical Center, Bethesda, Md.
- David W. Hawkins**, PharmD, Associate Professor and Assistant Dean, University of Georgia College of Pharmacy, Athens
- Cynthia S. Heister**, RN, MN, OCN, Instructor of Clinical Nursing, University of Southern California, Department of Nursing, Los Angeles
- Anne Cowley Herzog**, RN, BSN, CCRN, Education Coordinator, Quakertown (Pa.) Community Hospital
- Kathleen Hill-Besinque**, PharmD, Clinical Pharmacist, Kenneth Norris Cancer Hospital; and Course Coordinator, University of Southern California, School of Pharmacy, Los Angeles
- Alan W. Hopefl**, PharmD, Assistant Professor of Clinical Pharmacy, St. Louis College of Pharmacy; and Assistant Professor of Pharmacy in Internal Medicine, St. Louis University School of Medicine
- Priscilla Deming Houck**, RN, MSN, Oncology Clinical Nurse Specialist, Philadelphia Hematology and Oncology Associates, Inc.
- Ruth Susan Kitson**, RN, BAA, MBA, Director of Nursing, Critical Care Services, Toronto Western Hospital
- Barbara N. Klaus**, RN, MN, Patient Education Coordinator, Ambulatory Services, York (Pa.) Hospital
- Karen Landis**, RN, MS, CCRN, Pulmonary Clinical Nurse Specialist, Lehigh Valley Hospital Center, Allentown, Pa.
- Bruce H. Livengood**, PharmD, RPh, Clinical Pharmacy Specialist, Mercy Hospital of Pittsburgh; and Associate Professor of Clinical Pharmacy, Duquesne University, Pittsburgh
- Sharon Lock**, RN, MSN, Clinical Instructor, Pitt County Memorial Hospital and East Carolina University School of Nursing, Greenville, N.C.
- Janet McCombs**, PharmD, RPh, Clinical Pharmacology Associate, University of Georgia, College of Pharmacy, Athens
- Marlene McNemar-Ciranowicz**, RN, MSN, Diabetes Clinical Nurse Specialist, Hahnemann Medical College and Hospital, Philadelphia

**Terry T. Martinez**, BSPH, PhD, Associate Professor of Pharmacy and Toxicology, St. Louis College of Pharmacy

**Margaret E. Miller**, RN, MSN, Head and Neck Nurse Coordinator, Illinois Masonic Medical Center, Chicago

**Patricia Gonce Morton**, RN, MS, Doctoral Candidate and Assistant Professor, University of Maryland, School of Nursing, Baltimore

**Madeline A. Naegle**, RN, PhD, Associate Professor, Division of Nursing, New York University, School of Health, Education, Nursing and the Arts Professions, New York

**Sandra Ludwig Nettina**, RN, MSN, CRNP, Nurse Practitioner, Department of Emergency Medicine, Temple University Hospital, Philadelphia

**Donald S. North**, PharmD, Assistant Professor of Clinical Pharmacy, University of Wyoming, School of Pharmacy, Laramie

**John D. Ostrosky**, PharmD, Drug Information Specialist and Drug Utilization Review Coordinator, Medical College of Virginia Hospitals, Department of Pharmacy Services and Drug Information Service, Richmond, Va.

**Theresa S. Richmond**, RN, MSN, CCRN, Trauma Nurse Coordinator, Thomas Jefferson University Hospital, Philadelphia

**Dorothy A. Ruzicki**, RN, PhD, Patient Education and Research Coordinator, Sacred Heart Medical Center, Spokane, Wash.

**Jeanne L. Sawyer**, BSN, MA, Instructor, Midland Lutheran College, Division of Nursing, Fremont, Neb.

**William Simonson**, PharmD, Associate Professor of Pharmacy, Oregon State University, College of Pharmacy, Corvallis

**Irving Steinberg**, PharmD, Assistant Professor of Clinical Pharmacy and Clinical Pediatrics, University of Southern California, Schools of Pharmacy and Medicine, Los Angeles

**Joseph F. Steiner**, PharmD, RPh, Professor of Clinical Pharmacy, University of Wyoming, College of Health Sciences, Wyoming Family Practice Residency Program, Casper

**Thomas F. Turco**, PharmD, Drug Information Specialist, University of Maryland Medical System, Department of Pharmacy Services, Baltimore

**Susan A. Turner-Savage**, RN, MSN, Pediatric Nursing Instructor, Northeastern Hospital School of Nursing, Philadelphia

**Paul J. Vitale**, PharmD, Assistant Director of Pharmacy and Clinical Services, The Anne Arundel General Hospital, Annapolis, Md.

**Frederick P. Zeller**, PharmD, Assistant Professor, Department of Pharmacy Practice, University of Illinois at Chicago, College of Pharmacy; and Instructor in Medicine, Section of Cardiology, University of Illinois at Chicago, Department of Medicine



# PREFACE

Medication therapy is an essential component of health care today. Indeed, most patients receive a number of different types of medications several times a day. Thus, dealing with medication therapy constitutes a major portion of the nurse's activities. Specifically, the nurse is directly responsible for:

- knowing the pharmacokinetic, pharmacodynamic, and pharmacotherapeutic information about each drug that the patient receives
- using appropriate procedures and techniques to administer various medications
- using appropriate safeguards to prevent errors during medication administration
- assessing the patient's clinical responses to medication therapy, including observing for adverse reactions
- documenting the patient's clinical responses to medication therapy.

These activities require an extensive pharmacologic knowledge base and familiarity with a growing number of references and other resources. *Clinical Pharmacology and Nursing* was designed to meet both of those requirements: it can be used by the student nurse in a basic pharmacology course and in subsequent clinical courses; it is also a general reference book for the practicing clinician.

One of the major needs for students of basic clinical pharmacology is an appropriate conceptual framework that organizes the information for clinical application. This text provides such a framework. Unit I gives an overview of pharmacology. Unit II relates medication therapy to the nursing process and provides the context for the clinical application of the content. Units III through XVII present specific drug classes used in providing patient care. Consistently structured, these units present essential pharmacokinetic, pharmacodynamic, pharmacotherapeutic, and adverse drug reaction information. Additionally, each drug class includes:

- contraindications and precautions
- techniques for preventing and treating adverse reactions
- essential specific interventions
- proper drug preparation and administration techniques
- patient education information.

Numerous graphs, illustrations, and summary charts facilitate learning.

This text exists to provide students and clinicians with essential pharmacologic principles and data for patient care. Therefore, all contributors are at least master's degree-prepared, practicing clinicians, academicians, or pharmacologists. These experts represent the various specialty areas of nursing and pharmacology, providing the most current, accurate, and clinically applicable information. Their collective efforts have produced a resource that is greater than the sum of its parts.

Charold L. Baer  
Bradley R. Williams

# FOREWORD

At last, a publisher has produced an unusually comprehensive and readable textbook on pharmacology for student nurses, nursing educators, and clinical nurses. *Clinical Pharmacology and Nursing* is a welcome choice among today's pharmacologic nursing textbooks. It stands out as a text and reference that organizes relevant scientific content into conceptual frameworks with related information for clinical application. Organizing vast amounts of information in a clear format streamlines learning and makes it enjoyable. An impressive group of specialists in nursing and pharmacology is represented in the book's 76 contributing authors and 53 clinical reviewers; these experts ensure accurate, current, complete, and clinically applicable content. Moreover, the authors have related details on specific drugs to a broad base of pharmacologic concepts and perspectives, thereby enhancing student understanding and application of information and providing faculty with organized approaches for teaching. The book is an indispensable text for a basic pharmacology course and for more advanced clinical courses and practice.

*Clinical Pharmacology and Nursing* successfully combines pharmacology theory and clinical application. Pharmacologic theory is presented through general pharmacologic principles, including pharmacokinetics, pharmacodynamics, pharmacotherapeutics, toxicity and poisoning, and drug abuse, dependence, and addiction. A conceptual framework controls the presentation. Clinical application details pharmacologic products that treat, control, and prevent disorders in individuals across the life span including pediatric, young and mid-life, pregnant, lactating, and geriatric patients. Medication therapy in emergency situations also is covered.

Overview chapters are organized by the nursing process, and that process is reflected, when applicable, in the drug classification chapters. These describe assessment data, intervention strategies, drugs' interactions and effects, and nursing implications. Nursing responsibilities are outlined clearly for the drug selected; its mechanism of action; predictable patient reactions; method of administration; signs of dependence, overdose, or toxicity; steps in the event of an untoward reaction; and patient and family education. "Reader-friendly" information in this classic textbook makes difficult decisions easier.

The student's study and learning needs also have been given full consideration. Theory, interwoven throughout, helps establish and reinforce a strong con-

ceptual foundation. Each chapter offers learning objectives and summaries and includes graphics, charts, and tables that summarize drug information, illustrate procedures, and succinctly explain complicated pharmacodynamics and physiology. The two-color design enhances the presentation. The 17 unit introductions provide overviews for the drugs covered, including necessary anatomy and physiology and a glossary of terms. The comprehensive index aids the student in easily locating general information and generic and brand-name drugs.

Although each chapter is a valuable reference and may be read as an independent selection, the book's organization sequences and reinforces learning. For example, an overview of the fundamental principles of pharmacology is presented in the first 6 chapters (Unit One). Unit Two, containing 10 chapters, presents the principles and applications of pharmacology in the context of the nursing process. The 15 other units, including chapters 17 to 82, use a format that includes drug class, pharmacokinetics, pharmacodynamics, pharmacotherapeutics, adverse drug reactions, nursing implications, and a chapter summary. So much important information gives the reader a sense of security in its ownership.

Drug therapy is a major part of health care practice today, and the nurse is the major provider in the administration of this therapy. Given the dynamic nature of biomedical knowledge and technology and the extensive and growing knowledge base in clinical pharmacology, the nurse is challenged to remain up to date in medication therapy. Yet, how can the student and the practicing nurse exercise informed nursing judgments and provide safe, high-quality care? One way is to draw on resources like *Clinical Pharmacology and Nursing*. It is the newest and finest authoritative reference in its field for nursing students, faculty, and clinical nurses. No nurse should practice without it.

Kathleen G. Andreoli, DSN, FAAN  
Vice-President, Nursing Affairs  
and the John L. and Helen Kellogg Dean  
of the College of Nursing  
Rush-Presbyterian-St. Luke's Medical Center/Rush  
University, Chicago

# CONTENTS

<b>CONTRIBUTORS</b>	<b>xiv</b>
<b>REVIEWERS</b>	<b>xvi</b>
<b>PREFACE</b>	<b>xviii</b>
<b>FOREWORD</b>	<b>xix</b>

## UNIT ONE: GENERAL PHARMACOLOGY

	<b>UNIT INTRODUCTION</b>	<b>1</b>
	Charold L. Baer, RN, PhD	
<b>1</b>	<b>INTRODUCTION TO PHARMACOLOGY</b>	<b>4</b>
	Janet M. Farahmand, RN, MSN, EdD	
<b>2</b>	<b>PHARMACOKINETICS</b>	<b>18</b>
	James D. Carlson, PharmD, RPh; Phyllis G. Hummel, RN, MSN	
<b>3</b>	<b>PHARMACODYNAMICS</b>	<b>41</b>
	James D. Carlson, PharmD, RPh; Phyllis G. Hummel, RN, MSN	
<b>4</b>	<b>PHARMACOTHERAPEUTICS</b>	<b>56</b>
	Carol L. Beck, PharmD, RPh; Phyllis G. Hummel, RN, MSN	
<b>5</b>	<b>TOXICITY AND POISONING</b>	<b>71</b>
	Ann Ziegler Sedore, RN, MA	
<b>6</b>	<b>DRUG ABUSE, DEPENDENCE, AND ADDICTION</b>	<b>81</b>
	Karen P. Padrick, RN, MN	

## UNIT TWO: PHARMACOTHERAPEUTICS AND THE NURSING PROCESS

	<b>UNIT INTRODUCTION</b>	<b>92</b>
	Brenda L. Lyon, RN, DNS	
<b>7</b>	<b>ASSESSMENT, DIAGNOSIS, AND PLANNING</b>	<b>97</b>
	Meredith Ann McCord, RN, MS	
<b>8</b>	<b>INTERVENTION: ADMINISTRATION PROCESSES</b>	<b>116</b>
	Patricia A. Diehl, RN, BSN, MA	

<b>9</b>	<b>INTERVENTION: DOSAGE MEASUREMENTS AND CALCULATIONS</b>	<b>138</b>
	Catherine M. Todd, RN, MS; Belle Erickson, RN, MS	
<b>10</b>	<b>INTERVENTION: ROUTES AND TECHNIQUES OF ADMINISTRATION</b>	<b>159</b>
	Rebecca E. Boehne, RN, MSN	
<b>11</b>	<b>INTERVENTION: PATIENT EDUCATION</b>	<b>188</b>
	Meredith Ann McCord, RN, MS	
<b>12</b>	<b>INTERVENTION: THE PEDIATRIC PATIENT</b>	<b>199</b>
	Kathleen C. Byington, RN, MSN	
<b>13</b>	<b>INTERVENTION: THE GERIATRIC PATIENT</b>	<b>213</b>
	Brenda M. Splitz, RN, MSN, GNP	
<b>14</b>	<b>INTERVENTION: THE PREGNANT OR LACTATING PATIENT</b>	<b>222</b>
	Linda P. Brown, RN, PhD	
<b>15</b>	<b>INTERVENTION: EMERGENCIES</b>	<b>235</b>
	Colleen S. Pfeiffer, RN, MS, CCRN	
<b>16</b>	<b>EVALUATION</b>	<b>247</b>
	Rebecca E. Boehne, RN, MSN	

### **UNIT THREE: DRUGS AFFECTING THE AUTONOMIC NERVOUS SYSTEM**

	<b>UNIT INTRODUCTION</b>	<b>256</b>
	Margaret I. Wallhagen, RN, MSN	
<b>17</b>	<b>CHOLINERGIC AGENTS</b>	<b>264</b>
	Naomi R. Ballard, RN, MA, MS	
<b>18</b>	<b>CHOLINERGIC BLOCKING AGENTS</b>	<b>277</b>
	Naomi R. Ballard, RN, MA, MS	
<b>19</b>	<b>ADRENERGIC AGENTS</b>	<b>286</b>
	Corre J. Garrett, RN, EdD, CCRN	
<b>20</b>	<b>ADRENERGIC BLOCKING AGENTS</b>	<b>309</b>
	Corre J. Garrett, RN, EdD, CCRN	
<b>21</b>	<b>NEUROMUSCULAR BLOCKING AGENTS</b>	<b>331</b>
	Naomi R. Ballard, RN, MA, MS	

## UNIT FOUR: DRUGS TO TREAT NEUROLOGIC AND NEUROMUSCULAR SYSTEM DISORDERS

### UNIT INTRODUCTION 340

Jan L. Lee, RN, MN, CS

### 22 SKELETAL MUSCLE RELAXING AGENTS 347

Lillian Sklaver, PharmD

### 23 ANTIPARKINSONIAN AGENTS 358

Martin R. Giannamore, PharmD, RPh

### 24 ANTICONVULSANT AGENTS 371

Jan L. Lee, RN, MN, CS

## UNIT FIVE: DRUGS TO PREVENT AND TREAT PAIN

### UNIT INTRODUCTION 394

Joseph F. Steiner, PharmD, RPh

### 25 NONNARCOTIC ANALGESIC, ANTIPYRETIC, AND NONSTEROIDAL ANTI-INFLAMMATORY AGENTS 398

Barbara L. MacDermott, RN, MS

### 26 NARCOTIC AGONIST AND ANTAGONIST AGENTS 415

Barbara L. MacDermott, RN, MS

### 27 GENERAL ANESTHETIC AGENTS 432

John Nagelhout, RN, PhD, CRNA

### 28 LOCAL AND TOPICAL ANESTHETIC AGENTS 447

N. Michael Davis, MS, RPh

## UNIT SIX: DRUGS TO ALTER PSYCHOGENIC BEHAVIOR AND PROMOTE SLEEP

### UNIT INTRODUCTION 462

Barbara Gross Braverman, RN, MSN, CS

### 29 CEREBRAL STIMULATING AGENTS 465

Thomas R. Simpson, PharmD, RPh



<b>30</b>	<b>SEDATIVE AND HYPNOTIC AGENTS</b>	<b>477</b>
	Patricia O'Leary, RN, MSN	
<b>31</b>	<b>ANTIDEPRESSANT AND ANTIMANIC AGENTS</b>	<b>499</b>
	David Pipher, PharmD	
<b>32</b>	<b>ANTIANXIETY AGENTS</b>	<b>514</b>
	David Pipher, PharmD	
<b>33</b>	<b>ANTIPSYCHOTIC AGENTS</b>	<b>522</b>
	Vivian Hayes Churness, RN, DNSc	

## UNIT SEVEN: DRUGS TO IMPROVE CARDIOVASCULAR FUNCTION

	<b>UNIT INTRODUCTION</b>	<b>534</b>
	Rita Short Monahan, RN, MSN, EdD	
<b>34</b>	<b>CARDIAC GLYCOSIDE AGENTS AND BIPYRIDINES</b>	<b>539</b>
	Robin Donohoe Dennison, RN, MSN, CS	
<b>35</b>	<b>ANTIARRHYTHMIC AGENTS</b>	<b>548</b>
	Richard K. Gibson, RN, MN, JD, CCRN	
<b>36</b>	<b>ANTIANGINAL AGENTS</b>	<b>567</b>
	Richard K. Gibson, RN, MN, JD, CCRN	
<b>37</b>	<b>ANTIHYPERTENSIVE AGENTS</b>	<b>582</b>
	Barbara Given, RN, PhD, FAAN	
<b>38</b>	<b>DIURETIC AGENTS</b>	<b>606</b>
	Kathleen Whittaker Groves, RN, MS	
<b>39</b>	<b>PERIPHERAL VASCULAR AGENTS</b>	<b>630</b>
	Anna Gawlinski, RN, MSN, CCRN	
<b>40</b>	<b>ANTILIPEMIC AGENTS</b>	<b>636</b>
	David M. Stuart, BScPh, PhD	

## UNIT EIGHT: DRUGS AFFECTING THE HEMATOLOGIC SYSTEM

<b>UNIT INTRODUCTION</b>	<b>648</b>
--------------------------	------------

C. Lynne Ostrow, RN, MS, EdD

<b>41</b>	<b>HEMATINIC AGENTS</b>	<b>657</b>
-----------	-------------------------	------------

C. Lynne Ostrow, RN, MS, EdD

<b>42</b>	<b>ANTICOAGULANT AGENTS</b>	<b>669</b>
-----------	-----------------------------	------------

C. Lynne Ostrow, RN, MS, EdD

<b>43</b>	<b>THROMBOLYTIC AGENTS</b>	<b>687</b>
-----------	----------------------------	------------

C. Lynne Ostrow, RN, MS, EdD

## UNIT NINE: DRUGS TO IMPROVE RESPIRATORY FUNCTION

<b>UNIT INTRODUCTION</b>	<b>696</b>
--------------------------	------------

Susan B. Stillwell, RN, MSN, CCRN

<b>44</b>	<b>METHYLXANTHINE AGENTS</b>	<b>701</b>
-----------	------------------------------	------------

Gary D. Smith, PharmD, RPh; Gary Milavetz, PharmD, RPh

<b>45</b>	<b>EXPECTORANT, ANTITUSSIVE, AND MUCOLYTIC AGENTS</b>	<b>713</b>
-----------	---	------------

Susan B. Stillwell, RN, MSN, CCRN

<b>46</b>	<b>DECONGESTANT AGENTS</b>	<b>726</b>
-----------	----------------------------	------------

Colleen Lucas, RN, MN, CNS

## UNIT TEN: DRUGS TO IMPROVE GASTROINTESTINAL FUNCTION

<b>UNIT INTRODUCTION</b>	<b>736</b>
--------------------------	------------

Frances W. Quinless, RN, PhD, CCRN

<b>47</b>	<b>ADSORBENT, ANTIFLATULENT, AND DIGESTIVE AGENTS</b>	<b>738</b>
-----------	---	------------

Frances W. Quinless, RN, PhD, CCRN

<b>48</b>	<b>ANTIDIARRHEAL AND LAXATIVE AGENTS</b>	<b>747</b>
-----------	--	------------

Frances W. Quinless, RN, PhD, CCRN

<b>49</b>	<b>EMETIC AND ANTIEMETIC AGENTS</b>	<b>765</b>
	Joseph Steiner, PharmD, RPh	

<b>50</b>	<b>PEPTIC ULCER AGENTS</b>	<b>782</b>
	Joseph Steiner, PharmD, RPh	

## UNIT ELEVEN: DRUGS FOR FLUID, ELECTROLYTE, AND NUTRITIONAL BALANCE

	<b>UNIT INTRODUCTION</b>	<b>796</b>
	Patricia Peschman, RN, MS; Dean E. Goldberg, PharmD	
<b>51</b>	<b>VITAMIN AND MINERAL AGENTS</b>	<b>801</b>
	Patricia Peschman, RN, MS; Dean E. Goldberg, PharmD	
<b>52</b>	<b>ELECTROLYTE REPLACEMENT AGENTS</b>	<b>828</b>
	Carmel A. Esposito, RN, MSN	
<b>53</b>	<b>ALKALINIZING AND ACIDIFYING AGENTS</b>	<b>837</b>
	Bruce C. Carlstedt, BSPH, PhD, RPh	
<b>54</b>	<b>CATION-EXCHANGE RESIN AND AMMONIA-DETOXICATING AGENTS</b>	<b>847</b>
	Patricia Peschman, RN, MS; Dean E. Goldberg, PharmD	

## UNIT TWELVE: DRUGS TO TREAT ENDOCRINE SYSTEM DISORDERS

	<b>UNIT INTRODUCTION</b>	<b>858</b>
	David W. Hawkins, PharmD	
<b>55</b>	<b>HYPOGLYCEMIC AGENTS AND GLUCAGON</b>	<b>863</b>
	Rita Short Monahan, RN, MSN, EdD	
<b>56</b>	<b>THYROID AND ANTITHYROID AGENTS</b>	<b>881</b>
	Sande Jones, RNC, MS	
<b>57</b>	<b>PARATHYROID AGENTS</b>	<b>895</b>
	Margot T. Stock, RN, MSN	
<b>58</b>	<b>PITUITARY AGENTS</b>	<b>906</b>
	Margot T. Stock, RN, MSN	

<b>59</b>	<b>ANDROGENIC AND ANABOLIC STEROID AGENTS</b>	<b>922</b>
	James D. Carlson, PharmD, RPh; Phyllis G. Hummel, RN, MSN	
<b>60</b>	<b>ESTROGENS, PROGESTINS, AND ORAL CONTRACEPTIVE AGENTS</b>	<b>930</b>
	Carol B. Pugh, PharmD; Mark C. Pugh, PharmD	
<b>61</b>	<b>FERTILITY AGENTS</b>	<b>951</b>
	Carol Solomon Dalglish, RN, MSN	
<b>62</b>	<b>UTERINE MOTILITY AGENTS</b>	<b>960</b>
	Keith M. Olsen, PharmD; Laura D'Oria, PharmD	

## UNIT THIRTEEN: DRUGS TO CONTROL INFLAMMATION, ALLERGY, AND ORGAN REJECTION

	<b>UNIT INTRODUCTION</b>	<b>971</b>
	Eileen Hayes Lantier, RN, MSN	
<b>63</b>	<b>ANTIHISTAMINIC AGENTS</b>	<b>976</b>
	Colleen Lucas, RN, MN, CNS	
<b>64</b>	<b>CORTICOSTEROIDS AND OTHER IMMUNOSUPPRESSANT AGENTS</b>	<b>988</b>
	Lynne Kreutzer-Baraglia, RN, MS; Beverly A. Post, RN, MS, CIC	
<b>65</b>	<b>URICOSURICS, OTHER ANTIGOUT AGENTS, AND GOLD SALTS</b>	<b>1012</b>
	Karna Bramble, RN, MS, CGNP	

## UNIT FOURTEEN: DRUGS TO PREVENT OR TREAT INFECTIONS

	<b>UNIT INTRODUCTION</b>	<b>1026</b>
	Mary Y. Ma, PharmD	
<b>66</b>	<b>ANTIBACTERIAL AGENTS</b>	<b>1032</b>
	Mary Y. Ma, PharmD	
<b>67</b>	<b>ANTITUBERCULAR AND ANTILEPTOTIC AGENTS</b>	<b>1080</b>
	Larry A. Pfeifer, BSPH, RPh, LT. COMMANDER U.S. PUBLIC HEALTH SERVICE	
<b>68</b>	<b>ANTIVIRAL AGENTS</b>	<b>1089</b>
	Paul J. Vitale, PharmD	