

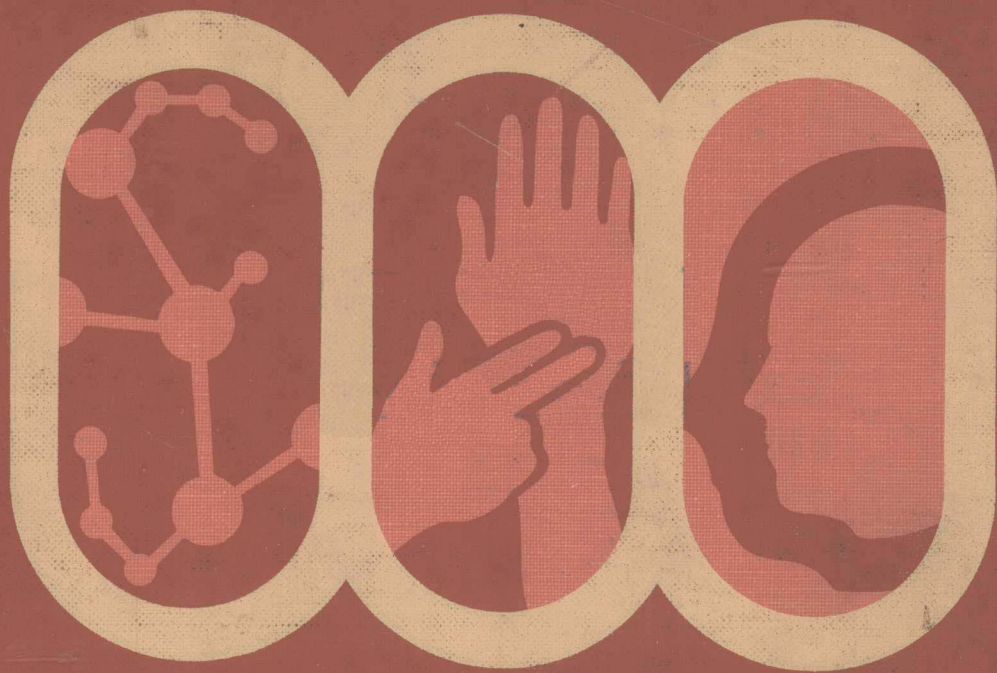
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*The* **DRUG**

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W. B. SAUNDERS COMPANY  
Philadelphia London Toronto

W. B. Saunders Company: West Washington Square  
Philadelphia, PA 19105  
1 St. Anne's Road  
Eastbourne, East Essex BN 21 3UN, England  
1 Goldthorne Avenue  
Toronto, Ontario M8Z 5T9, Canada

Listed here is the latest translated edition of this book together with the language of the translation and the publisher.

French (5th Edition)—Les Editions HRW LTEE Montreal, Quebec, Canada

Spanish (5th Edition)—Nueva Editorial Interamericana S. A. de C. V. Mexico  
4 D. F., Mexico

The Drug, The Nurse, The Patient

ISBN 0-7216-3549-0

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Last digit is the print number: 9 8 7 6 5 4 3 2

TO OUR STUDENTS

# PREFACE

## to the Sixth Edition

The patient-centered approach continues to be the primary emphasis in this extensive revision of *The Drug, The Nurse, The Patient*. New information has been added and earlier information has been deleted or updated where appropriate.

The major emphasis in Part I is on the general nursing knowledge required for the safe administration of drugs. The specific knowledge a nurse must have concerning the patient before administering drugs is discussed. The book also identifies the general information a nurse must have about the drug that is to be administered, the reasoning behind this information and the resources for it. Recent changes in the drug distribution system are incorporated, as are some of the more obvious effects of these changes on the nurse and the patient.

The chapters which formerly dealt with administration of drugs to the young and the aged now cover all age groups, and include a review of developmental changes and how these influence the patient's response to illness and drug therapy. The reader is reminded that man's development is biological, psychological and social in nature. We have tried to show how the nurse can incorporate this knowledge in contributing to effective patient care.

Part II of the text continues to focus on clinical pharmacology as it applies to specific conditions. In each chapter the most recently accepted therapies are included, with special emphasis on the effects on the patient and related nursing care. Only those drugs approved by the Food and Drug Administration for distribution in the United States at the time of writing have been included. The authors realize that drugs now being used on an experimental basis may possibly be approved for distribution in the near future but there is always the possibility that they may not. It is for this reason that we chose not to include these drugs.

The reader will note major changes in the chapters dealing with drugs in fluid and electrolyte imbalance, nutritional and psychogenic disorders, as well as those of the skin, pregnancy and delivery and malignant conditions. Overviews and tables have been incorporated to summarize pertinent information.

The most recent revision of the *Current Drug Handbook* has been included with the text for quick reference to drugs. Implications for nurses administering specific drugs are given in more detail in the text and could only be summarized in the Handbook. The reader is thus encouraged to use the text and the Handbook as a single unit. The Handbook is published separately as a paper-bound reference, and is revised on a biennial basis to keep it up-to-date.

This text is dedicated to students in nursing education as well as to those nurses in clinical practice who are continuing to update their knowledge. Our hope is that this text will teach the student and remind the clinician that "drugs are used to treat people—not diseases."

Mary W. Falconer  
Eleanor Sheridan  
H. Robert Patterson  
Edward A. Gustafson

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# PREFACE TO THE FIRST EDITION

The teaching of pharmacology by the teacher and its learning by the student has always been one of the most difficult accomplishments in the nursing school curriculum. Students, generally, have seemed to be unable to crystallize the subject clearly in their minds, and there has been attendant difficulty in translating classroom theory into bedside nursing. Everyone agrees that rote memory with parrot-like answering is inadequate. The administration of medicines must include not only remembering, but understanding and critical thinking as well. A student who thinks critically, uses and applies facts and principles. In giving medicines, the nurse must recall facts and principles which apply to the situation, and use these in acting upon and evaluating the results. She must be able to select information about her patient which is relevant and pertinent, see the significance of these data and be able to act upon them. It cannot be denied that the theoretical study of drugs, to be effective and thorough, cannot be separated from practical application.

A variety of different methods of teaching this subject have been tried with varying degrees of success; but no one method ever seemed to carry with it what could be considered a full measure of success. Some years ago, the answer yielded itself to teachers who had deliberated and struggled with the problem for so long a time. The answer embodied the desirability and the necessity of approaching the teaching of the subject from the clinical viewpoint—using the patient and his recovery as the central theme of the course. Since then, this approach has been used by an ever-increasing number of teachers, and results have brought assurance that it is the correct one, the logical one, the practical one. It encourages the student and the teacher to focus attention and emphasis on the chief motive of nursing—helping the patient. It is the most valuable method, for it finally bridges the gap between classroom theory and bedside nursing. It should enable the nurse to use the problem-solving technique in the administration of medications.

This book has been prepared to present the study of drugs from this more interesting aspect. It is important to note that because the book describes this subject through the medium of the patient, it is automatically adapted for use in the academic program which correlates the various classroom subjects in the area of treatment, as well as where pharmacology is taught as a separate subject.

The limitation on the number of hours that can be devoted to the teaching of this subject precludes encompassing all the facts of pharmacology that have usually been included in the course in years gone by, as well as all of the material which automatically makes up the clinical approach to the subject. The time limitation necessitates the elimination of some of “the old” because of the necessity of including “the new.” Those teachers who feel that the correlated program is the correct approach appreciate that the over-all improvement,

resulting from presentation of the material from the clinical viewpoint, more than overshadows the loss of some of the strictly pharmacologic material.

For practical reasons, the book has been divided into two parts. The first part provides a comprehensive basis for the clinical study which follows in Part II. The clinical section is neither entirely nor primarily concerned with the study of drugs as such. Rather, the study of drugs is in balance and in relation to those other equally important aspects of the total picture, the nurse and the patient. The extensive index provides a quick means of finding data about drugs.

Because an understanding of the educational assets and the method of using a book is a sensible prerequisite to its use, the authors have prepared a brief summary of suggested means of obtaining the most value from the book. It is suggested that those using this book carefully read the "Suggestions to Teachers and Students."

A wide variety of references has been used in the preparation of the manuscript. The authors have relied heavily on the United States Pharmacopeia XV and the British Pharmacopoeia not only to insure the most up-to-date list of drugs, but also to offer drug standards. Information on the more recent drugs has been secured from several different sources, all of which are ethically and scientifically acceptable and regularly used.

A bibliography of books which the authors have found useful is included. It is not intended to be all inclusive. Some of these are official publications, others are general reference books, while still others are publications from the field of pharmacy. This last group will be needed to keep the student abreast of the latest information in the field of drugs.

The authors are deeply grateful for the assistance of all the many people who have helped to bring this work to completion. All clinical chapters have been checked for accuracy by physicians who are specialists in their fields. Special thanks go to Sister Leander, R.N., B.S., for the aid she has given, both material and spiritual. We would like to express our grateful appreciation to Miss June Roslund, R.N., M.S., and Dr. N. A. Hall for their valuable critical appraisal of the manuscript.

MARY W. FALCONER

MABELCLAIRE R. NORMAN



# SUGGESTIONS FOR USE OF THE BOOK FOR BOTH TEACHERS AND STUDENTS

This book is the result of much thought about the ways and means of making the subject of Pharmacology more meaningful to the student and of bringing into closer contact the formal study of drugs and the actual care of the patient. The authors have attempted to keep the book patient-centered at all times. It would seem unnecessary to emphasize that "drugs are used to treat people—not diseases," but many nurses become so enthusiastic over the scientific and therapeutic value of drugs for specific conditions that they forget that it is an individual person who is being treated and that, no matter how good a certain drug may usually be, it can be wholly ineffective for the patient under treatment.

The book itself is patient-centered, but all the major drugs that nurses are usually called upon to administer have been collected for reference in the Current Drug Handbook. It has been planned that the text will be used throughout the student's entire preclinical and clinical experiences, and that it may also be retained as a reference after graduation.

The book is divided into three parts:

- I. Material of basic general interest which will be needed in all clinical areas.
- II. Material about the administration of drugs.
- III. Material on drugs and their use in the treatment of patients, divided according to the usual clinical divisions of most hospitals and medical books.

The first part of the book does not deviate markedly from a standard pharmacology textbook, though the authors have tried to eliminate nonessential details in order to make this area more interesting to the student.

Chapter 5 covers the mathematics of pharmacology. It has been kept as simple as was consistent with the material involved. Only those areas which are usually difficult for the student to understand have been included. Any student seriously deficient in basic arithmetic processes should take a remedial course before attempting posology. The number of practice and review problems is small. Some have been added at the end of various clinical chapters. The instructor should use those which are pertinent to the practice in her area. Calculation of dosage is becoming less and less the nurse's responsibility. However, when it is required, she must be able to do the calculations accurately.

The third part of the book is planned for use in conjunction with the various clinical experiences of the student. There are chapters discussing drugs used in



specialized areas, such as in the treatment of the obstetric patient, as well as chapters discussing drugs for the general medical and surgical patient.

A regular chapter plan has been used in the development of this part of the text, varying only as needed to suit the different materials presented. At the beginning of each chapter there is a list of basic scientific information important in the understanding of the material in the body of that chapter. These are very brief, but the student should study (from an appropriate reference source) any she feels she does not fully understand. A somewhat arbitrary coding has been used to secure uniformity. The sciences have been numbered with Roman numerals as follows:

- I. Anatomy and Physiology
- II. Chemistry
- III. Microbiology
- IV. Physics
- V. Psychology
- VI. Sociology

The subheadings have been given Arabic numerals, thus 1, 2, 3, and so on. This plan has been followed even though, in some cases, a heading has only one subheading. References have been placed at appropriate places in the body of the chapters, thus, I-3, V-1, III-4, etc. It is expected that the student will refer back to the beginning of the chapter to aid her understanding of the subject matter presented. Naturally, some chapters will need far more basic scientific background than others and, in some cases, there will be only one or at most two sciences used as reference.

The body of each chapter in which clinical material is included contains, first, a brief discussion of the typical clinical picture, with the predominant symptoms as they are usually encountered. Following this is a consideration of which drugs are used to alleviate these symptoms or to cure the condition, how they are administered, and what action is likely to take place. Only information about drugs directly pertinent to the proper care of the patient is given. If further information is desired, the student is expected to refer to the last section of the book or to other appropriate references.

The following outline has been maintained throughout the clinical section, varying, as mentioned before, according to change in subject material.

Definition (of the disease or condition, usually with a brief discussion of it)

Major Symptoms

Drug Therapy

The Drug

The Nurse

The Patient

The basic divisions have been further subdivided as follows:

### **THE DRUG NAME**

**The Drug.** Here is a brief statement as to source, historical significance of the drug or any other pertinent fact not covered in the other areas.

**Physical and Chemical Properties:** A very brief coverage of the physical and chemical properties of the drug under consideration, especially those that are of significance to the nurse.

**Action:** This covers the action of the drug in the body insofar as this is known.

**Therapeutic Uses:** Conditions for which the drug is used.

**Absorption and Excretion:** How the drug enters the body, its fate within the body, how, where and in what form it is excreted. Again, this insofar as it is known.

**Preparations and Dosages:** Various preparations of the drug, how given, the average dose and usually how often it is administered. In this area are included the generic and major trade names, both of the United States and Canada. The letter designation is also given, such as U.S.P., N.F., B.P.

**The Nurse.** There may or may not be a short introductory statement of the place of the nurse in the administration of this drug, depending upon the contents of the subheadings under this main heading.

**Mode of Administration:** How the drug is administered, why that route is used, if pertinent, and any problems the nurse is likely to encounter in administering this drug. The next four headings may be combined or one or more may be omitted depending upon the specific drug being discussed. They are:

**Side Effects:** Effects to be expected from this drug other than those for which it is given. What, if anything, can and should be done about them.

**Toxicity and Treatment:** If the side effects are all undesirable, this heading may merge with the one above. However, usually serious toxic symptoms and their treatment are discussed here.

**Interactions:** Effect this drug has on other drugs given at or about the same time, and also their action on the drug being discussed.

**Contraindications:** Contraindications are given if there are any.

**Patient Teaching:** This heading is self-explanatory, what the nurse should tell the patient and/or his family about the medicine, especially if the drug is to be taken at home without direct medical or nurse supervision.

In some instances subdivisions are not given, since a brief overall coverage seemed more appropriate.

**The Patient.** Under this heading is considered the psychologic, emotional, social, economic and spiritual aspects of the particular drug and/or disease being discussed. Some phases of patient teaching may be included here. In some instances the material under this heading may be applicable to several drugs. When this is the case, the information is given only once to avoid repetition. There are cross-references to cover this contingency.

Each major drug has been covered in detail only once. This is to avoid repetition. In the index, in bold type, will be found the reference for this. Since many drugs are used for a number of different disorders, but in most cases there is one main use, cross references are again used to show this and to designate other uses.

At the end of each chapter the authors have included a section labeled "It Is Important to Remember." Very briefly, this gives some of the more important facts brought out in the chapter, especially facts which are somewhat contrary to the layman's belief. Lastly, there is a section marked "Topics for Study and Discussion." It is hoped that these will serve to stimulate the student to further investigation of drugs and their place in helping people to "get well" and to "keep well." Among these topics will be found problems which the student may encounter in giving the drugs, discussed in the body of the chapter. The authors feel that even though the subject of the mathematics of drugs may be covered early in the nursing program, it is well to refresh the memory with up-to-date problems. Many instructors ask this type of question at each class as a teaching aid.

It is suggested that each chapter be taught with the clinical classes covering that specific material and/or the clinical experiences in that particular subject. Thus, the chapter "Drugs Used During Pregnancy, Delivery and Lactation" would be studied while the student is doing practical work in obstetrics. If the school curriculum is not planned so that this is possible, the student should review the chapter when studying the clinical material to which it relates.

Some of the chapters can be covered in a single class, but most of them have been planned for several classes. For instance, the chapter mentioned discusses the drugs used during pregnancy, labor, delivery and the puerperium. This might be four separate classes or parts of several classes dealing with these areas in the general course in obstetric nursing. Or, the instructor might feel that there is insufficient material for more than two classes. These are things that will be decided by the number of hours devoted to the entire subject.

When pharmacology is taught as a separate subject preceding or concurrent with the first clinical courses, this text will prove very valuable, since there is sufficient coverage of the various diseases and conditions to show the reasons for the drugs used in treating them.

The fourth and last part is a revision of the Current Drug Handbook, published by the same authors. This section is included at the request of instructors using the text. The authors have tried to list all drugs still in relatively common use and, at the same time, to include many of the newer ones. It is impossible for any book to comprise all drugs or to be completely up-to-date. There are a great many new drugs marketed each year, and some become important adjuncts to pharmaceutical therapy. Because of the time lapse between writing and publication, drugs of recent origin will not be found. The student is advised to augment the information found in the text with a notebook or card file system of her own. Most pharmaceutical firms will gladly give information about their products, and many new drugs come with printed material telling of their use, dosage, toxicity, etc. Excellent reference information for the library and classes can be obtained from the same sources. The instructor, if she has not already made this discovery will find that drug companies will gladly place her on their mailing lists, and this will give an updated source of information about new drugs and new uses for old drugs.

A glossary has not been included since most students find it more convenient and helpful to use a regular medical dictionary for words not understood or not explained in the text.

THE AUTHORS

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# I INTRODUCTION





# I THE DEVELOPMENT OF PHARMACOLOGY

Fire properly controlled is man's best friend—uncontrolled, it is his worst enemy. This same statement might well be applied to drugs. Properly used, drugs are a great blessing to mankind; indiscriminately or improperly used, they could destroy the race.

The nurse will find the study of drugs a fascinating pursuit. There is real romance in the origin of many medicines, and a real thrill in the dramatic recoveries some drugs produce. However, as with most important subjects, the study of pharmacology is accompanied by many less interesting details. The student must be able to see the final goal—the lessening of human suffering—to appreciate the need for understanding these seemingly minor points. It is the fact that most drugs can kill as well as cure that makes the full understanding of all the details essential.

The history of pharmacology is as old as the story of mankind. Man has always experienced sickness and injury and has searched for means of combating disease and caring for the wounded. This search for therapeutic measures marks the progress of civilization.

Man's earliest medicinal remedies were the result of several divergent factors. One was his observation of the activities of animals, both wild and those he early domesticated. He was able, by watching them, to learn some of the therapeutic properties of various plants, waters and muds. Most primitive peoples believed that the world was filled with invisible spirits which were either good or bad. Disease was the manifestation of the evil spirit. Therefore, to cure disease it was essential to "drive out" these spirits by giving the patient all sorts of noxious materials. The experimentation with these substances led to the beginning of medicine, for some of the "medicines" actually did help the patients to recover. Combining the information gained from these, and no

doubt other sources, with his own observations of the effects of certain herbs, other plants, and animal products, led early man to the discovery of the real value of many substances used in medicine today. Savages in widely separated areas knew the effects of certain poisons such as curare, veratrine, ouabain and nux vomica. They used these poisons on their arrows and spear tips to paralyze or kill the victim, animal or man. Curare, which causes temporary paralysis, was used mainly for hunting, as the agent did not affect persons eating the meat of animals on which it had been used. Today curare is used as a skeletal muscle relaxant. Veratrine, ouabain and nux vomica usually killed and in the latter case the meat was apt to be poisonous. Strychnine is obtained from nux vomica. It is a strong muscle stimulant causing convulsions in large doses. It is not in common use now since other less toxic drugs are available. Veratrine derivatives are now used to reduce high blood pressure and ouabain is used in the treatment of certain forms of heart disease.

Primitive men also knew of the beneficial effects of many drugs which are still used. Probably the most important of these was the latex (milk) of the capsule of the poppy—opium—which is still used to relieve pain.

## PRE-CHRISTIAN MEDICINE

### Egyptian

Some of the oldest written records of drugs are the Egyptian papyri, the most important of which is the Ebers papyrus written about the sixteenth century B.C. This is a scroll over 20 yards long which contains clinical reports, a

collection of prescriptions and formulas covering a wide range of materials. Many of the recipes include drugs that are still in use. Among these are castor oil, wormwood, aloe, peppermint, opium and henbane. Minerals and metals used by the Egyptians were iron, copper sulfate, magnesia, niter, sodium carbonate, sodium chloride and precious stones finely pulverized. The animal products included such extraordinary substances as lizard's blood, swine's teeth, asses' hoofs, goose grease, animal fat and animal excreta; other weird things listed were the thigh bone of a hanged man and moss grown on a human skull.

The pharmacist of the period made pharmaceutical preparations of these drugs in the form of pills, powders, infusions, decoctions, salves, plasters and confections. Some of the recipes contained as many as 35 ingredients. It is believed that the Egyptians used the juice of the poppy and Indian hemp to make the patients drowsy before surgical operations were performed. Since physicians were also priests, the healing art was closely associated with the spiritual life; no doubt there were many patients healed by "psychosomatic" means. Many of the Egyptian drugs found their way later into the *materia medica* of the Greeks and, through them, were passed on to other nations.

### Asia Minor

Babylonia, Assyria, Palestine and Persia (the "Fertile Crescent") were all, at one time or another, important historically. In general, these countries contributed more toward the prevention than the cure of disease. Moses gave the Hebrews excellent rules for community sanitation which may be found in the Bible in the Books of Leviticus and Numbers. Here are discussed means of obtaining clean food and water, the proper disposal of waste and the isolation of people with communicable diseases. King Hammurabi's Code listed many fine rules of hygiene and sanitation for the people of Babylon. There is not much in these writings, however, concerning actual drugs.

### Other Areas

In the New World, the various Indian tribes had their "medicine men" who used incantations and many herbs to cure diseases. As with other primitive peoples, their medicine was a mixture of religion, mysticism, superstition and actual knowledge of the medicinal properties of various substances. Specifically, in South America, the Peruvians used cinchona for malaria and coca (from which cocaine is derived) to relieve fatigue. Cocaine and its derivatives are now used as local anesthetic agents. Brazilians used ipecac for amebic dysentery. The North American Indians knew of the value of cascara as a laxative, arbutus for rheumatism, lobelia for colds, sassafras leaves for wounds and the root of this plant for "cooling and purifying" the blood.

Other countries early contributed to the realm of medicine. Indians (Hindus) used rauwolfia to calm the restless and to treat heart diseases. It is still used for these and other conditions. The Chinese used ma huang, from which ephedrine is obtained, to treat asthma centuries before the birth of Christ. The alkaloid ephedrine, responsible for the effectiveness of ma huang, was first isolated in 1924, and it is still used extensively in the management of asthma and other conditions.

### Greco-Roman

In Greece, as in all ancient countries, the healing art was a part of the religious practices of the people. Temples to Aesculapius, the god of healing, were built. Since these temples were usually situated in the hills and mountains near mineral springs, they virtually became sanatoria. The patients were treated first by prayer and sacrifices for spiritual perfection. Then came physical cleansing in the mineral baths and internal cleansing by catharsis. Further treatments were massage, inunctions and the taking of medicated wines. Soft music was used to induce restful sleep. If the treatments were successful and the patient recovered, a votive tablet giving the history of the case and the treatment was hung in the temple where anyone who wished might