



THE MERCK MANUAL

FIFTEENTH
EDITION

FIFTEENTH EDITION

THE
MERCK
MANUAL

OF
DIAGNOSIS AND THERAPY

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THE MERCK MANUAL

FIFTEENTH EDITION



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4th Edition - 1911
5th Edition - 1923
6th Edition - 1934
7th Edition - 1940
8th Edition - 1950
9th Edition - 1956
10th Edition - 1961
11th Edition - 1966
12th Edition - 1972
13th Edition - 1977
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FOREWORD

⑤ 1. K a m p e n d i a m
The MERCK MANUAL first appeared in 1899 as a slender 262-page text titled MERCK'S MANUAL OF THE MATERIA MEDICA. It was expressly designed to meet the needs of general practitioners in selecting medications, noting that "memory is treacherous" and even the most thoroughly informed physician needs a reminder "to make him at once master of the situation and enable him to prescribe exactly what his judgment tells him is needed for the occasion." It was well received and, by the 6th Edition (1934), THE MERCK MANUAL had become highly valued by medical students and house staff also; by the end of World War II the pocket-sized manual was an established favorite ready-reference. Today THE MANUAL is the most widely used medical text in the world. While the book has grown to about 2500 pages, its primary purpose remains the same—to provide useful information to practicing physicians, medical students, interns, residents, and other health professionals.

Fewer physicians now attempt to manage the whole range of medical disorders that can occur in infants, children, and adults, but those who do must have available a broad spectrum of current and accurate information. The specialist requires precise information about subjects outside his area of expertise. All physicians need more and more information for study and examination purposes as well as for patient care. THE MERCK MANUAL continues to try to meet these needs, excluding only details of surgical procedures.

Precisely how do we attempt to meet these needs? First, from a disease orientation, THE MANUAL covers all but the most obscure disorders of mankind, not only those that a general internist might expect to encounter, but also problems of pregnancy and delivery, the more common and serious disorders of neonates, infants, and children, and many special situations. Disorders are mainly organized according to the organ systems primarily affected, on the basis of their etiology (as with most of the infectious diseases and disorders due to physical agents), or on the basis of disciplines (eg, gynecology, obstetrics, pediatrics, genetics, psychiatry). In addition, THE MANUAL contains information for special circumstances, such as radiation reactions and injuries, problems encountered in deep-sea diving, or dental emergencies. The entire book is updated for each new edition, and new subjects continue to be added, such as discussions of diagnostic and therapeutic procedures in gastroenterology; acquired immunodeficiency syndrome (AIDS), reproductive endocrinology, oncology, the management of severe and chronic pain, the value of hyperbaric O₂ therapy, and special considerations in drug treatment of infants and children. This edition has 114 pages (approximately 5%) more text than the preceding edition. We therefore urge you to check the Index whenever you require information, even on unusual subjects or those not commonly found in other texts.

② A completely disease-oriented compendium, however, would have serious limitations. Since patients usually present with complaints or concerns that must be meticulously described, sorted, and deciphered, many chapters are devoted to discussions of symptoms and signs and how to elicit the historical and physical data required for diagnosis. Common clinical procedures and laboratory tests used as diagnostic and management aids are described with emphasis on their indications, contraindications, and possible complications. New and sophisticated laboratory and technologic procedures are also described, with comments on their uses, interpretations, and limitations.

Current therapy is presented for each disorder and supplemented with a separate section on clinical pharmacology that describes general principles, new ad-

vances (eg, the role of drug receptors, plasma concentration monitoring), details of pharmacologic groups and specific agents, and even a discussion on the use of placebos. The use of complex equipment (eg, respirators) is also described. Prophylaxis is emphasized wherever possible. Finally, reference guides are provided for checking normal values, calculating dosages, and converting weights, measures, and volumes to metric equivalents.

Can so many subjects be covered adequately in a single book? You, the reader, must make the ultimate judgment, but we believe the answer is in the affirmative. This edition required a concerted effort by many people, beginning with an internal analysis and critique of the previous edition, even though it enjoyed highly favorable reviews and outstanding reader acceptance. Sections of that book were then sent to outside experts, who had had nothing to do with its preparation, to solicit their most candid criticism. Published reviews and letters received from readers were analyzed. Next, the Editorial Board met to compare reviews and critiques and to plan this 15th Edition. Distinguished special consultants were enlisted to provide additional expertise. Then, 269 authors with outstanding qualifications, experience, and knowledge were engaged. Their manuscripts were edited repeatedly in-house to retain every valuable morsel of knowledge while eliminating sometimes elegant, but unneeded, words. Each manuscript was then reviewed by a member of the Editorial Board or a consultant. In many cases, additional special reviewers were invited to comment. Every mention of a drug and its dosage was reviewed by a separate outside consultant. The objectives of all these reviews were to ensure adequate and relevant coverage of each subject, accuracy, and simple and clean exposition. The authors then reworked, modified, and polished their manuscripts. Almost all of the manuscripts were revised at least 6 times; 15 to 20 revisions were not uncommon. We believe that no other medical text undergoes as many reviews and revisions as THE MERCK MANUAL.

Owing to the extensive subject matter covered and a successful tradition, the style and organization of THE MANUAL have some unique characteristics. Readers are urged to spend a few minutes reviewing the Guide for Readers (p. viii), the Table of Contents *at the beginning of each section*, and the Index (p. 2577). Scrutiny of the arrangement of subject headings within each section, of internal headings within a subject discussion, and of boldfaced terms in the text will reveal a pattern of outlining intended to aid study of the text.

The foregoing is a simplified review of the complex, arduous, and rewarding 5-year enterprise that culminates in the presentation of this 15th Edition of THE MERCK MANUAL. The members of the Editorial Board, special consultants, contributing authors, and in-house editorial staff and their affiliations are listed on the pages that follow. They deserve a degree of gratitude that cannot be adequately expressed here, but we know they will feel sufficiently rewarded if their efforts serve your needs.

We hope this edition of THE MERCK MANUAL will be a welcome aid to you, our readers—compatible with your needs and worthy of frequent use. Suggestions for improvements will be warmly welcomed and carefully considered.

Robert Berkow, M.D., *Editor-in-Chief*
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GUIDE FOR READERS

- The **Contents** (p. vii) shows the pages where readers will find lists of Editorial Board members, consultants, and contributors, as well as abbreviations and symbols, titles of sections (groupings of related chapters), and the index. **Thumb-tabs** with appropriate abbreviations and section numbers mark each section and the index.
- Each **Section**, designated by the symbol §, begins with its own table of contents, listing chapters and subchapters in that section.
- **Chapters** are numbered serially from the beginning to the end of the book.
- The **Index** contains many cross-entries; page numbers in bold type signify major discussions of the topics. In addition, the text in **THE MANUAL** gives numerous cross-references to other sections and chapters.
- Each **Page Head** carries (1) the page number (page numbers and chapter numbers run serially from the beginning to the end of the book); (2) left-hand pages contain the section title, and (3) right-hand pages contain the chapter number and title.
- **Abbreviations and Symbols**, used liberally as essential space savers, are listed on pp. ix and x.
- The **Tables and Figures** found throughout the text are referenced appropriately in the index but are not listed in a table of contents.
- Section 22, **Special Subjects**, contains discussions such as **Geriatric Medicine**, **Aids for the Disabled Patient**, **Nuclear Medicine**, and **Hyperbaric Oxygen Therapy**, as well as **Laboratory Medicine** and **Ready Reference Guides**.
- **Drugs** are designated in the text by generic (nonproprietary) names. In the last chapter of the Clinical Pharmacology section, many of the drugs mentioned in the book are listed alphabetically, with each generic term followed by one or more trademarks.
- The authors, reviewers, editors, and publisher of this book have made extensive efforts to ensure that treatments, drugs, and dosage regimens are accurate and conform to the standards accepted at the time of publication. However, constant changes in information resulting from continuing research and clinical experience, reasonable differences in opinions among authorities, unique aspects of individual clinical situations, and the possibility of human error in preparing such an extensive text require that the reader exercise individual judgment when making a clinical decision and, if necessary, consult and compare information from other sources. In particular, the reader is advised to check the product information provided by the manufacturer of a drug product before prescribing or administering it, especially if the drug is unfamiliar or is used infrequently.

ABBREVIATIONS AND SYMBOLS

ACTH	adrenocorticotrophic hormone	FDA	U.S. Food and Drug Administration
ADH	antidiuretic hormone	ft	foot; feet (measure)
ADP	adenosine diphosphate	FUO	fever of unknown origin
AIDS	acquired immunodeficiency syndrome	GFR	glomerular filtration rate
ALT	alanine aminotransferase (formerly SGPT)	GI	gastrointestinal
AST	aspartate aminotransferase (formerly SGOT)	gm	gram
ATP	adenosine triphosphate	G6PD	glucose-6-phosphate dehydrogenase
bid	2 times a day	GU	genitourinary
BMR	basal metabolic rate	h	hour
BP	blood pressure	Hb	hemoglobin
BSA	body surface area	HCl	hydrochloric acid; hydrochloride
BUN	blood urea nitrogen	HCO₃	bicarbonate
C	Celsius; centigrade; complement	Hct	hematocrit
Ca	Calcium	Hg	mercury
CBC	complete blood count	HI	hemagglutination-inhibition, inhibiting
CF	complement fixation, fixating	HLA	human leukocyte group A
Ch.	chapter	Hz	hertz (cycles/second)
Ci	curie	ICF	intracellular fluid
CK	creatine kinase	IgA, etc	immunoglobulin A, etc
Cl	chloride; chlorine	IM	intramuscular(ly)
cm	centimeter	IPPB	inspiratory positive pressure breathing
CNS	central nervous system	IU	international unit
CO	carbon monoxide; cardiac output	IV	intravenous(ly)
CO₂	carbon dioxide	IVU	intravenous urography
CPR	cardiopulmonary resuscitation	K	potassium
CSF	cerebrospinal fluid	kcal	kilocalorie (food calorie)
CT	computed tomography	kg	kilogram
cu	cubic	17-KGS	17-ketogenic steroids
D & C	dilation and curettage	17-KS	17-ketosteroids
dL	deciliter (=100 mL)	L	liter
DNA	deoxyribonucleic acid	lb	pound
DTP	diphtheria-tetanus-pertussis (toxoids/vaccine)	LDH	lactic dehydrogenase
D/W	dextrose in water	LE	lupus erythematosus
ECF	extracellular fluid	lt	left
ECG	electrocardiogram	m	meter
EEG	electroencephalogram	M	molar
ENT	ear, nose, and throat	MCH	mean corpuscular hemoglobin
ESR	erythrocyte sedimentation rate	MCHC	mean corpuscular hemoglobin concentration
F	Fahrenheit	mCi	millicurie
		MCV	mean corpuscular volume
		mEq	milliequivalent
		mg	milligram
		Mg	magnesium

x Abbreviations and Symbols

MIC	minimum inhibitory concentration	RF	rheumatic fever; rheumatoid factor
min	minute	RNA	ribonucleic acid
mIU	milli-international unit	rt	right
mL	milliliter	SaO₂	arterial oxygen saturation
mm	millimeter	SBE	subacute bacterial endocarditis
mM	millimole		
mo	month	s.c.	subcutaneous(ly)
mol wt	molecular weight	sec	second
mOsm	milliosmole	SI	International System of Units
MRC	Medical Research Council (units)	SLE	systemic lupus erythematosus
MRI	magnetic resonance imaging	soln	solution
N	nitrogen; normal (strength of solution)	sp gr	specific gravity
Na	sodium	sq	square
NaCl	sodium chloride	sq m	square meter
ng	nanogram (= millimicrogram)	STS	serologic test(s) for syphilis
nm	nanometer (= millimicron)	TB	tuberculosis
17-OHCS	17-hydroxycorticosteroids	tbbsp	tablespoon
OTC	over-the-counter (pharmaceuticals)	tid	3 times a day
oz	ounce	tsp	teaspoon
P	phosphorus; pressure	u.	unit
P_{CO₂}	carbon dioxide pressure (or tension)	URI	upper respiratory infection
P_{O₂}	oxygen pressure (or tension)	UTI	urinary tract infection
P_{aCO₂}	arterial carbon dioxide pressure	USPHS	United States Public Health Service
P_{aO₂}	arterial oxygen pressure	WBC	white blood cell
PA_{O₂}	alveolar oxygen pressure	WHO	World Health Organization
pg	picogram (= micromicrogram)	wk	week
pH	hydrogen-ion concentration	wt	weight
po	orally	yr	year
PPD	Purified Protein Derivative (tuberculin)	μ	micro-
ppm	parts per million	μL	microliter
prn	as needed	μm	micrometer; micron
psi	pounds per square inch	mμ	millimicron (= nanometer)
q	every	μCi	microcurie
q 4 h, etc	every 4 hours, etc	μg	microgram
qid	4 times a day	μmol	micromole
R, r	roentgen	μOsm	micro-osmole
RA	rheumatoid arthritis	/	per
RBC	red blood cell	<	less than
		>	more than
		≤	equal to or less than
		≥	equal to or more than
		≈	approximately equal to
		±	plus or minus
		§	section

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Bronchial Asthma

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Radiology

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Echocardiography

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Bacterial Diseases Caused by Gram-Positive Cocci; Rheumatic Fever; Sydenham's Chorea

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Laboratory Evaluation of the Liver and Biliary System; Fatty Liver; Fibrosis and Cirrhosis; Liver Disease Due to Alcohol; Vascular Lesions of the Liver

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Drug Absorption and Bioavailability; Drug Distribution; Antiemetics

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Chief, Pain Service, Memorial Sloan Kettering Cancer Center; Associate Professor of Neurology and Pharmacology, Cornell University

Pain

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Pericardial Disease

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Behavioral Problems

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Obstructive Uropathies; Myoneurogenic Disorders; Urinary Incontinence; Male Genital Lesions; Genitourinary Trauma; Neoplasms; Congenital Abnormalities—Kidney; Congenital Abnormalities—Ureter; Wilms' Tumor; Neuroblastoma

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Lymphomas

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Anemias

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Irritable Bowel Syndromes

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Sudden Cardiac Death

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Psychiatric Emergencies

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Myeloproliferative Diseases

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Immunologically Mediated Renal Diseases

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Neonatal Hepatitis B Virus Infection

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Cardiac Arrest and Cardiopulmonary Resuscitation

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Congenital Glaucoma; Glaucoma; Contact Lenses

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George Washington Goler Professor of Pediatrics and Medicine, University of Rochester

Acute Epiglottitis; Croup; Bronchiolitis

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The Glomerular Diseases

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Diphtheria

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Neurology and Chairman, Department of Neurol-
ogy, Northwestern University; Chairman, Depart-
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*Slow Virus Infections; Subacute Sclerosing Panen-
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Dyslexia

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Invasive Cardiovascular Procedures

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Ophthalmology, Albert Einstein College of Medi-
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Montefiore Hospital and Medical Center

*Retinopathy of Prematurity; Retinoblastoma; Ret-
ina*

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Infectious Mononucleosis

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*Prevention of Infection—Antimicrobial Chemopro-
phylaxis; Superficial Infections; Abscesses; Osteo-
myelitis*

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*Disorders of the Stomach and Duodenum; Child-
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*Adolescent Psychiatric Conditions; Suicide in Chil-
dren and Adolescents*

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*Pediatrics and Genetics—Introduction; Health
Management in Normal Neonates, Infants, and
Children—Introduction; Health Supervision of the
Well Child; Acute Infectious Gastroenteritis; Pin-
worm Infestation*

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Erysipeloid; Listeriosis

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Adult Respiratory Distress Syndrome

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*Pregnancy Complicated by Disease—Diabetes Mel-
litus; Pregnancy Complicated by Disease—Thyroid
Disease*

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*Salmonella Infections; Shigellosis; Tularemia; Lep-
tospiriosis*