a LANGE clinical manual

Internal Medicine

Diagnosis and Therapy

Department of Medicine
University of Texas Health Science Center
San Antonio

2nd Edition

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Edited by

Jay H. Stein, MD
Dan F. Parman Distinguished Chair in Medicine
Professor and Chairman
Department of Medicine
University of Texas Health Science Center
San Antonio, Texas

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Contributors

Ralph A. DeFronzo, MD
[Metabolic Disorders]
Professor of Medicine and Chief, Diabetes Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Louis J. Dell'Italia, MD
[Diseases of the Heart]
Assistant Professor of Medicine, Cardiovascular Disease Division, Department of Medicine, University of Alabama, Birmingham.

Richard L. De Villez, MD
[Skin Diseases]
Professor of Medicine, Dermatology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

James F. Dunn, MD
[Endocrine Disorders]
Assistant Professor of Medicine and Assistant Program Director, Clinical Research Unit, Endocrinology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Gregory L. Freeman, MD
[Diseases of the Heart]
Associate Professor of Medicine, Cardiology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Bonnie B. Furner, MD
[Skin Diseases]
Assistant Professor of Medicine, Dermatology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Thomas C. Hardin, PharmD, FCCP
[General Aspects of Drug Therapy; Hospital Orders]
Clinical Associate Professor of Medicine and Pharmacology, Pharmacology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Gary D. Harris, MD
[Pulmonary Diseases]
Associate Professor of Medicine, Pulmonary Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Claudia E. Hura, MD
[Renal and Electrolyte Disorders; Drug Dosages for Patients with Renal Failure]
Assistant Professor of Medicine, Nephrology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Michael S. Katz, MD
[Endocrine Disorders]
Associate Professor and Head, Geriatrics and Gerontology Division, Department of Medicine, University of Texas Health Science Center, San Antonio. Director, Geriatric Research, Education and Clinical Center, and Associate Chief of Staff for Extended Care, Audie L. Murphy Memorial Veterans Hospital, San Antonio.

Valerie A. Lawrence, MD
[General Aspects of Drug Therapy; Hospital Orders]
Assistant Professor of Medicine, General Medicine Division, Department of Medicine, University of Texas Health Science Center, San Antonio. Staff Physician, Audie L. Murphy Memorial Veterans Hospital, San Antonio.

Jonathan A. Leighton, MD
[Emergencies]
Fellow, Gastroenterology, Gastroenterology and Nutrition Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Shirley P. Levine, MD
[Hematologic Disorders]
Associate Professor of Medicine, Hematology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

John P. Mulrow, MD
[Diseases of the Heart]
Assistant Professor of Medicine, Medical Director of Cardiac Transplantation, Cardiology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

I. Jon Russell, MD, PhD
[Rheumatologic and Musculoskeletal Disorders]
Associate Professor of Medicine, Clinical Immunology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Alexander M.M. Shepherd, MD, PhD
[Hypertension]
Associate Professor of Medicine and Pharmacology and Chief, Clinical Pharmacology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

David G. Sherman, MD
[Neurologic Diseases]
Professor and Chief, Neurology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Jean A. Smith, MD
[Infectious Diseases]
Assistant Professor of Medicine, Infectious Diseases Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

David L. Stump, MD
[Gastrointestinal, Liver, and Pancreatic Diseases]
Assistant Professor of Medicine, Gastroenterology and Nutrition Division, Department of Medicine, University of Texas Health Science Center, San Antonio. Chief, Gastroenterology, Audie L. Murphy Memorial Veterans Hospital, San Antonio.

Knox H. Todd, MD
[Emergencies]
Assistant Professor, General Medicine Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Geoffrey R. Weiss, MD
[Oncology]
Associate Professor of Medicine, Oncology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Elliot Weser, MD, FACP
[Nutritional Assessment and Therapy]
Professor of Medicine, Gastroenterology and Nutrition Division, Department of Medicine, University of Texas Health Science Center, San Antonio. Chief, Medicine Service, Audie L. Murphy Memorial Veterans Hospital, San Antonio.

A. John Yates, MD
[Metabolic Disorders]
Assistant Professor, Endocrinology Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Eleanor A. Young, PhD, RD/LD
[Nutritional Assessment and Therapy]
Professor of Medicine, Gastroenterology and Nutrition Division, Department of Medicine, University of Texas Health Science Center, San Antonio.

Preface

PURPOSE

The goal of the second edition of this manual is the same as that for the first edition—to provide a practical, portable source of essential information needed for the effective management of the most important medical syndromes and diseases. As we embarked on preparation of the second edition, we were very encouraged by the response to the first edition. Features of the first edition that won high marks were the numerous practical tables, the detailed information on diagnosis as well as treatment, and the inclusion of some important diseases and syndromes not found in other similar manuals. These features have been retained and, whenever possible, improved upon. We trust that medical students, house staff, and practicing physicians will continue to find the manual a "constant" pocket companion for the betterment of patient care.

ORGANIZATION AND SCOPE

Like the first edition, the second edition groups diseases and syndromes into chapters by medical subspecialty, with the exception of the first chapter, General Aspects of Drug Therapy. The last chapter is devoted to medical emergencies. All material in the first edition was carefully reviewed for necessary updating on the most current techniques in clinical diagnosis and therapy. There is increased space devoted to acquired immune deficiency syndrome (AIDS), more detailed sections on the management of coronary artery disease and diabetes, and an extensive update of antibiotic therapy, to mention just a few enhancements.

OTHER USEFUL FEATURES

- The convenient outline format and selective use of boldface type afford quick, easy access to key aspects of patient assessment and management.
- Basic summaries of a disease's pathophysiology are provided when important for the understanding of the rationale behind the approach to diagnosis and therapy.
- Precise guidelines on approach to diagnosis and therapy. For indicated drug therapy, details on dosage and administration are given.
- Two appendices: Hospital Orders; Drug Dosages for Patients with Renal Failure.
- Table on drugs and procedures for advanced cardiac life support on inside front cover.
- References at the end of each chapter, listing recent clinical studies and reviews.

The editor welcomes suggestions and comments about any aspects of this manual. Letters should be addressed to:

Jay H. Stein, MD
Department of Medicine
University of Texas Health Sciences Center
7703 Floyd Curl Dr.
San Antonio, TX 78284

Contents

1 General Aspects of Drug Therapy

Valerie A. Lawrence, MD, and Thomas C. Hardin, PharmD, FCCP

BASIC PRINCIPLES OF DRUG THERAPY

I. **Know a few drugs well**—sites of action, metabolism, routes of excretion, adverse effects, clinical and laboratory monitoring parameters. A limited repertoire with sufficient depth of knowledge and experience will ensure safer and more effective drug therapy than a wide-ranging but superficial one. If a new drug offers no advantage over an old one, prescribe the old drug, with which there is more experience and documented safety and which is probably less expensive as well.

II. **Administer drugs only upon clear indications.** Do not prescribe drugs just to satisfy patients' expectations.

III. **Dosage and monitoring**

- A. Individualize the dosage according to age, weight, and renal, cardiac, and hepatic function.
- B. Decide how the patient will be monitored for drug efficacy and toxicity.
- C. Review medication orders regularly, and discontinue unnecessary drugs. Always consider whether symptoms, signs, or laboratory abnormalities might be drug-related. The frequency of adverse drug reactions is directly proportionate to the number of drugs prescribed. As many as 20% of patients have undesirable drug reactions during hospitalization.

IV. **Give patients specific oral and written instructions** about medications. Remember that while you speak 2 "languages" (medical and lay), most patients speak only one.

PHARMACOKINETIC MONITORING

Pharmacokinetic monitoring is a means of individualizing drug therapy to maximize efficacy and minimize toxicity. Serum drug levels are helpful but are not a substitute for clinical monitoring. Monitoring of serum drug levels is most useful for drugs whose efficacy is not easily assessed by observation of clinical results or whose toxicity might be reduced with careful dosage titration.

I. **Interpreting drug levels.** For house officers, the most common dilemmas in interpreting drug levels are uncertainties about missed doses and the timing of sample collection. Ideally, samples should be drawn when drug concentrations are at a steady state. If samples are drawn during the drug's distribution phase, the report will overestimate the drug concentration at the site of action.

II. **Therapeutic drug levels.** See Table 1–1.

DRUG INTERACTION

A drug interaction is a pharmacologic response—usually but not invariably an adverse response—that cannot be explained by the action of a single drug but is

TABLE 1–1. THERAPEUTIC DRUG LEVELS

Drug	Therapeutic Range	When to Draw Level
Theophylline (many)	10–20 μg/mL	Before dose
Digoxin (Lanoxin)	0.8–2 ng/mL	Before dose (AM lab)
Quinidine (many)	2–5 μg/mL	Immediately before dose
Procainamide (Pronestyl)	4–8 μg/mL	Before dose
N-Acetylprocainamide (NAPA)	5–20 μg/mL	Before dose
Lidocaine (Xylocaine)	1–5 μg/mL	3 and 9 hours postinfusion
Phenytoin (Dilantin)	10–20 μg/mL	Before dose (AM lab)
Carbamazepine (Tegretol)	6–10 μg/mL	Before dose (AM lab)
Phenobarbital (many)	15–40 μg/mL	Before dose (AM lab)
Valproic acid (Depakene, Myproic Acid)	50–100 μg/mL	Before dose (AM lab)
Gentamicin (many)	Peak: 5–10 μg/mL Trough: < 2 μg/mL	30 minutes postinfusion Immediately before dose
Tobramycin (Nebcin)	Peak: 5–10 μg/mL Trough: < 2 μg/mL	Same as for gentamicin
Amikacin (Amikin)	Peak: 15–25 μg/mL Trough: < 10 μg/mL	Same as for gentamicin
Vancomycin (Vancocin, Vancoled)	Peak: 25–40 μg/mL Trough: 5–10 μg/mL	1 hour postinfusion Immediately before dose
Lithium (many)	0.7–1.5 meq/L	8–12 hours after dose
Salicylate	15–30 mg/dL	Random collection acceptable

due to 2 or more drugs acting simultaneously. Beneficial interactions occur when penicillin is given with probenecid, heparin with protamine, opiates with naloxone, or aminoglycosides with antipseudomonal penicillin. Examples of adverse drug interactions are given in Table 1–2. Always be aware that symptoms, signs, or laboratory abnormalities may be drug-related, and obtain detailed drug histories for both prescription and over-the-counter medications. Elderly persons have increased central nervous system and cardiac sensitivity to many drugs, and they frequently take multiple medications.

DRUG THERAPY AND RENAL FUNCTION

I. **Drug clearance and dosage adjustment.** The clearance of many commonly prescribed drugs is reduced in renal insufficiency, and adjustments both in the amount of drug and frequency of administration are often necessary. (See Appendix B, p 567.) These changes in dosing are based on the creatinine clearance. In any situation of reduced renal function, the creatinine clearance can be estimated by the following equation:

$$C_{cr} = \frac{(140 - \text{age}) \times \text{kg}}{\text{Serum creatinine} \times 72} \quad \left(\begin{array}{c} \text{For women,} \\ \text{multiply by 0.85.} \end{array} \right)$$

II. **Dialysis and drug clearance.** Important factors in drug clearance by hemodialysis include molecular weight, solubility, and protein binding. For a given dialysis membrane, clearance falls as molecular weight increases; drugs with molecular weights greater than 500 are usually not effectively removed by dialysis. Drugs insoluble in water are not soluble in the aqueous dialysate. Because effective dialysis is driven by the concentration gradient of free solute between plasma and dialysate, dialysis clearance falls as the fraction bound to protein increases. Table 1–3 shows the extent to which several commonly used drugs are dialyzable. (See also Appendix B, p 567.)

TABLE 1-2. DRUG INTERACTIONS

(NOTE: DRUGS AND DRUG CLASSES ARE ARRANGED ALPHABETICALLY. SCAN COLUMN A. IF DRUG IS NOT FOUND, SCAN COLUMN B.)

Interacting Drug or Drug Class (A)	Interacting Drug or Drug Class (B)	Mechanism[a]	Clinical Effect
Allopurinol	Azathioprine	3	Increased blood levels of 6-mercaptopurine (active metabolite of azathioprine).
Antacids (in general)	Cimetidine, iron preparations, isoniazid, penicillamine, phenothiazines, ranitidine, tetracycline	1, 4	May result in decreased serum levels of B.
Antacids (in general)	Salicylates	6	May see decrease in serum salicylate levels due to alkalinization of the urine.
Anticonvulsants (phenytoin, phenobarbital, carbamazepine)	Antiarrhythmics, oral anticoagulants, anticonvulsants, beta-blockers, oral contraceptives, corticosteroids, narcotics, theophylline	2	May result in decreased serum levels of B; potential for subtherapeutic effect. For example, decreased prothrombin time in patients receiving warfarin.
Beta-blockers	Antidiabetic agents	9	Beta-blocking agents can delay glucose recovery from insulin-induced hypoglycemia and may inhibit cardiac stimulatory response to hypoglycemia.
Cholestyramine	Acetaminophen, digitalis glycosides, hydrocortisone, thyroid hormones, warfarin	1	May result in decreased serum levels of B; potential for subtherapeutic effect. For example, patient may develop worsening heart failure if digoxin and cholestyramine are given concurrently.
Cimetidine	Oral anticoagulants, beta-blockers, lidocaine, phenytoin, quinidine, theophylline, verapamil	3	May result in increased serum levels of B; increased risk of toxicity. For example, patient may experience arrhythmias due to theophylline toxicity.
Cimetidine	Procainamide	7	Increased procainamide and N-acetylprocainamide serum levels; increased risk of toxicity.
Ciprofloxacin	Theophylline	3	May increase theophylline level and potential toxicity.
Digoxin	Cholestryamine, diuretics, amphotericin B, quinidine, verapamil		Please refer to interacting drugs where listed in column A.
Diuretics, amphotericin B	Digitalis glycosides	8	Hypokalemia induced by A may enhance development of digitalis toxicity.
Diuretics, loop (eg, furosemide)	Aminoglycosides	9	Potentiation of ototoxicity of either compound.
Erythromycin	Theophylline	3	May result in increased serum theophylline levels; dose- and duration-dependent.

(continued)