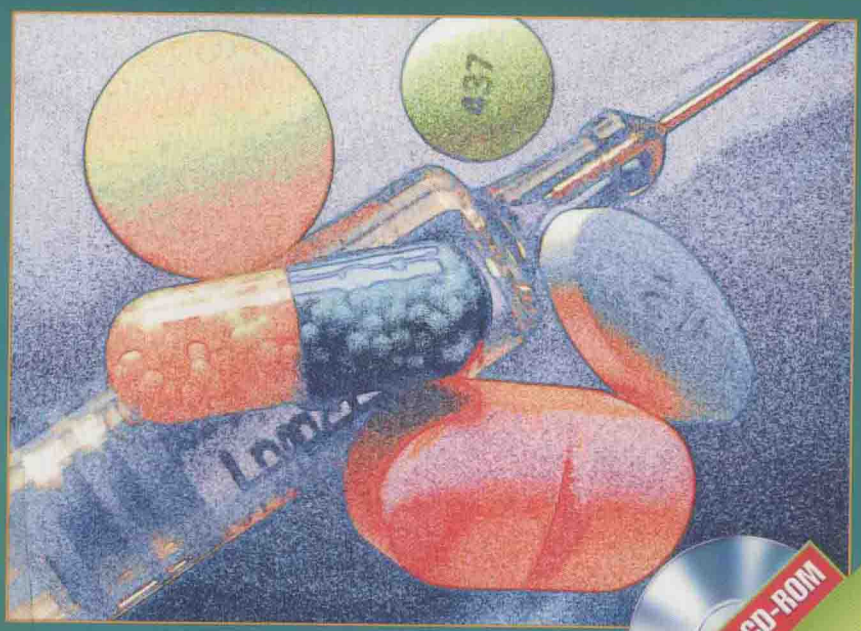
Springhouse Nurse's Drug Guide 2006

Foreword by **Stephen Gilliam**, FNP, APRN, BC, PhD



Includes CD-ROM with NCLEX®-Style Questions Including Alternate-Format

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Springhouse Nurse's Drug Guide 2006

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Foreword

As a pharmacology professor, I refer my students to *Springhouse Nurse's Drug Guide* as the authoritative source of drug information. In fact, it is an efficient and effective tool for nursing students as well as for practicing nurses.

The first section of the guide reviews the application of the nursing process to drug therapy and supplies the essentials of drug calculations, drug administration, and methods for avoiding medication errors.

The drug classes section provides an organized description of 40 classes of drugs. These classes allow nursing students to organize the world of drugs into a manageable framework of similar actions, adverse reactions, and comparable characteristics.

The next section contains an alphabetic listing of drug monographs that offer extensive information in a concise and relevant format. The monographs provide drug pronunciations, indications and dosages, contraindications and cautions, drug action, pharmacokinetics, adverse reactions, interactions, and effects on lab test results. I have found the drug, herb, food, and lifestyle interactions section particularly helpful in planning care and in patient education. I have also found the effects on lab test results segment to be succinct and practical.

The nursing process segment of each monograph offers information unique to the drug for assessment, nursing diagnosis, implementation, and evaluation. Graphic logos direct attention to unique alert considerations (similar drug names or unique assessment issues) and to lifespan issues with emphasis on the developmental. The Photoguide to tablets and capsules in this section is essentially a "field guide" that supplies the student nurse (and practicing nurse) with a quick reference to accurately identify some of the most commonly prescribed tablets and capsules.

The World Health Organization estimates that 80 percent of the world population currently uses herbal medicine for some aspect of primary health care. About 25 percent of the prescription drugs and many of the nonprescription drugs taken in the United States contain at least one active ingredient derived from plant material. This wide use of herbal therapies dictates that students and nurses must become informed of and develop an appreciation for the benefits and consequences of herbal medicines. In the herbal medicine section, *Springhouse Nurse's Drug Guide 2006* addresses herbal medicines objectively and provides the same level of information and detail as it provides for conventional drugs. The common name of the herb, alternative names, reported uses, dosages, cautions, adverse reactions, interactions, actions (when known), common forms, and nursing considerations with patient teaching issues are addressed for the most common herbal medicines.

The appendices of the book provide a variety of unique features such as an English-to-Spanish drug phrase translator. The pregnancy risk categories, controlled substance schedules, table of equivalents, and normal laboratory test values in the appendices provide quick references. The final supplement to *Springhouse Nurse's Drug Guide 2006* is the *PharmDisk 2006* mini-CD. *PharmDisk* helps you study for the NCLEX® and offers a direct link to eDrugInfo.com for drug updates and drug news.

As a nurse practitioner and nursing professor, I am acutely aware that all health professionals must meet the challenge of providing care based upon the best available scientific evidence. The tough task of accomplishing the transfer of current knowledge from scientific research to practice is made easier by *Springhouse Nurse's Drug Guide 2006.* Including this book in their libraries offers the student and the professional accurate drug information and tools that define and demystify the world of drug therapy.

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How to use *Springhouse Nurse's Drug Guide 2006*

Springhouse Nurse's Drug Guide 2006 is the premier drug reference for all nursing students—beginning to advanced. Tightly organized entries offer consistent, practical drug information for more than 750 common generic drugs, presented in a clear writing style that beginning students can understand. The book is also a must-have for advanced students: it includes comprehensive pharmacokinetic and pharmacodynamic information and route-onset-peak-duration tables that give a clear understanding of drug actions. Because each entry also follows the nursing process, the book even helps students formulate accurate care plans. Students of all levels will find that *Springhouse Nurse's Drug Guide 2006* offers a comprehensive and convenient resource.

The book begins with introductory material crucial to safe, accurate drug administration. Chapter 1 discusses drug therapy as it relates to the nursing process. Chapter 2 explains how to calculate dosages and provides examples for each step in the calculations. Chapter 3 discusses how to give drugs by common routes and includes illustrations to guide students through the steps of each procedure. Chapter 4 focuses on common medication errors and explains how to avoid them.

Drug classifications

Springhouse Nurse's Drug Guide 2006 provides complete overviews of 40 pharmacologic and therapeutic drug classifications, from alkylating drugs to xanthine derivatives. After each class name is an alphabetical list of drugs in that class; the drug highlighted in color represents the prototype drug for the class. Each class entry has specific information on indications, actions, adverse reactions, contraindications, and precautions. Look for the special Lifespan logo ( ) for contraindications and cautions for specific populations, such as children, pregnant and breast-feeding women, and elderly patients.

Alphabetical listing of drugs

Drug entries appear alphabetically by generic name for quick reference. The generic name is followed by a pronunciation guide and an alphabetical list of brand (trade) names. Brands that don't need a prescription are designated with a dagger (†); those available only in Canada with a closed diamond (♦); those available only in Australia with an open diamond (◇); and those that contain alcohol with an asterisk (*). A trade name may also have a capsule ( ), meaning that the drug appears in the full-color photoguide. The mention of a brand name in no way implies endorsement of that product or guarantees its legality.

Each entry then identifies the drug's pharmacologic (chemical category) and therapeutic (main use) classes. Seeing both classes helps you grasp the multiple, varying, and sometimes overlapping uses of drugs within a single pharmacologic class and among different classes. Each entry then lists the drug's pregnancy risk category and, if appropriate, its controlled substance schedule.

Indications and dosages

The next section lists the drug's indications and provides dosage information for adults, children, and elderly patients. Off-label indications (uses not approved by the FDA) are designated with a double dagger (‡). Dosage instructions reflect current trends in therapeutics but can't be considered absolute or universal. For your patient, dosage instructions must be considered in light of his condition.

When giving a drug to a patient who requires special dosing considerations, look for the Adjust-a-Dose label and logo ( ) at the end of the indication.

I.V. administration

This section, only found in drugs that can be given I.V., addresses preparation, administration, and storage information, as well as cautions and other information about the safe use of I.V. drugs.

Contraindications and cautions

This section specifies situations in which the drug shouldn't be used and details recommendations for cautious use. The Lifespan logo () draws your attention to contraindications and cautions for special populations, such as children, pregnant or breast-feeding women, and elderly patients.

Adverse reactions

This section lists adverse reactions by body system. The most common adverse reactions (those experienced by at least 10% of people taking the drug in clinical trials) are in *italic* type; less common reactions are in roman type; life-threatening reactions are in ***bold italic*** type; and reactions that are common *and* life-threatening are in **BOLD CAPITAL** letters.

Interactions

This section lists confirmed, significant interactions with other drugs (added, increased, or decreased effects), herbs, foods, and lifestyle behaviors (such as alcohol use and smoking).

Drug interactions are listed under the drug that is adversely affected. For example, antacids that contain magnesium may decrease absorption of tetracycline so this interaction is listed under tetracycline. To determine the possible effects of using two or more drugs simultaneously, check the interactions section for each of the drugs in question.

Drugs that cause interactions that arise quickly and require immediate attention, called rapid-onset interactions, are shown in color.

Effects on lab test results

This section lists increased and decreased levels, counts, false results, and other laboratory test results that may be caused by the drug.

Pharmacokinetics

This section describes absorption, distribution, metabolism, and excretion, along with the drug's half-life. It also provides a quick reference table highlighting onset, peak, and duration for each route of administration. Values for half-life, onset, peak, and duration are for patients with normal renal function, unless specified otherwise.

Action

This section explains the drug's chemical and therapeutic actions. For example, although all antihypertensives lower blood pressure, they don't all do so in the same way.

Available forms

This section lists all available preparations for each drug (for example, tablets, capsules, solutions for injection) and all available dosage forms and strengths. As with the brand names discussed above, over-the-counter dosage forms and strengths are marked with a dagger (†); those available only in Canada with a closed diamond (♦); those available only in Australia with an open diamond (◇); and those that contain alcohol with an asterisk (*).

Nursing process

This section uses the nursing process as its organizational framework. It also contains an Alert logo () to call your attention to vital, need-to-know information or to warn you about a common drug error.

- *Assessment* focuses on observation and monitoring of key patient data, such as vital signs, weight, intake and output, and laboratory values.
- *Nursing diagnoses* represent those most commonly applied to drug therapy. In actual use, nursing diagnoses must be relevant to an individual patient so they may not include the listed examples and may include others not listed.
- *Planning and implementation* offers detailed recommendations for drug administration, including full coverage of P.O., I.M., S.C., and other routes.
- *Patient teaching* focuses on explaining the drug's purpose, promoting compliance, and ensuring proper use and storage of the drug. It also includes instructions for preventing or minimizing adverse reactions.
- *Evaluation* identifies the expected patient outcomes for the listed nursing diagnoses.

Because nursing considerations in this text emphasize drug-specific recommendations, they don't include standard recommendations that apply to all drugs, such as "assess the six

rights of drug therapy before administration" or "teach the patient the name, dose, frequency, route, and strength of the prescribed drug."

Photoguide to tablets and capsules

To make drug identification easier and to enhance patient safety, *Springhouse Nurse's Drug Guide 2006* offers a full-color photoguide to the most commonly prescribed tablets and capsules. Shown in their actual sizes, the drugs are arranged alphabetically by generic names. Trade names and most common dosage strengths are included. Page references appear under each drug name so you can turn quickly to information about the drug.

Herbal medicines

Herbal medicine entries appear alphabetically by name, followed by a phonetic spelling.

Reported uses

This section lists reported uses of herbal medicines. Some of these uses are based on anecdotal claims; other uses have been studied. A listing in this section should not be considered a recommendation; herbal medicines aren't regulated by the FDA.

Preparations and amounts

This section lists the preparation and amounts for each form of the herb according to its reported use. This information has been gathered from the herbal literature, anecdotal reports, and available clinical data. Not all uses have specific information; often, no consensus exists. Amounts shown reflect current trends and shouldn't be considered as recommendations by the publisher.

Cautions

This section lists any condition, especially a disease, in which use of the herbal remedy is undesirable. It also provides recommendations for cautious use, as appropriate.

Adverse reactions

This section lists undesirable effects that may follow use of an herbal supplement. Some of these effects haven't been reported but are theoretically possible, given the chemical composition or action of the herb.

Interactions

This section lists each herb's clinically significant interactions, actual or potential, with other herbs, drugs, foods, and lifestyle choices. Each statement describes the effect of the interaction and then offers a specific suggestion for avoiding the interaction. As with adverse reactions, some interactions have not been proven but are theoretically possible.

Actions and components

This section describes the herb's chemical and therapeutic actions and active components.

Common forms

This section lists the available preparations for each herbal medicine as well as forms and strengths.

Nursing considerations

This section offers helpful information, such as monitoring techniques and methods for the prevention and treatment of adverse reactions. Patient teaching tips that focus on educating the patient about the herb's purpose, preparation, administration, and storage are also included, as are suggestions for promoting patient compliance with the therapeutic regimen and steps the patient can take to prevent or minimize the risk or severity of adverse reactions.

Appendices and index

The appendices include a list of look-alike and sound-alike drug names for use in preventing drug errors, a listing of opioid analgesic combination products detailing the components of each product, a list of dialyzable drugs, a glossary explaining unfamiliar medical words and phrases, a list of drugs that shouldn't be crushed, a table of equivalents, an English-to-Spanish translator of common drug-related phrases, a list of normal laboratory test values, a new table of adverse reactions that can be misinterpreted as normal aging changes.

The comprehensive index lists drug classifications, generic drugs, brand names, indications, and herbal medicines included in this

book. Drugs that appear in the photoguide are listed in the index with the photoguide page number in **bold**.

PharmDisk 2006

New to *PharmDisk 2006,* is a pharmacology self-test with NCLEX®-style questions, including alternate-format. *PharmDisk 2006* also provides a link to eDrugInfo.com.

eDrugInfo.com

This Web site keeps *Springhouse Nurse's Drug Guide 2006* current by providing the following features:

- updates on new drugs, indications, and warnings
- patient teaching aids on new drugs
- news summaries of pertinent drug information.

The Web site also gives you:

- two QuikTools, *Construct-a-card,* which lets you create custom drug information cards, and *Construct-a-calendar,* which lets you create individualized drug regimen calendars for your patients.
- information on herbs
- links to pharmaceutical companies, government agencies, and other drug information sites
- a bookstore full of nursing books, PDAs, software, and more.

Plus, registering with eDrugInfo.com entitles you to e-mail notifications when new drug updates are posted.

Guide to abbreviations

ACE	angiotensin-converting enzyme
ACT	activated clotting time
ADH	antidiuretic hormone
AIDS	acquired immunodeficiency syndrome
ALT	alanine transaminase
APTT	activated partial thromboplastin time
AST	aspartate transaminase
AV	atrioventricular
b.i.d.	twice daily
BPH	benign prostatic hyperplasia
BUN	blood urea nitrogen
C	celsius
cAMP	cyclic adenosine monophosphate
CBC	complete blood count
CK	creatine kinase
CMV	cytomegalovirus
CNS	central nervous system
COMT	catechol-O-methyltransferase
COPD	chronic obstructive pulmonary disease
CPK	creatine phosphokinase
CSF	cerebrospinal fluid
CV	cardiovascular
CVA	cerebrovascular accident
CYP	cytochrome P450
DIC	disseminated intravascular coagulation
D_5W	dextrose 5% in water
dl	deciliter
DNA	deoxyribonucleic acid
ECG	electrocardiogram
EEG	electroencephalogram
EENT	eyes, ears, nose, throat
F	Fahrenheit
FDA	Food and Drug Administration
g	gram
G	gauge
GABA	gamma-aminobutyric acid
GFR	glomerular filtration rate
GGT	gamma-glutamyltransferase
GI	gastrointestinal
gtt	drops
GU	genitourinary
G6PD	glucose-6-phosphate dehydrogenase
H_1, H_2	histamine-1, histamine-2
HDL	high-density lipoprotein
HIV	human immunodeficiency virus
HMG-CoA	3-hydroxy-3-methylglutaryl coenzyme A
hr	hour
h.s.	at bedtime
ICU	intensive care unit
I.D.	intradermal
I.M.	intramuscular
INR	international normalized ratio
IPPB	intermittent positive-pressure breathing
IU	international unit
I.V.	intravenous
kg	kilogram
L	liter

lb	pound
LDH	lactate dehydrogenase
LDL	low-density lipoprotein
M	molar, moles
m^2	square meter
MAO	monoamine oxidase
mcg	microgram
mEq	milliequivalent
mg	milligram
MI	myocardial infarction
min	minute
ml	milliliter
mm^3	cubic millimeter
Na	sodium
NG	nasogastric
NSAID	nonsteroidal anti-inflammatory drug
OTC	over-the-counter
oz	ounce
PABA	para-aminobenzoic acid
$Paco_2$	partial carbon dioxide pressure
Pao_2	partial oxygen pressure
PCA	patient-controlled analgesia
P.O.	by mouth
P.R.	by rectum
p.r.n.	as needed
PT	prothrombin time
PTT	partial thromboplastin time
PVC	premature ventricular contraction
q	every
q.i.d.	four times daily
RBC	red blood cell
RDA	recommended daily allowance
REM	rapid eye movement
RNA	ribonucleic acid
RSV	respiratory syncytial virus
SA	sinoatrial
S.C.	subcutaneous
SIADH	syndrome of inappropriate antidiuretic hormone
S.L.	sublingual
SSRI	selective serotonin reuptake inhibitor
T_3	triiodothyronine
T_4	thyroxine
tbs	tablespoon
t.i.d.	three times daily
tsp	teaspoon
USP	United States Pharmacopeia
UTI	urinary tract infection
WBC	white blood cell
wk	week

Contents

1

Drug therapy and the nursing process

Springhouse Nurse's Drug Guide 2006 uses the nursing process as its organizing principle for good reason. The nursing process guides the way that nurses give drugs, ensuring patient safety and medical and legal standards. The process has four parts:

- assessment
- nursing diagnoses
- planning and implementation
- evaluation.

Assessment

Assessment begins with the patient history. After taking the patient's history, perform a thorough physical examination. Also, assess the patient's knowledge and understanding of the drug therapy he's about to receive.

History

When taking a history, investigate the patient's allergies, use of drugs and herbs, medical history, lifestyle and beliefs, and socioeconomic status.

Allergies

Specify to which drugs and foods the patient is allergic. Describe the reaction he has; its situation, time, and setting; and other contributing causes, such as a significant change in eating habits or the use of stimulants, tobacco, alcohol, or illegal drugs. Don't forget to place an allergy label conspicuously on the front of the patient's chart and place an allergy band on the patient.

Drugs and herbs

Take a complete drug history that includes both prescription and over-the-counter drugs. Also find out which herbs the patient takes. Ask the patient why he uses this drug or herb and how much he knows about its purpose. Explore the patient's thoughts and attitudes about drug use to find out if he may have trouble complying with his drug therapy. Note any special procedures the patient will need to perform himself, such as monitoring glucose level or checking heart rate; make sure he can perform them correctly.

After the patient starts taking the drug, discuss with him the effects of therapy to determine whether new symptoms or adverse drug reactions have developed. Also talk about measures the patient has taken to recognize, minimize, or avoid adverse drug reactions or accidental overdose. Ask the patient where medication is stored and what system he uses to help remember to take it as prescribed.

Medical history

Note any chronic disorders the patient has, and record the date of diagnosis, the prescribed treatment, and the name of the prescriber. Careful attention during this part of the history can uncover one of the most important problems with drug therapy: incompatible drug regimens.

Lifestyle and beliefs

Ask about the patient's support systems, marital and childbearing circumstances, attitudes toward health and health care, and daily patterns of activity. These influences all affect patient compliance and, consequently, the patient's care plan.

Also ask about the patient's diet. Certain foods can influence the effectiveness of many drugs. Don't forget to inquire about the patient's use of alcohol, tobacco, caffeine, and illegal drugs, such as marijuana, cocaine, and heroin. Note any substance used and the amount and frequency of use.

Socioeconomic status

Note the patient's age, educational level, occupation, and insurance coverage. These characteristics help determine the plan of care, the likelihood of compliance, and the possible need for financial assistance, counseling, or other social services.

Physical examination

Examine the patient closely for expected drug effects and for adverse reactions. Every drug

has a desired effect on one body system, but it also may have one or more undesired effects on that or another body system. For example, chemotherapeutic drugs destroy cancer cells but also affect normal cells. These drugs typically cause hair loss, diarrhea, and nausea. Besides looking for adverse drug effects, investigate whether the patient has any sensory impairments or changes in mental state.

Sensory impairment

Assess the patient for sensory impairments that could influence his care plan. For example, impaired vision or paralysis can hinder the patient's ability to give a subcutaneous injection, break a scored tablet, or open a drug vial. Impaired hearing can prevent a patient from finding out from you all that he needs to know about the drug.

Mental state

Note whether the patient is alert, oriented, and able to interact appropriately. Assess whether he can think clearly and talk properly. Check the patient's short-term and long-term memory, which are both necessary to follow the prescribed regimen correctly. Also, determine whether the patient can read and, if he can, at what level.

Understanding drug therapy

A patient is more likely to comply if he understands the reason for drug therapy. During your assessment, evaluate your patient's understanding of the therapy and the reason for it. Pay particular attention to his emotional acceptance of the need for drug therapy. For instance, a young patient being prescribed an antihypertensive may need more education than an older patient to ensure compliance.

Nursing diagnosis

Using the information you gathered during assessment, define drug-related problems by formulating each problem into a relevant nursing diagnosis. The most common problem statements related to drug therapy are "Deficient knowledge," "Ineffective health maintenance," and "Noncompliance." Nursing diagnoses provide the framework for planning interventions and outcome criteria, also known as patient goals.

Planning and implementation

Make sure that your patient goals state the desired patient behaviors or responses that should result from nursing care. Such criteria should be:

- measurable
- objective
- concise
- realistic for the patient
- attainable by nursing interventions.

Express patient behavior in terms of expectations, and specify a time frame. An example of a good outcome statement is "Before discharge, the patient verbalizes major adverse effects related to his chemotherapy."

After developing outcome criteria, determine the interventions needed to help the patient reach the desired goals. Appropriate interventions may include administration procedures and techniques, legal and ethical concerns, patient teaching, and special actions for pregnant, breast-feeding, pediatric, or geriatric patients. Interventions also may be independent nursing actions, such as turning a bedridden patient every 2 hours.

Evaluation

The final piece of the nursing process is a formal and systematic determination of your nursing care's effectiveness. This evaluation lets you determine whether outcome criteria were met so you can make informed decisions about subsequent interventions. If you stated the outcome criteria in measurable terms, you can easily evaluate whether the criteria were met.

For example, if a patient experiences relief from headache pain within 1 hour after receiving an analgesic, the outcome criterion was met. If the headache was the same or worse, the outcome criterion wasn't met. In that case, you need to reassess the patient, which may produce new data that might go against the original nursing diagnosis, new nursing interventions that are more specific or more appropriate for the patient, or a new care plan. This reassessment could lead to a higher dosage, a different analgesic, or the discovery of the underlying cause of the headache pain.

2

Essentials of dosage calculations

Because nurses frequently perform drug and intravenous (I.V.) fluid calculations, it's important to understand how drugs are weighed and measured, how to convert between systems and measures, how to compute drug dosages, and how to make adjustments for children.

Systems of drug weights and measures

Several systems of measurement can be used to determine the proper drug dosage. They include the metric, household, apothecary, and avoirdupois systems.

The metric and household systems are so widely used that most brands of medication cups for liquid measurements are standardized in both systems. The apothecary system isn't widely used but is still encountered in practice. A fourth system, the avoirdupois system, is rarely used. This system uses solid units of measure, such as the ounce and the pound. Also, some special systems of measurement — such as units, international units, and milliequivalents — have been developed by international scientists for standardization and only pertain to particular drugs or biological agents.

Metric system

The metric system is the international system of measurement, the most widely used system, and the system used by the U.S. Pharmacopoeia. This system has units for both liquid and solid measures. Among its many advantages, the metric system enables accuracy in calculating small drug dosages. The metric system uses Arabic numerals, which are commonly used by health care professionals worldwide. And most manufacturers standardize newly developed drugs in the metric system.

Liquid measures

In the metric system, one liter (L) is equal to about 1 quart in the apothecary system. Liters are often used when ordering and administering I.V. solutions. Milliliters are frequently used for parenteral and some oral drugs. One milliliter (ml) equals $\frac{1}{1,000}$ of a liter.

Solid measures

The gram (g) is the basis for solid measures or units of weight in the metric system. One milligram (mg) equals $\frac{1}{1,000}$ of a gram. Drugs are frequently ordered in grams, milligrams, or an even smaller unit, the microgram (mcg), depending on the drug. One microgram equals $\frac{1}{1,000}$ of a milligram. Body weight is usually recorded in kilograms (kg). One kilogram equals 1,000 g.

The following are examples of drug orders using the metric system:

- 30 ml milk of magnesia P.O. at bedtime
- 1 g Ancef I.V. q 6 hours
- 0.125 mg Lanoxin P.O. daily.

Household system

Most foods, recipes, over-the-counter drugs, and home remedies use the household system. Health care professionals seldom use this system for drug administration; however, knowledge of household measures may be useful in some home care and patient teaching situations.

Liquid measures

Liquid measurements in the household system include teaspoons (tsp) and tablespoons (tbs). For medical use, these measurements have been standardized to 5 milliliters and 15 milliliters, respectively. Using these standardized amounts, 3 teaspoons equal 1 tablespoon, 6 teaspoons equal 1 ounce, and so forth. Patients who need to measure doses by teaspoon or tablespoon should do so using standardized medical devices to make sure they receive exactly the prescribed amount. Advise patients not to use an ordinary spoon to measure a teaspoonful of a drug because the amount will most likely be inaccurate. Teaspoon sizes vary from 4 to 6 milliliters or more.

The following are examples of drug orders using the household system:

- 2 tsp Bactrim P.O. twice daily

• 2 tbs Riopan P.O. 1 hour before meals and at bedtime.

Apothecary system

Two unique features distinguish the apothecary system from other systems: the use of Roman numerals and the placement of the unit of measurement before the Roman numeral. For example, a measurement of 5 grains would be written as *grains V.*

In the apothecary system, equivalents among the various units of measure are close approximations of one another. By contrast, equivalents in the metric system are exact. When using apothecary equivalents for calculations and conversions, the calculations won't be precise but still must fall within acceptable standards. (See *Imprecision of dosage computations,* page 9.)

The apothecary system is the only system of measurement that uses both symbols and abbreviations to represent units of measure. Although the apothecary system isn't used frequently in health care today, you must still be able to read dosages that have been written in the apothecary system and convert them to the metric system.

Liquid measures

The smallest unit of liquid measurement in the apothecary system is the minim (℥), which is about the size of a drop of water; 15 to 16 minims equal about one ml.

Solid measures

The grain (gr) is the smallest solid measure or unit of weight in the apothecary system. It equals about 60 milligrams; 1 dram equals about 60 grains.

The following are examples of drug orders using the apothecary system:

• Robitussin f3 (fluidrams) IV P.O. every 6 hours

• Mylanta f3 (fluidounce) I P.O. 1 hour after meals

• Tylenol gr X P.O. every 4 hours as needed for headache.

Units, international units, and milliequivalents

For some drugs, you'll need to use a measuring system developed by drug companies. Three of the most common special systems of measurement are units, international units, and milliequivalents.

Units

Insulin is one of the drugs measured in units. Although many types of insulin exist, all are measured in units. The international standard of U-100 insulin means that 1 ml of insulin solution contains 100 units of insulin, regardless of type. Heparin, an anticoagulant, is also measured in units, as are several antibiotics available in liquid, solid, and powder forms for oral or parenteral use. Each drug company provides specific information about the measurement of its drugs that are measured in units.

The following are examples of drug orders using units:

• Inject 14 units NPH insulin S.C. this a.m.

• Heparin 5,000 units S.C. q 12 hours

• Nystatin 200,000 units P.O. q 12 hours.

The unit is not a standard measure. Different drugs, although all measured in units, may have no relationship to one another in quality or activity.

Units should never be abbreviated as "U" because of the potential for confusing a "U" with a "0."

International units

International units (IU) are used to measure biologicals, such as vitamins, enzymes, and hormones. For instance, the activity of calcitonin, a synthetic hormone used in calcium regulation, is expressed in international units.

The following are examples of drug orders using international units:

• 100 IU calcitonin (salmon) S.C. daily

• 8 IU somatropin S.C. three times a week.

Milliequivalents

Electrolytes may be measured in milliequivalents (mEq). Drug companies provide information about the number of metric units needed to provide a prescribed number of milliequivalents. Potassium chloride (KCl), for example, is usually ordered in milliequivalents.

The following are examples of drug orders using milliequivalents:

• 30 mEq KCl P.O. b.i.d.

• 1 L dextrose 5% in normal saline solution with 40 mEq KCl to be run at 125 ml/hour.