

Pharmacology History and Classification

- Brief History of Pharmacology
 - Began with the early humans
 - Started using plants to relieve disease
 - Herbal medicine is the oldest form
 - Most cultures have practiced herbal medicine.
- Science
 - Modern pharmacology begins in 1800s.
 - Chemists first isolated active agents.
 - Early drugs are from natural plants.
- Current practice
 - Complex
 - Application is still the same.
 - Focus on patient and improving quality of life to relieve human suffering.

Pharmacology: The Study of Medicines

- Drug
 - Any substance that is taken to:
 - Prevent
 - Cure
 - Reduce
 - Symptoms of a medical condition
 - Drugs are a form of health intervention.
- Pharmacology
 - Study of medicines
- Pharmacotherapy
 - Critical intervention
 - The application of drugs for prevention or treatment of suffering
- Over 11,000 trade-name, generic, and combination agents
 - Each has its own application, interactions, adverse effects, and actions.
 - Many have multiple effects on the body.
- Patient factors can alter responses:
 - Age
 - Gender
 - Race
 - Body mass
 - Health status
 - Genetics
- Drugs can improve quality of life.
- Drug reactions can also cause disability or death.
- Enormous challenge for the nurse to stay current and in the application of medications

Characteristics of an Ideal Drug

- Effectively treats, prevents, cures patient's condition
- Produces rapid, predictable response at relatively low doses
- Produces no adverse effects
- Can be taken conveniently (by mouth)
- Characteristics of an Ideal Drug
- Can be taken infrequently and for a short length of time
- Inexpensive and easily accessible
- Quickly eliminated by body after beneficial effect produced
- Does not interact with other medications or food
- Indications
 - Conditions for which a drug is approved
 - All prescription drugs must have some degree of effectiveness.
 - Every drug has at least one indication.
 - Many drugs have multiple indications.
 - Unapproved indications are unlabelled or off-label.
- Ideal drug as general rule
 - The more a medicine strays from perfect drug profile, the less it is used.
 - Drugs that cause annoying adverse effects, have inconvenient dosing schedules, or are expensive often not taken by patients at home.
 - Careful administration or instruction about drugs requiring invasive routes

Classification of Drugs

- FDA, the U.S. Food, and Drug Administration
 - “Orange Book” of approved drugs
 - Classified by therapeutic and pharmacological properties
 - Categories used for both prescription and nonprescription medications
- Therapeutic classification
 - What is being treated by the drug
- Pharmacologic classification
 - How the drug acts
- Therapeutics is the usefulness in treating a specific disease.
- Some may be placed in several therapeutic classes.
- Classification is what condition is being treated by the particular drug.

Table 1.1 Organizing Drug Information by Therapeutic Classification

Therapeutic Focus: Drugs Affecting Cardiovascular Disease

| Therapeutic Usefulness | Therapeutic Classification |
|-------------------------------|----------------------------|
| Influence blood clotting | Anticoagulants |
| Lower blood cholesterol | Antihyperlipidemics |
| Lower blood pressure | Antihypertensives |
| Restore normal cardiac rhythm | Antidysrhythmics |
| Treat angina | Antianginals |

- Pharmacologic classification
 - The mechanism of the drug or how the drug produces its effects in the body
 - More specific than therapeutic classification
 - Requires understanding of biochemistry and physiology
 - May use drug's chemical name

Table 1.2 Organizing Drug Information by Pharmacologic Classification

FOCUS ON HOW A DRUG WORKS: PHARMACOTHERAPY OF HYPERTENSION

| Mechanism of Action | Pharmacologic Classification |
|--|---|
| Lowers plasma volume | Diuretic |
| Blocks heart calcium channels | Calcium channel blocker |
| Blocks hormonal activity | Angiotensin-converting enzyme inhibitor |
| Blocks physiologic reactions to stress | Adrenergic antagonist (or blocker) |
| Dilates peripheral blood vessels | Vasodilator |

- Drugs can have multiple classifications
- Dependent on the clinical use of the drug
- Important to understand and know the different classifications for each drug

Prototype Drugs

- A prototype drug is the agent to which all other medications in a class are compared.
 - Single drug from each class
 - May compare all other medications in the class to the prototype
 - Usually oldest and best understood drug in its class
 - Can be combination of traditional and new drugs
 - Helps with learning pharmacology

Naming Drugs

- Chemical names
 - Standard nomenclature established by IUPAC
 - Each drug has only one chemical name.
 - Clear, concise meaning of the nature of the drug
 - Often difficult to remember and pronounce
- Generic name
 - Assigned by United States Adopted Name Council
 - Less complicated than chemical names
 - Many organizations use generic names to describe and identify.
 - Easy for students to memorize one name
- Trade name (chosen by country)

- Name given by the pharmaceutical company marketing the drug
- Attempt to be short and easy to remember
- Proprietary
- Each drug receives period of exclusivity.
- May be dozens of products containing the same drug
- May contain one or more active ingredient
- Combination drugs
 - More than one active generic ingredient
- Generic drugs are less expensive than trade-name drugs, but they may differ in bioavailability.
- Generic drugs
 - Usually less expensive than trade-name drugs
 - Drug formulations may be different.
 - Inert and/or active ingredients may be same or different.
 - This can change the bioavailability.
- Table 1.3 Examples of Generic Drugs Contained in Trade-Name Products

Table 1.3 Examples of Generic Drugs Contained in Trade-Name Products

| Generic Drugs | Trade Names |
|-----------------|--|
| Aspirin | Acetylsalicylic Acid, <u>Acuprin</u> , <u>Anacin</u> , <u>Aspergum</u> , <u>Bayer</u> , <u>Bufferin</u> , <u>Ecotrin</u> , <u>Empirin</u> , <u>Excedrin</u> , <u>Maprin</u> , <u>Norgesic</u> , <u>Salatin</u> , <u>Salocol</u> , <u>Salsprin</u> , <u>Supac</u> , <u>Talwin</u> , <u>Traphen-10</u> , <u>Vanquish</u> , <u>Verin</u> , <u>ZORprin</u> |
| Diphenhydramine | <u>Allerdryl</u> , <u>Benadryl</u> , <u>Benahist</u> , <u>Bendylate</u> , <u>Caladryl</u> , <u>Compoz</u> , <u>Diahist</u> , <u>Diphenadril</u> , <u>Eldadryl</u> , <u>Fenylhist</u> , <u>Fvnex</u> , <u>Hydramine</u> , <u>Hydril</u> , <u>Insomnal</u> , <u>Noradryl</u> , <u>Nordryl</u> , <u>Nytol</u> , <u>Tusstat</u> , <u>Wehdryl</u> |
| Ibuprofen | <u>Advil</u> , <u>Amersol</u> , <u>Apsifen</u> , <u>Brufen</u> , <u>Haltran</u> , <u>Medipren</u> , <u>Midol 200</u> , <u>Motrin</u> , <u>Nuprin</u> , <u>Pamprin-IB</u> , <u>Rufen</u> , <u>Trendar</u> |

- Exclusivity
 - Pharmaceutical companies market their trade-name drugs.
 - Claim significant difference between trade-name and generic.
 - Consumer advocates argue generic should be available.
 - Cost difference between generic and trade-name can be significant.
- Substitution
 - Laws vary by state.
 - Pharmacists may substitute generic for brand.

- Pharmacists may have to obtain approval from provider before substituting generic.
 - Can be cost saving for patients.
- Bioavailability
 - Defined as the rate and extent to which the active ingredients are absorbed from a drug product and then available at the site of action
 - May be different between trade and generic
- Internet sales
 - Drug laws vary by country.
 - Some drugs may be available without a prescription.
 - Quality control standards may differ.
 - Sources may be unreliable.
- PharmFACT
 - Nine out of every 10 prescriptions dispensed in the United States are for generic drugs. The greatest cost savings are for generic drugs prescribed for mental health indications and for hypertension (Generic Pharmaceutical Association, 2015).
- Biosimilar drugs are highly similar to biologic medications that have already received FDA approval.
- Biologic drugs
 - Medicines made by living cells
 - Complex molecules that require years of research to develop and gain status as FDA-approved drugs
- Biosimilar drugs
 - Comparable effectiveness and safety to FDA-approved biologic products
 - Not exact, duplicate copy of original medication (reference product)
 - Should not be called a generic medication