Drug Classifications

Unit: Basic Skills

Problem Area: Drug Classifications

Lesson: Drug Classifications

Student Learning Objectives.

Instruction in this lesson should result in students achieving the following objectives:

1. **Review drug classifications and associated vocabulary.**
2. **Differentiate between brand and generic drugs.**

Resources.

The following resources may be useful in teaching this lesson:

Aiken, Cheryl and Robert J. Anderson. *Certification Exam Review for Pharmacy Technicians,* 4th ed. Paradigm, 2016.

Ballington, Don A., and Mary M. Laughlin. *Pharmacology for Technicians,* 5th ed. Paradigm, 2012.

Ballington, Don A., and Robert J. Anderson. *Pharmacy Practice for Technicians,* 5th ed. Paradigm, 2015.

"Here's the Real Difference Between Generic and Brand Name Drugs," *HEALTHWAY*. Accessed June 1, 2019. https://www.healthyway.com/content/heres-the-real-difference-between-generic-and-brand-name-drugs/

"Medicine Prices Are Sky High-But Is It Always A Good Idea To Go Generic?" *Well Good.* Accessed June 1, 2019. https://www.wellandgood.com/good-advice/name-brand-vs-generic-drugs/

Neumiller, Joshua J., et al. *Pharmacy Technician Principles and Practice,* 4th ed. Elsevier, 2016.

Equipment, Tools, Supplies, and Facilities

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

Key Terms.

The following terms are presented in this lesson (shown in bold italics):

- adverse reaction
- analgesics
- anesthetics
- anti-infectives
- antineoplastics
- brand name
- cardiovascular
- dermatological
- gastrointestinal
- generic drugs
- hormones
- musculoskeletal
- neoplasms
- neurological
- ophthalmic
- otic
- psychotropic
- renal
- respiratory
- therapeutic effect

Interest Approach.

Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

> *What if you could pay as much as 80–85% less for the medications that you take? You may wonder what the catch is. According to the Food and Drug Administration (FDA), on average, generic drugs are 80–85% less expensive than their brand name counterparts. However, some people believe that generic drugs might be less effective than brand name drugs because they cost less. The Food and Drug Administration (FDA) states that there is no evidence to*

support that claim. The real difference between generic and brand name drugs has nothing to do with safety and a lot more to do with business.

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Review drug classifications and associated vocabulary.

Anticipated Problem: What are the drug classifications and associated vocabulary?

I. Drug classifications and associated vocabulary

A. A drug classification is used to describe medications that are grouped together because of their similarities. Many times drugs in the same class have the same mechanism of action. This information can assist the prescriber in determining the expected ***therapeutic effect***, a desired effect for treating a disease, and also possible ***adverse reactions***, an undesired harmful effect resulting from a medication. Drugs are classified according to a number of different criteria, depending on the group doing the classifying and the reason for classification. There are four main methods of classifying drugs.

1. Therapeutic use: classifying drugs based upon the type of condition they are used to treat.
2. Mode of action: classifying drugs based upon the specific way in which the body responds to the drug.
3. Mechanism of action: classifying drugs based upon the specific biochemical reaction that occurs when you take a drug.
4. Chemical structure: classifying drugs based upon the arrangement of chemical bonds between atoms in a molecule.

B. Based on these classification methods, some drugs may be grouped together under one system but not another. In other cases, a drug may have multiple uses or actions, and may be included in multiple drug classes. The aim of classifying drugs is to ensure that the patient uses the drug safely and achieves the utmost benefit from the drug. Every time you take a drug, your body chemistry is altered. This effect is meant to be therapeutic, but it can also cause side effects that may be harmful. Taking multiple drugs can cause your body chemistry to be changed in such a way that a drug is far less effective or the side effects are far more severe. By noting the classification of a drug, the prescriber can have a better understanding of what to expect when you take it, and which drugs you can switch to if needed.

1. ***Analgesics***: an agent producing diminished sensation to pain without loss of consciousness. There are several types of analgesics:
   a. nonsteroidal anti-inflammatory drugs (ibuprofen)
   b. salicylates (aspirin)
   c. general (acetaminophen)
   d. narcotics (morphine)
2. ***Anesthetic:*** agents that cause an absence of sensation or pain. Anesthetic agents are classified as either local or general.
   a. local anesthetics block pain conduction from peripheral nerves to the central nervous system without causing the loss of consciousness.
   b. general anesthetics depress the central nervous system to a level of unconsciousness.
3. ***Anti-Infectives:*** agents that treat disease produced by microorganisms such as bacteria, viruses, fungi, and parasites. Common drug classes of anti-infectives are:
   a. antibiotics (bacteria)
   b. antifungals (fungus)
   c. antivirals (virus)
4. ***Antineoplastics***: agents that inhibit the new growth of cancer cells or ***neoplasms***, new and abnormal growth of tissue in some part of the body.
5. ***Cardiovascular***: agents that treat disease associated with the heart and blood vessels.
   a. antianginals (chest pain)
   b. antirrhythmics (variation from the normal rhythm of heart)
   c. anticoagulants (prevent blood from clotting)
   d. antihyperlipidemics (high levels of fat proteins)
   e. antihypertensives (high blood pressure)
   f. vasopressors (constrict blood vessels)
6. ***Dermatological***: agents that treat conditions related to the skin. These conditions can occur on or in the skin.
7. ***Gastrointestinal***: agents that are used to treat disorders of the stomach and or the intestines.
   a. anti-diarrheal (diarrhea)
   b. anti-emetics (vomiting)
   c. anti-ulcer (ulcer)
   d. gastroesophageal reflux disease (heartburn)
   e. laxatives (constipation)
   f. stool softeners (constipation)
8. ***Hormones***: special chemical messengers in the body that control most major bodily functions, from simple basic needs like hunger to complex systems like reproduction.
   a. anti-hyperglycemics (diabetes)

b. female hormones (contraceptives)
c. male hormones (male characteristics)
d. thyroid disorders (hyperthyroidism and hypothyroidism)

9. ***Musculoskeletal:*** an agent that treats conditions involving the muscles, bones, tendons, ligaments, and nerves. Common drug classes used to treat musculoskeletal conditions are:
   a. benzodiazepines (seizures)
   b. muscle relaxants (muscle spasms)
   c. nonsteroidal anti-inflammatory drugs (ibuprofen)
   d. anti-rheumatics (rheumatoid arthritis)
   e. anti-gout (gout)
   f. biphosphonates (bone disorders)
10. ***Neurological***: agents that treat or correct disruptions or dysfunction of the complex chemical process of nerve transmission in the central nervous system.
   a. anti-alzheimer (Alzheimer's disease)
   b. anti-epileptic (seizures)
   c. anti-parkinson (Parkinson's disease)
11. ***Ophthalmic***, relating to the eye and ***Otic***, relating to the ear: agents that are used to treat various conditions of the eyes and the ears.
   a. analgesics (eye or ear pain)
   b. antibiotics (pink eye)
   c. corticosteroids (seasonal allergies)
   d. prostaglandins (glaucoma)
12. ***Psychotropic***: agents that affect behavior, psychiatric state, and sleep. They act on the brain to suppress or control the symptoms of common psychological disorders such as bipolar disorder, anxiety, depression, schizophrenia, and drug dependency.
   a. antipsychotics (hallucinations)
   b. benzodiazepines (anxiety)
   c. hypnotics (sleep)
   d. monoamine oxidase inhibitor (depression)
   e. serotonin and norepinephrine reuptake inhibitor (depression)
   f. selective serotonin reuptake inhibitors (anxiety)
13. ***Renal***: agents that treat diseases of the kidneys, ureters, bladder, and urethra.
   a. alpha blockers (benign prostatic hyperplasia)
   b. antibiotics (infections)
   c. diuretics (urine output)
14. ***Respiratory***: agents that are used to relieve, treat, or prevent breathing diseases such as asthma, bronchitis, and pneumonia.
   a. antibiotics (infections)
   b. antihistamines (allergy)
   c. antitussive (cough)

d. bronchodilators (increase airway diameter)
e. corticosteroids (asthma)
f. decongestants (relieve nasal congestion)
g. expectorants (remove mucus)

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–A to review the four main methods of classifying drugs.*

Objective 2: Differentiate between brand and generic drugs.

Anticipated Problem: What are the differences between brand and generic drugs?

II. Differences between brand and generic drugs

A. Drugs often have several names. When a drug is first discovered, it is given a chemical name. The chemical name describes the atomic or molecular structure of the drug. The chemical name is usually too complex for general use. When a drug is approved by the Food and Drug Administration (FDA) it is given a brand and a generic name. Generic and brand names must be unique to prevent one drug from being mistaken for another when drugs are prescribed and prescriptions are dispensed. Generic names are usually more complicated and harder to remember that brand names. Brand names are usually catchy, often related to the drug's intended use, and are relatively easy to remember.

B. A ***brand name*** drug is a drug that is patented and sold by one manufacturer. The brand name is developed by the company requesting approval for the drug and identifies it as the exclusive property of that company. A manufacturer of a brand name drug can make that drug without any competition. When a company brings a new drug onto the market, it has spent substantial money on research, development, and marketing of the drug. A patent is granted that gives the company that developed the drug an exclusive right to sell the drug as long as the patent is in effect. An example of a brand name drug is "Advil." Advil is the trade mark name of the drug although its generic or chemical name is ibuprofen.

C. When a drug patent is nearing expiration, manufacturers can apply to the FDA for permission to make and sell generic versions of the drug. ***Generic drugs*** are copies of brand name drugs that have exactly the same dosage, intended use, effects, and side effects, route of administration, risks, safety, and strength as the original drug. Their effects on the body are exactly the same as those of their brand name counterpart. The FDA requires that generic drugs be as safe and effective as brand name drugs and that those generic drugs contain the same active ingredients as their brand name counterparts. Generic drug manufacturers are allowed to have different inactive ingredients. Inactive ingredients such as dyes, fillers, flavors, and coatings may be different, so generic drugs often look different from the brand name counterpart. Generic drugs are less expensive because the manufacturers have not had the expenses of developing and

marketing a new drug. When multiple companies begin producing and selling a drug, the competition among them can also drive the price down even further.

D. The following is a list of commonly prescribed brand name drugs and their generic counterparts.

Brand Name Drug	Generic Equivalent	Medical Use
Abilify	Aripiprazole	Psychosis, Depression
Adderall	Dextroamphetamine and Levoamphetamine	ADHD treatment
Advil	Ibuprofen	Painkiller, fever reducer
Advair Diskus, Seretide	Fluticasone + Salmeterol	Asthma
Agiolax	Sphagula husk + Senna	Gastrointestinal disorders
Allegra	Fexofenadine	Seasonal allergies
Amoxil	Amoxicillin	Antibiotic used to treat infection
Atripla	Emtricitabine/tenofovir/efavirenz	HIV infection
Avastin	Bevacizumab	Colorectal cancer
Copaxone	Glatiramer	Multiple sclerosis
Crestor	Rosuvastatin	Cholesterol
Cymbalta	Duloxetine	Depression, Anxiety disorders
Enbrel	Etanercept	Rheumatoid arthritis
Epogen	Erythropoietin	Anemia
Humira	Adalimumab	Rheumatoid arthritis
Januvia	Sitagliptin	Diabetes
Lantus	Insulin analog (Insulin glargine)	Type 2 and type 1 diabetes
Lipitor	Methylphenidate	Cholesterol
Lyrica	Pregabalin	Neuropathic pain
Motrin	Ibuprofen	Painkiller, fever reducer
Neosporin	Neomycin	Infection
Neulasta	Filgrastim	Neutropenia
Nurofen	Ibuprofen	Painkiller, fever reducer
OxyContin	Oxycodone	Pain
Prevacid	Lansoprazole	Acid reflux, GERD
Prozac	Fluoxetine	Depression, OCD
Provigil	Modafinil	Narcolepsy, obstructive sleep apnea

Brand Name Drug	Generic Equivalent	Medical Use
Remicade	Infliximab	Crohn's disease, Rheumatoid arthritis
Ritalin	Methylphenidate	ADHD, postural orthostatic tachycardia syndrome and narcolepsy
Rituxan, MabThera	Rituximab	Non-Hodgkin's Lymphoma Rheumatoid arthritis
Spiriva	Tiotropium	Chronic obstructive pulmonary disease
Tamiflu	Oseltamivir	Flu
Truvada	Tenofovir + Emtricitabine	HIV infection
Tylenol	Acetaminophen	Pain reliever, Fever reducer
Vicodin	Acetaminophen + hydrocodone	Moderate to severe pain relief
Vyvanse	Lisdexamfetamine dimesylate	ADHD treatment
Xanax	Alprazolam	Anxiety, Panic disorders

Note: Reprinted from "Brand Name Drugs vs Generic Drugs." Diffen LLC, n.d. Web 28 Apr 2019. https://www.diffen.com/difference/Brand_Name_Drugs_vs_Generic_Drugs

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–B to compare brand name drugs and generic drugs. Assign LS–A.*

Review/Summary.

Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may also be included in the Review/Summary.

Application.

Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.

Evaluation.

Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

Answers to Sample Test:

Part One: Matching

1. f
2. c
3. a
4. d

5. e
6. b

Part Two: Completion

1. brand name
2. respiratory
3. adverse reaction
4. psychotropic
5. hormones
6. anti-infectives

Part Three: True/False

1. T
2. T
3. F
4. T
5. F
6. F

Sample Test

Name _____

Drug Classifications

Part One: Matching

Instructions: **Match the term with the correct definition.**

a. renal
b. antineoplastics
c. gastrointestinal
d. analgesics
e. ophthalmic
f. neoplasm

_____1. New and abnormal growth of tissue in some part of the body

_____2. Agents that are used to treat disorders of the stomach and or the intestines

_____3. Agents that treat diseases of the kidneys, ureters, bladder, and urethra

_____4. An agent producing diminished sensation to pain without loss of consciousness

_____5. Relating to the eye

_____6. Agents that inhibit the new growth of cancer cells or neoplasms

Part Two: Completion

Instructions: **Provide the word or words to complete the following statements.**

1. A _____drug is a drug that is patented and sold by one manufacturer.
2. Agents that are used to relieve, treat, or prevent diseases such as asthma, bronchitis, and pneumonia are called _____ agents.
3. An undesired harmful effect resulting from a medication is called an _____.
4. _____agents affect behavior, psychiatric state, and sleep.

5. _____ are special chemical messengers in the body that control most major bodily functions.

6. Agents that treat disease produced by microorganisms are called _____.

Part Three: True/False

Instructions: **Write *T* for true or *F* for false.**

_____1. Anesthetics are agents that cause an absence of sensation or pain.

_____2. A drug may have multiple uses or actions, and may be included in multiple drug classes.

_____3. Generic drugs must have the same inactive ingredients as their brand name counterparts.

_____4. The aim of classifying drugs is to ensure that the patient uses the drug safely and achieves the utmost benefit from the drug.

_____5. Otic agents are used to treat diseases of the eyes.

_____6. Brand name drugs are less expensive because the manufacturers have not had the expenses of developing and marketing a new drug.

FOUR MAIN METHODS FOR CLASSIFYING DRUGS

- Therapeutic use: classifying drugs based upon the type of condition they are used to treat.
- Mode of action: classifying drugs based upon the specific way in which the body responds to the drug.
- Mechanism of action: classifying drugs based upon the specific biochemical reaction that occurs when you take a drug.
- Chemical structure: classifying drugs based upon the arrangement of chemical bonds between atoms in a molecule.

COMPARISON CHART: BRAND NAME DRUGS VS. GENERIC DRUGS

Brand Name Drugs	Generic Drugs
Available first	Available only after brand name patent runs out
More expensive	80–85% Cheaper
Proven safe and effective	Proven safe and effective
Proven active ingredients	Same proven active ingredients
Inactive ingredients	Different inactive ingredients
Therapeutic effect	Same therapeutic effect
Available as liquid, pill, topical, or injectable,	Must also be available as liquid, pill, topical, or injectable
Available in different dosages	Available in those same dosages

LS–A

Name _____

Drug Classification Pamphlet

Purpose

The purpose of this activity is to create a pamphlet that describes one of the drug classifications from this lesson.

Objective(s)

1. Review the different drug classifications discussed in this lesson.
2. Conduct research on one of the categories of drug classifications.
3. Create a pamphlet about the category you have researched.
4. Participate in a class discussion of the drug pamphlet.

Materials

- lab sheet
- computer or device with word processing software and Internet access
- printer
- paper
- colored pencils or markers

Procedure

1. Review your class notes.
2. Choose one category of drug classification to investigate and prepare an informational pamphlet.
3. Ask your instructor to review and approve your choice.

4. Research information about the selected drug classification including the following:
    a. Drug classification.
    b. Mechanism of action of drug classification.
    c. Categories within the drug classification.
    d. Indications for use.
    e. Contraindications.
    f. Adverse effects.
    g. Dosage forms.
    h. Routes of administration.
    i. Examples of drugs including their brand and generic names
5. Create an informational drug classification pamphlet.
6. Share your pamphlet with the entire class.
7. Turn your pamphlet into your instructor.