



NYCSHP Pharmacy Technician Certification Board Exam Review – Part 2

NYC Pharmacy Technician Executive Committee
July 29th, 2021

NYSCHP PTCE Review: Medications II

Matthew Li, PharmD, BCPS, BCCCP

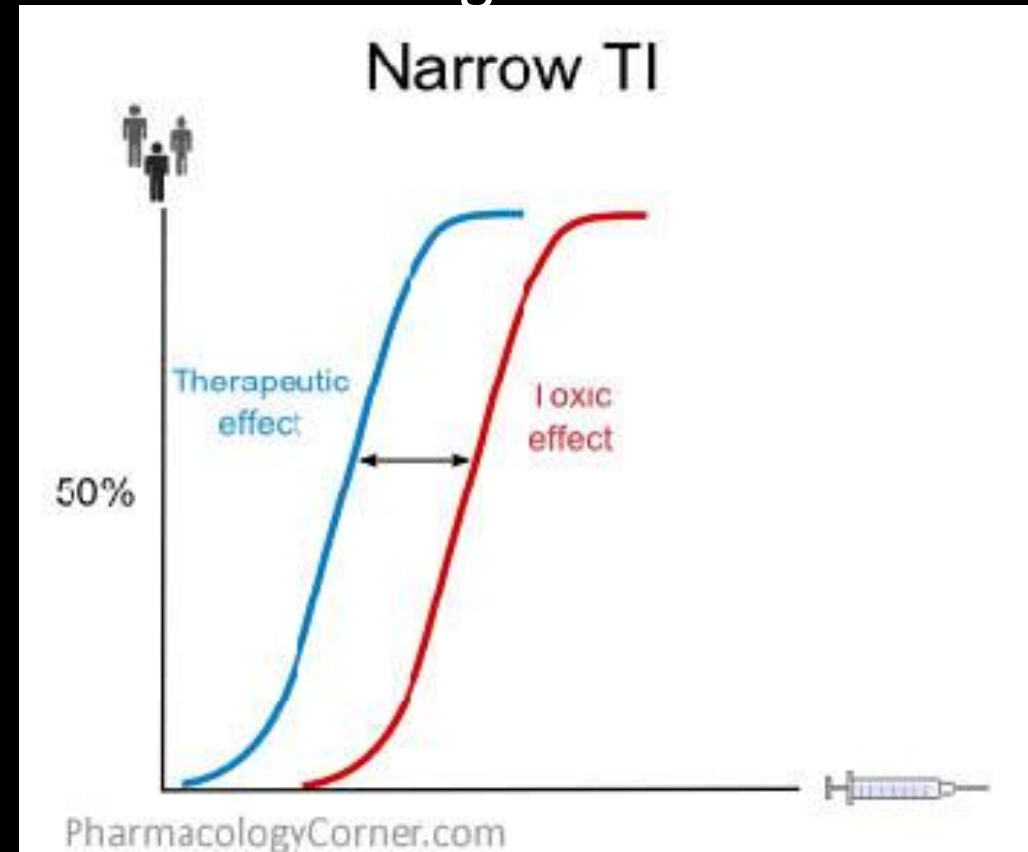
July 29, 2021

Objectives

- Discuss medications with narrow therapeutic indexes
- Summarize storage considerations
- List common medication indications

Narrow Therapeutic Index

- Medications where small differences in dose or blood concentration may lead to serious therapeutic failures or adverse drug reactions



NTI Medication	Indication
Carbamazepine Phenytoin Fosphenytoin Phenobarbital Valproic acid Lithium Clozapine	Seizures, bipolar disorder
Digoxin	Atrial fibrillation Congestive heart failure
Warfarin Heparin	Thrombosis
Methotrexate	Rheumatoid arthritis/cancer
Levothyroxine	Hypothyroidism
Vancomycin Aminoglycosides	Bacterial infections
Amphotericin	Fungal infection
Amiodarone	Arrhythmia
Theophylline	Asthma/COPD

Medication Storage

- Storage in recommended temperature zone to prevent physical and chemical changes
 - Alterations to taste, appearance, smell
 - Drug precipitation, decomposition, combustion
- Additional considerations include light and moisture sensitivity

Room Temperature	Refrigerator	Freezer
20-25 centigrade 68 to 77 Fahrenheit	2 to 8 centigrade 36 to 46 Fahrenheit	-25 to -10 centigrade -13 to 14 Fahrenheit

Beyond-Use Dating vs. Stability

- Beyond-use date (BUD): date at which a compounded sterile product should no longer be transported or stored for a patient

Risk	Room Temperature	Refrigerator	Freezer
Low-risk (ISO 5 environment with no more than 3 products)	48H	14D	45D
Medium-risk (made with > 3 products)	30H	9D	45D
High-risk (made with non-sterile ingredients)	24H	3D	45D

- Stability: extent to which a preparation retains the same properties and characteristics it possessed at the time of compounding

Drug Interactions

- Concomitant use of two or more medications leading to a desirable or adverse effect

Interaction	Effect
Statins and grapefruit juice	Grapefruit juice contains furanocoumarins that decrease statin metabolism, increasing risk of side effects such as muscle pains and aches
Multivalent ions and tetracyclines or fluoroquinolones or levothyroxine or bisphosphonates	Calcium, magnesium, iron bind to select drugs and decrease effectiveness
Nitrates and PDE5 inhibitors	Increased risk of severe hypotension
ACE inhibitors and potassium	Increased risk of hyperkalemia with K-elevating drugs or potassium supplements
Macrolides, amiodarone, SSRIs, fluoroquinolones, quinine, antipsychotics	Increased risk for QTc prolongation leading to fatal arrhythmias

Drug Resources

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[Interactions](#)

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Pharmacologic Category

AmLODIPine (Lexi-Drugs)

Outline [Expand All](#)

Pronunciation

> Brand Names

Pharmacologic
Category

> Dosages

> Uses

Class and Related
Monographs

Clinical Practice
Guidelines

> Administration and
Storage Issues

Medication Patient
Education with
HCAHPS
Considerations

Monograph

Images

Adult Patient Education

Pronunciation



(am LOE di peen)

Brand Names: US

Katerzia; Norvasc

Brand Names: Canada

ACH-Amlodipine; ACT AmLODIPine; AG-AmLODIPine; /
AmLODIPine; DOM-AmLODIPine; GD-AmLODIPine [DS
AmLODIPine; MINT-AmLODIPine; MYLAN-AmLODIPine
PHARMA-AmLODIPine; PMS-AmLODIPine; Priva-AmLO
SANDOZ AmLODIPine; SANDOZ-AmLODIPine; Septa-A
AmLODIPine; VAN-AmLODIPine [DSC]

Pharmacologic Category

Antianginal Agent; Antihypertensive; Calcium Channe
Dihydropyridine

Search Results for Pharmacologic category is "Calcium Channel Blocker"

Lexi-Drugs

AmLODIPine

07/14/21

Amlodipine and Atorvastatin

07/06/21

Amlodipine and Benazepril

07/02/21

Amlodipine and Celecoxib

07/02/21

Amlodipine and Olmesartan

07/02/21

Amlodipine and Valsartan

07/02/21

Amlodipine, Valsartan, and Hydrochlorothiazide

07/02/21

Clevidipine

06/30/21

Common Indications (Self-Study)

Antidepressants

Tricyclic Antidepressants	Monoamine Oxidase Inhibitors	Selective Serotonin Reuptake Inhibitors	Selective Norepinephrine Reuptake Inhibitors	Miscellaneous
Amitriptyline (Elavil) Clomipramine (Anafranil) Desipramine (Norpramin) Doxepin (Sinequan) Imipramine (Tofranil) Nortriptyline (Pamelor)	Isocarboxazid (Marplan) Phenzelzine (Nardil) Tranylcypromine (Parnate)	Citalopram (Celexa) Fluoxetine (Prozac) Fluvoxamine Paroxetine (Paxil) Sertraline (Zoloft)	Desvenlafaxine (Pristiq) Duloxetine (Cymbalta) Levomilnacipran (Fetzima) Venlafaxine (Effexor)	Bupropion (Wellbutrin) Mirtazapine (Remeron) Nefazodone (Serzone) Trazodone (Desyrel) Vilazodone (Viibryd) Vortioxetine (Trintellix)

Oral/Inhaled Corticosteroids

Medications	Available Dosage Forms	Comments
Oral corticosteroids		
Prednisone	Solution, intensol, tablets	Bitter taste
Methylprednisolone (Medrol, Solu-Medrol)	Injection, long-acting injection, tablets, dosepak	
Prednisolone (Orapred)	Solution, orally disintegrating tablets, tablets	
Inhaled corticosteroids		
Beclomethasone (QVAR)	BAI	
Budesonide (Pulmicort)	DPI, nebulizer solution	
Ciclesonide (Alvesco)	MDI	
Flunisolide (Aerospan)	MDI	
Mometasone (Asmanex, Asmanex HFA)	DPI, MDI	
Fluticasone Furoate (Arnuity Ellipta)	DPI	
Fluticasone propionate (Flovent HFA, Flovent Diskus)	MDI, DPI	

Diuretics

Classifications and Medications	Available Dosage Forms
<i>Thiazide diuretics (suffix-diazide)</i>	
Chlorothiazide (Diuril)	Injection, suspension, tablets
Hydrochlorothiazide (Microzide)	Capsules, tablets
Metolazone (Zaroxolyn)	Tablets
<i>Loop diuretics</i>	
Bumetanide (Bumex)	Injection, tablets
Ethacrynic acid (Edecrin)	Injection, tablets
Furosemide (Lasix)	Injection, solution, tablets
Torsemide (Demadex)	Injection, tablets
<i>Potassium-sparing diuretics</i>	
Eplerenone (Inspra)	Tablets
Spirolactone (Aldactone)	Tablets
Triamterene (Dyrenium)	Capsules
<i>Combination agents</i>	
Aliskiren/HCTZ (Tekturna HCT)	Tablets
Triamterene/HCTZ (Dyazide, Maxzide)	Tablets, capsules
Spirolactone/HCTZ (Aldactazide)	Tablets

HCT/HCTZ = hydrochlorothiazide.

Insulins

Insulin Type	Onset of Action	Duration of Action
<i>Rapid-acting</i>		
Aspart (NovoLOG)	15 min	3-4 hr
Glulisine (Apidra)	15 min	3-4 hr
Lispro (AdmeLOG, HumaLOG, HumaLOG Jr, HumaLOG U 200)	15 min	3-4 hr
<i>Short-acting</i>		
Regular (HumuLIN R, HumuLIN R U-500, NovoLIN R, Afrezza)	30-60 min	4-6 hr
<i>Intermediate-acting</i>		
NPH (HumuLIN N, NovoLIN N)	2-4 hr	12-18 hr
<i>Long-acting (basal)</i>		
Detemir (Levemir)	3-4 hr	16-20 hr
Glargine (Basaglar, Lantus, Toujeo)	2-4 hr	24 hr
Degludec (Tresiba, Tresiba U-200)	1 hr	24 hr
<i>Insulin combinations</i>		
Aspart Protamine and Aspart (NovoLOG 70/30)	10-20 min	18-24 hr
Lispro Protamine and Lispro (HumaLOG 50/50, HumaLOG 75/25)	15-30 min	14-24 hr
NPH and Regular (HumuLIN 70/30, NovoLIN 70/30)	30 min	18-24 hr
<i>Long-acting insulin and GLP-1 combinations</i>		
Degludec and Liraglutide (Xultophy)	1 hr	24 hr
Glargine and Lixisenatide (Soliqua)	2-4 hr	24 hr

Lacher BE, 2011. Pharmacy technician certification. Bethesda, Md.: American Society of Health-System Pharmacists

NYSCHP PTCE Review: Medications II

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July 29, 2021

Federal Requirements (12.5%)

Rafael Roman, BA, CPhT, RPhT

Federal Requirement Review:

- 2.1 Federal Requirements for handling and disposal of non-hazardous, hazardous, and pharmaceutical substance and waste
- 2.2 Federal Requirements for controlled substance prescriptions (i.e new, refill, transfer) and DEA controlled substance schedules
- 2.3 Federal Requirements (e.g DEA, FDA) for controlled substance (i.e receiving, storing, ordering, labeling, reverse distribution, take-back programs and loss or theft of)
- 2.4 Federal requirements for restricted drug programs and related medication processing (e.g. pseudoephedrine, Risk Evaluation and Mitigation Strategies [REMS])
- 2.5 FDA recall requirements (e.g., medications, devices, supplies, supplements, classifications)

Safe Handling and Disposal

- Main areas to focus:
 - Hazardous Materials
 - Non-Hazardous Materials
 - Pharmaceutical Substances
 - Controlled Substances

Hazardous Materials

- Hazardous materials: any chemical or drug that poses potential harm to the person preparing or coming in contact with it.
- Regulatory Body: Occupational Safety and Health Administration (OSHA): protects employees who work with hazardous materials.
 - Requirements for Personal Protective Equipment (PPE) [ie: gloves, gown, goggles, masks, hair covers, etc].
 - Procedures for dealing with different types of hazardous substances [Hazardous class 1,2,3]
- References: Safety Data Sheets (SDS)- outline appropriate handling, storage requirements, and cleanup procedures for the hazardous product:
 - Handling: Hazardous materials and chemicals should be stored separately from other materials
 - Storage Requirements: materials stored in a negative pressure room. During transport, these type of material are stored in a leakproof container or sealed bag clearly labeled “hazardous drug waste”.
 - Clean up procedures: Accidental exposure:
 - Equipment: eyewash station, shower, sinks
 - Spill kits
 - Event reporting

Non-Hazardous Materials

- Non-Hazardous Materials do not have the same level of attention as Hazardous drugs, BUT they can have potential harm to the environment if not disposed of correctly
 - P or U listed drugs
 - Antibiotics

Pharmaceutical Substances

- Pharmaceutical Substance is any substance used for therapeutic treatment. Or
- Medications or the ingredients used to make:
 - Hazardous vs Non-Hazardous
- Expired medications can be sent back to manufacturer for reverse distribution
- Equipment disposal: Vaccines, syringe, and needles disposed of in sharps container

Controlled Substances

- **Controlled Substances:** are medications that carry a high risk for abuse and misuse.
- **Regulatory Body:** Drug Enforcement Agency (DEA)
- **Storage Conditions:** designated area, such as vault or locked cabinet, certain controlled medications are segregated to maintain:
 - Accurate Inventory
 - Potential for diversion
 - Unethical practices
- **Tracking Movement:** the DEA regulates all movements and ensures that the process is traceable for proper handling and minimize any potential for diversion or unethical practices.
 - Manufacture to Pharmacy
 - Pharmacy to Patient

Schedules of Controlled Substances (C)

Schedule:	I	II	III	IV	V
Abuse Potential:	Extremely High	High	Moderate	Low	Minimal
Description:	No accepted medicinal use in the US	Severe psychological and/or physical dependence	Risk for dependence	Risk for dependence	<ul style="list-style-type: none"> - Risk for dependence - Contains limited amount of narcotics
Examples:	<ul style="list-style-type: none"> - Heroin - Cocaine 	<ul style="list-style-type: none"> - Oxycodone - Adderall 	<ul style="list-style-type: none"> - Ketamine - Suboxone 	<ul style="list-style-type: none"> - Alprazolam - Zolpidem 	<ul style="list-style-type: none"> - Codeine-containing cough syrups (Robitussin AC) - Pregabalin

C:II Filling Restrictions

Schedule:	II
Prescribed	<ul style="list-style-type: none"> -Electronically -Handwritten on a secure prescription <ul style="list-style-type: none"> - Faxes only acceptable for hospice or long-term care - Phone (Verbal): limited to 72- hour supply (Depending on jurisdiction). Must be followed up an electronic or hard copy.
Expiration date /Restrictions:	<ul style="list-style-type: none"> - State regulations typically w/in 90 days of the written date - Federal regulations do not suggest a specific time limit
Refills:	NO!
Partial Fills:	<ul style="list-style-type: none"> -If a pt insurance has specific qty limits or pt doesn't want to fill the entire qty: remainder balance is forfeited and CAN NOT be refilled -Hospice pt are eligible to partially fill in increments and such rx's expire in 60 days from written date.
Transfers:	NO!

C: III-V Filling Restrictions

Schedule:	III-V
Prescribed	<ul style="list-style-type: none">- Electronic- Handwritten- Faxed- Phone
Expiration date /Restrictions:	- 6 months from the date written and a limited of 90- day supply max per fill
Refills: (Yes/No)	<ul style="list-style-type: none">- Yes!- Limited to a max of 5 refills or 6 months
Transfers: (Yes/No)	<ul style="list-style-type: none">- Yes!- Between pharmacies 1 time only, unless pharmacies share an online, real-time database.

FYI When Filling Controlled Substances

- Refills:
 - Controlled substance cannot be filled early! At most, 1-2 days may be acceptable.
- Transfers:
 - All transfers must be between 2 pharmacists
 - After transfer, the prescription should be voided by the original pharmacy after transfer and a notation that it is a transferred prescription should be written by the current pharmacy
 - C III-V:
 - Indicated by law for refill purposes only! Not initial fills (non transferable)
 - Information needed for transfer:
 - Original prescription date and dispensing date
 - Number of refills remaining
 - The name of the transferring pharmacist
 - The DEA #, Name, and address of the transferring pharmacy

Receiving Control Substance Shipments

C- II	C III-V
<ul style="list-style-type: none">- RPh on duty must verify each item and document the date each was received on copy 3 of the original order form that accompanies the order- Copy 3 of each order form must be maintained in the pharmacy for at least 2 years	<ul style="list-style-type: none">- No special requirements

Storing Controlled Substances

C II	C III-V
<ul style="list-style-type: none">- Must be kept under lock and key and in their own designated vault or cabinet- Vault or cabinet must be equipped with a proper locking mechanism in addition to having multiple cameras positioned on it at all times	<ul style="list-style-type: none">- Dispersed throughout a pharmacy's non-control medication inventory or in their own area of the locked vault.- Cameras must be positioned on these medications as well.

Ordering Controlled Substances

C II

- Must be ordered on a DEA 222 form
- DEA 222 form is specific to schedule II drugs, must be completed in triplicate , and can be handwritten or typed:
 - Top Copy: for the supplier
 - Middle Copy: sent to the DEA
 - Bottom Copy: sent back to the purchaser
- DEA 222 valid only for 60 days once filled out
- Max of 10 different medication on 1 form, signed by RPh who is registered with the DEA (or)
- A Controlled Substance Ordering System (CSOS) can be used in place of a DEA 222 form for ordering C II's.
- Pharmacy must meet specific electronic requirements to ensure digital security when using the CSOS.
- Largely replaced paper DEA 222 due to convenience and ease of use.
- 10/2019: DEA has ruled in favor of a single copy DEA 222 form to replace previous triplicate format. (triplicate will be obsolete soon)

Alternative Facts - Controlled Substance :

- Part of filling Controlled Substance is developing an eye for unethical practices:
 - Quantity and Day supply limitations: it is vital to know how to calculate a prescriptions days supply!!
 - Alterations:
 - CII- Can NOT be altered! Even with a confirmation from practitioners, it isn't allowed!
 - Expiration date
 - DEA Verification
- Remember: pharmacies must follow both federal and state laws. In events, when federal and state laws conflict, **the stricter of the two must be followed!**

DEA Verification

- DEA #'s consists of two letters followed by 7 numbers
- The first letter identifies the type of DEA registrant and the second letter is the first letter of the prescribers last name
- To verify, follow the following steps:
 - (+) 1st, 3rd, and 5th #'s together [ODD's] = Sum 1
 - (+) 2nd, 4th, and 6th #'s together [EVENS's] (x) 2 = Sum 2
 - (+) Sum 1 and Sum 2= Grand Sum
 - The second digit of the Grand Sum is the same as the last digit of the prescriber's DEA #

The Food and Drug Administration

- FDA:
 - Food and Drug Administration (FDA) is responsible for regulating the safety and efficacy of medical devices drugs, and biologics
 - Responsible for approval of all medication before it can be put on the market
 - Regulates the manufacturing. Labeling dispensing and post-market surveillance

FDA- Black Box Warning

- Black Box Warning: warning aim to alert healthcare providers and consumers of serious potential adverse effects or life-threatening risk
- Example of Black Box Warning Drugs:
 - Opioid analgesics: contain a black box warning alerting the products high risk of abuse, misuse and addiction in addition to the potential for life threatening respiratory depression

FDA Labeling Requirements

- Pharmacy labeling of a Controlled Substances must be compliant with the following federal regulations:
 - Fill Date
 - Pharmacy name and address
 - Prescription#
 - Patient name
 - Prescribing practitioner
 - Drug name, strength, dosage form, quantity, and number of fills (if CIII-V)
 - Direction for use and any applicable cautionary verbiage
- The FDA requires that the following warning must be present on the label:
“Caution: Federal law prohibits the transfer of this drug to any person other than the patient for whom it was prescribed.”

Dispensing Controlled Substances

- A prescription is only valid and can be dispensed if it is written for a legitimate medical purpose under the usual scope of practice of the prescribing practitioner.
- Medication must be legally dispensed to the patient or a member of their household
- There is no federal quantity limit on controlled prescriptions, state law depending on jurisdiction typically limits CII dispensing to a 30-day supply and CIII-V to a 90-day supply.

Reverse Distribution- DEA 41 Form

- Reverse Distribution: this occurs when a pharmacy sends outdated, unusable drug product back to the drug manufacturer or other authorized distributor for processing or disposal.
- Also, this may occur when drugs are returned by patients or the drugs are expired
- DEA 41 Form: Outdated, damaged, or unwanted controlled substances may be destroyed under the authorization of the DEA. This form is used to destroy the medications. The form must contain the following information:
 - Dates, location, and method of destruction
 - The NDC, name, strength, dosage form, and quantity of the medications being destroyed
 - Signatures of two witnesses of the destruction (should be employees

“Take Back” Programs

- Take back program: a program to safely dispose of unwanted prescriptions medications, regardless of being controlled or non-controlled.
- Occur at local police stations, university, and some hospital systems
- Beneficial as unwanted medications are voluntarily donated and disposed of correctly
- Helps with public safety to ensure unwanted medications do not end up in the wrong hands or the environment (waterways/air)

Loss and Theft- DEA 106 form

- In the event of lost or stolen CII-V medications, the DEA and local law enforcement must be notified immediately.
- RPh must then fill out a DEA 106 form that details the medications involved in the left:
 - Original form: sent to the DEA
 - Copy of form: kept by the pharmacy for pharmacy records
- Only a “significant” loss of controlled substance require DEA 106 forms. Small liquid spills or broken tablets do not need to be reported.

REMS Program

- A Risk Evaluation and Mitigation Strategy (REMS) is a drug safety program that the FDA can require for certain medications with serious safety concerns to help ensure the benefits of the medication outweigh its risks
- REMS programs are designed to reinforce medication use behaviors and actions that support the safe use of that medication.
- Currently there are 61 drugs that have REMS programs. Some Examples:
 - Alosetron
 - Ambrisentan
 - Clozapine
 - Isotretinoin (iPledge)
 - Mycophenolate
 - Opioid Analgesic REMS
 - Suboxone/Subutex
 - Thalomid
 - Zyprexa Relprevv (olanzapine)

Restricted Drug Programs

- Pseudoephedrine
 - Based on the combat Methamphetamine Epidemic Act of 2005 (CMEA), restrictions are in place on Pseudoephedrine:
 - Sale: max amount that can be bought is 3.6 grams per day and 8 grams in a 30-day period based on the chemical not the tablet strength
 - Storage: kept behind the pharmacy counter to ensure compliance with documentation with the sale and theft prevention
 - Records: an electronic or written logbook must be kept detailing:
 - Personal information of the person purchasing product
 - Qty
 - Strength
 - Date of product sale
 - Time of product sale

Drug Recalls

- Pharmacies must comply with all drug and product recalls and responsible for keeping accurate records to aid in the safety of patients that might have been affected.
- Various reasons for a drug or product is recalled:
 - Problems with the dosage or form
 - Adverse reactions related to the specific medications
- RPh's needs to contact all patients who might have been affected and reconcile the need for the recall
- All recall records should be maintained similar to prescriptions

Recall Classifications

Class I	Class II	Class III
Most severe type of recall and involves medication that is likely to cause adverse effects or even death	Occurs when medication may cause temporary adverse health effects that are reversible or if there is a small risk of serious adverse effects:	Least severe and not likely to cause a patient to have adverse effects
Example: one drug is labeled as another drug	Example: J&J recall	Example: 2017 Glipizide ER tablets recalled due to failed limits for water content during stability testing.

Recall Targets

Medication	Devices	Supplies	Supplements
<ul style="list-style-type: none"> - Recalls protect the public from imperfect or potentially dangerous medications that are discovered after the medication reaches the US Market 	<ul style="list-style-type: none"> - Devices can become defective or a health hazard, which would warrant a product recall 	<ul style="list-style-type: none"> - Recalled by the FDA or voluntarily by medical supply manufactures due to faulty components 	<ul style="list-style-type: none"> - Recalled from time to tome for various health reasons
<p>Common reasons:</p> <ul style="list-style-type: none"> - Product contamination - Presence of impurities - Product mislabeling - Adverse effects 	<p>Common medical devices:</p> <ul style="list-style-type: none"> - Insulin pumps - Glucose meters - Infuse pumps - Glucose test strips - Cardiac Pacemakers 	<p>Common medical supplies:</p> <ul style="list-style-type: none"> - Needles - Syringes - Surgical gloves - Sterile saline 	<p>Common reasons:</p> <ul style="list-style-type: none"> - Contamination - Presence of undeclared ingredients - Super/subpotency - Product mislabeling

Laws to Study and Memorize

- 1938 Food, Drug, and Cosmetic Act
- 1970:
 - Occupational Safety & Health Act
 - Controlled Substances Act
 - Poison Prevention Packaging Act
- 1990: Omnibus Budget Reconciliation Act
- 1996: Health Insurance Portability and Accountability Act
- 2005: Combat Methamphetamine Epidemic Act

References:

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- Center for Drug Evaluation and Research. (n.d.). Risk evaluation and mitigation strategies (rems). Retrieved May 02, 2021, from <https://www.fda.gov/drugs/drug-safety-and-availability/risk-evaluation-and-mitigation-strategies-rems#:~:text=A%20Risk%20Evaluation%20and%20Mitigation,the%20medication%20outweigh%20its%20risk.>
- Choose PTCB. Choose EXCELLENCE. (n.d.). Retrieved May 02, 2021, from <https://www.ptcb.org/guidebook/ptce-content-outline>

4. Order Entry and Processing

Sarah Amin, PharmD,
Medication Reconciliation Pharmacist
Mercy Hospital

PTCE Content

- 21.25%
- 4.1 Procedures to compound non-sterile products
- 4.2 Formulas, calculations, ratios, proportions, alligations, conversions, Sig codes, abbreviations, medical terminology, and symbols for days supply, quantity, dose, concentration, dilutions
- 4.3 Equipment/supplies required for drug administration
- 4.4 Lot numbers, expiration dates, and National Drug Code (NDC) numbers
- 4.5 Procedures for identifying and returning dispensable, non-dispensable, and expired medications and supplies



Non-Sterile
Compounding

Mixtures

Ointments

Liquids

Emulsions

Suppositories

Enemas

1. Create a formula

- Products needed
- Calculations
- Amounts of ingredients required

2. Wash hands and wear PPE

3. Obtain hardware supplies needed

4. Weigh/Measure all ingredients

5. Combine ingredients

6. Documentation and labeling

Compounding Procedure

Mixtures

At least two substances

- Two liquids
- Solid and liquid
- Two solids

Active and inactive ingredients make up a **compound**

Liquid Mixture

- Magic Mouthwash
 - Lidocaine 2%, liquid antacid, diphenhydramine
 - 1:1:1 ratio

Ointments



- Topical medication preparation
- Water-in-oil mixture (w/o)
- Mixing through **spatulation** using **geometric dilution**
- Stored in tube or jar

Liquids

Solute

- Active drug
- **Homogenously** dispersed through solvent

Solvent

- Liquid component
- Used to administer active drug

Emulsions

- Two liquids that are **immiscible**
- **Discontinuous phase** dispersed throughout **continuous phase**
 - salad dressing



Suppositories and Enemas

- Suppositories
 - **Solid formulation**
 - Rectal or vaginal
 - Active medication suspended in base
 - **Hand rolling, fusion molding, compression molding**
- Enemas
 - **Solution formulation**



Percentage Strengths

Weight/weight (w/w%)

- Grams of ingredient/100 grams of total product

Volume/volume (v/v%)

- mL of ingredient/100 mL of total product

Weight/volume (w/v%)

- Grams of ingredient/100 mL of total product

Metric Conversions

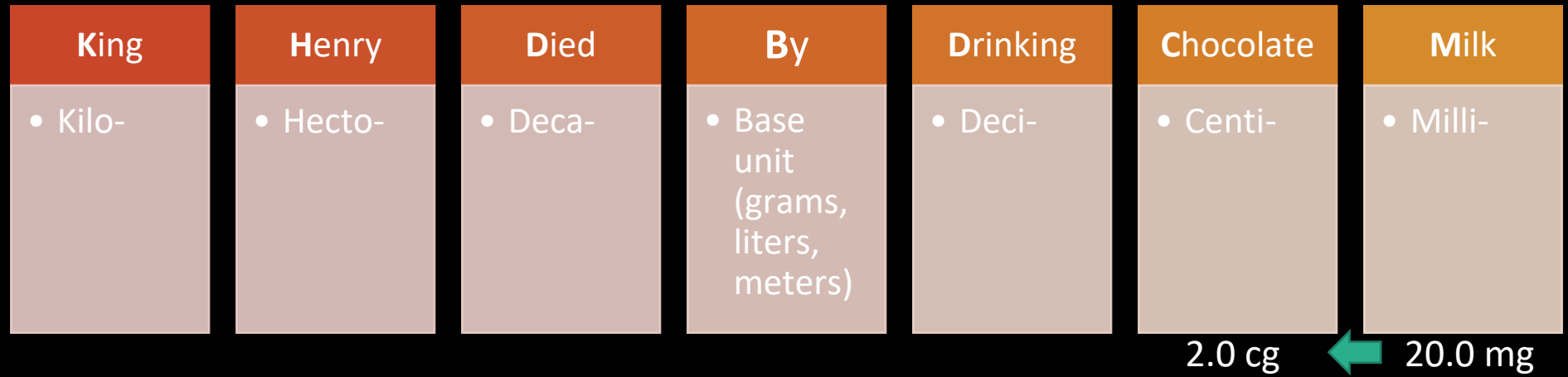
King	Henry	Died	By	Drinking	Chocolate	Milk
<ul style="list-style-type: none">• Kilo-	<ul style="list-style-type: none">• Hecto-	<ul style="list-style-type: none">• Deca-	<ul style="list-style-type: none">• Base unit (grams, liters, meters)	<ul style="list-style-type: none">• Deci-	<ul style="list-style-type: none">• Centi-	<ul style="list-style-type: none">• Milli-

Metric Conversions

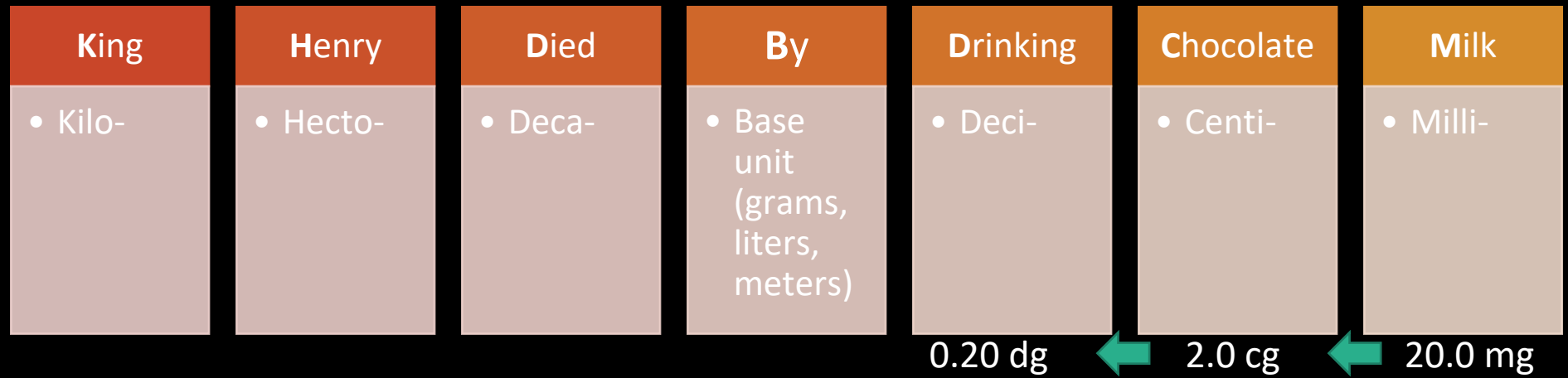
King	Henry	Died	By	Drinking	Chocolate	Milk
• Kilo-	• Hecto-	• Deca-	• Base unit (grams, liters, meters)	• Deci-	• Centi-	• Milli-

20.0 mg

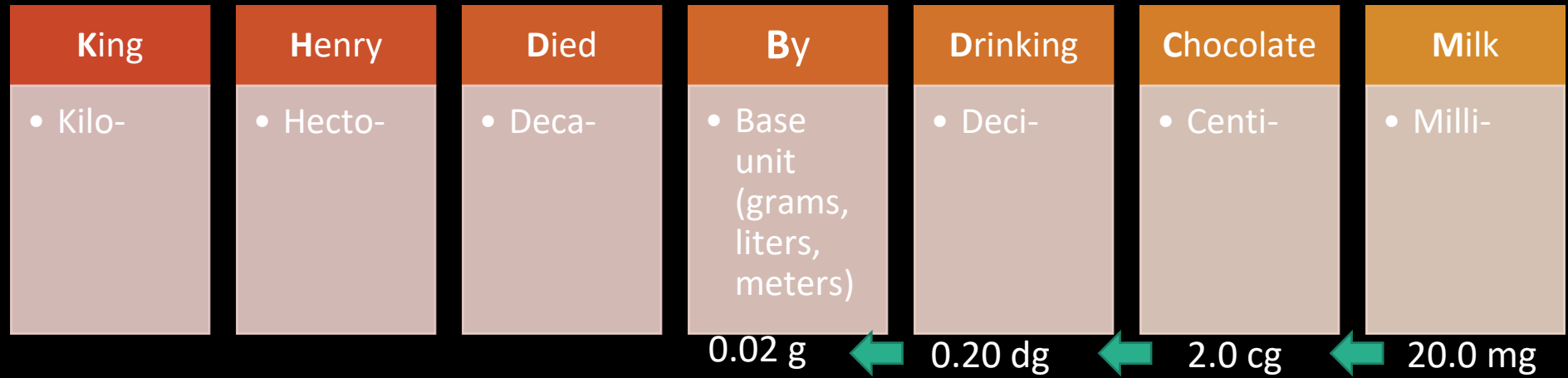
Metric Conversions

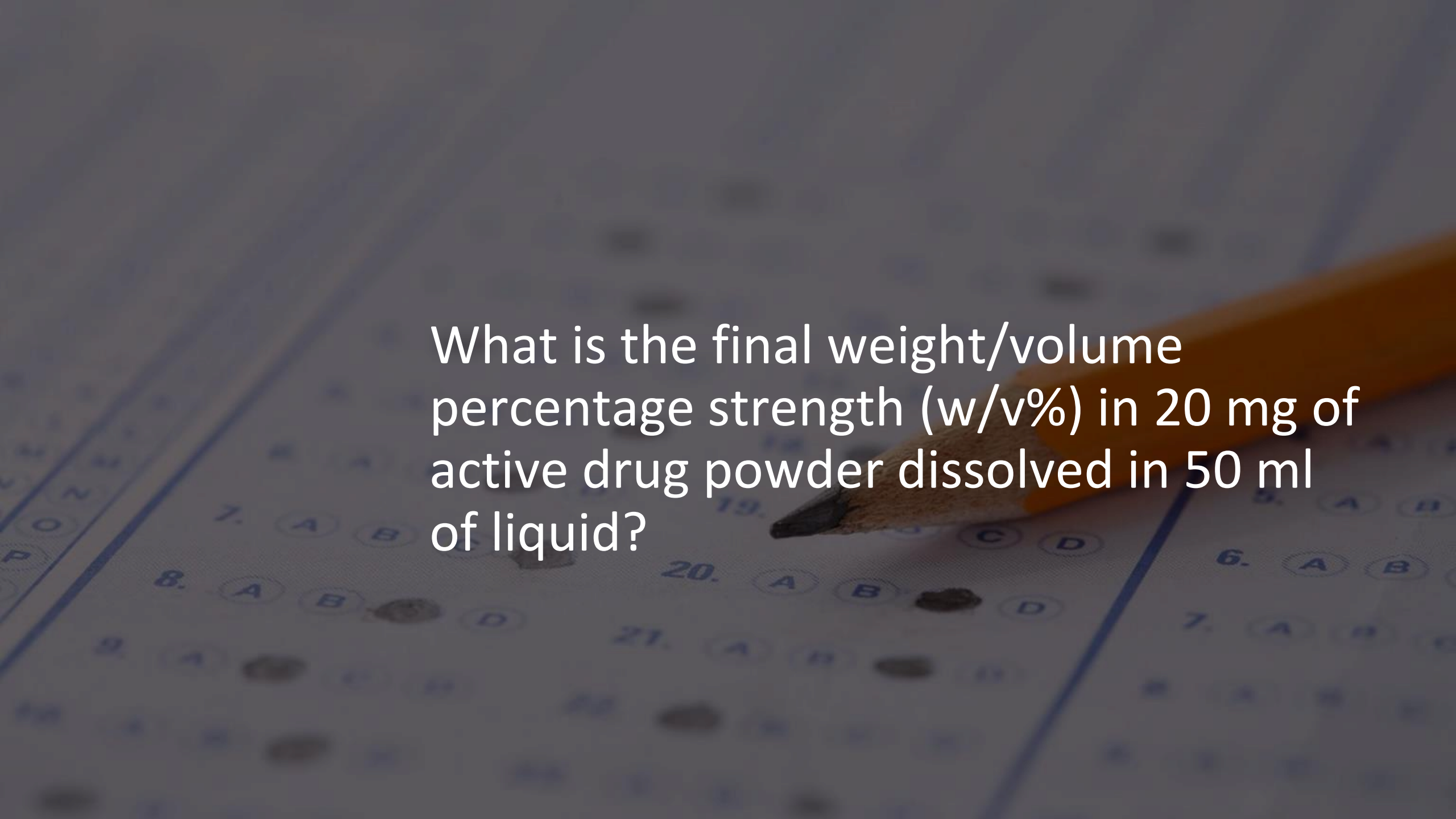


Metric Conversions



Metric Conversions



A yellow pencil is positioned diagonally across the page, pointing towards the bottom left. The notebook page is blue-lined and features a grid of bubbles for multiple-choice answers, labeled with letters A, B, C, and D. The text is overlaid on the page in a white, sans-serif font.

What is the final weight/volume percentage strength (w/v%) in 20 mg of active drug powder dissolved in 50 ml of liquid?

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- $\frac{0.02 \text{ gm}}{50 \text{ ml}} \times \frac{x \text{ gm}}{100 \text{ ml}}$

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- $\frac{20 \text{ mg}}{1000} = 0.02 \text{ gm}$
- $\frac{0.02 \text{ gm}}{50 \text{ ml}} \propto \frac{x \text{ gm}}{100 \text{ ml}}$
- $2 = 50x$

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- $\frac{2}{50} = 0.04 \text{ gm in } 100 \text{ ml}$
- **0.04% w/v**

Ratios and Proportions

- Ratio
 - Relative value between two numbers
 - $\frac{1}{2}$
 - 1:2
 - One part to two parts
- Proportion
 - Equality of two ratios
 - $a:b = c:d$
 - $a/b = c/d$
 - $a:b :: c:d$

Dimensional Analysis

- Factor-Label Method
- Converts units of measure
- **Conversion factor**
 - Shows the numerical relationship between two numbers

$$\textit{unit given} \times \frac{\textit{unit wanted}}{\textit{unit given}}$$

How many centimeters are in 6 inches?

- $\text{unit given} \times \frac{\text{unit wanted}}{\text{unit given}}$

$$1 \text{ inch} = 2.54 \text{ cm}$$

How many centimeters are in 6 inches?

- $\text{unit given} \times \frac{\text{unit wanted}}{\text{unit given}}$

$$\text{inches} \times \frac{\text{cm}}{\text{inches}} \quad 1 \text{ inch} = 2.54 \text{ cm}$$

How many centimeters are in 6 inches?

- $\text{unit given} \times \frac{\text{unit wanted}}{\text{unit given}}$

$$\text{inches} \times \frac{\text{cm}}{\text{inches}} \quad 1 \text{ inch} = 2.54 \text{ cm}$$

$$6 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}}$$

How many centimeters are in 6 inches?

- *unit given* \times $\frac{\text{unit wanted}}{\text{unit given}}$

$$\text{inches} \times \frac{\text{cm}}{\text{inches}} \quad 1 \text{ inch} = 2.54 \text{ cm}$$

$$\frac{6 \text{ in}}{1} \times \frac{2.54 \text{ cm}}{1 \text{ in}}$$

How many centimeters are in 6 inches?

- $\text{unit given} \times \frac{\text{unit wanted}}{\text{unit given}}$

$$\text{inches} \times \frac{1 \text{ inch} = 2.54 \text{ cm}}{\text{inches}}$$

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$$x = 15.24 \text{ cm}$$

Conversions

1 tsp	5 mL
1 tbsp	15 mL
1 L	1000 ml
1 mL	20 drops
1 gal	4 qts
1 fl oz	29.6 mL
1 qt	2 pints
1 pint	~473 mL
1 kg	2.2 lbs
1 gm	1000 mg
1 grain	64.8 mg
1 lb	16 oz
1 lb	~454 gm
1 inch	2.54 cm

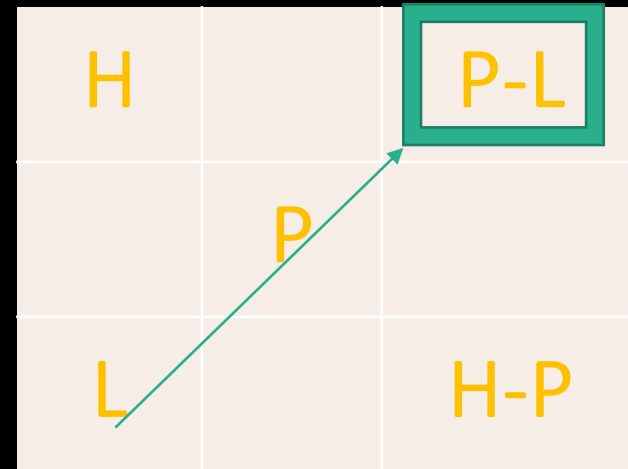
Alligation Method

- Calculates the proportion of two solutions of different concentrations needed to produce a final solution of a desired concentration
- L = lower strength
- H = higher strength
- P = desired product strength

H		P-L
	P	
L		H-P

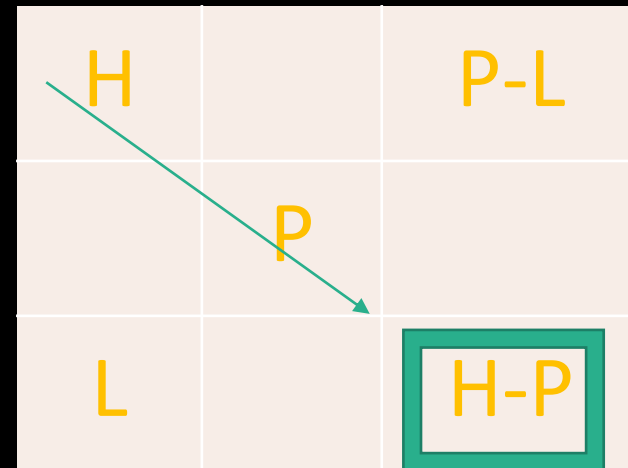
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How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

H		P-L
	P	
L		H-P



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H		P-L
	30	
L		H-P



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

60		P-L
	30	
L		H-P



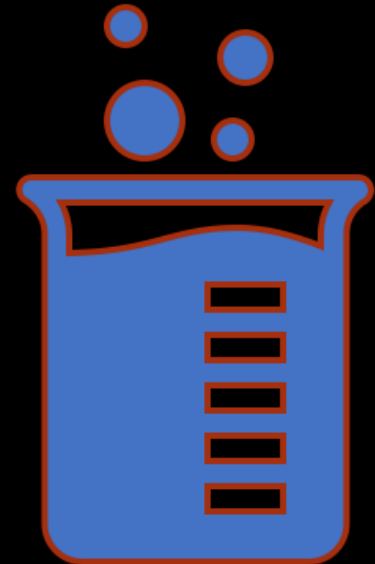
How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

L=25%

60		P-L
	30	
25		H-P



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

L=25%

30-25=5

60		5
	30	
25		H-P



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

L=25%

$30-25=5$

$60-30=30$

60		5
	30	
25		30



How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

L=25%

$30-25=5$

$60-30=30$

60		5
	30	
25		30

Number of parts of higher solution

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

P=30%

H=60%

L=25%

$30-25=5$

$60-30=30$

60		5
	30	
25		30

← Number of parts of lower solution

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

5 parts of 60%

30 parts of 25%

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

- 5 parts of 60%
30 parts of 25%

$$30 + 5 = 35 \text{ total parts}$$

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

- 5 parts of 60%
30 parts of 25%

$$30 + 5 = 35 \text{ total parts}$$

$$\frac{700 \text{ ml}}{35 \text{ parts}} = 20 \text{ ml/part}$$

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?

-

5 parts of 60%

30 parts of 25%

$30 + 5 = 35$ *total parts*

$$\frac{700 \text{ ml}}{35 \text{ parts}} = 20 \text{ ml/part}$$

60 % solution	20 mL/part x 5 parts = 100 mL
25% solution	20 ml/part x 30 parts = 600 mL

How would you make 700 ml of a 30% solution if you have a 60% solution and a 25% solution?



Sig Codes

Frequency	
QD	Once daily
QOD	Every other day
QOW	Every other week
BID	Twice daily
TID	Three times daily
QID	Four times daily
Q4H*	Every 4 hours*

Route of Administration	
PO	By mouth
SL	Sublingual
BUCC	Bucally
TOP	Topical
SC, SUBQ	Subcutaneously
IM	Intramuscular
IN	Intranasal
IV	Intravenous
ID	Intradermal
IT	Intrathecal
INH	Inhale
PR	Rectal

Roman Numerals

- Repeated (up to 3 times), values added together
 - $XX = X + X = 20$
- V cannot be repeated
- Values are added when a larger number is followed by a smaller number
 - $VI = 5 + 1 = 6$
- Values are subtracted when a smaller number is followed by a larger number
 - $IV = 5 - 1 = 4$

ss = 1/2

I or i = 1

V or v = 5

X or x = 10

L or l = 50

C or c = 100

D or d = 500

M or m = 1,000

Abbreviations

Abbreviation	Meaning
Stat	Immediately
PRN	As needed
DAW	Dispense as written
AC, PC	Before meals, after meals
AAA	Apply to affected area
Amp	Ampule
Gtt	Drop
OS, OD, OU	Left eye, right eye, both eyes
AS, AD, AU	Left ear, right ear, both ears
Q	Every
UD	As directed

Abbreviation	Meaning
Oint, ung	Ointment
NPO	Nothing by mouth
D5W	Dextrose 5% in water
NS	Normal Saline
Syr	Syringe
Inj	Injection
TDS	Transdermal
ODT	Orally disintegrating tablet
MDI	Metered dose inhaler
Neb	Nebulization
ATC	Around the clock

Thank
You!

DRUG ADMINISTRATION

Matt Goldstein, PharmD
Long Island Jewish Valley Stream

Section 4.4 SYRINGES

- ORAL SYRINGE
- NOT FOR INJECTABLE USE



INJECTABLE SYRINGE

- FOR USE WITH VACCINES OR IV PREPARATION





ORAL SOLID
UNIT
DOSING

RESPIRATORY SPACERS

- USED WITH INHALERS TO BREAK UP THE DRUG PARTICLES TO INCREASE ABSORPTION INTO THE LUNGS.



DIABETES SUPPLIES

- LANCETS,
GLUCOMETERS,
TEST STRIPS



Section 4.4

- **Lot numbers**
- **Expiration Dating**
- **NDC numbers**

LABELS

100 Tablets
ONCE - DAILY

NDC 57237-055-00

**Lisinopril
Tablets, USP**

20 mg

Rx only

Citron
Pharm

Each tablet contains:
20 mg of lisinopril USP.

Usual Dosage: See package insert for Dosage and Administration.

Warning: As with all medications, keep out of the reach of children.

Store at 20° to 25°C (68° to 77°F) [See USP Controlled Room Temperature]. Protect from moisture, freezing and excessive heat.

Pharmacist: Dispense in a tight, light-resistant container as defined in the USP, with a child-resistant closure (as required).

Distributed by: Citron Pharm
Suite -1101
2 Tower Cent
East Brunswick

Code No.: DRUGS/AP/19/199
Made in India

P1412096

Batch:

Expiry:



LOT NUMBER

- Used as identification by manufacturer for various batches.
- Very useful for drug recalls and when repacked.
- Also useful in drug inventory control

DRUG EXPIRATION DATING

- Manufacturer expiration determined by the stability of three batches of the drug.

DRUG EXPIRATION DATES

- Re-packaging of oral solid dosage forms will change the expiration date.
- Formula is $\frac{1}{2}$ the manufacturer's expiration date or 6 months whichever is less.

DRUG EXPIRATION DATES

- Example:
- Using a repack date of 5/31/2021
- The expiration date on the bottle is expiring 3/30/2022...the repacked expiration date would be 5 months or 10/31/2021

NDC NUMBERS

- NDC=National drug code
- 10 or 11 digits long
- Example: 0777-3105-02 or 00777-3105-02
- Manuf-product code-package size

RETURNING MEDICATIONS

- Dispensable (unopened, good dating) can be returned for credit.
- Indispensable medications (ie: open bottles) can not be returned to wholesaler, since they are not re-dispensable.

RETURNING MEDICATIONS

Medications can be returned due to expiration dates, inventory control, and ordering errors.

Most wholesalers charge a restocking fee before they issue credit.

RETURN TO STOCK

- Retail prescriptions not picked up can be returned to stock. If picked up and returned, it can not be re-used.
- Hospital unit dose returned can be returned to stock if the integrity of the packaging is intact

REVERSE DISTRIBUTION

- Pharmacies use outside companies to return to the manufacturer and/or destroy outdated, non-dispensable products

Appendix

Medications II Self Study

Antiepileptics

Generic Name (Brand Name)	Dosage Forms	FDA-Approved Indications
Brivaracetam (Briviact)	Injection, tablets, solution	Adjunctive to partial onset seizures
Carbamazepine (Tegretol, Tegretol XR)	Capsules, suspension, tablets, extended-release	Tonic-clonic, partial onset seizures
Clobazam (Onfi)	Suspension, tablets	Adjunctive to seizures associated with Lennox-Gastaut syndrome
Clonazepam (Klonopin)	Tablets, orally disintegrating tablets, wafers	Absence, myoclonic seizures
Diazepam (Valium, Diastat)	Injection, rectal gel	Status epilepticus
Divalproex sodium (Depakote, Depakote ER)	Capsules (sprinkle), delayed-release tablets, extended-release tablets	Absence, partial onset seizures
Eslicarbazepine (Aptiom)	Tablets	Partial onset seizures
Ezogabine (Potiga)	Tablets	Partial onset seizures
Fosphenytoin (Cerebyx)	Injection	Status epilepticus, prevention and treatment of seizures during neurosurgery, short-term administration when unable to take oral phenytoin
Gabapentin (Neurontin)	Capsules, solution, tablets	Tonic-clonic, partial onset seizures
Lacosamide (Vimpat)	Tablets, injection, solution	Adjunctive to partial onset seizures
Lamotrigine (Lamictal, Lamictal XR)	Tablets, orally disintegrating tablets, extended-release tablets	Partial onset seizures, tonic-clonic seizures
Levetiracetam (Keppra)	Injection, solution, tablets, extended-release tablets	Adjunctive to partial onset, myoclonic and tonic-clonic seizures
Lorazepam (Ativan)	Injection	Status epilepticus
Oxcarbazepine (Trileptal, Oxtellar XR)	Suspension, extended-release (XR) tablets, tablets	Partial onset seizures
Perampanel (Fycompa)	Suspension, tablets	Partial onset, tonic-clonic seizures
Phenobarbital	Tablets, injection, solution	Generalized tonic-clonic, partial onset seizures
Phenytoin (Dilantin)	Extended-release capsules, chew-tabs, suspension, injection	Generalized tonic-clonic (grand mal), complex partial onset seizures, prevention and treatment during or following neurosurgery, status epilepticus (intravenous)
Pregabalin (Lyrica)	Capsules, solution	Adjunctive to partial onset
Tiagabine (Gabitril)	Tablets	Adjunctive to partial onset
Topiramate (Topamax)	Capsules (sprinkle), tablets	Adjunctive to tonic-clonic, partial onset
Valproic acid (Depakene), valproate sodium (Depacon)	Capsules, syrup, injection	Absence seizures, complex partial onset
Zonisamide (Zonegran)	Capsules	Adjunctive to partial onset seizures

Lacher BE, 2011. Pharmacy technician certification. Bethesda, Md.: American Society of Health-System Pharmacists

Parkinson Disease

Classifications and Medications	Available Dosage Forms
Anticholinergics	
Amantadine (Symmetrel)	Tablets, capsules, solution
Benztropine (Cogentin)	Tablets, injection
Trihexyphenidyl (Artane)	Tablets, sustained-release capsules
Carbidopa/levodopa products	
Carbidopa/levodopa (Sinemet, Sinemet CR)	Tablets, ER and CR tablets
Carbidopa/levodopa/entacapone (Stalevo)	Tablets
MAO-B inhibitors	
Rasagiline (Azilect)	Tablets
Selegiline (Eldepryl, Zelapar ODT, Emsam patch)	Capsules, ODT, transdermal patch
COMT inhibitors	
Entacapone (Comtan)	Tablets
Tolcapone (Tasmar)	Tablets
Dopamine agonists	
Apomorphine (Apokyn)	Subcutaneous injection
Bromocriptine (Parlodel)	Tablets, capsules
Pramipexole (Mirapex)	Tablets, ER tablets
Ropinirole (Requip)	Tablets, ER tablets
Rotigotine (Neupro)	Transdermal patch

COMT = catechol-O-methyl transferase, CR = controlled release, ER = extended release, MAO-B = monoamine oxidase B, ODT = orally disintegrating tablet.

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Alzheimer Disease

Classifications and Medications	Available Dosage Forms
<i>Cholinesterase inhibitors</i>	
Donepezil (Aricept)	Tablets, orally disintegrating tablets
Galantamine (Razadyne)	Tablets, extended-release tablets, solution
Rivastigmine (Exelon)	Capsules, solution, patch
<i>N-methyl-D-aspartate (NMDA) receptor antagonists</i>	
Memantine (Namenda)	Tablets, oral solution
Memantine/donepezil (Namzaric)	Capsules

Multiple Sclerosis

Medications—Generic (Brand) Names	Available Dosage Forms	Indications
<i>First-generation agents</i>		
Glatiramer acetate (Copaxone)	Sub-Q injection	To reduce the frequency of relapses in relapsing remitting MS
Interferon beta-1a (Avonex, Rebif)	IM, sub-Q injection	Treatment of relapsing forms of MS to slow disease progression and prevent exacerbations
Interferon beta-1b (Betaseron)	Sub-Q injection	Treatment of relapsing forms of MS and to prevent exacerbations
Mitoxantrone (Novantrone)	IV infusion	To reduce neurologic disability and frequency of relapses in secondary, chronic progressive, relapsing remitting MS
<i>Second-generation agents</i>		
Alemtuzumab (Lemtrada)	IV infusion	To reduce relapse rate in relapsing-remitting MS
Daclizumab (Zinbryta)	Sub-Q injection	Treatment of relapsing forms of MS
Dimethyl Fumarate (Tecfidera)	Capsule	Treatment of relapsing forms of MS
Fingolimod (Gilenya)	Capsule	Treatment of relapsing forms of MS
Natalizumab (Tysabri)	IV infusion	Treatment of relapsing forms of MS to delay disease progression and prevent exacerbations; used when an inadequate response or intolerance to other agents
Ocrelizumab (Ocrevus)	IV infusion	Treatment of primary progressive and relapsing MS
Teriflunomide (Aubagio)	Tablets	Treatment of relapsing forms of MS

IM = intramuscular, IV = intravenous, MS = multiple sclerosis, sub-Q = subcutaneous.

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Headaches

Classifications and Medications	Available Dosage Forms
<i>Triptans (common suffix)</i>	
Almotriptan (Axert)	Tablets
Eletriptan (Relpax)	Tablets
Frovatriptan (Frova)	Tablets
Naratriptan (Amerge)	Tablets
Rizatriptan (Maxalt)	Tablets, orally disintegrating tablets
Sumatriptan (Imitrex)	Tablets, nasal spray, injection
Zolmitriptan (Zomig)	Tablets, orally disintegrating tablets, nasal spray

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Headaches (cont)

Classifications and Medications	Available Dosage Forms
Sumatriptan and naproxen (Treximet)	Tablets
<i>Butalbital-containing products</i>	
Butalbital and acetaminophen	Tablets
Butalbital, acetaminophen, caffeine (Fioricet, Esgic)	Tablets
Butalbital, acetaminophen, caffeine, codeine (Fioricet with codeine)	Tablets
Butalbital, aspirin, caffeine (Fiorinal)	Capsules, tablets
Butalbital, aspirin, caffeine, codeine (Fiorinal with codeine)	Capsules
<i>Ergotamine derivatives</i>	
Ergotamine, caffeine (Cafergot, Migergot, Ergomar)	Suppositories, tablets, sublingual tablets
Dihydroergotamine (D.H.E. 45, Migranal)	Injection, nasal spray

Neuropathic Pain

Classifications and Medications	Available Dosage Forms
Topical agents	
Capsaicin (Zostrix)	Lotion, cream, gel, patch, roll-on stick
Lidocaine (Lidoderm)	Patch
Antidepressants	
Amitriptyline (Elavil)	Tablets
Bupropion (Wellbutrin)	Extended-release tablets, sustained-release tablets, tablets
Duloxetine (Cymbalta)	Capsules
Fluoxetine (Prozac)	Tablets, capsules, oral solution
Nortriptyline (Pamelor)	Capsules, solution
Venlafaxine (Effexor)	Tablets, extended-release tablets and capsules
Antiepileptics	
Carbamazepine (Tegretol)	Tablets, capsules, oral suspension
Divalproex, valproic acid (Depakote, Depakene)	Capsules, tablets, syrup
Gabapentin (Neurontin, Horizant)	Tablets, capsules, oral solution
Lamotrigine (Lamictal)	Tablets
Pregabalin (Lyrica)	Capsules
Topiramate (Topamax)	Tablets, capsules
Miscellaneous agents	
Tapentadol (Nucynta)	Extended-release tablets, tablets
Baclofen	Tablets

Antidepressants

Tricyclic Antidepressants	Monoamine Oxidase Inhibitors	Selective Serotonin Reuptake Inhibitors	Selective Norepinephrine Reuptake Inhibitors	Miscellaneous
Amitriptyline (Elavil) Clomipramine (Anafranil) Desipramine (Norpramin) Doxepin (Sinequan) Imipramine (Tofranil) Nortriptyline (Pamelor)	Isocarboxazid (Marplan) Phenzelzine (Nardil) Tranylcypromine (Parnate)	Citalopram (Celexa) Fluoxetine (Prozac) Fluvoxamine Paroxetine (Paxil) Sertraline (Zoloft)	Desvenlafaxine (Pristiq) Duloxetine (Cymbalta) Levomilnacipran (Fetzima) Venlafaxine (Effexor)	Bupropion (Wellbutrin) Mirtazapine (Remeron) Nefazodone (Serzone) Trazodone (Desyrel) Vilazodone (Viibryd) Vortioxetine (Trintellix)

Bipolar Disorder

Classifications and Medications	Dosage Forms
Lithium carbonate (Lithobid)	Capsules, tablets, controlled-release tablets, syrup
<i>Antiepileptics</i>	
Carbamazepine (Tegretol, Equetro)	Capsules, suspension, tablets, extended-release tablets, chewable tablets, extended-release capsules
Divalproex sodium (Depakote)	Capsules (sprinkle), injection, delayed-release tablets, extended-release tablets
Lamotrigine (Lamictal)	Tablets, orally disintegrating tablets
Oxcarbazepine (Trileptal)	Suspension, tablets, extended-release tablets
<i>Atypical antipsychotics</i>	
Aripiprazole (Abilify)	Injection, solution, tablets, orally disintegrating tablets
Olanzapine (Zyprexa)	Injection, tablets, orally disintegrating tablets
Quetiapine (Seroquel, Seroquel XR)	Tablets, extended-release tablets
Risperidone (Risperdal)	Injection, solution, tablets, orally disintegrating tablets
Ziprasidone (Geodon)	Capsules, injection capsules
Olanzapine/fluoxetine (Symbyax)	Capsules

XR = extended release.

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Anxiety Disorder

Classifications and Medications	Available Dosage Form
<i>Benzodiazepines (suffix-pam)</i>	
Alprazolam (Xanax)	Tablets, oral concentrate solution, extended-release tablets, orally disintegrating tablets
Diazepam (Valium)	Injection, oral concentrate solution, oral solution, tablets
Lorazepam (Ativan)	Tablets, injection, oral concentrate solution
Clonazepam (Klonopin)	Tablets, orally disintegrating tablets, wafers
Chlordiazepoxide (Librium)	Capsules
<i>Nonbenzodiazepine</i>	
Buspirone (BuSpar)	Tablets

Antipsychotics

Classifications and Medications	Available Dosage Forms
<i>Conventional antipsychotics</i>	
Chlorpromazine	Tablets, injection
Fluphenazine	Tablets, injection, oral concentrate, elixir
Haloperidol (Haldol)	Tablets, oral concentrate, injection
Loxapine (Adasuve)	Capsules, inhalation powder
Thioridazine	Tablets
Thiothixene	Capsule
Trifluoperazine	Tablets
<i>Atypical antipsychotics</i>	
Aripiprazole (Abilify, Abilify Maintena)	Tablets, solution, orally disintegrating tablets, long-acting injection
Clozapine (Clozaril, Fazaclo, Versacloz)	Tablets, orally disintegrating tablets, oral suspension
Olanzapine (Zyprexa, Zyprexa Relprevv, Zyprexa Zydis)	Tablets, orally disintegrating tablets, injection
Paliperidone (Invega, Invega Sustenna), Invega Trinza	Extended-release tablets, long-acting injection
Quetiapine (Seroquel, Seroquel XR)	Tablets, extended-release tablets
Risperidone (Risperdal, Risperdal Consta)	Tablets, orally disintegrating tablets, solution, long-acting injection
Ziprasidone (Geodon)	Capsules, injection

XR = extended release.

Sedatives/Hypnotics

Classifications and Medications	Available Dosage Forms
<i>Benzodiazepines (suffix-pam)</i>	
Estazolam	Tablets
Flurazepam (Dalmane)	Capsules
Quazepam (Doral)	Tablets
Temazepam (Restoril)	Capsules
Triazolam (Halcion)	Tablets
<i>Other agents (nonbenzodiazepines)</i>	
Eszopiclone (Lunesta)	Tablets
Ramelteon (Rozerem)	Tablets
Zaleplon (Sonata)	Capsules
Zolpidem (Ambien, Ambien CR, Edular, Intermezzo, Zolpmist)	Tablets, extended-release tablets, sublingual tablets, solution

CR = controlled release.

ADHD

Stimulants	Non-stimulants
Amphetamine (Evekeo)	Atomoxetine (Strattera)
Dexmethylphenidate (Focalin)	
Dextroamphetamine (Dexedrine)	
Lisdexamfetamine (Vyvanse)	
Methylphenidate (Ritalin, Metadate, Concerta, Daytrana)	
Mixed amphetamine salts (Adderall)	

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Cholesterol-Lowering Agents

Classifications and Medications	Available Dosage Forms
<i>Bile acid sequestrants</i>	
Cholestyramine (Questran)	Powder, packets
Colestipol (Colestid)	Granules, packets, tablets
Colesevelam (Welchol)	Tablets
<i>HMG-CoA reductase inhibitors (statins) (common ending-statin)</i>	
Atorvastatin (Lipitor)	Tablets
Fluvastatin (Lescol, Lescol XL)	Capsules, extended-release tablets
Lovastatin (Altoprev)	Tablets, extended-release tablets
Pitavastatin (Livalo)	Tablets
Pravastatin (Pravachol)	Tablets
Simvastatin (Zocor)	Tablets
Rosuvastatin (Crestor)	Tablets
<i>Fibrates</i>	
Gemfibrozil (Lopid)	Tablets
Fenofibrate, fenofibric acid (Antara, Fenoglide, Lofibra, Lipofen, Triglide, Trilipix, Tricor)	Tablets, capsules
<i>PCSK-9 inhibitors</i>	
Alirocumab (Praluent)	Injection
Evolocumab (Repatha)	Injection
<i>Miscellaneous and combination agents</i>	
Amlodipine/atorvastatin (Caduet)	Tablets
Ezetimibe (Zetia)	Tablets
Ezetimibe/simvastatin (Vytorin)	Tablets
Niacin/lovastatin (Advicor)	Extended-release tablets
Niacin/simvastatin (Simcor)	Extended-release tablets
Nicotinic acid (Niacin, Niaspan)	Tablets, capsules, extended-release
Omega-3 fatty acids (Lovaza)	Capsules

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Diuretics

Classifications and Medications	Available Dosage Forms
<i>Thiazide diuretics (suffix-diazide)</i>	
Chlorothiazide (Diuril)	Injection, suspension, tablets
Hydrochlorothiazide (Microzide)	Capsules, tablets
Metolazone (Zaroxolyn)	Tablets
<i>Loop diuretics</i>	
Bumetanide (Bumex)	Injection, tablets
Ethacrynic acid (Edecrin)	Injection, tablets
Furosemide (Lasix)	Injection, solution, tablets
Torsemide (Demadex)	Injection, tablets
<i>Potassium-sparing diuretics</i>	
Eplerenone (Inspra)	Tablets
Spirolactone (Aldactone)	Tablets
Triamterene (Dyrenium)	Capsules
<i>Combination agents</i>	
Aliskiren/HCTZ (Tekturna HCT)	Tablets
Triamterene/HCTZ (Dyazide, Maxzide)	Tablets, capsules
Spirolactone/HCTZ (Aldactazide)	Tablets

HCT/HCTZ = hydrochlorothiazide.

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Beta Blockers

Medications	Cardioselective or Nonselective	Available Dosage Forms
Atenolol (Tenormin)	Cardioselective	Tablets
Bisoprolol	Cardioselective	Tablets
Carvedilol (Coreg, Coreg CR)	Nonselective	Tablets, extended-release (CR) tablets
Labetalol (Trandate)	Nonselective	Tablets, injection
Metoprolol tartrate (Lopressor)	Cardioselective	Injection, tablets
Metoprolol sodium succinate (Toprol-XL)	Cardioselective	Extended-release (XL) tablets
Nadolol (Corgard)	Nonselective	Tablets
Nebivolol (Bystolic)	Cardioselective	Tablets
Propranolol (Inderal LA)	Nonselective	Solution, extended-release (LA) capsules, tablets, injection
Sotalol (Betapace)	Nonselective	Tablets
Combination agents		
Atenolol/chlorthalidone (Tenoretic)	Cardioselective	Tablets
Bisoprolol/HCTZ (Ziac)	Cardioselective	Tablets
Metoprolol/HCTZ (Lopressor HCT)	Cardioselective	Tablets

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CR = controlled release, HCT/HCTZ = hydrochlorothiazide, LA = long acting, XL = extended release.

ACE Inhibitors/ARBs

Classifications and Medications	Available Dosage Forms
<i>ACE inhibitors (ACEIs) (suffix-pril)</i>	
Benazepril (Lotensin)	Tablets
Captopril	Tablets
Enalapril, enalaprilat (Vasotec)	Injection, tablets
Fosinopril	Tablets
Lisinopril (Prinivil, Zestril)	Tablets
Moexipril	Tablets
Quinapril (Accupril)	Tablets
Perindopril (Aceon)	Tablets
Ramipril (Altace)	Capsules, tablets
Trandolapril (Mavik)	Tablets
<i>Angiotensin II receptor blockers (ARBs) (suffix-sartan)</i>	
Azilsartan (Edarbi)	Tablets
Candesartan (Atacand)	Tablets
Eprosartan	Tablets
Irbesartan (Avapro)	Tablets
Losartan (Cozaar)	Tablets
Olmesartan (Benicar)	Tablets
Telmisartan (Micardis)	Tablets
Valsartan (Diovan)	Tablets

ACE/ARB: Combinations

<i>Combination products</i>	
Amlodipine/olmesartan (Azor)	Tablets
Amlodipine/valsartan (Exforge)	Tablets
Amlodipine/valsartan/HCTZ (Exforge HCT)	Tablets
Benazepril/HCTZ (Lotensin HCT)	Tablets
Candesartan/HCTZ (Atacand HCT)	Tablets
Enalapril/HCTZ (Vaseretic)	Tablets
Irbesartan/HCTZ (Avalide)	Tablets
Lisinopril/HCTZ (Zestoretic)	Tablets
Losartan/HCTZ (Hyzaar)	Tablets
Moexipril/HCTZ (Uniretic)	Tablets
Olmesartan/HCTZ (Benicar HCT)	Tablets
Quinapril/HCTZ (Accuretic)	Tablets
Telmisartan/HCTZ (Micardis HCT)	Tablets
Trandolapril/verapamil (Tarka)	Tablets
Valsartan/HCTZ (Diovan HCT)	Tablets
Valsartan/Sacubitril (Entresto)	Tablets

HCT, HCTZ = hydrochlorothiazide.

Calcium Channel Blockers

Medications	Available Dosage Forms
Amlodipine (Norvasc)	Tablets
Clevidipine (Cleviprex)	Injection
Diltiazem (Cardizem, Tiazac)	Tablets, extended-release capsules and tablets, injection
Felodipine	Tablets
Isradipine	Capsules
Nifedipine (Procardia, Adalat CC)	Capsules, extended-release tablets
Nicardipine (Cardene)	Capsules, sustained-release capsules, injection
Nimodipine (Nymalize)	Capsules, solution
Nisoldipine (Sular)	Extended-release tablets
Verapamil (Calan, Verelan)	Sustained-release caplets, extended-release capsules, injection, tablets
<i>Combination agents</i>	
Amlodipine/atorvastatin (Caduet)	Tablets
Amlodipine/benazepril (Lotrel)	Tablets
Amlodipine/olmesartan/HCTZ (Tribenzor)	Tablets

HCTZ = hydrochlorothiazide.

Antiarrhythmic Agents

Class	Medications	Available Dosage Forms
IA	Disopyramide (Norpace, Norpace CR)	Capsules, extended-release capsules
	Procainamide	Injection
	Quinidine	Tablets, injection
IB	Lidocaine (Xylocaine)	Injection
	Mexiletine	Capsules
IC	Flecainide	Tablets
	Propafenone (Rythmol)	Tablets, capsules
II	Atenolol (Tenormin)	Tablets
	Esmolol (Brevibloc)	Injection
	Metoprolol (Lopressor, Toprol XL)	Tablets, injection
	Propranolol (Inderal)	Tablets, capsules, oral solution, injection
III	Amlodarone (Pacerone, Cordarone)	Tablets, injection
	Dofetilide (Tikosyn)	Capsules
	Dronedarone (Multaq)	Tablets
	Ibutilide (Corvert)	Injection
	Sotalol (Betapace)	Tablets, injection

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Asthma/COPD

Short-acting bronchodilators (SABAs)	
Albuterol (Proventil HFA, Ventolin HFA, ProAir HFA, ProAir RespiClick)	MDI, BAI, nebulizer solution, extended-release tablets, oral liquid
Levalbuterol (Xopenex, Xopenex HFA)	MDI, nebulizer solution
Long-acting bronchodilators (LABAs)	
Arformoterol (Brovana)	Nebulizer solution
Formoterol (Perforomist)	Nebulizer solution
Indacaterol (Arcapta)	DPI
Olodaterol (Striverdi)	SMI
Salmeterol (Serevent)	DPI
Methylxanthines	
Aminophylline	Injection
Theophylline (Theo-24, Elixophyllin, Theochron)	Injection, elixir, extended-release capsules/tablets
Anticholinergics	
Aclidinium (Tudorza)	DPI and BAI
Ipratropium (Atrovent HFA)	MDI, nebulizer solution
Tiotropium (Spiriva Handihaler, Spiriva Respimat)	DPI, SMI
Umeclidinium (Incruse Ellipta)	DPI

Asthma/COPD (Cont.)

<i>Leukotriene modifiers</i>	
Montelukast (Singulair)	Chewable tablets, tablets, granules
Zafirlukast (Accolate)	Tablets
Zileutin (Zyflo, Zyflo CR)	Tablets, extended-release tablets
<i>Combination agents</i>	
Formoterol/budesonide (Symbicort)	MDI
Formoterol/mometasone (Dulera)	MDI
Ipratropium/albuterol (Combivent Respimat, Duoneb)	SMI, nebulizer solution
Salmeterol/fluticasone (Advair, Advair HFA)	DPI, MDI
Tiotropium/olodaterol (Stiolto Respimat)	SMI
Umeclidinium/vilanterol (Anoro Ellipta)	DPI
Vilanterol/fluticasone (Breo Ellipta)	DPI

Oral/Inhaled Corticosteroids

Medications	Available Dosage Forms	Comments
<i>Oral corticosteroids</i>		
Prednisone	Solution, intensol, tablets	Bitter taste
Methylprednisolone (Medrol, Solu-Medrol)	Injection, long-acting injection, tablets, dosepak	
Prednisolone (Orapred)	Solution, orally disintegrating tablets, tablets	
<i>Inhaled corticosteroids</i>		
Beclomethasone (QVAR)	BAI	
Budesonide (Pulmicort)	DPI, nebulizer solution	
Ciclesonide (Alvesco)	MDI	
Flunisolide (Aerospan)	MDI	
Mometasone (Asmanex, Asmanex HFA)	DPI, MDI	
Fluticasone Furoate (Arnuity Ellipta)	DPI	
Fluticasone propionate (Flovent HFA, Flovent Diskus)	MDI, DPI	

Antihistamines

Medications	Available Dosage Forms
<i>Older antihistamines</i>	
Chlorpheniramine (Chlor-Trimeton)	Tablets, solution
Clemastine (Tavist)	Tablets
Diphenhydramine (Benadryl)	Caplets, capsules, solution, strips, syrup, orally disintegrating tablets, chewable tablets, injection
<i>Newer antihistamines</i>	
Azelastine (Astelin)	Intranasal
Cetirizine (Zyrtec)	Solution, syrup, tablets, chewable tablets, orally disintegrating tablets
Desloratadine (Clarinx)	Syrup, tablets, orally disintegrating tablets
Fexofenadine (Allegra)	Suspension, tablets, orally disintegrating tablets
Levocetirizine (Xyzal)	Solution, tablets
Loratadine (Claritin, Alavert)	Capsules, solution, syrup, tablets, chewable tablets, orally disintegrating tablets Intranasal
Olopatadine (Patanase)	Capsules, solution, syrup, tablets, chewable tablets, orally disintegrating tablets Intranasal

Osteoporosis

Classifications and Medications	Available Dosage Forms
<i>Calcium supplements</i>	
Calcium carbonate (Caltrate, Os-Cal, Viactiv, Tums)	Tablets, chewable tablets, chews, suspension, powder
Calcium carbonate + vitamin D (Caltrate +D, Os-cal + D, Viactiv + D)	Tablets, chewable tablets, chews
Calcium citrate (Citracal)	Tablets, capsules, powder
<i>Bisphosphonates</i>	
Alendronate (Fosamax)	Tablets, solution
Alendronate/cholecalciferol (Fosamax + D)	Tablets
Ibandronate (Boniva)	Tablets, injection
Risedronate (Actonel, Atelvia)	Tablets
Risedronate/calcium (Actonel and Calcium)	Tablets
Zoledronic acid (Reclast)	Injection
<i>Parathyroid hormone analog</i>	
Teriparatide (Forteo)	Injection
<i>Selective estrogen receptor modulators (SERMs)</i>	
Raloxifene (Evista)	Tablets
<i>Miscellaneous agents</i>	
Calcitonin (Miacalcin, Fortical)	Intranasal
Denosumab (Prolia)	Injection

NSAIDS

Medications	Available Dosage Forms
Diclofenac (Flector, Voltaren)	Tablets, gel, delayed-release tablets, patch
Etodolac	Tablets, capsules, extended-release tablets
Flurbiprofen	Tablets
Ibuprofen (Motrin, Advil)	Caplets, capsules, gelcaps, suspension, oral concentrate, drops, tablets, chewable tablets
Indomethacin (Indocin)	Capsules, extended-release capsules, injection, suppository, suspension
Ketorolac	Tablets, injection
Ketoprofen	Capsules, extended-release capsules
Meloxicam (Mobic)	Tablets
Nabumetone	Tablets
Naproxen (Naprosyn, Naprelan, Aleve, Anaprox DS)	Caplets, capsules, gelcaps, suspension, tablets, delayed-release tablets, extended-release tablets
Oxaprozin (Daypro)	Tablets
Piroxicam (Feldene)	Capsules
Sulindac	Tablets
Diclofenac/misoprostol (Arthrotec)	Tablets
COX-2 inhibitors	
Celecoxib (Celebrex)	Capsules

Muscle Relaxants

Medications	Available Dosage Forms
Baclofen (Lioresal)	Tablets, intrathecal injection
Carisoprodol (Soma)	Tablets
Chlorzoxazone	Tablets
Cyclobenzaprine	Tablets
Dantrolene (Dantrium)	Tablets, injection
Diazepam (Valium)	Tablets, oral solution, injection
Metaxalone (Skelaxin)	Tablets
Methocarbamol (Robaxin)	Tablets, injection
Orphenadrine	Tablets, injection
Tizanidine (Zanaflex)	Tablets

Opioids

Medications	Available Dosage Forms
Alfentanil (Alfenta)	Injection
Buprenorphine (Buprenex, Subutex)	Sublingual tablets, injection
Butorphanol (Stadol)	Injection, nasal spray
Codeine	Tablets
Fentanyl (Sublimaze, Duragesic, Fentora, Actiq, Lazanda)	Injection, patch, buccal tablets, transmucosal lozenge, nasal solution
Hydrocodone Bitartrate (Zohydro)	Extended-release capsules, antiabuse capsules and tablets
Hydromorphone (Dilaudid, Exalgo)	Tablets, solution, injection, suppository, extended-release tablets
Levorphanol	Tablets
Meperidine (Demerol)	Tablets, solution, injection
Morphine (Avinza, Kadian, MS Contin, Oramorph SR, Roxanol)	Tablets, capsules, extended-release tablets, solution, injection, suppository
Nalbuphine	Injection
Oxycodone (Oxaydo, OxyContin)	Tablets, extended-release tablets, solution
Oxymorphone (Opana, Opana ER)	Tablets, solution, extended-release tablets
Remifentanil (Ultiva)	Injection
Sufentanil (Sufenta)	Injection
Tapentadol (Nucynta)	Tablets, extended-release tablets
Tramadol (Ultram)	Tablets, solution, extended-release tablets

Insulins

Insulin Type	Onset of Action	Duration of Action
<i>Rapid-acting</i>		
Aspart (NovoLOG)	15 min	3-4 hr
Glulisine (Apidra)	15 min	3-4 hr
Lispro (AdmeLOG, HumaLOG, HumaLOG Jr, HumaLOG U 200)	15 min	3-4 hr
<i>Short-acting</i>		
Regular (HumuLIN R, HumuLIN R U-500, NovoLIN R, Afrezza)	30-60 min	4-6 hr
<i>Intermediate-acting</i>		
NPH (HumuLIN N, NovoLIN N)	2-4 hr	12-18 hr
<i>Long-acting (basal)</i>		
Detemir (Levemir)	3-4 hr	16-20 hr
Glargine (Basaglar, Lantus, Toujeo)	2-4 hr	24 hr
Degludec (Tresiba, Tresiba U-200)	1 hr	24 hr
<i>Insulin combinations</i>		
Aspart Protamine and Aspart (NovoLOG 70/30)	10-20 min	18-24 hr
Lispro Protamine and Lispro (HumaLOG 50/50, HumaLOG 75/25)	15-30 min	14-24 hr
NPH and Regular (HumuLIN 70/30, NovoLIN 70/30)	30 min	18-24 hr
<i>Long-acting insulin and GLP-1 combinations</i>		
Degludec and Liraglutide (Xultophy)	1 hr	24 hr
Glargine and Lixisenatide (Soliqua)	2-4 hr	24 hr

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Antidiabetics

Classifications and Medications	Available Dosage Forms
<i>Sulfonylureas</i>	
Glimepiride (Amaryl)	Tablets
Glipizide (Glucotrol)	Tablets, extended-release tablets
Glyburide (Glynase)	Tablets
<i>Meglitinides (secretagogues)</i>	
Nateglinide (Starlix)	Tablets
Repaglinide (Prandin)	Tablets
<i>Biguanides</i>	
Metformin (Glucophage, Fortamet, Glumetza, Riomet)	Tablets, extended-release tablets, solution
<i>Thiazolidinediones (glitazones)</i>	
Pioglitazone (Actos)	Tablets
Rosiglitazone (Avandia)	Tablets

Antidiabetics (Cont.)

Classifications and Medications	Available Dosage Forms
<i>Alpha-glucosidase inhibitors</i>	
Acarbose (Precose)	Tablets
Miglitol (Glyset)	Tablets
<i>Incretin mimetics</i>	
Albiglutide (Tanzeum)	Injection
Dulaglutide (Trulicity)	Injection
Exenatide (Byetta, Bydureon)	Injection
Liraglutide (Victoza)	Injection
<i>Amylin analog</i>	
Pramlintide (Symlin)	Injection
<i>Dipeptidyl peptidase-4 (DPP-4) inhibitors</i>	
Alogliptin (Nesina)	Tablets
Linagliptin (Tradjenta)	Tablets
Saxagliptin (Onglyza)	Tablets
Sitagliptin (Januvia)	Tablets
<i>Sodium-glucose cotransporter 2 inhibitors (SGLT-2) inhibitors</i>	
Canagliflozin (Invokana)	Tablets
Dapagliflozin (Farxiga)	Tablets
Empagliflozin (Jardiance)	Tablets

Thyroid Agents

Medications	Available Dosage Forms
<i>Agents to treat hypothyroidism</i>	
Levothyroxine (Synthroid, Levothroid, Levoxyl, Tirosint, Unithroid)	Tablets, injection, capsules
Liothyronine (Cytomel)	Tablets, injection
Liotrix (Thyrolar)	Tablets
Thyroid USP (Armour Thyroid, Nature-throid)	Tablets
<i>Agents to treat hyperthyroidism</i>	
Iodides (SSKI, Lugol's solution)	Solutions
Methimazole (Tapazole)	Tablets
Propylthiouracil (PTU)	Tablets

H2RA

Medications	Available Dosage Forms
Cimetidine (Tagamet HB)	Solution, tablets
Famotidine (Pepcid)	Chewable tablets, injection, suspension, tablets
Nizatidine	Capsules, solution, tablets
Ranitidine (Zantac)	Injection, capsules, syrup, tablets

PPI

Medications	Available Dosage Forms
Dexlansoprazole (Dexilant)	Capsules
Esomeprazole (Nexium)	Delayed-release capsules, granules for suspension, injection
Lansoprazole (Prevacid)	Delayed-release capsules, delayed-release tablets, orally disintegrating tablets, suspension
Omeprazole (Prilosec)	Delayed-release capsules, granules for suspension, delayed-release tablets
Pantoprazole (Protonix)	Granules for suspension, delayed-release tablets, injection
Rabeprazole (Aciphex)	Delayed-release tablets

Antiemetics

Medications	Available Dosage Forms
Aprepitant (Emend)	Capsules, suspension
Dimenhydrinate (Dramamine)	Injection, tablets, chewable tablets
Fosaprepitant (Emend)	Injection
Meclizine (Antivert, Bonine)	Tablet, chewable tablets
Metoclopramide (Reglan)	Injection, solution, tablets
Prochlorperazine (Compro)	Injection, suppository, tablets
Promethazine (Phenergan)	Injection, suppository, syrup, tablets
Scopolamine (Trans-Derm Scop)	Patch
Trimethobenzamide (Tigan)	Capsules, injection
<i>5-HT₃ antagonists</i>	
Dolasetron (Anzemet)	Tablets, injection
Granisetron (Sancuso)	Injection, solution, tablets, patch
Ondansetron (Zofran, Zuplenz)	Injection, solution, tablets, orally disintegrating tablets, film
Palonosetron (Aloxi)	Injection

Laxatives

Classifications and Medications	Available Dosage Forms
<i>Bulk-forming laxatives</i>	
Methylcellulose (Citrucel)	Caplets, powder
Polycarbophil (FiberCon, Equalactin)	Caplets, tablets, chewable tablets
Psyllium (Metamucil, Konsyl)	Capsules, powder, wafers
<i>Bowel evacnants</i>	
Polyethylene Glycol-PEG (Miralax)	Powder
<i>Stool softeners</i>	
Docusate Calcium (Surfak)	Capsules, liquid
Docusate Sodium (Colace, Correctol)	Capsules, liquid, enema, syrup
<i>Lubricant laxatives</i>	
Magnesium citrate (Citroma)	Solution
Magnesium hydroxide (Phillips Milk of Magnesia)	Suspension, chewable tablets
Mineral Oil (Fleet Mineral Oil Enema, Kondremul)	Liquid, oil (rectal)
Saline laxatives	
<i>Hyperosmotic laxatives</i>	
Glycerin	Suppository
Lactulose (Generlac)	Solution
<i>Stimulant laxatives</i>	
Bisacodyl (Dulcolax)	Enema, suppository, tablets
Senna (Senokot, Ex-Lax)	Liquid, drops, orally disintegrating strips, syrup, tablets, chewable tablets

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Topical Corticosteroids

Corticosteroid Potency Medications	Available Dosage Forms
<i>Low potency</i>	
Desonide (DesOwen)	Cream, ointment, gel, foam, lotion
Hydrocortisone (Cortaid, Cortizone-10)	Cream, ointment, gel, spray, solution, lotion
<i>Medium potency</i>	
Mometasone (Elocon)	Cream, ointment, lotion, solution
<i>High potency</i>	
Desoximetasone (Topicort)	Cream, ointment, gel, solution
Fluocinonide (Vanos)	Cream, ointment, gel, solution
Triamcinolone (Kenalog)	Cream, ointment, lotion, solution
<i>Very high potency</i>	
Clobetasol (Clobex, Clodan, Olux, Temovate)	Cream, ointment, gel, foam, lotion, solution

Benign Prostatic Hypertrophy

Classifications and Medications	Available Dosage Forms
<i>Alpha₁ adrenergic inhibitors</i>	
Alfuzosin (Uroxatral)	Extended-release tablets
Doxazosin (Cardura, Cardura XL)	Tablets, extended-release tablets
Prazosin (Minipress)	Capsules
Silodosin (Rapaflo)	Capsules
Tamsulosin (Flomax)	Capsules
Terazosin	Capsules
<i>Androgen hormone inhibitors</i>	
Dutasteride (Avodart)	Capsules
Dutasteride/tamsulosin (Jalyn)	Capsules
Finasteride (Proscar)	Tablets

XL = extended release.

Cephalosporins

First-Generation	Second-Generation	Third-Generation	Fourth-Generation	Fifth-Generation
Cefadroxil Cefazolin (Ancef) Cephalexin (Keflex)	Cefaclor Cefotetan Cefoxitin (Mefoxin) Cefprozil Cefuroxime (Ceftin)	Cefdinir (Omnicef) Cefixime (Suprax) Cefotaxime (Claforan) Cefpodoxime Ceftazidime (Fortaz) Ceftriaxone (Rocephin)	Cefepime (Maxipime)	Ceftaroline (Teflaro)

Fluoroquinolones

Medications	Available Dosage Forms
Ciprofloxacin (Cipro)	Injection, suspension, tablets, extended-release tablets
Gemifloxacin (Factive)	Tablets
Levofloxacin (Levaquin)	Injection, solution, tablets
Ofloxacin (Floxin)	Tablets
Moxifloxacin (Avelox)	Injection, tablets

Macrolides

Generic Name	Brand Name	Route of Administration
Azithromycin	Zithromax	Oral, IV
Clarithromycin	Biaxin	Oral
Dirithromycin	Dynabac	Oral
Erythromycin	Various	Oral, IV, topical

IV = intravenous

Penicillins

Generic Name	Brand Name	Route of Administration
Penicillin G	Bicillin, Bicillin LA	IM, IV
Penicillin VK	Various	Oral
<i>Penicillinase-resistant</i>		
Cloxacillin	Dynapen, Pathocil	Oral, injection
Nafcillin	Unipen	Oral, IV
<i>Broad-spectrum</i>		
Amoxicillin	Various	Oral
Amoxicillin/clavulanate	Augmentin	Oral
Ampicillin	Principen, Unasyn	Oral, injection

Antifungals

Classifications and Medications	Available Dosage Forms
<i>Amphotericin B</i>	
Conventional (Amphotericin B)	Injection
Liposomal (AmBisome)	Injection
Lipid complex (Abelcet)	Injection
<i>Azole antifungals</i>	
Fluconazole (Diflucan)	Tablets, powder for oral suspension, injection
Itraconazole (Sporanox)	Capsules, oral solution
Ketoconazole	Tablets
Posaconazole (Noxafil)	Oral suspension, tablets, injection
Voriconazole (Vfend)	Tablets, powder for oral suspension, injection
<i>Echinocandins</i>	
Anidulafungin (Eraxis)	Injection
Caspofungin (Cancidas)	Injection
Micafungin (Mycamine)	Injection

Vaccines

Vaccines	Available Dosage Form	Disease Prevented
<i>Inactivated vaccines</i>		
Hepatitis A (Havrix, Vaqta)	IM injection	Hepatitis A
Hepatitis B (Recombivax HB, Engerix-B)	IM injection	Hepatitis B
Herpes Zoster (Shingrix)	IM injection	Shingles
Human Papillomavirus (Gardasil-9)	IM injection	Cervical cancer, genital warts
Influenza (Fluzone, Fluvirin, Afluria, FluLaval)	IM injection	Influenza
Meningococcal (Bexsero, Menactra, Menveo)	IM injection	Meningitis
Pneumococcal (Pneumovax-23, Prevnar-13)	IM or sub-Q injection	Pneumonia
Poliomyelitis (IPOL)	IM injection	Polio
Tetanus/diphtheria (Tenivac)	IM injection	Tetanus and diphtheria (Td)
Tetanus/diphtheria/pertussis (Daptacel, Infanrix—children)	IM injection	Tetanus, diphtheria, pertussis (DTAP)
Tetanus/diphtheria/pertussis (Adacel, Boostrix—adult, adolescent)	IM injection	Tetanus, diphtheria, pertussis (Tdap)
<i>Live/attenuated vaccines</i>		
Herpes Zoster (Zostavax)	Sub-Q injection	Shingles
Measles, mumps, rubella (MMR II)	Sub-Q injection	Measles, mumps, rubella
Rotavirus (Rotarix, RotaTeq)	Oral suspension	Rotavirus gastroenteritis
Varicella (Varivax)	Sub-Q injection	Chicken pox

Anticoagulants/Thrombolytics

Classifications and Medications	Available Dosage Forms
Heparin	
Unfractionated heparin	Injection
Low-molecular-weight heparins	
Dalteparin (Fragmin)	Injection
Enoxaparin (Lovenox)	Injection
Factor Xa inhibitors	
Apixaban (Eliquis)	Tablets
Betrixaban (Bevyxxa)	Tablets
Edoxaban (Savaysa)	Tablets
Fondaparinux (Arixtra)	Injection
Rivaroxaban (Xarelto)	Tablets
Direct thrombin inhibitors	
Argatroban	Injection
Bivalirudin (Angiomax)	Injection
Dabigatran (Pradaxa)	Capsules
Desirudin (Iprivask)	Injection
Vitamin K₁ inhibitors	
Warfarin sodium (Coumadin, Jantoven)	Tablets
Thrombolytics	
Alteplase (Activase, Cathflo)	Injection
Tenecteplase (TNKase)	Injection

Lacher BE, 2011. Pharmacy technician certification. Bethesda, Md.: American Society of Health-System Pharmacists