HEALTH TECH ACADEMY

Perioperative Pharmacology

Treating the Surgical Patient

Lesson Objectives:

1. List the sources of drugs
2. Discuss the importance of drug regulation
3. Understand how drugs are named and formulated
4. Correctly identify and interpret the components of a drug label
5. Discuss ways to prevent drug errors
6. List and use the seven rights of the medication process
7. Apply the correct protocol for receiving drugs on the sterile field
8. List and describe the different drug delivery devices
9. Describe the role of the surgical technologist in handling drugs
10. List drug administration routes
11. Explain the different drug categories and give examples of drugs in each category

Pharmacology

- The study of drugs
- Drug - a substance intended for use in the diagnosis, cure, relief, treatment, or prevention of disease or intended to affect the structure or function of the body
- Sources of Drugs
    - Synthetic chemical
    - Animal and human protein
    - Minerals
    - Elemental metals
    - Plants
- Drug Information Resources
    - *Physicians' Desk Reference*
    - American Hospital Formulary Services Drug Information
    - United States Pharmacopeia-National Formulary
    - Online drug resources
    - Pharmacology textbooks

Drug Regulations

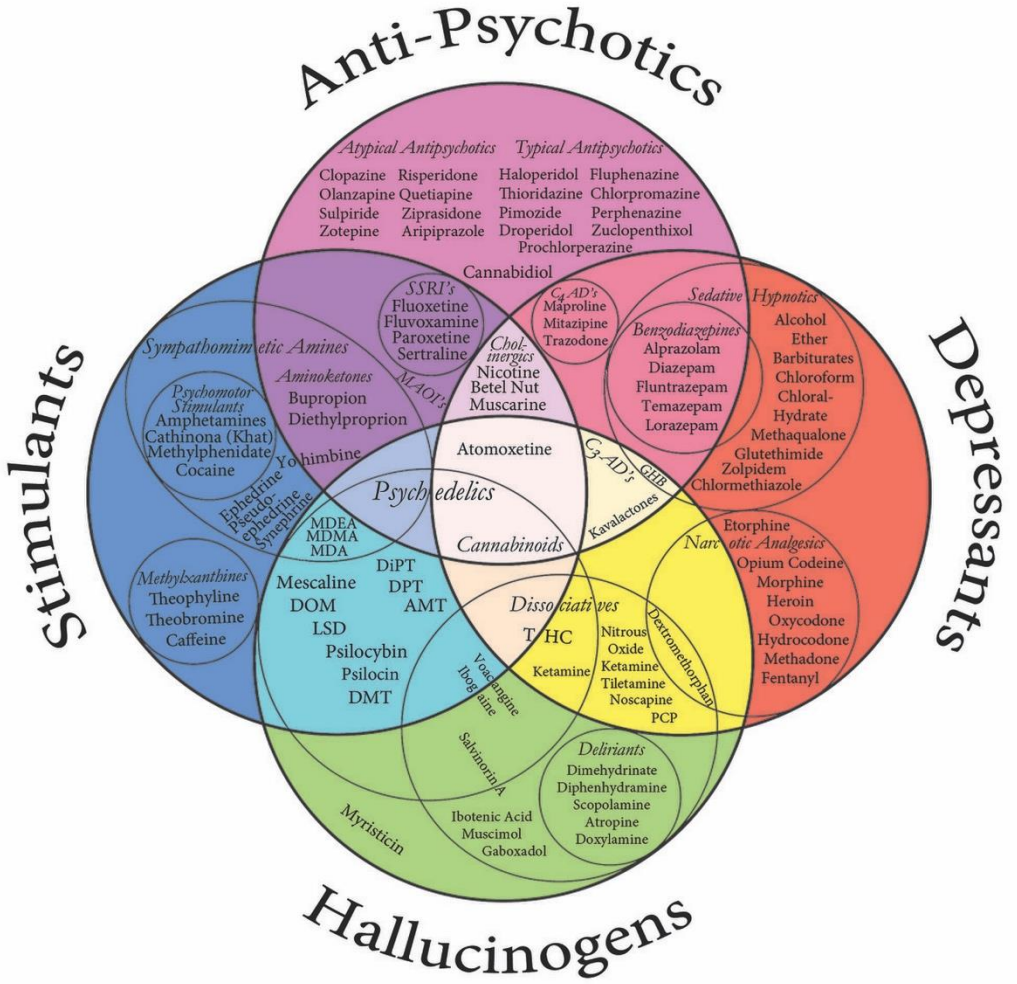
- **State Regulation:**
  - State laws dictate prescriptions, dispensing, and administration, governed by individual state practice acts.
  - Healthcare organizations must align policies with state laws per Joint Commission requirements.
  - Knowledge of institutional policies and state laws is crucial for surgical technologists.
  - To access state laws, search "[State] practice act [profession]."
- **Federal Regulation:**
  - The FDA oversees federal regulation of drugs, substances, and devices.
  - FDA regulates prescription, generic, and OTC drugs, along with food supplements, cosmetics, medical devices, implants, equipment, and more.
  - Approval process involves rigorous testing and adherence to safety standards.
  - FDA-approved labeling informs healthcare providers and the public about drug use and associated risks.

Quality Standards and International Standards

- **Quality Standards:**
  - US Pharmacopeia (USP) sets standards for quality, purity, identity, and strength.
  - Approved substances bear USP initials after their generic name.
  - USP-NF publishes approved substances.
- **International Standards:**
  - The World Health Organization (WHO) publishes the International Pharmacopoeia as an international formulary.

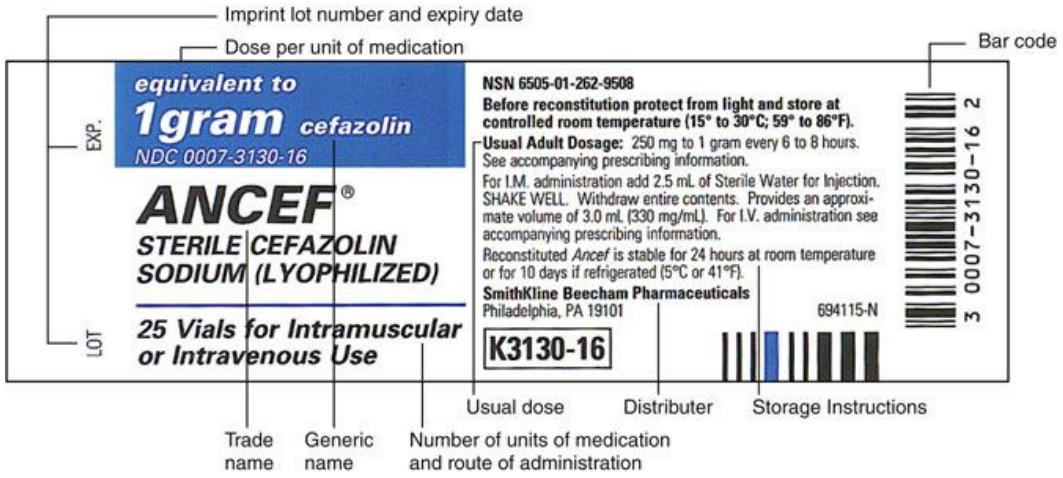
Drug Types

- **Prescription and over-the-counter drugs**
  - Prescription requires authorization
  - OTC available without authorization
- **Controlled substances**
  - Carry a high risk of abuse or addiction – or have no medical use
  - Schedule I, II, III, IV, V
- **Pregnancy categories**
  - Carry a potential risk to the fetus
  - A, B, C, D, X
- **Herbal remedies and food supplements**
  - Regulated differently than medications
  - Can interact with medications



Drug Identification (Nomenclature)

- **Generic name**
  - The active ingredient that makes the drug work. Generic names are not capitalized.
  - Ex. acetaminophen
- **Trade name**
  - The "Brand Name" sold by a company. Brand names are capitalized.
  - Ex. Tylenol
- **Chemical composition**
  - The actual chemical makeup of the drug
  - Ex. (N-(4-hydroxyphenyl)ethanamide, $C_8H_9NO_2$)



Drug Labeling

- **Pharmaceutical formulation**
- **Drug labeling**
  - Name of the drug including proprietary and generic
  - Dosage form
  - Amount contained in the package
  - Indications
  - Dosage
  - Administration
  - Bar code
  - Lot number
  - Expiration date

- **Watch the "Reading a Medication Label" Video for an explanation of all these items**

Reading a Medication Label Video

Reading a Medication Label Video

Summary of Video:

- Difference between Brand Name and Generic Name
- Amount Supplied
- Route
- Volume

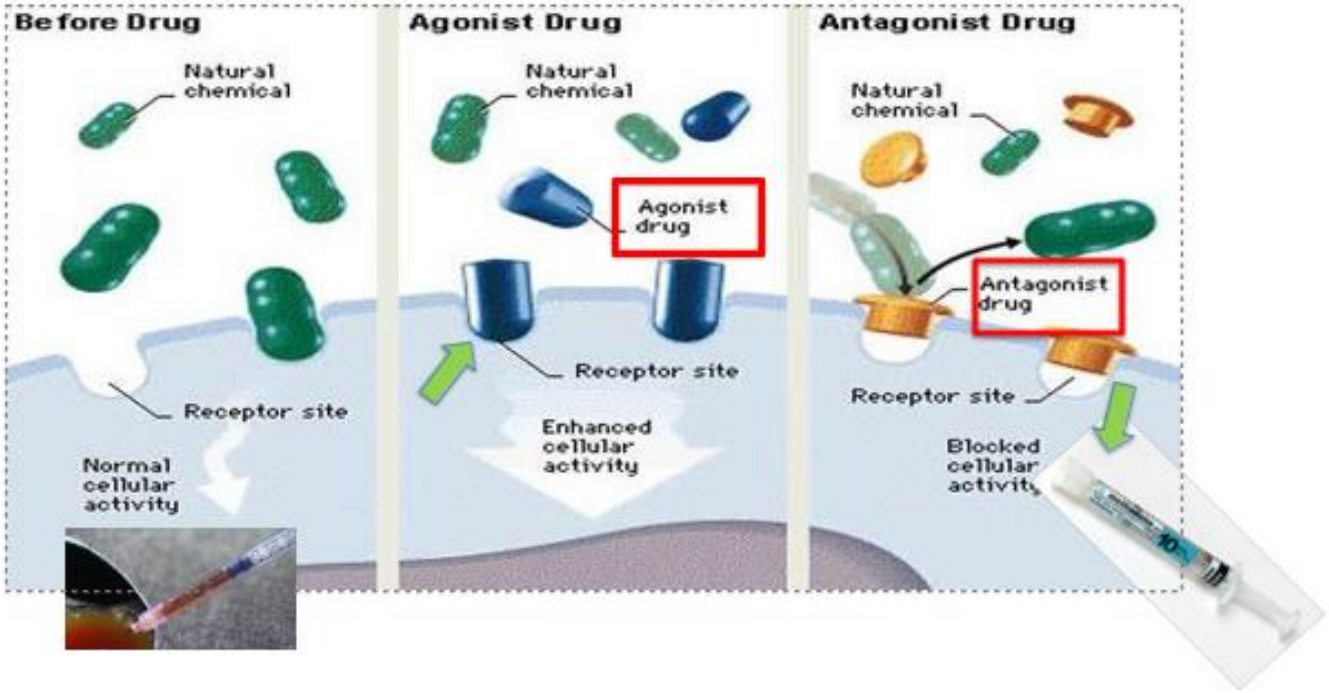
Drugs in the Operating Room

- Most medications given to the patient in the OR setting are administered by the Anesthesia team. The Anesthesia team will give a different variety of medications to achieve the following:
  - Keep the patient Unaware of the procedure
  - Keep the patient pain free
  - Monitor and Maintain the patient's hemodynamics/vital signs

- Some medications may be delivered by the Surgeon at the surgical field. These medications will be dispensed to the Sterile field by a Licensed Healthcare Provider (LHP), usually the RN circulator. Common medications on the sterile field:
  - Solutions such as Normal Saline Solution (0.9% NSS) and Sterile Water
  - Antibiotic Irrigation Solution
  - Hemostatic Agents
  - Local Analgesics, such as lidocaine

Medication Action

- Agonists interaction: enhances effect -(2-types)
  - Synergistic agents: stronger effect
  - Additive agents: alter action of the original drug
- Antagonists: prevent effect-reversal



Drug Action Terms

Indication	• Medical conditions drug treats/cures
Contraindications	• Drug should NOT be used
Onset	• Time till effect
Peak effect	• Time till max benefit
Duration	• Time of drug effect

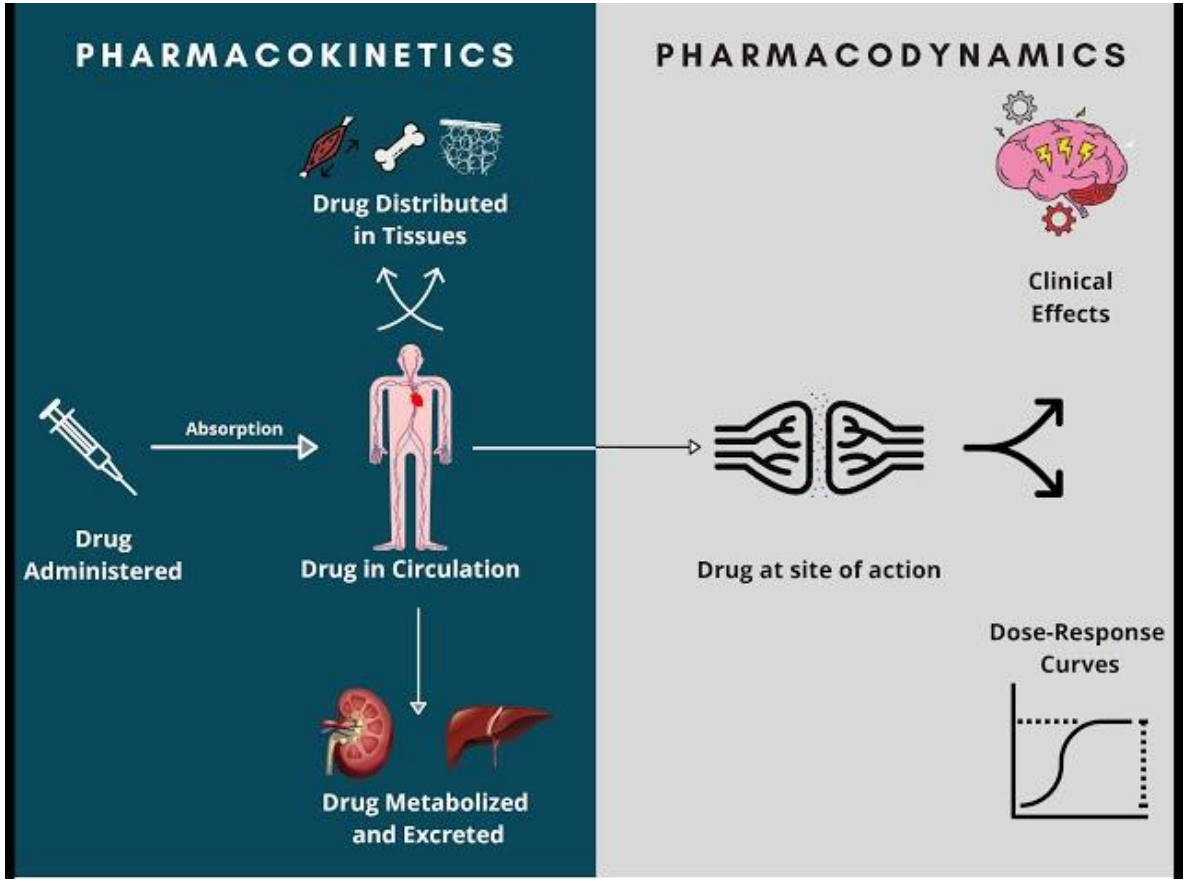
Medication Effects

Therapeutic effect	• Desired effect
Side effect	• Expected but unwanted effects
Adverse effect	• Potential harmful effects
Toxic effect	• Dangerous, harmful effects-Cancer*, birth defects*
Tolerance	• Reduction in effect over time
Addiction	• Dependency

How Drugs Work

- **Pharmacokinetics**
  - Changes to the drug
  - Processes: Absorption, Distribution, Biotransformation (Metabolism), Excretion (Elimination).

- **Pharmacodynamics**
  - Changes to the body
  - Changes occur due to drug's ability to interact with receptor sites.



Pharmacokinetics

Absorption

- Entry of drug into body tissues after administration.
- Factors affecting absorption: Chemical structure, method of administration, patient condition.
- Involves chemical and physical breakdown.
- Examples: Oral drugs dissolve in the small intestine and liver; injected drugs reach target tissue faster.

Distribution

- Drug carried to body tissues via bloodstream.
- Bioavailability: Amount of available drug and rate of availability.
- Factors affecting distribution: Binding to blood proteins, solubility.
- Only free unbound drug is available for pharmacological effect.

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Pharmacokinetics

Biotransformation (Metabolism)

- Chemical breakdown of drugs in the body, mainly in the liver.
- Prepares drugs for elimination from the body.
- Conditions affecting metabolism: Liver disease, advanced age.
- Drug's half-life: Time for half of the drug to be cleared from the body.

Excretion (Elimination)

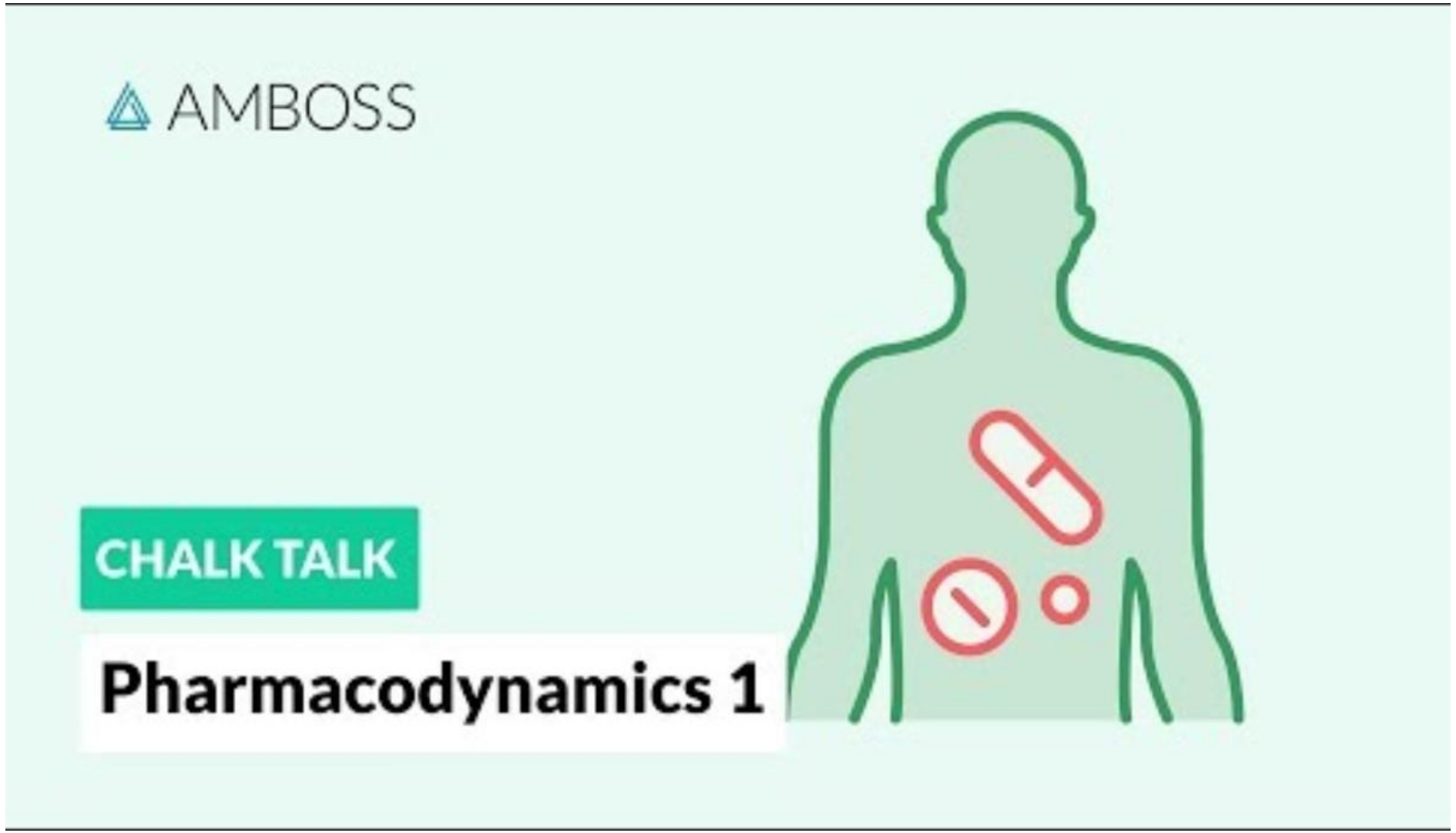
- Clearance of drug from the body.
- Mainly through urinary tract; some through biliary tract, breast milk, saliva, intestine, or lungs.
- Liver and kidney diseases can affect excretion, leading to toxicity.

Pharmacodynamics

- Study of drug effects on the body.
- Onset: Time when drug first takes effect.
- Peak Effect: Point of greatest drug effect.
- Duration of Action: Total time drug is active.
- Changes occur due to drug's ability to interact with receptor sites.
- Antagonists block receptor sites, while agonists increase receptor efficiency.

Watch the "Pharmacodynamics" video for an overview

Pharmacodynamics Video



Pharmacodynamics Video

Summary of Video:

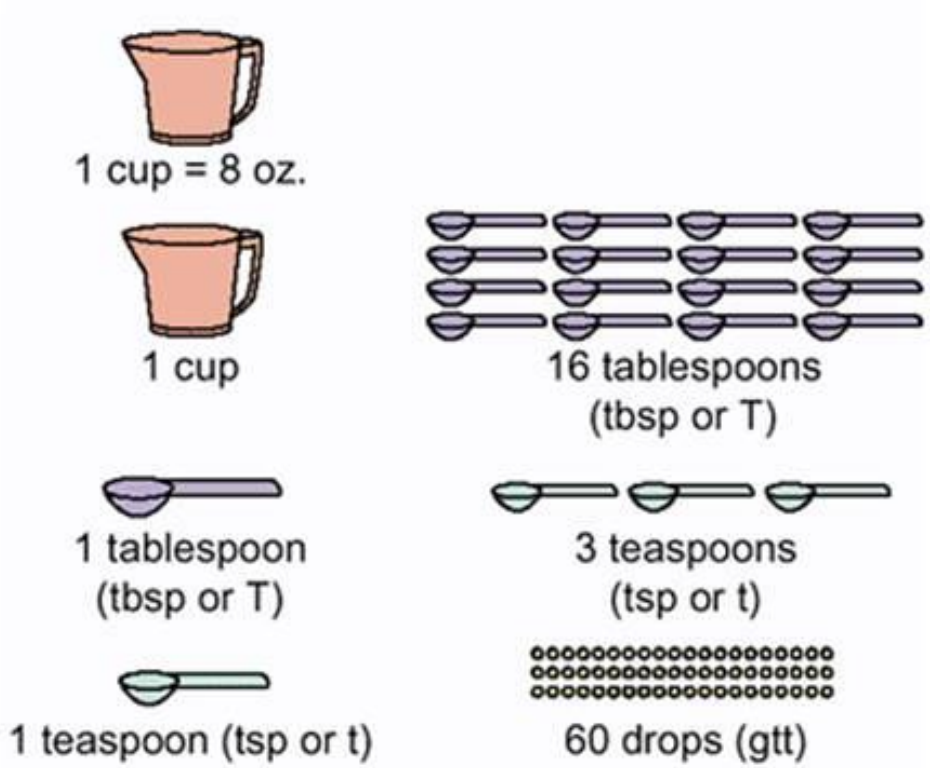
- Receptors and Enzymes: Target Structures that the drugs act on
- Agonist: Activation
- Antagonist: Inhibition

Therapeutic Window

- Range of drug concentrations producing desired effect without toxicity.
- Some drugs have narrow therapeutic windows, requiring precise dosing.
- Importance in surgery: Identification of drug strength and dosage to avoid toxicity.

Measurement Systems

- Metric
  - Ex. Milliliters (mL), Milligrams (mg), etc
- Apothecary
  - Ex. Drops (gtts)
- International units
  - 7 Base Units. For Medications: Meter (length),
  - Kilogram (Mass), Second (Time)
- Roman numerals
- International time ("military time")



Measurement Equivalents

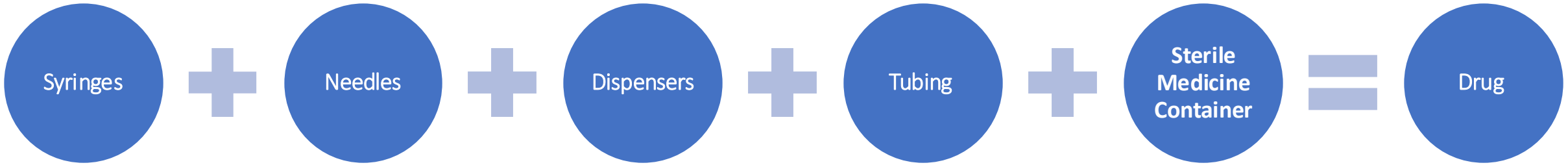
LENGTH:
1 yard = 914 mm (0.914 Meters)
1 inch = 25.4 mm (0.0254 Meters)
1 foot = 304.8 mm (0.3048 Meters)

VOLUME:
1 cubic cm= 1 mL (0.001 Liters)
1 fluid ounce = 30 mL (0.030 Liters)
1 pint = 500 mL (0.5 Liters)
1 quart = 1000 mL (1 Liter)
1 gallon = 4000 mL (4 Liters)

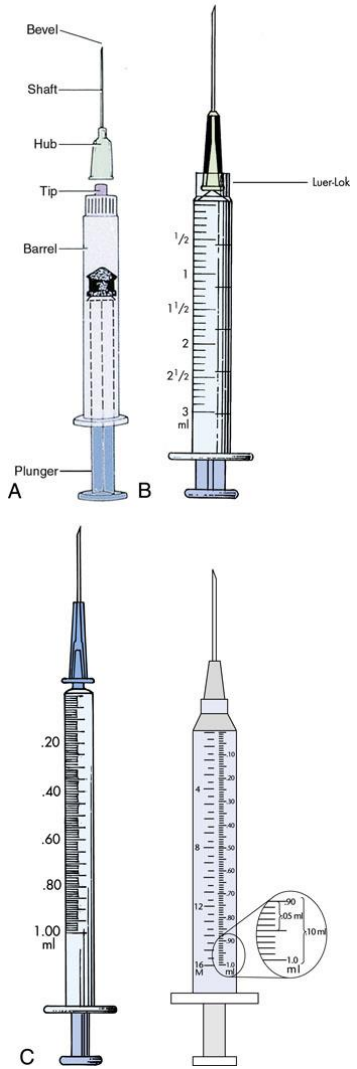
WEIGHT:
1 pound = 45359mg (453.59g)
1 ounce = 28349mg (28.34g)
1 grain = 64.79 mg (0.06479g)

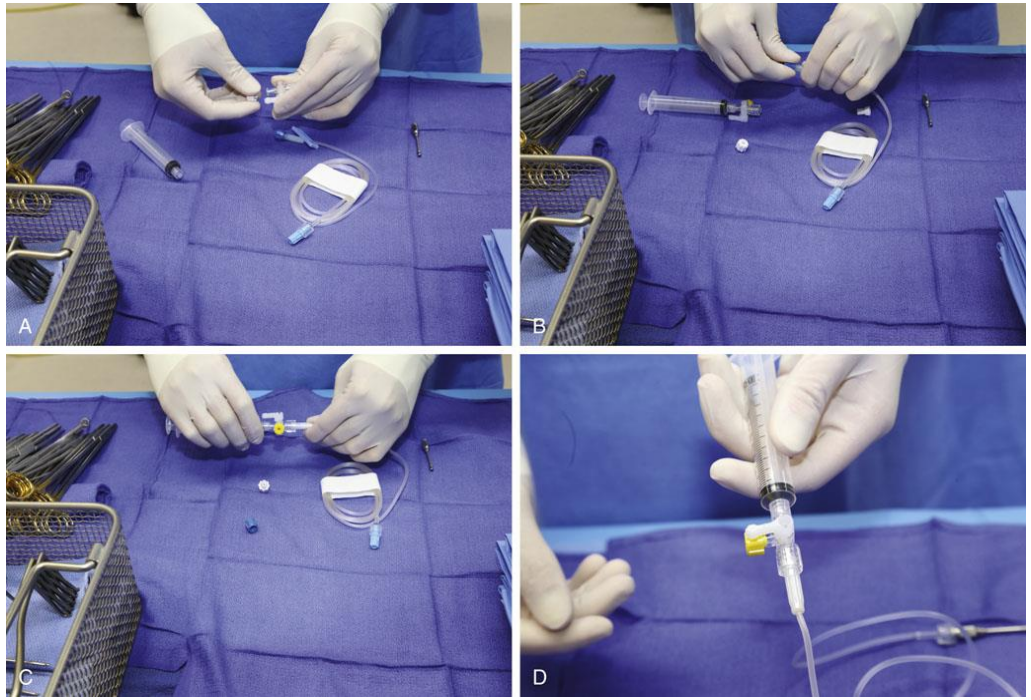
METRIC (Meter/Liter/Gram)		
Kilo	Km/kL/kg	1000
Hecto	Hm/hL/hg	100
Deca	Dam/daL/dag	10
Unit	m/L/g	1
Deci	Dm/dL/dg	0.1
Centi	Cm/cL/cg	0.01
Milli	Mm/mL/mg	0.001

Devices for Drug Preparation and Delivery



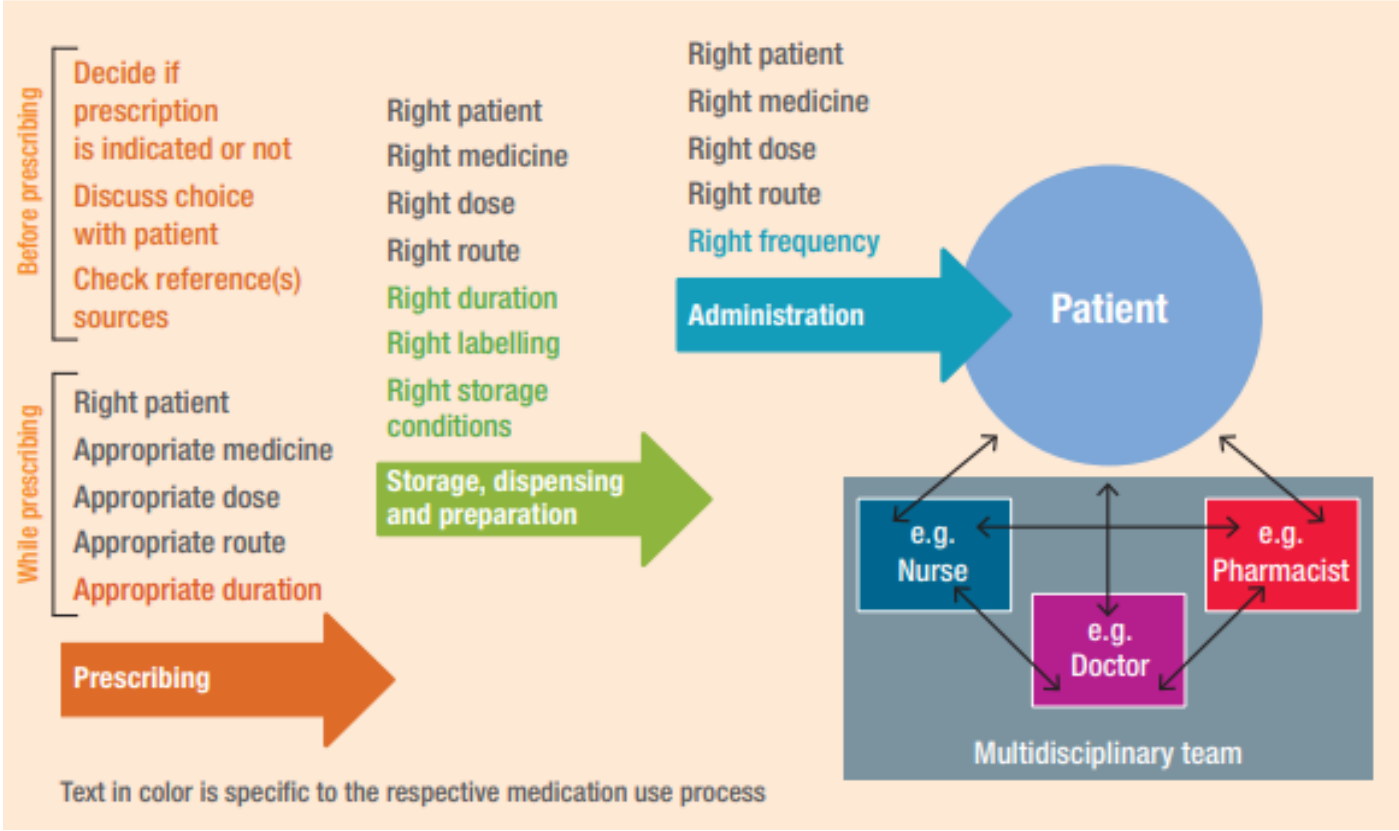
Devices for Drug Preparation





Drug Rights

- **Check these rights prior to every medication administration to prevent errors**
  - Right drug
  - Right patient
  - Right dose
  - Right route
  - Right time
  - Right indication
  - Right documentation



Prescription and Drug Orders

- In the first step of the drug process, a **prescription** is issued by a licensed health care provider.
  - The elements of an order are as follows:
  - Name of the patient
  - Name of the drug
  - Strength of the drug
  - Dose (amount)
  - Route
  - Time or frequency of administration

- In the clinical setting, the written prescription that the patient receives from the health care provider is replaced by a **drug order**

Types of Drug Orders

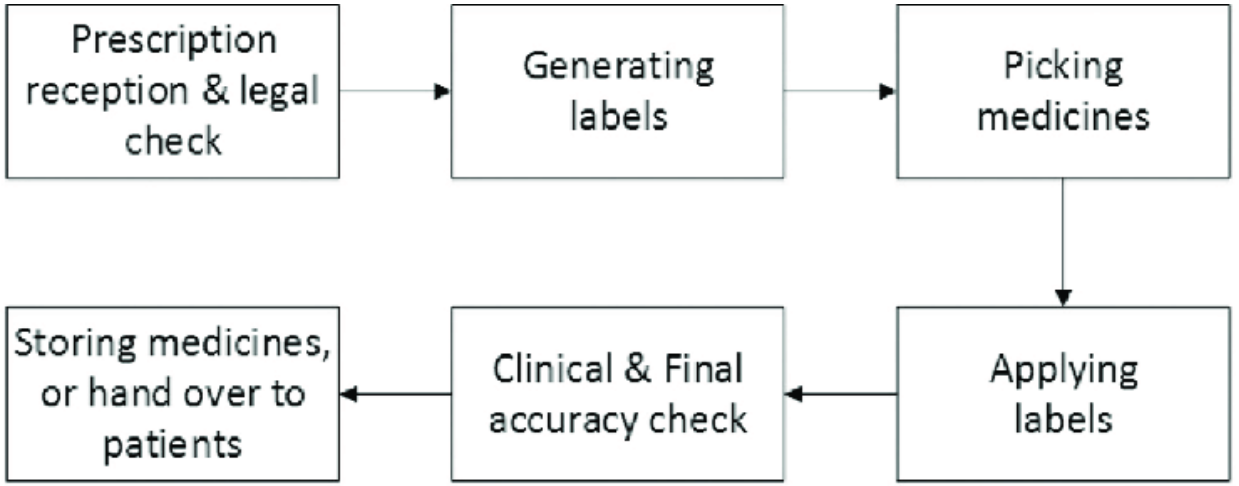
- Verbal order
- Written order
- Standing order
- STAT order
  - From latin – meaning "Immediately" or "Emergently"
- PRN order
  - From latin – means "As needed"
  - Pain medications are often PRN

Drug Preparation and Transfer to Surgical Field

- **Preparation by Circulating Nurse:**
  - Reconstitution of powders with liquid diluents or combining drugs as required.
  - Selection of a delivery device for aseptic transfer to the sterile field.
- **Preparation by Scrubbed Surgical Technologist:**
  - Assembling plastic and stainless medicine containers or bowls, drug labels, and a marking pen.
  - Preparation of dispensing devices suitable for types and amounts of drugs to be received.
- **Responsibilities of Scrubbed Surgical Technologist:**
  - Knowing generic names, effects, dose limits, strengths, and concentrations of drugs.
  - Monitoring drug usage throughout the surgical case.
  - Sharing responsibility for drug errors as an intermediary in the drug-dispensing process.

Protocol for Dispensing and Receiving Drugs

- Select appropriate size and type of container
- Circulator holds to allow the scrub to easily read
- Both check the integrity
- The STSR reads the label out loud
- The circulator verifies, verbally and visually
- The circulator dispenses
- Label is reconfirmed
- Maximum dose is verified
- All containers are labeled



Dispensing Drugs to the Sterile Field

- **Circulator**
  - Hold drug so it can be seen
  - Recite drug name, dose, amount, strength, and expiration date
- **Surgical technologist**
  - Look at medication
  - Recite drug name, dose, amount, strength, and expiration date
  - Receive drug
  - Label drug
  - Recite to surgeon the name and concentration

Watch the "Dispensing and Drawing up Medications" Video to see this process

Dispensing and Drawing up Medications Video

Dispensing and Drawing up Medications Video

Summary of Video:

- Rights of Medication Administration: Review these every time
  - Right Patient
    - Verify Allergies
  - Right Medication
  - Right Dose
  - Right Route
  - Right Time
  - Right Documentation (Labelling)
- Label Medications Immediately when they are dispensed to sterile field

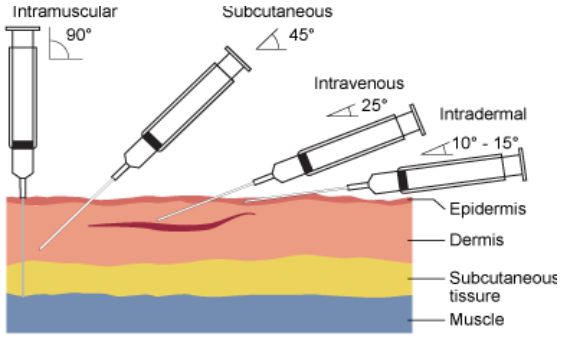
Parenteral Drug Administration Routes
(Slide 1 of 2)

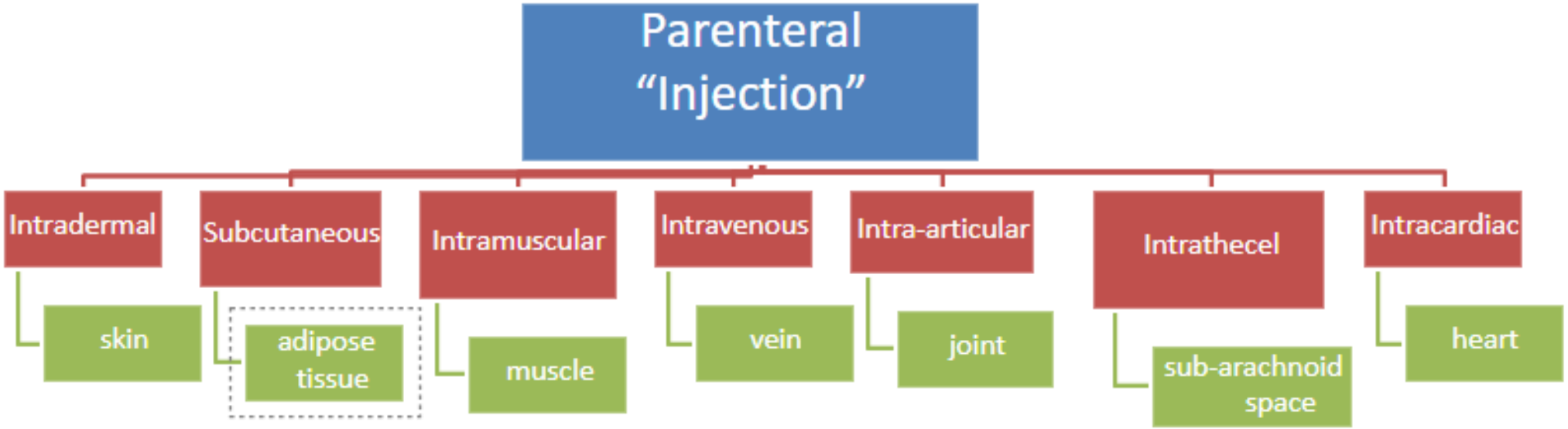
- Usual clinical routes of administration
- Usual clinical routes of administration

1) Parenteral: By Injection

- Intravenous (IV)
  - Through Veins
- Intraosseous (IO)
  - Into Bone, Usually done emergently if IV access cannot be established
- Intramuscular (IM)
  - Into Muscle – Ex. Vaccinations given IM
- Subcutaneous
  - Into Subcutaneous layer of skin – ex. Insulin given Subcutaneous
- Intradermal (between the dermis and epidermis)
- Intraspinal (Injection into the subarachnoid space (intrathecal) or epidural space (epidural injection)
- Intraperitoneal (Injected into the peritoneal cavity)

Parenteral Administration





Parenteral Drug Administration Routes
(Slide 2 of 2)

2) Oral: By mouth (PO, per os)

- Ingestion: Swallowed
- Buccal: Tablet placed between the gum and mucous membrane of the cheek
- Sublingual: Under Tongue

3) Topical: On surface Tissue

- Instillation: Administration of drops into the eye or ear
- Transdermal: Drug is absorbed through a skin patch
- Rectal: Topical effect or systemic absorption through the rectal mucosa
- Vaginal: Topical effect or absorption through the mucous membrane
- Nasal: On nasal mucosa
- Inhalant: Drug is inhaled as an aerosol and absorbed through the bronchial tree and lungs

Assessment and Documentation

- Monitor for adverse reaction to a drug
- Drug allergy
- Allergic reaction

- Required elements after administration
  - Drug name
  - Dose
  - Amount
  - Route
  - Time
  - Name of person administering
  - Patient assessment

Preventing Drug Errors

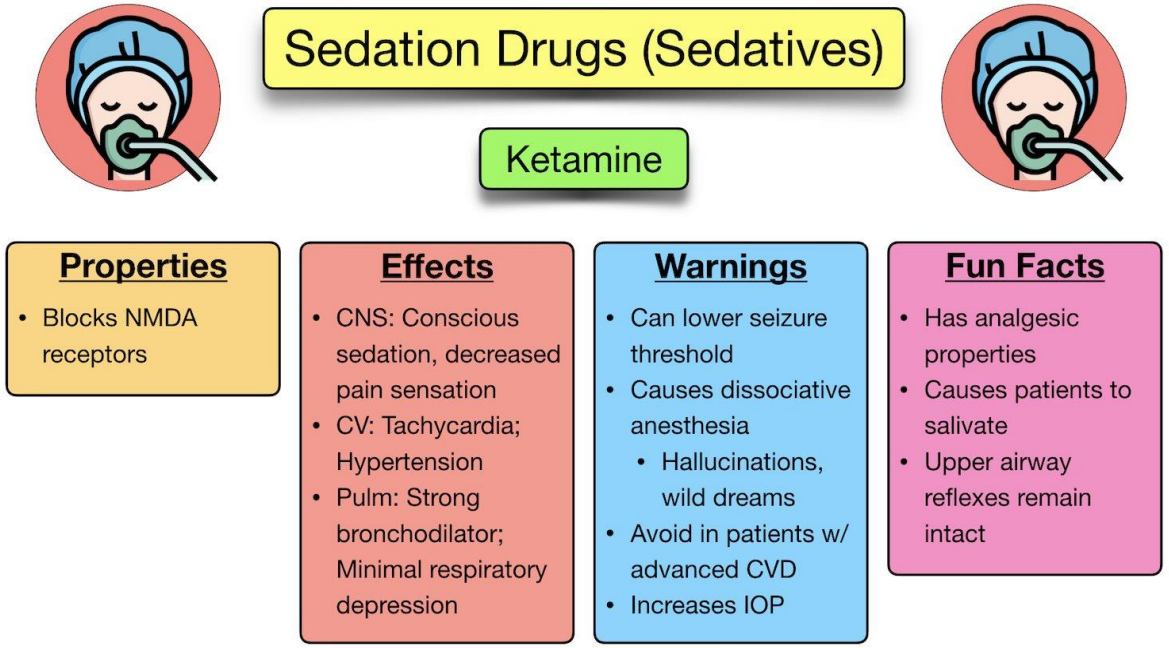
- To **avoid drug errors**, observe the following:
  - Patient information
    - Verify correct patient and patient allergies
  - Drug information
  - Drug packaging, labeling, and nomenclature
  - Environmental factors
  - Drug device acquisition, use, and monitoring
  - Staff competency and education
  - Patient education on medications
  - Quality processes and risk management

Medication Classifications

- **Look-alike, sound-alike drugs**
  - The Institute for Safe Medication Practices
  - Individual health care institution lists
- **High-alert drugs**
  - Drugs that have been implicated in an extraordinarily high number of errors
  - Must be able to differentiate them clearly

Surgical Drugs

- Local anesthetics
- Blood and blood derivatives
- Blood and blood products
- Hemostatic agents
- Anticoagulants and thrombolytics
- Central nervous system agents
- Neuromuscular blocking agents
- Analgesics
- Sedatives and hypnotics
- Contrast media
- Colored dyes and stains
- Anti-infective agents



Surgical Drugs

- Antineoplastic agents
- Drugs that affect the autonomic nervous system
- Fluid balance and electrolytes
- Irrigation fluids
- Cardiac drugs
- Diuretics
- Gastrointestinal drugs
- Hormones and synthetic substitutes
- Antidiabetic drugs
- Prostaglandins
- Drugs used in obstetrics
- Gonadal steroids
- Emergency drugs

DRUGS TO BE CONTINUED ON THE DAY OF SURGERY

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***Mnemonic :* SHE CANT STOP**

Steroids
HIV Drugs (ART)
Epilepsy drugs (Anti-Epileptics)

Ca channel blockers
ATT (Anti tubercular therapy)
NTG
Thiazides

Statins
Thyroid Drugs
OCP (progesterone only pill)
Propranolol (Beta Blockers)

Read chapter 12 from the E-book

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Thank you!

Get ready for your quiz and rest of the activities now. Best of luck!

Congratulations!

Lesson 12 is complete.