



Pharmacologic Principles

Unit 3 Part 2

Radiologic Technologists need a basic understanding of pharmacology principles



Current Practice Status

Professional Standards

ASRT Scope of Practice

- Performing venipuncture as prescribed by a licensed practitioner.
- Starting, maintaining and/or removing intravenous access as prescribed by a licensed practitioner.
- Identifying, preparing and/or administering medications as prescribed by a licensed practitioner.



Radiography Scope of Practice accessed 6/15/21 asrt.org

ASRT Practice Standard

- Radiographers prepare, administer and document activities related to medications and radiation exposure in accordance with federal and state laws, regulations or lawful institutional policy.
 - Standard 4 - Monitors the patient for reactions to medications.





Professional Liability

- The professional radiographer who administers drugs is expected to know the safe dosage, the safe route of administration, and the limitations of the drug to be administered. All potential hazards of any drug that is incorrectly or unsafely administered must also be known. If drug administration errors are made because of lack of knowledge, the person who administers the drug is legally liable.



Negligence

- Court decisions against a health care provider may be centered on what another provider in your profession would have done under the same circumstance to determine if your actions were appropriate or inappropriate (negligent). Negligence of duty is malpractice.

State Statutes and Employer Prerogative

- State Statutes: <http://www.pacodeandbulletin.gov/>
- Employer Prerogative:
 - Free will of management to conduct its own affairs to achieve its purpose.
 - However, the exercise of its management prerogative through policies, rules and regulations on work-related activities of the employees must always be fair and reasonable and the corresponding penalties, when prescribed, commensurate to the offense involved and to the degree of the infraction.

<https://definitions.uslegal.com/m/management-prerogative-law/>



Basic Principles of Pharmacology



- Drug – Any substance that, when taken into a living organism, may modify one or more of its functions
- Pharmacology – Study of drugs and their origin, nature, properties, and effects on living organisms

Classifications

Nomenclature
Chemical group (Action)
Method of Legal Purchase
Mechanism and site of action
Primary effect

+

o

•

Nomenclature

(classified system of names)

- *Chemical Name*: N-acetyl-p-aminophenol, C₈H₉NO₂
- *Generic Name* (Nonproprietary name): *acetaminophen*
- *Brand Name* (Trademark, Trade name, Proprietary name) : *Tylenol*

Chemical Group

(Action or Function)

- Grouped into **FAMILIES** that have similar chemical actions
 - Family: Relieve Pain → analgesics
 - Family: Treat high BP → antihypertensives
 - Family: fight inflammation → anti-inflammatories

WARNING: one drug may be listed in more than one family

Legal Purchase

Prescription vs. Non-prescription

FDA: "Caution: Federal law prohibits dispensing without prescription"

Mechanism and site of action (MOA)

- a term used to describe how a drug or other substance produces an effect in the body

Primary Effect

- Desired therapeutic effect of the drug



General Pharmacologic Principles

Pharmacokinetics
Pharmacodynamics
Pharmacogenetics



Pharmacokinetics

- Study of how a drug is absorbed into the body, circulates within the body, is changed by the body, and leaves the body
 - Absorption
 - Distribution
 - Metabolism
 - Excretion

Absorption

- Drug movement from its site of administration into the blood.
- The drug must be absorbed and taken through the bloodstream to its intended site in order to act.
- Absorption also depends on the surface available

Absorption

- The rate and extent of drug absorption depend on a number of factors...
 - Route of drug administration
 - Dosage form
 - Gastro-Intestinal motility
 - Interaction with food/other drugs
 - Absorption surface available
 - Blood flow
 - Age and present disease

Distribution

- After absorption, the drug is *distributed* via circulation (bloodstream) to target tissues
 - If circulation compromised, distribution of the drug is also compromised
 - Some drugs accumulate in specific tissues (fat) which can prevent the drug from reaching target site

Metabolism

(Biotransformation)

- Body alters the chemical structure of a drug or other foreign substance
- Most drugs are metabolized in the liver
- Many factors can alter drug metabolism

- Delay drug metabolism could cause an adverse reaction
- Rapid drug metabolism could interfere with intended effect

Excretion

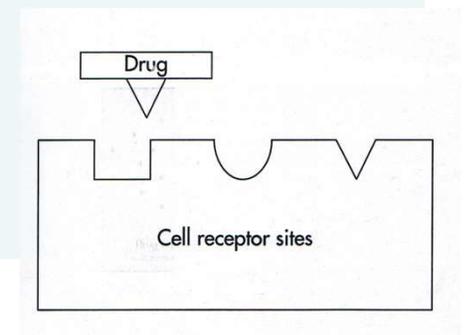
- Clearance Rate = Drug's removal from the body
- Primarily occurs in the kidneys
 - Other removal:
 - Intestines
 - Lungs
 - Breast milk
- Slow clearance rate and drug given too often = toxic level
- Contrast media is not metabolized = excretion in about 24 hours

Excretion: Half-Life

- The time it takes for a 50% decrease in a drug's presence in the body
 - Ex: $100 \rightarrow 50 \rightarrow 25 \rightarrow 12.5 \rightarrow 6.25 \rightarrow 3.125 \rightarrow 1.56$ etc
- Short half-life = more frequent doses

Pharmacodynamics

- Study of the method or mechanism of drug action on living tissues or the response of tissues to chemical agents at various sites in the body
- Drugs can alter physiologic effects in the body
- Receptor
 - The particular area for which a drug is intended and that receives the maximum effect
 - Agonist vs Antagonist



Therapeutic Index/Range

Measures the safety of a drug

- The relation between dosage at which the intended effect of a drug is obtained and the amount that produces an unwanted effect

When a drug does not have the desired effect, it causes.....

DRUG REACTIONS

Undesirable drug effects

- **Side Effect**
 - When a drug produces an effect that is mild, common, and/or non-toxic
 - Drug acts on unintended tissues
- **Adverse reaction**
 - When a drug produces a severe or more life-threatening reaction
 - Toxic Reaction
 - Unwanted effect that is an extension of the therapeutic effect otherwise known as Overdose
- **Drug Tolerance**
 - Occurs when a drug received continually for a length of time creates a change in the response to the drug

Pharmacogenetics

- The study of how genes affect a person's response to drugs
- Combines field of pharmacology and genomics

Most drugs today are a “one size fits all” ---but not all drugs work the same for everyone.



6 Rights of Drug Administration

- ✓ RIGHT medication
- ✓ RIGHT dose
- ✓ RIGHT patient
- ✓ RIGHT time
- ✓ RIGHT route
- ✓ RIGHT documentation



**Chapter 21 pg. 267
ASRT – states 6 RIGHTS versus Textbook*

Right: MEDICATION

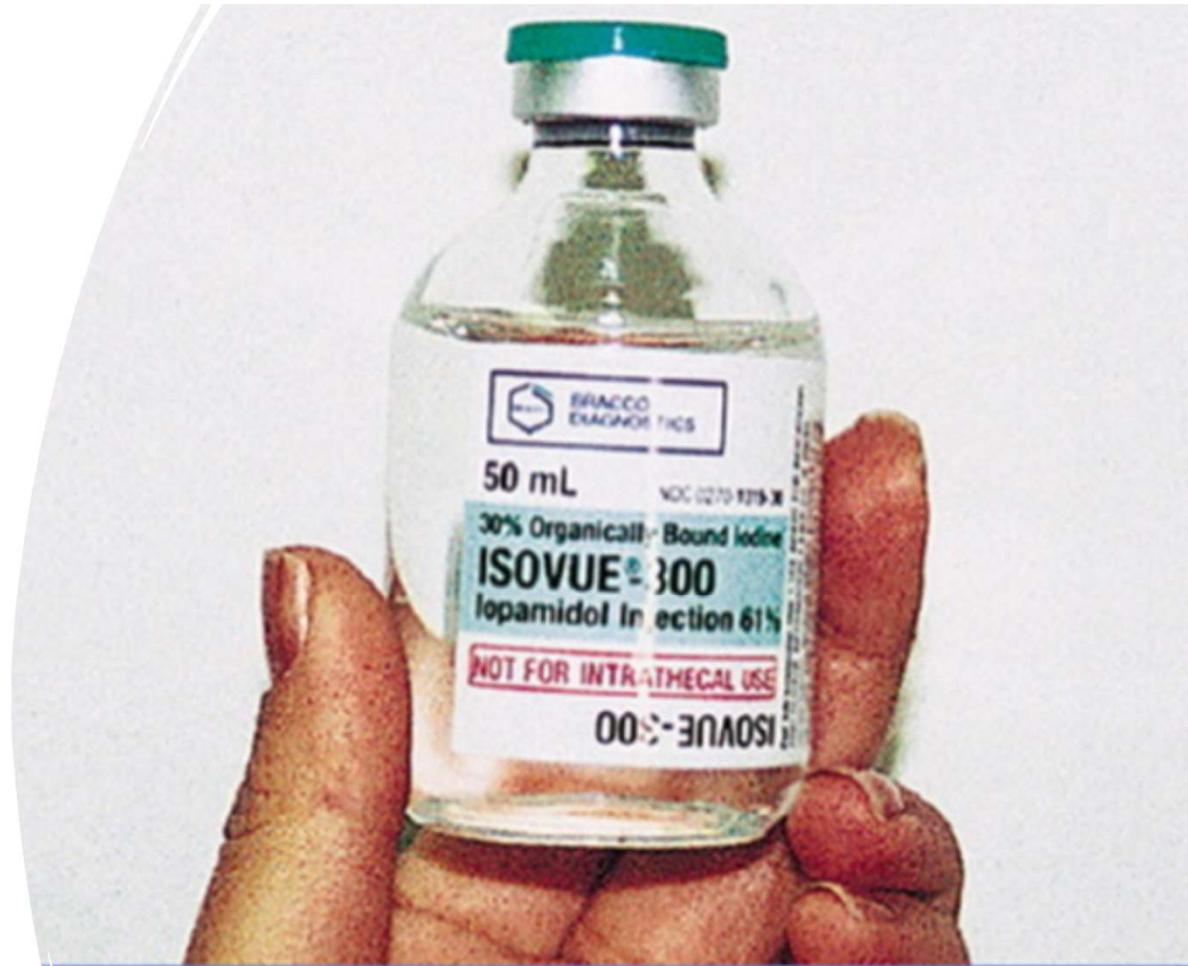
(Drug)

Read the label **3** times— Check Name Carefully!

- When container removed from storage area/shelf
- When drug is removed from the container
- When container is replaced

- Never use an unlabeled drug/medication

- Check for expiration dates



Confirm contents and
expiration date

Right: DOSE
(Amount)

Calculate/measure dose accurately

- Check Radiology Dept Protocols
- IF there are any questions with dosage – speak with the Radiologist Assistant or the Radiologist

Right: PATIENT

Must receive the drug

Follow institution/employers' protocol for patient identifiers

- Verify the patient's identification **each** time a medication is given
- Check
 - Name
 - MRN
 - DOB





Right: TIME

- Radiologic Technologist does not determine the time of administration
 - Follow facility protocols (Example: Fluoroscopy, etc.)
- Physician/Practitioner responsible for ordering drug and determining time of administration
- Once drug/medication administered—do not leave unattended.....Patient could have allergic reaction

Right: ROUTE

- Physician/Protocol specifies route
- Radiology- Follow Protocols
- Most common routes:
 - Oral
 - Intravenous (IV)
 - Rectal
 - Intrathecal
- Things to consider:
 - Absorption
 - Conscious State
 - Ability to swallow

Let's talk more about
ROUTES

Oral

Rectal

Tube/Catheter

Inhalation

Topical

Parenteral

Oral Route

- Most common method of drug administration
- Abbreviation: PO → means by mouth
- ADVANTAGES:
 - Safest, most economical, and most convenient way of giving medication
- DISADVANTAGES:
 - May have bad taste, odor, may be large
 - May irritate gastric mucosa – nausea and vomiting
 - Seriously ill or uncooperative person might aspirate
 - Digestive enzymes may destroy them

