Pharmacology Principles

1. The study of how drugs enter the body, reach the site of action, and are removed from the body is called
   a. pharmacotherapeutics
   b. pharmacology
   c. pharmacodynamics
   d. pharmacokinetics

2. The use of generic drug names is recommended because:
   a. They can then be classified in published literature
   b. They are easily recognized and pronounced
   c. They identify the drug’s precise chemical structure
   d. They are used when writing prescriptions

3. Manufactures of brand name drugs hold the drug’s name copyright for:
   a. 7 years
   b. 10 years
   c. 13 years
   d. 20 years

4. Chemical names of drugs:
   a. Are easily recognized and pronounced
   b. Allow the drug to be classified in published literature
   c. Are used when writing prescriptions
   d. Identify the drug’s precise chemical structure

5. The brand name of a drug:
   a. Allows the drug to be classified in published literature
   b. Identifies the drug as coming from a specific manufacturer
   c. Means it is a higher quality drug than a generic drug
YOUR RIGHTS and three way checks

Right Drug
1. Check before removing the container from the drawer
2. Check as the amount of drug prescribed is removed from the container
3. Check before returning the container to storage

Right Dose
Any time that measuring system use to order the medication is different than how it is supplied by the pharmacy increases the risk of error. Double check all calculations with another nurse if possible. Double check calculations by reversing the math.

Right Patient
1. Always ask the patient to state his or her name prior to administering the drug.
2. Check the patient’s identification band against the medication administration record.
3. If the ID bracelet is smudged or illegible, or missing, the nurse must have it replaced.

Right Route
The route must be clearly identified on the pharmacy label for the person administering the drug. If not the HCP must be called to verify the route.

Right Time
Schedule drug administration to maximize therapeutic effects and minimize adverse effects. All routine drugs should be administered within 60 minutes of the time ordered (30 minutes before or after the prescribed time).

Right Documentation
Medication errors can result from inaccurate documentation. Documentation of the drug should clearly include the patient’s name, name of drug, time given, dosage, route and frequency. Ensure accuracy once per day by verifying the original drug order with the records used for preparation and administration of the drug.

Right to Refuse
This assumes, of course, that the patient is coherent and understands the implications of such action. Document the patient’s refusal, the reason for the refusal, and the notification of the HCP.
1. The nurse is having difficulty reading an order for a drug. The nurse knows the health care provider is very busy and does not like to be disturbed for such minor problems. The nurse should:
   a. Ask the unit secretary to interpret the physician’s handwriting
   b. Call a pharmacist to interpret the orders
   c. Call the health care provider to have the order clarified
   d. Consult the unit manager to help interpret the orders

2. Which of the following rights has been added to the traditional five rights of medication administration?
   a. Right time
   b. Right route
   c. Right drug
   d. Right documentation

3. Which of the components of the drug order identified below is missing? There may be more than one correct answer.

   2/28/10 Lasix 40mg now then 20mg daily for 5 days.

4. Documentation of the drug administration should clearly reflect the name, name of the administered, the given, and the drug’s ___________, ___________, and ___________.
Pharmacokinetics

Absorption: the movement of a drug from the administration site to the systemic circulation (e.g. from the stomach to the circulation: from the muscle to the circulation).
   The ways to cross the membrane:
   1. passage through channels or pores.
   2. passage with the aid of a transport system
   3. Direct penetration of the membrane (lipid soluble)

Distribution: the drug is transported via the circulation to its site of action.

   Protein binding of drugs can prevent the movement of drugs from the blood to the tissue. Only unbound drug is available to have its effects on the body. The amount of albumin in the blood can modify the availability of a drug in the body.

Metabolism: Is the body’s way to get rid of lipid soluble compounds, so they can be eliminated through the kidneys in urine. Enzymes in the liver known as the cytochrome P450 system do this job. Drugs are broken down into metabolites. Many times the metabolites have a change in chemical structure and no longer have effect on target tissues. A prodrug is one that must be metabolized into an active form. Sometimes a metabolite can be toxic. (Damaged or immature liver tissue can greatly impair metabolism)

Elimination: is the movement of a drug or its metabolites from the tissues back into the circulation and then to the organs of elimination. GI tract, respiratory system, sweat, saliva, tears and breast milk are able to eliminate drugs. The Kidney is the system of elimination. The kidneys use glomerular filtration, and active tubular secretion to rid the body of unchanged unbound drug molecules and their metabolites. Active transport may pump molecules into the urine. (Damaged or immature renal tissue can impair elimination)

True/False

1. _____ Drug formulations are designed and administered to produce either local or systemic effects.
2. _____ Active transport moves drugs from higher to lower concentration across a semipermeable membrane.
3. _____ Small, lipid-soluble, nonionized drugs readily diffuse across cell membranes, whereas larger, water soluble, ionized drugs do not.
4. _____ Acidic drugs, such as aspirin and ibuprofen, are nonionized in an acidic environment and thus are readily available for absorption in the stomach.
Multiple Choice

5. A health care provider would be particularly concerned about a patient’s ability to adequately eliminate drugs that are prescribed if the patient had dysfunction of which of the following body systems?
   a. gastrointestinal
   b. cardiovascular
   c. renal
   d. respiratory

6. Which of the following ingredients in a drug would be considered an active ingredient rather than an additive?
   a. binder
   b. polypeptide
   c. dye
   d. filler

7. A patient is receiving supplemental doses of vitamin D, a lipid-soluble drug. The health care provider knows that this drug will be absorbed through which of the following mechanisms of transport?
   a. active transport
   b. filtration
   c. pinocytosis
   d. simple passive diffusion

8. When drugs undergo metabolism, the reaction usually alters the chemical structure of the drug so that its metabolite is more_______________________ than the parent drug.
   a. acidic
   b. basic
   c. lipid soluble
   d. water soluble

Definitions: define the following terms.

1. Steady state

2. half-life

3. onset of action

4. peak effect

5. duration of action
Multiple Choice

1. A HCP uses knowledge of a drug’s half-life as a factor in determining:
   a. The dosage and frequency of drug administration
   b. The precise timing of drug distribution
   c. The precise timing of drug elimination
   d. Which brand of a generic drug to mandate

2. The route by which a drug is administered affects how quickly it reaches its:
   a. Half life
   b. peak
   c. onset of action
   d. Steady state

Matching

3. A drug’s ___________________________ is the time it takes an effective drug concentration to elicit a therapeutic response.
4. The ___________________________ is the time it takes for a drug to begin eliciting a therapeutic response.
5. ___________________________ describes the relationship between plasma drug concentration and its steady state and clearance from the body.
6. The time it takes for that drug to reach its highest effective concentration is known as the ___________________________.

<table>
<thead>
<tr>
<th>Half-life</th>
<th>Onset of action</th>
<th>Peak effect</th>
<th>Duration of action</th>
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Critical Thinking

You are caring for a 75 year old female patient who is admitted for sepsis. The HCP has added IV gentamicin every 12 hours to her treatment regimen, with instruction to obtain peak and trough levels with the third dose. The therapeutic range for gentamicin is 2-5, or 10mcg/mL. The results for the patient’s serum creatinine level has just arrived from the lab and it is 1.5 (normal for a female: 0.6-1.2mg/dL). What information and nursing actions are required at this time to safely carry out the health care providers orders?
Pharmacodynamics

Define the following terms

1. pharmacodynamics

2. bioavailability

3. affinity

4. intrinsic activity

5. agonist

6. antagonist

7. Potency

8. Efficacy
Which Term is Correct?
(Circle the term in the parentheses to make the statements correct.)

1. Proteins of the cell membrane are the most important (drug receptors / drug agonist).

2. The (magnitude/ specificity) of a drug effect is related to the effective concentration of the drug present at the receptor.

3. (Magnitude / specificity) is the property of receptors that allows them to differentiate among similar drugs and bind only to those with the critical features.

4. How much of a drug is actually available to produce an effect at the receptor is known as its (bioavailability / affinity).

5. The term (affinity / potency) is used to describe the strength of a drug’s binding to receptors.

6. (Efficacy / potency) refers to the degree to which a drug is able to produce maximal effects.

7. (Affinity / potency) refers to the dosage needed to produce a response.

8. Any compound, either natural or synthetic, that stimulates specific receptors is called an (agonist / antagonist).

Multiple choice
1. A drug that mimics the effects of an endogenous chemical in the body is called a(n):
   a. Agonist
   b. Antagonist
   c. Competitive inhibitor
   d. noncompetitive inhibitor

2. A HCP provider is reading drug information pertaining to bioavailability. This term refers to which of the following properties of a drug?
   a. The ability of a drug to treat a disease or illness
   b. The concentration of the active drug in a specific drug preparation
   c. The degree to which a drug produces an effect through binding to its site of action
   d. The number and severity of adverse effects of a drug

3. The majority of drugs are thought to act by which of the following mechanisms?
   a. Altering protein synthesis inside the cell
   b. Attaching to receptors on the cell surface
   c. Changing the DNA structure within the cell
   d. Promoting cell growth
True False
4. ____ The specificity of a drug effect is related to the effective concentration of the drug present at the receptor.

5. ____ Potency is influenced by the drug’s affinity for receptors and by the body’s absorptive, distributive, metabolic, and elimination capabilities.

6. ____ One drug that blocks the action of another drug at the receptor is known as an antagonist.

7. ____ Efficacy refers to the degree to which a drug is able to produce maximal effects.

8. ____ Magnitude is the property of receptors that allows them to differentiate among similar drugs and bind only to those with the critical features.

Drug Administration

Multiple choice

1. Absorption of enteral drugs occurs most frequently in the
   a. mouth
   b. stomach
   c. esophagus
   d. small intestine

2. What type of enteral medications should be avoided in children?
   a. syrups
   b. elixirs
   c. capsules
   d. tablets

3. The onset of action is rapid after IM administration because
   a. the drug is always in solution.
   b. the drug bypasses the vasculature.
   c. the muscle has a good blood supply.
   d. the drug reaches the GI system quickly.

4. The saline lock is an example of
   a. subcutaneous administration
   b. intradermal administration
   c. peripheral access device
   d. central access.

5. Which of the following would be affected if an enteric coated tablet were cut in half?
   a. absorption
   b. drug interactions
   c. adverse effects
   d. elimination