Miami Dade College

Course Description

RET2350 |Respiratory Care Pharmacology | 2.00 credits

This course is designed to provide training in the basic principles of the administration of medications including dosage and solutions. The drugs administered by respiratory therapists are covered in-depth, along with an introduction to the general pharmacological classifications of other drugs that may be administered to pulmonary patients. Prerequisites: CHM 1033, RET 1484; corequisites: RET 2503, 2275, 2275L.

Course Competencies

Competency 1: The student will describe the general concepts related to pharmacological therapy by:

1. Describe a drug's trade naming, generic naming, therapeutic dose, and side effects; determine whether it is a teratogen or carcinogen, when provided with the drug's information.
2. Describing the four phases of drug development.
3. Describing some aspects of governmental control of the abuse of prescription drugs and reviewing the five schedules of drugs as defined by the Federal Comprehensive Drug Abuse Prevention and Control Act of 1970.
4. Listing the sources from where detailed and up-to-date information about drugs can be obtained.
5. Defining pharmacology and describing several disciplines within the area of pharmacologic study.
6. Comparing and contrasting the different routes of medication administration.
7. Determining the safety of a drug by calculating the therapeutic index.
8. Predicting the action or effect of a receptor agonist and antagonist.
9. Explaining how lipid solubility and ionization affect the absorption of medications.
10. Identifying the patient factors that may alter drug effects.
11. Describe the process of drug metabolism and excretion and list the most common organs responsible for each.
12. Describing the overall function and differences between the somatic nervous system, the sympathetic division, and the parasympathetic division of the autonomic nervous system.
13. Explaining the function of neurotransmitters.
14. Comparing and contrasting the sites of action, neurotransmitters at the ganglion site, and neuroeffector sites of somatic, sympathetic, and parasympathetic nervous systems.
15. Listing the characteristic physiologic functions that the sympathetic and parasympathetic divisions control.
16. Identifying If given an adrenergic agonist drug and the receptors it acts on and be able to predict its effects on the blood vessels, heart, and lungs.
17. Determining the effects each α-blocking β-blocking drug will have on the patient's vital signs and listing the possible side effects when given a patient with low blood pressure.
18. Describing the mechanism by which the choline esters and anticholinesterase drugs work and the clinical effects one would expect to see with their use.
19. Explain in which clinical situations you would use an anticholinergic agent and what clinical and toxic effects you would expect to see.
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21. Calculating an appropriate medication dosage in both weight (milligram) and volume (milliliter) and converting medication dosages from one system to the other.
22. Determining dosages of reconstituted medications.
23. Converting metric dosage measures into household units.
24. Determining the appropriate volumes of drugs and diluents for administering continuous bronchodilator aerosol therapy using proportions.
25. Determining drug doses using percentage strength solutions.

Competency 2: The student will describe the function of the electrical conduction system of the heart assessing its function by ECG interpretation by:

1. Describing the characteristics of an aerosol solution that leads to more effective drug delivery into the lung tissue.
2. Listing the advantages and disadvantages of drug administration by the aerosol route. 3. Describing the equipment used for aerosol administration of drugs by small-volume nebulizer (SVN) and the procedure that should be followed.
3. Describing patient instructions for taking an effective SVN treatment.
4. Describe the purpose of a spacer or valved holding chamber device for aerosol administration.
5. Describing patient instructions for taking an effective dose of medication by MDI, including the use of a spacer or holding chamber.
6. Describing the use of SVN, MDI, and aerosol medications during continuous mechanical ventilation, including placement of these devices in the ventilator circuit.
7. List the drugs currently administered by powder aerosol (dry poser inhaler), including the devices used for this administration.
8. List the indications (for clinical settings) for drug administration by instillation and the disadvantages or hazards of drug administration by instillation.
9. Comparing and contrasting nebulizers, MDI, and dry powder inhalers for aerosol drug delivery.
10. Recommending the appropriate method for medication delivery when given a patient case study.
11. Comparing and contrasting bronchoconstriction and bronchospasm.
12. List the three categories of bronchodilators and describe the mechanism of how each class causes bronchodilation.
13. Describing the common adverse effects and contraindications of sympathomimetic, anticholinergic, and methylxanthine bronchodilators.
14. List the common drugs that interact with sympathomimetic, anticholinergic, and methylxanthine bronchodilators and predict the potential effect of using the drugs concomitantly.
15. Comparing the use of adrenergic, anticholinergic, and methylxanthine bronchodilators in clinical practice.
16. Assessing the clinical indications for short-acting and long-acting inhaled bronchodilators.
17. Suggest the most appropriate bronchodilator therapy, including the drug of choice and route of administration, given a patient case study.
18. Describing mucosal edema and how it relates to difficulty breathing or respiratory distress.
19. List the clinical conditions or diseases that may lead to bronchoconstriction caused by mucosal edema and therapies used for the treatment.
20. Recommending a dose and listing the important adverse effects that need monitoring and special consideration when using racemic epinephrine.
21. Describe asthma's pathophysiology and the rationale for using corticosteroid therapy to control asthmatic symptoms.
22. Describing the mechanism of action of corticosteroids used to treat airway inflammation.
23. Listing the brand and generic naming of inhaled corticosteroids used to treat airway inflammation and its adverse effects and contraindications.
24. Describing the mechanism of action of leukotriene inhibitors and antagonists.
25. Distinguishing between controlled and uncontrolled asthmatic patients and determining who would benefit most from using a monoclonal antibody.
26. Suggest the most appropriate drug therapy, including the drug(s) of choice, route of delivery, and recommended dosage(s), given a patient case study.
27. Comparing and contrasting the causes of mucus dysfunction in asthma, chronic obstructive pulmonary disease, and cystic fibrosis patients.
28. Define bland aerosol, mucoactive, mucolytic, mucokinetic, and expectorant.
29. Describing the therapeutic indications for the use of bland aerosols and mucolytic agents in airway maintenance.
30. Comparing and contrasting the two primary mucolytic aerosols.
31. Describing the proposed mechanisms of action, contraindications, and hazards of each mucolytic agent.
32. Describing the use of sodium bicarbonate as an expectorant or thinning agent

33. Suggesting the most appropriate mucolytic therapy, including the drug of choice, route of delivery, and recommended dosage, given a case study
34. Defining surface tension and describing the clinical importance of surface tension as it relates to the work of breathing.
35. Describing the physiologic purpose of pulmonary surfactant.
36. Describing the clinical indications for the use of surfactant replacement drugs.
37. Comparing and contrasting the three surfactant replacement drugs currently in use in the United States with relation to:
    a. Brand naming
    b. Indications
    c. Contraindications
    d. Side effects/adverse reaction
    e. Dosage and route of administration
38. Suggesting the appropriate surface-active agent, including dosage and method of delivery, given a patient case study.
39. List the most common indications for aerosolized antimicrobial agents.
40. Describing the disadvantages or limitations of aerosol administration of antimicrobial drugs.
41. Naming the FDA-approved aerosolized antimicrobial agents and special equipment required for each administration.
42. Describing contraindications and side effects of each drug that may be administered by aerosol as an antimicrobial agent.
43. Suggest the most appropriate antimicrobial therapy, including the drug of choice, route of delivery, and recommended dosage, given a patient case study.
44. Describing the purpose of lidocaine use during a bronchoscopy.
45. Composing a plan for the use of lidocaine during bronchoscopy, including strength, route of administration, and maximum dose.
46. Listing drugs used in performing "bronchial challenge" pulmonary function studies, including generic naming, actions, contraindications, and side effects/hazards.
47. Describing the role and differences between methacholine and mannitol when used for bronchial challenge testing.
48. Creating a plan for using inhaled nitric oxide and inhaled epoprostenol as selective vasodilators, dosage, and method of administration and monitoring for adverse effects.
49. Describing smoking cessation strategies and given a patient case be able to recommend appropriate pharmacologic smoking cessation therapy and instructions for use.

Competency 3: The student will describe the foundations of critical care pharmacotherapy related to advanced cardiac life support, cardiovascular, renal, endocrine, and central nervous systems as well as antimicrobial pharmacology by:

1. Identify the steps of rapid sequence intubation and summarize the actions and medications administered at each step.
2. Explaining the mechanism of action of neuromuscular blocking agents in patients requiring mechanical ventilation for respiratory failure.
3. List the medications used for pain management in the intensive care unit and identify possible adverse effects associated with these agents.
4. Assess the indications for deep sedation and light sedation and list appropriate medications for each indication.
5. Explaining the rationale behind coordinating daily sedation vacations with spontaneous breathing trials.
6. Distinguishing between the various types of shock and identifying the need for vasopressor therapy.
7. Explaining the differences in action and adverse effects between available vasoactive agents used for shock.
8. Indicating which advanced cardiovascular life support (ACLS) medications can be administered via an endotracheal tube and describing the proper administration technique.

9. Comparing the management of pulseless ventricular fibrillation/ventricular tachycardia with pulseless electrical activity/asystole cardiac arrest.
10. Suggest the most appropriate ACLS therapy, including the drug of choice and route of administration, given a patient case study.
11. Describe the basic physiology of the nephron and how it is related to the pathophysiology of hypertension.
12. Describe the mechanism of action of each class of diuretics and be able to determine the most appropriate class to use for the treatment of pulmonary edema.
13. Defining heart failure with reduced ejection fraction and coronary artery disease. 14. Identifying the drug classes used to treat heart failure with reduced ejection fraction.
14. Defining arrhythmia and listing the different types and most common causes of arrhythmias.
15. Describing the classification of antiarrhythmic drugs.
16. Describing the classification of antianginal drugs.
17. Describing the coagulation process and how it is affected by anticoagulants. 19. Describing the classification of anticoagulant drugs.
18. Describing the central nervous system's general anatomy and listing each area's functions.
19. Comparing the uses, mechanisms of action, and adverse effects of barbiturates and benzodiazepines.
20. Identifying factors that can enhance the effects of barbiturates and benzodiazepines.
21. Recommending a drug therapy for the treatment of respiratory depression caused by an acute opioid overdose.
22. Defining the term general anesthesia and listing the properties of an ideal general anesthetic.
23. Defining the term conscious sedation and describing the patient monitoring requirements.
24. Summarize the glucocorticoids' overall effects, therapeutic uses, and side effects.
25. Describe the overall function of the pancreas and explain the functions of insulin and glucagon.
26. Describing the role of the pancreatic enzymes in cystic fibrosis.
27. Comparing the pathogenesis of the two types of diabetes mellitus (DM).
28. Describing the relationship between antigen-antibody reactions, mast cells, and histamine.
29. Identifying the overall effects of histamine and listing the locations and types of histamine receptors.
30. Distinguishing between the typical uses and the adverse effects of first- and second-generation antihistamines.
31. Defining the terms antibacterial, antimicrobial, antiviral, antifungal, bacteriostatic, and bactericidal.
32. Summarizing the principles of appropriate use of antibiotics about empiric and definitive therapy.
33. Identify the microorganisms that cause upper and lower respiratory tract infections and determine appropriate drug therapy to treat these infections.
34. Comparing and contrasting antibiotic spectrums and common adverse effects.
35. Identify the three categories of antifungal drugs and examples of adverse effects.
36. Describe the overall approach to treating viral infections and list examples of antiviral drugs, therapeutic uses, and adverse effects.
37. Recommending an appropriate treatment regimen for managing tuberculosis and common side effects of each drug.

Learning Outcomes:

1. Communication
2. Numbers / Data
3. Critical Thinking
4. Information Literacy
5. Computer / Technology Usage
6. Ethical Issues