

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

38. 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
39. Suggesting the appropriate surface-active agent, including dosage and method of delivery, given a patient case study
40. List the most common indications for aerosolized antimicrobial agents
41. Describing the disadvantages or limitations of aerosol administration of antimicrobial drugs
42. Naming the FDA-approved aerosolized antimicrobial agents and special equipment required for each administration
43. Describing contraindications and side effects of each drug that may be administered by aerosol as an antimicrobial agent
44. Suggest the most appropriate antimicrobial therapy, including the drug of choice, route of delivery, and recommended dosage, given a patient case study
45. Describing the purpose of lidocaine use during a bronchoscopy
46. Composing a plan for the use of lidocaine during bronchoscopy, including strength, route of administration, and maximum dose
47. Listing drugs used in performing "bronchial challenge" pulmonary function studies, including generic naming, actions, contraindications, and side effects/hazards
48. Describing the role and differences between methacholine and mannitol when used for bronchial challenge testing
49. Creating a plan for using inhaled nitric oxide and inhaled epoprostenol as selective vasodilators, dosage, and method of administration and monitoring for adverse effects
50. 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
15. Defining arrhythmia and listing the different types and most common causes of arrhythmias
16. Describing the classification of antiarrhythmic drugs
17. Describing the classification of antianginal drugs
18. Describing the coagulation process and how it is affected by anticoagulants
19. Describing the classification of anticoagulant drugs
20. Describing the central nervous system's general anatomy and listing each area's functions
21. Comparing the uses, mechanisms of action, and adverse effects of barbiturates and benzodiazepines
22. Identifying factors that can enhance the effects of barbiturates and benzodiazepines
23. Recommending a drug therapy for the treatment of respiratory depression caused by an acute opioid overdose
24. Defining the term general anesthesia and listing the properties of an ideal general anesthetic
25. Defining the term conscious sedation and describing the patient monitoring requirements
26. Summarize the glucocorticoids' overall effects, therapeutic uses, and side effects
27. Describe the overall function of the pancreas and explain the functions of insulin and glucagon
28. Describing the role of the pancreatic enzymes in cystic fibrosis
29. Comparing the pathogenesis of the two types of diabetes mellitus (DM)
30. Describing the relationship between antigen-antibody reactions, mast cells, and histamine
31. Identifying the overall effects of histamine and listing the locations and types of histamine receptors
32. Distinguishing between the typical uses and the adverse effects of first- and second-generation antihistamines
33. Defining the terms antibacterial, antimicrobial, antiviral, antifungal, bacteriostatic, and bactericidal
34. Summarizing the principles of appropriate use of antibiotics about empiric and definitive therapy
35. Identify the microorganisms that cause upper and lower respiratory tract infections and determine appropriate drug therapy to treat these infections
36. Comparing and contrasting antibiotic spectrums and common adverse effects
37. Identify the three categories of antifungal drugs and examples of adverse effects
38. Describe the overall approach to treating viral infections and list examples of antiviral drugs, therapeutic uses, and adverse effects
39. Recommending an appropriate treatment regimen for managing tuberculosis and common side effects of each drug

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Demonstrate knowledge of ethical thinking and its application to issues in society
- Use computer and emerging technologies effectively