RESP-1340: PHARMACOLOGY FOR RESPIRATORY CARE

Cuyahoga Community College

Viewing: RESP-1340: Pharmacology for Respiratory Care

Board of Trustees:
2014-12-04

Academic Term:
2015-08-25

Subject Code
RESP - Respiratory Care

Course Number:
1340

Title:
Pharmacology for Respiratory Care

Catalog Description:
General principles of pharmacology and calculations of drug dosages. Discussion of pharmacologic principles and agents used in treatment of cardiopulmonary disorders.

Credit Hour(s):
2

Lecture Hour(s):
2

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
RESP-1300 Respiratory Care Equipment and RESP-1310 Cardiopulmonary Physiology.

I. ACADEMIC CREDIT

Academic Credit According to the Ohio Department of Higher Education, one (1) semester hour of college credit will be awarded for each lecture hour. Students will be expected to work on out-of-class assignments on a regular basis which, over the length of the course, would normally average two hours of out-of-class study for each hour of formal class activity. For laboratory hours, one (1) credit shall be awarded for a minimum of three laboratory hours in a standard week for which little or no out-of-class study is required since three hours will be in the lab (i.e. Laboratory 03 hours). Whereas, one (1) credit shall be awarded for a minimum of two laboratory hours in a standard week, if supplemented by out-of-class assignments which would normally average one hour of out-of-class study preparing for or following up the laboratory experience (i.e. Laboratory 02 hours). Credit is also awarded for other hours such as directed practice, practicum, cooperative work experience, and field experience. The number of hours required to receive credit is listed under Other Hours on the syllabus. The number of credit hours for lecture, lab and other hours are listed at the beginning of the syllabus. Make sure you can prioritize your time accordingly. Proper planning, prioritization and dedication will enhance your success in this course.

The standard expectation for an online course is that you will spend 3 hours per week for each credit hour.

II. ACCESSIBILITY STATEMENT

If you need any special course adaptations or accommodations because of a documented disability, please notify your instructor within a reasonable length of time, preferably the first week of the term with formal notice of that need (i.e. an official letter from the Student Accessibility Services (SAS) office). Accommodations will not be made retroactively.
A. Evaluate specific information on various categories of drugs.

Course Outcome(s):

Outcomes
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comply with the College's Zero Tolerance for Violence on College Property available at
http://www.tri-c.edu/accessprograms/pdf/.

As a Tri-C student, your behavior on campus must comply with the student code of conduct which is available on page 29 within
a designated parking area only by an individual in possession of a valid conceal carry permit.

College policy prohibits the possession of weapons on college property by students, faculty and staff, unless specifically approved in
advance as a job-related requirement (i.e., Tri-C campus police officers) or, in accordance with Ohio law, secured in a parked vehicle in
a designated parking area only by an individual in possession of a valid conceal carry permit.

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Outcomes

Course Outcome(s):

A. Evaluate specific information on various categories of drugs.
Objective(s):
1. Demonstrate an understanding of basic terminology for respiratory care pharmacology.
2. Identify the official drug publication in the U.S.
3. Identify four common sources of drug information.

Course Outcome(s):
B. Describe the basic principles of drug action emphasizing the pharmaceutical phase, pharmacokinetic phase and pharmacodynamic phase.

Objective(s):
1. Identify the three phases involved in drug action.
2. Identify five different routes of administration and give advantages and disadvantages of each route.
3. Identify the four processes involved in the pharmacokinetics phase.
4. Identify the essential concepts involved with the interaction of a drug molecule with its target receptor site.

Course Outcome(s):
C. Calculate and interpret adult dosages for medications given by respiratory care practitioners.

Objective(s):
1. Calculate dosages from percentage strength solutions.
2. Calculate the amount of solute per ml of solution given a ratio.
3. Calculate the ratio of drug to diluent given the amounts of drug and diluent or simple parts.
4. Calculate the amount or volume of drug needed given a medication order and the dose and amount of medication on hand.
5. Calculate a dosage based on a schedule (mg/Kg).
6. Identify correct dose and schedule for adult medications administered by respiratory care practitioners.
7. Convert from one unit to another within the metric system.

Course Outcome(s):
D. Differentiate between drugs affecting the autonomic nervous system, parasympathetic and sympathetic branch and their relationship to the heart and lungs.

Objective(s):
1. Describe the two branches of the autonomic nervous system.
2. Describe the effects that the sympathetic and parasympathetic branches of the ANS have on various body processes.
3. Identify drug representatives for parasympathomimetic (cholinergic) agents.
4. Identify drug representatives of the parasympatholytic (anticholinergic/antimuscarinic) agents.
5. Identify sympatholytic (antiadrenergic) agents.
6. Identify drug representatives for sympathomimetic (adrenergic) agents.
7. Identify pharmacologic effects of beta sympathetic stimulation.
8. Identify and understand the mechanism of action on bronchial smooth muscle and skeletal muscle of the parasympatholytic drugs.
9. Identify the role of parasympathetic stimulation in the normal lung.
10. Name desirable characteristics in a sympathomimetic bronchodilator.
11. Identify the advantages and disadvantages of aerosol administration of the sympathomimetic bronchodilators.

Course Outcome(s):
E. Evaluate the use of drugs given by respiratory care practitioners based on mode of action, therapeutic effect, adverse reactions and side effects.

Objective(s):
1. Identify dosage forms available, pharmacologic action on the lung, onset, duration, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for parasympatholytic bronchodilators.
2. Identify dosage forms available, pharmacologic action on the lung, onset, duration, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for sympathomimetic drugs.
3. Identify dosage forms available, pharmacologic action, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for mucus controlling drugs.
4. Identify dosage forms available, pharmacologic action on the lung, onset, duration, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for surfactant agents.
5. Identify dosage forms available, pharmacologic action, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for drug categories and types used in the treatment of pulmonary infections (antibiotics, antifungal agents, antituberculosis agents).
6. Identify dosage forms available, pharmacologic action on the lung, side effects, precautions, pharmaceutical precautions (i.e. storage requirements), and generic and trade names for drug categories and types used as anti-inflammatory agents delivered by aerosol administration and their application in clinical settings.

Course Outcome(s):
G. Compare drug categories and types used as skeletal muscle relaxants, their applications and clinical uses.

Objective(s):
1. Identify the mechanism of action and pharmacodynamics for the nondepolarizing neuromuscular blocking agents.
2. Identify the mechanism of action and pharmacodynamics for the depolarizing neuromuscular blocking agents.
3. Identify uses of neuromuscular blocking agents that relate to respiratory therapy/anesthesia.

Course Outcome(s):
H. Compare drug categories and types which both stimulate and depress ventilation, their application and clinical uses.

Objective(s):
1. Describe the differences between sedatives and hypnotics.
2. Identify the mechanism of action for the barbiturates.
3. Identify the primary uses of the barbiturates.
4. Identify the mechanism of action for the minor tranquilizers (benzodiazepines).
5. Identify representatives of the minor tranquilizers (benzodiazepines).
6. Identify the two major classes of antipsychotic drugs.
7. Identify the mechanism of action for the neuroleptic agents.
8. Identify the cardiac and CNS adverse reactions associated with the neuroleptic agents.
9. Identify the mechanism of action for the antidepressants.
10. Identify the cardiac, CNS and neurologic adverse reactions associated with the antidepressants.
11. Identify the mechanism of action for the narcotic analgesics.
12. Identify adverse reactions or side effects associated with the narcotic analgesics.
13. Identify the commonly used respiratory stimulants.
14. Identify uses for the respiratory stimulants and whether that use is indicated or not.

Course Outcome(s):
I. Compare drug categories and types which directly and indirectly affect cardiovascular function (electrophysiology, hemodynamics) their application and clinical uses.

Objective(s):
1. Identify the mechanism of action for the cardiac glycosides and the inotropic and chronotropic effects.
2. Identify the classes of antiarrhythmic drugs and several agents associated with each type.
3. Identify the major classes of antihypertensive drugs and several representatives of each class.
4. Identify the major mechanisms of action for the antihypertensive agents.
5. Identify the two major drug classifications included in the coronary vasodilators.
6. Identify the major indications for the coronary vasodilators.
7. Identify the more common cardiac stimulants and/or vasoconstricting agents.
8. Identify the more common drugs used in an emergency resuscitation attempt.

Methods of Evaluation:
1. Quizzes
2. Examinations
3. Comprehensive test

Course Content Outline:
1. Basic terminology
   a. Drugs
   b. Pharmacology
      i. pharmacokinetics
      ii. pharmacodynamics
      iii. toxicology
      iv. therapeutics
      v. pharmacogenetics
2. Legislation
a. Official publications
b. Legislation in U.S.A.

3. The naming of drugs
   a. Chemical name
   b. Code name
   c. Generic name
   d. Official name
   e. Trade (proprietary) name

4. Sources of drug information
   a. United States pharmacopeia, national formulary
   b. AMA drug evaluations
   c. PDR (Physician’s Desk Reference)
   d. Hospital formulary (ASHP)
   e. The pharmacist

5. Sources of drugs
   a. Chemical synthesis
   b. Animal
   c. Plant
   d. Mineral (inorganic)

6. Development of a new drug
   a. Animal studies
      i. acute, subacute or chronic toxicities
      ii. therapeutic index
      iii. pharmacokinetic studies
   b. Human studies
      i. phase 1 - preliminary pharmacologic evaluation
      ii. phase 2 - basic controlled evaluation for efficacy and safety
      iii. phase 3 - extended clinical studies

7. Principles of drug action
   a. Pharmaceutical phase
      i. drug form (dosage form)
      ii. route of administration
         1. determining factors
            a. systemic or local effect
            b. desired rate of onset and duration of action
            c. stability of a drug in various body fluids
            d. convenience vs. safety
            e. the amount of drug to be given
         2. oral route of administration
            a. advantages
            b. disadvantages
            c. dosage forms (or types)
         3. parenteral route of administration
            a. advantages
            b. disadvantages
            c. dosage forms (or types)
         4. inhalation route of administration
            a. advantages
            b. disadvantages
            c. dosage forms (or types)
         5. topical route of administration (mucous membranes)
            a. advantages
            b. disadvantages
            c. types:
         6. topical route of administration (skin)
            a. advantages
            b. disadvantages
            c. dosage forms (or types)
   b. Pharmacokinetic phase
i. absorption
   1. passive - requires no energy expenditure
   2. active requires energy
   3. bioavailability

ii. distribution

iii. metabolism

iv. excretion
   1. renal
   2. liver-biliary excretion
   3. GI
   4. lungs
   5. other

c. Pharmacodynamic phase
   i. essential concepts
   ii. lock-and-key analogy
      1. drug affinity
      2. drug efficacy
      3. agonist
      4. antagonist
   iii. drug interactions
      1. additive
      2. synergistic
      3. potentiation
      4. antagonism
      5. partial antagonist
      6. cummulation
      7. tolerance
      8. tachyphylaxis
   iv. therapeutic index

8. The prescription
   a. Parts of a prescription
   b. Administering a drug
   c. Abbreviations

9. Calculating drug dosages and math problems
   a. The metric system
      i. unit of length
      ii. unit of volume
      iii. unit of weight
      iv. prefixes
   b. The apothecary system
      i. unit of length
      ii. unit of volume
      iii. unit of weight
   c. The avoirdupois system
   d. Conversion between systems
      i. approximate equivalents
      ii. household equivalents
   e. Drug dosage calculations
      i. calculating dosages from prepared strength liquids, tablets, or capsules
      ii. calculating dosages from percentage-strength solutions
      iii. diluents and drug dosage strengths
   f. Solutions definitions and terms
      i. solution
      ii. isotonic solution
      iii. hypertonic solution
      iv. hypotonic solution

10. Organization of the nervous system
a. Central nervous system
   i. the brain
   ii. spinal cord

b. Peripheral nervous system
   i. somatic branches
      1. sensory (afferent)
      2. motor (efferent)
   ii. autonomic nervous system
      1. parasympathetic branch
      2. sympathetic branch
      3. effects

c. Neurotransmitters
   i. acetylcholine
   ii. norepinephrine

d. Autonomic receptors
   i. cholinergic
      1. muscarinic
      2. nicotinic
   ii. adrenergic
      1. alpha1
      2. alpha2
      3. beta1
      4. beta2
      5. dopaminergic

e. Terminology
   i. parasympathomimetic (cholinergic)
   ii. parasympatholytic (anticholinergic)
   iii. sympathomimetic (adrenergic)
   iv. sympatholytic (antiadrenergic)

11. Cholinergic receptor stimulants
   a. Direct acting cholinergic stimulants
      i. representatives
      ii. pharmacokinetics
      iii. pharmacologic effects
   b. Indirect-acting cholinergic stimulants (anticholinesterases)
      i. representatives
      ii. pharmacokinetics
      iii. pharmacologic effects

c. Clinical uses

d. Adverse effects

12. Cholinergic receptor antagonists (parasympatholytics)
   a. Muscarinic-blocking drugs
      i. representatives
      ii. organ system effects
      iii. clinical uses
      iv. adverse effects
         1. central nervous system disorders
         2. respiratory system disorders
         3. cardiovascular system disorders
   b. Ganglionic blocking drugs
      i. representatives
      ii. cardiovascular system effects
      iii. clinical uses

13. Adrenergic receptor-blocking drugs (sympatholytics)
   a. Representatives
   b. Alpha-antagonists
      i. pharmacologic effects
      ii. clinical uses
         1. cardiovascular system
         2. respiratory system
c. Beta-agonists (blockers)
   i. pharmacokinetics differences
   ii. pharmacologic effects
   iii. clinical applications
      1. hypertension
      2. cardiac arrhythmias
      3. neurologic diseases

14. Sympathomimetic bronchodilators
   a. Action of bronchodilators
      i. pharmacologic effects
      ii. bronchodilation drugs
   b. Structure-activity relationship (catecholamine)
   c. Desirable characteristics in a bronchodilator
      i. half-life
      ii. specificity
   d. Routes of administration
      i. aerosol
         1. advantages
         2. disadvantages
      ii. oral
         1. drugs which are ineffective orally
         2. disadvantages of the oral route of administration
      iii. parenterally
         1. uses
         2. disadvantages
         3. drugs given parenterally
   e. Tolerance
      i. tachyphylaxis
   f. Metered dose inhaler delivery problems
      i. determination of dose by patient
   g. Current sympathomimetic bronchodilators
      i. strength
      ii. dose aerosol
      iii. pharmacologic effects
      iv. onset of action
      v. duration
      vi. peak effect
      vii. side effects
   viii. precautions
      ix. storage considerations

15. Parasympatholytic and xanthine bronchodilators
   a. Parasympathetic and sympathetic stimulation on bronchial smooth muscle
      i. physiology
      ii. key factors
   b. Parasympathetic role in bronchoconstriction
      i. non-asthmatic lungs
      ii. asthmatic lungs
   c. Mechanism of action of parasympathetic overstimulation
      i. afferent pathway
      ii. efferent pathway
   d. Aerosolized parasympatholytics
      i. naturally occurring parasympatholytic agents
      ii. pharmacological effects
         1. bronchioles
         2. secretions
         3. heart rate
         4. pupil
      iii. side effects of parasympatholytics
      iv. common parasympatholytic drugs
1. aerosol dosages
2. peak effects
3. duration of effects
4. pharmacologic action
5. side effects
6. xanthine agents
v. common agents
vi. pharmacologic effects
   1. central nervous system (CNS)
   2. skeletal muscle
   3. bronchioles
   4. pulmonary vasculature
   5. smooth muscle
   6. coronary arteries
   7. heart rate
   8. urine output
vii. therapeutic serum concentration
viii. individualized loading dosages
e. Sustained-release products
   i. advantages
   ii. disadvantages
f. Combination products
   i. advantages of combination products
   ii. disadvantages of combination products
16. Management of bronchial secretions
   a. Mucociliary system
      i. function
      ii. alterations in certain diseases
   b. Mucus production
      i. mucus
      ii. sol
      iii. gel
      iv. mucin
      v. sputum
c. Factors which slow mucociliary transport rate
      i. health status of the patient
      ii. mechanical alterations of tracheo-bronchial tree
      iii. drugs
      iv. pollutants
d. Factors which increase mucociliary transport
      i. drugs
      ii. physiologic factors
e. Mucolysis
      i. hydration
         1. systemic hydration
         2. topical hydration
         3. increased topical ph
         4. rupture of disulfide bonding
         5. proteolytic enzymes
         6. stimulation of additional secretions
      f. Physical properties of mucus
         i. cohesion
         ii. adhesion
         iii. rheology
         iv. viscosity
         v. elasticity
g. Improving mucus transport
         i. changes in viscosity
         ii. changes in elasticity
h. Common mucolytic agents
   i. strengths
   ii. dose (for inhalation)
   iii. mechanism of action
   iv. side effects
   v. physical incompatibilities
   vi. storage precautions
i. surface-active agents
   i. surface tension
   ii. mechanism of action
   iii. clinical application
   iv. common agents

17. Corticosteroids in respiratory care
   a. Major pharmacologic effects
   b. Physiology of corticosteroid secretion
   c. Pharmacology of glucocorticoids
      i. anti-inflammatory effects
         1. causes of inflammatory response
         2. mechanism of inflammatory changes
         3. mechanism of action of glucocorticoids in preventing inflammatory changes
      ii. pharmacologic effects of glucocorticoids
         1. changed in tissue histamine
         2. enhanced bronchodilation
         3. immunosuppression
         4. blood sugar
         5. fluid balance
         6. blood pressure
         7. gastrointestinal tract
         8. bone structure
         9. cushingoid effect
         10. adrenal suppression
      iii. danger of excessive exogenous steroids
   d. Aerosol vs. systemic therapy
      i. advantages
      ii. disadvantages
      iii. limitations
   e. Common aerosol drugs
      i. dosage
      ii. duration of action
      iii. side effects
      iv. clinical uses

18. Allergic asthma
   a. chemical mediators of inflammation
   b. systemic affects of released chemical mediators
      i. increased vascular permeability
      ii. contraction of smooth muscle
      iii. increased mucus secretion
      iv. vasodilation with edema
   c. affects of chemical mediator release in the lung
      i. bronchospasm
      ii. mucus plugging
      iii. mucosal exema
   d. control of mast cell discharge
      i. cAMP
      ii. cGMP
   e. Antileukotriene Agents and Monoclonal Antibodies
      i. mechanism of action
      ii. precautions
      iii. clinical applications
iv. dosage forms  
v. dose  
vi. adverse effects

19. CNS depressants and respiratory stimulants  
a. The central nervous system (CNS)  
i. basic anatomy  
ii. reticular formation  
1. reticular activating system  
2. limbic system  
iii. extrapyramidal system  
1. response to drugs  
2. dose-related  
3. descending manner  
b. Sedatives and hypnotics  
i. barbiturates  
1. structure-activity relationship  
2. duration of action  
3. metabolism  
4. tolerance mechanism of action  
5. adverse reactions  
6. clinical uses  
7. barbiturate intoxication  
8. drugs  
ii. minor tranquilizers  
1. mechanism of action  
2. adverse reactions  
3. agents  
c. Nonbarbiturate hypnotics  
i. mechanism of action  
ii. adverse reactions  
d. Antipsychotic drugs  
i. neuroleptics  
1. uses  
2. adverse drug reactions  
3. common agents  
ii. antidepressants  
1. uses  
2. adverse reactions  
3. agents  
e. Analgesics  
i. pain  
1. types  
2. mechanism of pain  
3. mechanism of action for analgesics  
ii. narcotic analgesics  
1. uses  
2. mechanism of action  
3. adverse reactions/side effects  
4. overdose  
5. narcotic antagonists  
6. agents  
iii. non-narcotic analgesics  
1. uses  
2. mechanism of action  
3. adverse reactions  
4. agents  
f. Respiratory stimulants  
i. agents  
ii. clinical uses
20. Neuromuscular blocking agents
   a. Physiology of the neuromuscular junction
   b. Mechanism(s) of action
      i. nondepolarizing neuromuscular blocker
      ii. depolarizing neuromuscular blocker
   c. Nondepolarizing neuromuscular blockers
      i. agents
      ii. mechanism of action
      iii. pharmacodynamics
   d. Depolarizing neuromuscular blockers
      i. agents
      ii. mechanism of action
         1. phase 1
         2. phase 2
      iii. pharmacodynamics
      iv. sensitivity to succinylcholine
      v. desensitization (dual) block
   e. Clinical pharmacology
      i. skeletal muscle paralysis
      ii. cardiovascular system
      iii. drug interactions
   f. Uses of neuromuscular blockers
      i. elective intubation
      ii. continuous paralysis (control of ventilation)
      iii. treatment of convulsions
   g. Specific agents

21. Anti-infective agents
   a. Definitions
      i. bactericidal
      ii. bacteriostatic
   b. Mode of action for anti-infective agents
      i. inhibition of cell wall synthesis
      ii. inhibition of cell membrane function
      iii. inhibition of protein synthesis
      iv. inhibition of nucleic acid synthesis
      v. competitive antagonism of some metabolite
   c. Clinical aspects
      i. broad-spectrum vs. narrow-spectrum
      ii. bactericidal vs. bacteriostatic
      iii. gram-positive organism vs. gram-negative organism vs. anaerobic organism
      iv. sensitivity testing
      v. development of resistance
   d. Major categories used in respiratory infections
      i. penicillins
         1. indications
         2. adverse reactions
         3. resistance
         4. penicillin allergy
      ii. cephalosporins
         1. common agents
         2. indications
         3. adverse reactions
      iii. aminoglycosides
         1. agents
         2. indications
      iv. tetracyclines
         1. common agents
         2. indications
         3. adverse reactions
v. sulphonamides
   1. common agents
   2. indications
   3. adverse reactions
vi. miscellaneous agents
   1. indications
   2. adverse reactions
e. Antifungal agents
   i. common agents
   ii. indications
   iii. adverse reactions
f. Antituberculosis drugs
   i. primary agents
   ii. indications
   iii. adverse reactions
g. Antiviral agents
   i. indications
   ii. mechanism of action
h. Aerosolized antibiotics
   i. systemic vs. local effects
   ii. treatment of gram-negative pulmonary infections
   iii. treatment of fungal infections
   iv. hazards of aerosolized antibiotics
22. Cardiovascular agents
   a. Categories of major drug groups
      i. heart
         1. cardiac glycosides
         2. antiarrhythmic agents
         3. cardiac stimulants
      ii. circulatory vessels
         1. antihypertensive agents
         2. coronary vasodilators
         3. pulmonary vasodilators
         4. vasoconstricting agents
      iii. blood (anticoagulants)
   b. Factors that influence mean arterial pressure
      i. cardiac output
      ii. contractile force
      iii. blood volume
      iv. venous return
c. Electrophysiology of the heart
   i. normal electrical pathways
   ii. rapid depolarization
      1. sodium movement
      2. calcium movement
   iii. action potential
   iv. absolute refractory period
   v. electromechanical dissociation
d. Effects-of cardiac agents
   i. terms
      1. inotropic
      2. chronotropic
      3. preload
      4. afterload
   ii. filling pressures
      1. right heart
      2. left heart
e. Cardiac glycosides
i. agents
  ii. mechanism of action
  iii. effects on the heart
  iv. uses
  v. adverse reactions
f. Antiarrhythmic drugs
  i. mechanism of action
  ii. adverse reactions
  iii. indications
g. Antihypertensives
  i. mechanisms of action
  ii. step-care approach to treating hypertension
  iii. common agents
h. Coronary vasodilators
  i. indications
  ii. agents
  iii. agents and doses
  i. Vasoconstricting agents/cardiac stimulants
    i. indications
    ii. agents
j. Drugs used in emergency resuscitation attempts

23. Antithrombotic Agents
   a. Clotting process
   b. Agents
      i. Anticoagulants
      ii. Antiplatelets
      iii. Thrombolytics
   c. Adverse effects

24. Diuretics
   a. common agents
   b. mechanism of action
   c. pharmacokinetics
   d. uses
   e. adverse reactions

Resources


