RSPT 51B: RESPIRATORY PHYSIOLOGY

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2023
Units:	3
Hours:	3 lecture per week (36 total per quarter)
Prerequisite:	RSPT 51A or equivalent.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade Only
Repeatability:	Not Repeatable

Student Learning Outcomes

- The student will be able to describe various mechanisms that control and effect ventilation and oxygenation.
- The student will be able to interpret arterial blood gases and initiate therapy based on results.

Description

Respiratory physiology, including normal and altered lung physiology. Ventilation-perfusion relationships. Control of ventilation, renal, aging, exercise, altitude, and high pressure effects on physiology. Arterial blood gas interpretation and acid-base physiology. Intended for students in the Respiratory Therapy Program; enrollment is limited to students accepted in the program.

Course Objectives

The student will be able to:

1. Compare and contrast elastic and static characteristics of the lung
2. Calculate carbon dioxide transport in the blood
3. Interpret arterial blood gases
4. Describe ventilation perfusion ratio differences in the lung
5. Identify components of the control of ventilation
6. Apply clinically common causes of renal failure and their effects on the patient
7. Calculate intrapulmonary shunt
8. Calculate Alveolar-arterial PO2 difference
9. Describe the influence of aging on the cardiopulmonary system
10. Describe and identify exercise, altitude, and high pressure effects on the cardiopulmonary system

Course Content

1. Ventilation
    a. Static characteristics of the lungs
    b. Elastic properties of the lungs
    c. Surface tension and its effect on lung expansion
    d. Dynamic characteristics of the lungs
    e. Airway resistance
    f. Time constants
    g. Dynamic compliance
    h. Normal ventilatory patterns
    i. Alveolar ventilation versus dead space ventilation
    j. How normal intrapleural pressure differences cause regional differences in normal lung ventilation
    k. The effect of airway resistance and lung compliance on ventilatory patterns
    l. Overview of specific ventilatory pattern
2. Carbon dioxide transport and acid base balance
    a. Carbon dioxide transport in plasma and red blood cells
    b. Carbon dioxide elimination at the lungs
    c. Carbon dioxide dissociation curve
    d. Acid base balance
        i. The pH scale
        ii. The buffer systems
        iii. The Henderson Hasselbalch equation
    e. The role of the PC02/HCO3-/pH relationship in acid base balance
3. Interpretation of arterial blood gases
    a. Define: acidosis, alkalosis, compensated, base excess, standard bicarbonate, actual bicarbonate, respiratory, metabolic
    b. Interpret representative blood gas analysis reports and recommend appropriate therapy
4. Ventilation perfusion relationships
    a. Ventilation-perfusion ratio
        i. How the ventilation-perfusion ratio affects the alveolar gases
        ii. How the ventilation-perfusion ratio affects the end-capillary gases
        iii. Respiratory quotient
        iv. Respiratory exchange ratio
        v. How respiratory disorders affect the V/Q ratio
5. Control of ventilation
    a. The respiratory components of the medulla
    b. Central chemoreceptors
    c. Reflexes that influence ventilation
        i. Hering-breuer inflation reflex
        ii. Deflation reflex
        iii. Irritant reflex
        iv. Juxtapulmonary-capillary receptors
        v. Reflexes from the aortic and carotid sinus baroreceptors
        vi. Other stimuli that affect ventilation
6. Renal failure and its effects on the cardiopulmonary system
    a. The kidneys
    b. Urine formation
    c. Urine concentration and volume
    d. Regulation of electrolyte concentration
    e. Renal failure
    f. Cardiopulmonary problems caused by renal failure
7. Shunts
    a. Non-pulmonary factors
    b. Anatomical shunts
    c. Intrapulmonary shunts
    d. Physiologic shunts

e. Shunt equation
f. Clinical significance of shunts

8. Alveolar-arterial difference
   a. FiO2 effects on P(A-a)O2
   b. Abnormal gas exchange
   c. Hypoventilation
   d. Absolute shunt
9. Aging and its effects on the cardiopulmonary system
   a. Influence of aging on the respiratory system
   b. Pulmonary gas exchange
   c. Arterial blood gases
   d. Influence of aging on the cardiovascular system
10. Exercise, altitude, and high pressure effects on the cardiopulmonary system
    a. Exercise and its effects on the cardiopulmonary system
       i. Ventilation
       ii. Circulation
       iii. Interrelationships between muscle work, oxygen consumption, and cardiac output
       iv. The influence of training on the heart and on cardiac output
       v. Stroke volume vs. heart rate in increasing the cardiac output
       vi. Body temperature/cutaneous blood flow relationship
    b. High altitude and its effects on the cardiopulmonary system
       i. High altitude
       ii. Ventilation
       iii. Polycythemia
       iv. Acid-base status
       v. Oxygen diffusion capacity
       vi. Alveolar-arterial P02 difference
       vii. Ventilation-perfusion relationship
       viii. Cardiac output
       ix. Pulmonary vascular system
       x. Other physiologic changes
       xi. Sleep
       xii. Myoglobin concentration
       xiii. Acute mountain sickness
       xiv. High altitude pulmonary edema
       xv. High altitude cerebral edema
       xvi. Chronic mountain sickness
    c. High pressure environments and their effects on the cardiopulmonary system
       i. Diving

Lab Content

Not applicable.

Special Facilities and/or Equipment

Computer access for online component.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Quizzes, midterms, and final examination, consisting of problem-solving and application of principles at the level of the respiratory therapist

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture presentations and classroom discussion on the topic of respiratory physiology, acid base physiology, and ventilation perfusion ratios
Demonstration and practical application of respiratory calculations

Representative Text(s) and Other Materials

Beachey. Respiratory Care Anatomy and Physiology, 5th ed.. 2022.

Kacmarek, Stoller, and Heuer. Egan's Fundamentals of Respiratory Care, 12th ed.. 2020.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Assigned reading from required textbooks and lab manual competencies relevant to course content. Reading assignments will average 20-40 pages per week

Discipline(s)

Respiratory Technologies