Fall 9-1-2018

AHRC 131.01: Respiratory Care Fundamentals I

Paul J. Crockford
University of Montana - Missoula, paul.crockford@umontana.edu

The University of Montana – Missoula College
Respiratory Care Program

COURSE NUMBER AND TITLE: **AHRC- 131 Respiratory Care Fundamentals I**

DATE REVISED: **SEMESTER CREDITS: 5**

CONTACT HOURS: Tue 14:00 – 16:20 112
Wed 09:00 – 11:20 112

PREREQUISITE: Acceptance into the Respiratory Care program

FACULTY:
Paul J. Crockford, MEd, RRT
paul.crockford@umontana.edu
Office: 316 Phone: 243-7918 Cell: 406-399-4501
Office Hours: M & T 1200hrs – 1400 hrs, W 1200 hrs – 1300 hrs and by Appointment

RELATIONSHIP TO PROGRAM: This course is the fundamental foundation for the respiratory therapy program.

COURSE DESCRIPTION:

An orientation to basic respiratory care science including the application of physical principles of respiratory care. Emphasis is on theory, operation; application, safety, infection control, and troubleshooting equipment used at the entry level of practice, pulmonary rehabilitation and alternative respiratory care setting are discussed.

STUDENT PERFORMANCE OUTCOMES:
Upon completion, the student will be able to:

1. Discuss a few, significant, historical beginnings associated with the profession and current professional associations.
2. Identify current patient safety issues and describe physical principles utilized in the field.
3. Describe principles and techniques of equipment disinfection and processes.
4. Identify characteristics of medical gases, their storage, distribution and regulation.
5. Discuss rationale for medical gas therapy, including physical principles, equipment utilized and measurement devices, clinical practice and evidence-based guidelines.
6. Discuss rationale for humidity and aerosol therapy, including physical principles, equipment utilized and monitoring techniques, clinical practice and evidence-based guidelines.
7. Discuss rationale for lung expansion therapy, including physical principles, equipment utilized, measuring and monitoring techniques, clinical practice and evidence-based guidelines.
8. Discuss rationale for bronchial hygiene therapy, principles and techniques employed, outcome monitoring, clinical practice and evidence-based guidelines.
9. Identify and discuss pharmacological agents utilized in the administration of respiratory care.

BEHAVIOR STUDY SKILLS:

If you have difficulty with test anxiety or study skills, please take responsibility and engage in the study skills workshop series offered by the University as quickly as possible. Please contact the ASC ext. 7882. In the past, the workshop series included:

1. Time Management
2. Memory
3. Note Taking
4. Reading Strategies
5. Testing Strategies

METHODS OF INSTRUCTION:

Lecture, textbook reading assignments, group discussion and other assignments, as deemed necessary.

STUDENT ASSESSMENT METHODS AND GRADING PROCEDURES:

Unit Exams: 70%
Assignments: 10%
Quizzes: 10%
Participation: 10%

GRADING SCALE:

A =	4.0	95-100%	C =	2.00	74-76%
A- =	3.67	90-95%	C- =	1.67	70-73%
B+ =	3.33	87-89%	D+ =	1.33	67-69%
B =	3.00	84-86%	D =	1.00	64-66%
B- =	2.67	80-83%	D- =	.067	60-63%
C+ =	2.33	77-79%	F =	0.00	

Students in the Respiratory Care Program **must have a "B-" (80% or greater) final grade in order to progress** within the program. Test questions will be based on unit objectives. Unit objectives are to be used as study guides. On the exam day clear your desktop area of all items. If possible use every other seating. Do not leave the room during the exam period until you are finished and have filled in ALL the bubbles for ALL the questions. Do not ask for clarification of words or content unless there is an obvious typo or numbering error. A key with the correct answers (letter) or graph will be posted. It works best not to discuss the key the day of the exam unless again you find an obvious mistake.

METHODS TO IMPROVE COURSE:
Student evaluations and respiratory faculty assessment of course content.

ATTENDANCE: Class attendance is an integral part of this course. Exam dates will be announced. Only legitimate reasons for missing an announced exam will be accepted. Failure to appear for scheduled exams will result in zero points awarded.. There is no make-up for missed quizzes.
SEE: TEST/QUIZ MAKEUP

Please refer to your Student Manual for additional Policies and Student Resources.

Academic Misconduct: All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.

All students need to be familiar with the Student Conduct Code. The Code is available for review online at **http://life.umt.edu/vpsa/student-conduct.php**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommasson 154. I will work with you and DSS to provide an appropriate accommodation. **http://www.umt.edu/disability**

Cell Phones/Pagers: Due to an increasing number of students, who own and use cell phones and pagers, it has become necessary to institute a policy during class times. As you are aware, these tools are distracting to an entire class. However, some students require them for business, which allows them to further their education. Please follow these guidelines:

If the cell phone/pager is not business or emergency related, please turn it off.
Use the vibration option on your phone/pager.
Do not listen to the messages in class. Please leave class quietly.
CELL PHONES AND PAGERS MUST BE TURNED OFF DURING EXAM AND CLASS PRESENTATIONS.

SEATING: Many classrooms have chairs to accommodate persons with disabilities. These chairs will display the international disability symbol and are assigned to a particular student. Please refrain from using these chairs or making adjustments to them unless the chair is assigned to you. If you think you may have the need for a specific chair, please contact Disability Student Services. Thank you for your cooperation.

TEST/QUIZ MAKEUP: Make-up exams and lab experiences **will only be given under extreme circumstances** and then only if: **a)** permission is granted ***in advance*** by the course instructor, or **b)** a written excuse is provided by a medical doctor. **The burden of proof is on the student**, so you must document and prove a justifiable absence. Not following this procedure prior to the exam will automatically result in a zero points awarded for the exam. Missed tests need to be made up within ***one week*** of the original date given. You are responsible for contacting the Academic Support Center, 243-7826, to schedule the make-up. Failure to do so will result in a ***ZERO*** grade for the missed test.

The faculty senate guidelines concerning the issuance of incomplete grades will be followed. Attention to critical dates such as P/NP, drop, etc. is the responsibility of the student. Students wishing to drop the class after the drop deadline will need a documented justifiable reason for doing so. Dropping the class for fear of bad grade or to protect a GPA are **not** justifiable reasons. The principles embodied in the **Student Handbook Code** will be adhered to in this course.

Quizzes: Failure to be present for quizzes will result in a zero being recorded and used in computing your average. There will be no make-up opportunities for missed quizzes.

Homework: **It is the expectation that homework will be turned in when due**. If you are not present, it is your responsibility to see that it is in my mailbox or desk by 4:00 p.m. on the due date **or a zero will be recorded and used in computing your average.**

Student Decorum: All students are expected to conduct themselves in a professional manner at all times in the classroom. Discussions of an academic nature are encouraged and can enhance student learning. However, social conversation is not appropriate during lectures because it creates a distraction to students and faculty. Respect and courtesy will be shown at all times to peers, faculty, and the general public. **There are no exceptions to this policy at any time or under any circumstances.**

REQUIRED TEXTS:

Title: Egan's Fundamentals of Respiratory Care, 11th Ed.
ISBN: 978-0-323-34136-3
Author: Kacmarek, et al
Publisher: Elsevier (Mosby)

Title: Rau's Respiratory Care Pharmacology, 9th Ed.
ISBN: 978-0-323-29968-8
Author: Gardenhire, D. S.
Publisher: Elsevier

Unit Outlines, Objectives, and Readings:

UNIT I: Foundations of Respiratory Care

Outline:

A. History (1),
B. Infection Control (4)

Objectives: At the end of this unit, the student will be able to:

1. Define respiratory care.
2. Explain how the respiratory care profession got started.
3. Describe the historical development of the major clinical areas of respiratory care.
4. Describe the major respiratory care educational, credentialing, and professional associations.
5. Describe the development of respiratory care education.
6. Predict future trends for respiratory care.
7. Define health care-associated infections and state how often they occur.
8. Describe why infection control is important in respiratory care.
9. Identify and describe the three elements that must be present for transmission of infection within a health care setting.
10. List the factors associated with an increased risk of a patient acquiring a nosocomial infection.
11. State the three major routes for transmission of human sources of pathogens in the health care environment.
12. Describe strategies to control the spread of infection in the hospital.
13. Describe how to select and apply chemical disinfectants for processing respiratory care equipment.
14. Describe equipment-handling procedures that help prevent the spread of pathogens.
15. State when to use general barrier measures during patient care.
16. Describe surveillance with regard to infection control.
17. Discuss respiratory tract infections in terms of:
    1. resistant microorganisms
    2. airborne bacterial organisms
    3. viral components

Possibly a quiz

UNIT II: Physics and Chemistry Principles of Respiratory Care (6, 11)

Outline:

A. Basic review of ventilation
    1. Simple spirogram, minute and alveolar ventilation
    2. Tidal volume, Functional Residual Capacity, Total lung Capacity
    3. Normal inspiratory flow curve
    4. Peak expiratory flow (technique and value)
    5. Resting spontaneous pleural and alveolar pressure graph
    6. Alveolar oxygen tension (pressure) P_AO_2 (the alveolar air equation)

B. Properties and states of matter.

C. Gas Laws and gas behavior
    1. Pressure, density, molar volume
    2. Absolute, and relative humidity

D. Fluid Dynamics
    1. Pressure, flow, velocity and cross-sectional area
    2. Bernoulli and venturi effect
    3. Poiseuille's Law
    4. Coanda effect
    5. Torricelli tube

Objectives: Upon completion of this unit the student will be able to:

1. Draw a simple spirogram, label RV, ERV, FRC, V_T, TLC, and the spontaneous P_{pl} and P_A pressure graph.
2. State the importance of the resting FRC value.
3. Describe the properties that characterize the three states of matter.
4. Identify the three common temperature scales and explain how to use them.

5. List normal values for an adult for: V_T, V_E, f, resting spontaneous inspiratory flow, maximum peak expiratory flow and normal adult $R_{aw.}$
6. Describe how substances undergo change of state.
7. Describe: velocity, pressure, flow, cross sectional area as they relate to fluid flow and capillary beds.
8. Describe how water vapor capacity, absolute humidity, and relative humidity are related.
9. Describe how to predict gas behavior under changing conditions, including at variations of temperature, volume and pressure.
10. Describe the principles that govern the flow of fluids.
11. Calculate problems with all equations and examples given in the class and workshop periods.
12. Write the empirical formulas discussed in class, solve for any given variable and explain the relationships described by the equation.
13. Write the conventional units of measurement used in the medical field for the formulas discussed.
14. Discuss where airway resistance is highest during a normal spontaneous breath.
15. Write the following equations:
    Alveolar air, minute and alveolar ventilation
    Celsius to Kelvin degrees
    Universal Ideal Gas Law (combined gas law), PV = nRT
    Pressure of a liquid
    Laplace's Law
    %BH and %RH
    Graham's Law
    Henry's Law
    Poiseuille's Law
    Airway Resistance, R_{aw} (clinical working formula)
    Dalton's Law
    Law of Continuity

- **Exam I, Chapter 6**
- **Exam II, Chapter 11**

UNIT III: Storage/Delivery/Therapy of Medical Gases (40, 41)

Outline:
A. Characteristics and storage of medical gases (40)
B. Oxygen and other medical gas therapies (41)

Objectives: Upon completion of this unit, the student will be able to:

1. Discuss the clinical applications for medical gases and gas mixtures.
2. Distinguish between gaseous and liquid storage methods.
3. Calculate the duration of remaining contents of a compressed oxygen cylinder.
4. Calculate the duration of remaining contents of a liquid oxygen cylinder.
5. Describe how to properly store, transport, and use compressed gas, cylinders.
6. Distinguish between gas supply systems.
7. Describe what to do if a bulk oxygen system fails.
8. Differentiate between safety systems that apply to various equipment connections.
9. Select the appropriate devices to regulate gas pressure and/or control flow during various clinical settings.
10. Describe how to assemble, check for proper function, and identify malfunctions in gas delivery equipment.
11. Identify and correct common malfunctions of gas delivery equipment.
12. See chapter 41 objectives.

- **Exam II, Chapter 40, 41**

UNIT IV: Basic Therapeutics (38, 39, 42, 43)

Outline:
A. Aerosol and Humidity Therapy (38)

B. Aerosol Drug Therapy (39)
C. Lung Expansion Therapy (42)
D. Bronchial Hygiene and Airway Clearance Techniques (43)

Objectives: Upon completion of this unit, the student will be able to:

1. Describe how airway heat and moisture exchange normally occurs.
2. State the effect dry gases have on the respiratory tract.
3. State when to humidify and warm inspired gas.
4. Describe how various types of humidifiers work.
5. Describe how to enhance humidifier performance.
6. State how to select and safely use humidifier heating and feed systems.
7. Describe how to monitor patients receiving humidity therapy.
8. Describe how to identify and resolve common problems with humidification systems.
9. State when to apply bland aerosol therapy.
10. Describe how large-volume aerosol generators work.
11. Identify the delivery systems used for bland aerosol therapy.
12. Describe how to identify and resolve common problems with aerosol delivery systems.
13. Describe how to perform sputum induction and send sample to the laboratory.
14. State how to select the appropriate therapy to condition a patient's inspired gas.
15. Define the term "aerosol".
16. Describe how particle size, motion, and airway characteristics affect aerosol deposition.
17. Describe how aerosols are generated.
18. List the hazards associated with aerosol drug therapy.
19. Describe how to select the best aerosol drug delivery system for a given patient.
20. State the information patients need to know to properly self-administer drug aerosol therapy.
21. Describe how to assess patient response to bronchodilator therapy at the point of care.
22. Describe how to apply aerosol therapy in special circumstances.
23. Describe how to protect patients and caregivers from exposure to aerosolized drugs.
24. Describe when oxygen therapy is needed.
25. Assess the need for oxygen therapy.
26. Describe what precautions and complications are associated with oxygen therapy.
27. Select an oxygen delivery system appropriate for the respiratory care plan.
28. Describe how to administer oxygen to adults, children, and infants.
29. Describe how to check for proper function and to identify and correct malfunctions of oxygen delivery systems.
30. Describe how to evaluate and monitor a patient's response to oxygen therapy.
31. Describe how to modify or recommend modification of oxygen therapy on the basis of patient response.
32. Describe how to implement protocol-based oxygen therapy.
33. Identify when and how to administer helium-oxygen therapy.
34. Describe the various causes of atelectasis.
35. Explain which patient needs lung expansion therapy.
36. Identify the clinical findings seen in atelectasis.
37. Describe how lung expansion therapy works.
38. List the indications, hazards, and complications associated with the various modes of lung expansion therapy.
39. Describe the primary responsibilities of the respiratory therapist in planning, implementing, and evaluating lung expansion therapy.
40. Draw the pleural pressure and alveola pressure for a SMI breath. Fig. 39-2.
41. Describe how normal airway clearance mechanisms work and the factors that can impair their function.
42. Identify pulmonary diseases associated with abnormal clearance of secretions.
43. State the goals and clinical indications for bronchial hygiene therapy.
44. Describe the proper techniques and potential benefit of each of the following:
    - Postural drainage
    - Directed coughing and related expulsion techniques.
    - Positive expiratory pressure therapy.
    - High frequency compression/oscillation methods.
    - Mobilization and exercise.
45. Evaluate a patient's response to bronchial hygiene therapy.
46. Identify bronchial hygiene therapies on the basis of patient response.

- **Exam III, Chapters 38, 39**
- **Exam IV, Chapters 42, 43**

UNIT V: Respiratory Care Pharmacology

Outline:

A) Egan's: Respiratory Care Pharmacology (35)
B) Rau's: Basic Concepts and Principles in Pharmacology (Unit One)
C) Rau's: Drugs Used to Treat the Respiratory System (Unit Two)

Objectives: Upon completion of this unit, the student will be able to:

1. Analyze three phases that constitute the course of drug action from dose to effect.
2. Describe classes of drugs that are delivered via the aerosol route.
3. Compare mode of action, indications, and adverse effects that characterize each major class of aerosolized drug.
4. Compare available formulations, brand names, and dosages for each specific drug class.
5. Select the appropriate drug class for a specific patient or clinical situation.
6. Calculate drug doses using proportions and/or percentage-strength solutions.
7. Assess the outcomes for each class of aerosol drug therapy.

- **Exam V (Finals Week)**

*Examination dates TBA