

Bergen Community College
Division of Health Professions
RSP-250, Respiratory Critical Care

Revised:

Course and Section Number:

Meeting Time and Location:

Instructor:

Office Location:

Phone:

Departmental Secretary:

Office Hours:

Email Address:

Course Description

Lecture hours, laboratory hours, and credits: 3 lectures, 3 labs, 4 credits

Prerequisites: RSP-226. Co-requisites: RSP-231 and RSP-240

Course Description: This course provides the student with advance skills necessary to manage the intensive care patient. Students will be learning to evaluate, monitor, and use protocols to provide advance management therapies based on pathophysiology of the critically ill patient. The laboratory portion of this course will reflect the practical application of the topics presented in lecture.

Learning Objectives: As a result of meeting the requirements in this course, the student will

Indications for Ventilatory Support

Goal: Identify the indications and objectives of mechanical ventilation; measure and assess the parameters of respiratory insufficiency and failure; identify and describe the pathophysiological mechanisms causing alterations in pulmonary function.

1. Differentiate between the following clinical terms.
 - 1.1. Respiratory failure (acute and chronic)
 - 1.2. Respiratory insufficiency
 - 1.3. Ventilatory failure
 - 1.4. Ventilatory insufficiency
2. Differentiate between the pathophysiological mechanisms and clinical management of respiratory failure with or without hypercapnia
3. Identify respiratory and non-respiratory causes of alveolar hypoventilation and be able to describe the various clinical courses of arterial hypoxemia and tissue hypoxia.
4. Describe the etiology and clinical manifestations of acute respiratory failure with or without hypercapnia.
5. Identify, measure, and assess the following categories of pulmonary function.
 - 5.1. Oxygenation
 - 5.2. Mechanics

- 5.3. Ventilation, and
- 5.4. Related measured parameters to the proper clinical management of patients with acute or impending respiratory failure.
6. Explain clinical and laboratory criteria for weaning the patient from continuous mechanical ventilation.
7. Critiquing and the rationale and objectives of mechanical ventilation in each of the following categories of disease states potentially cause respiratory failure. The respiratory conditions including but not limited to the following conditions.
 - 7.1. COPD, restrictive conditions of the lungs and thorax, pulmonary infections, flail chest and other traumas including surgeries.
 - 7.2. Cardiovascular conditions: pulmonary edema, shock, disseminating intravascular coagulation.
 - 7.3. Central Nervous System (CNS) and neuromuscular conditions including cerebral trauma and edema, brain stem injuries, drug intoxication, CVA, tetanus and botulism, neuropathies, and myopathies.
 - 7.4. Multiple organ failures: renal failure, GI disorders-pancreatitis, abdominal distention, and thermal injuries.
8. Differentiate the common complications of acute and chronic respiratory failure.
9. Comparing the psychological and philosophical implications of respiratory care, critical care, organ system support and life prolongation measures, and relate this to patient therapist interaction.

Physiology Artificial Ventilation

Goal: By identifying some of the physiological aspects affecting volume exchange, the student will be able to differentiate between spontaneous ventilation and assisted ventilation; identify the harmful effects of mechanical ventilation and demonstrate an ability to minimize or avoid the harmful effects of mechanical ventilation.

1. Differentiate between spontaneous ventilation, assisted, assist/control, controlled, pressure and volume control ventilation, pressure support, intermittent mandatory ventilation, and noninvasive ventilation.
2. Define by words or graphs.
 - 2.1. Positive end expiratory pressure (PEEP)
 - 2.2. Pressure Limited Volume Control (PLVC)
 - 2.3. Synchronized Intermediate Mechanical Ventilation (SIMV)
 - 2.4. Pressure Control Ventilation (PCV) and Volume Control Ventilation (VCV)
 - 2.5. Airway Pressure Release Ventilation (APRV) and Bi-Level Ventilation (Bi-Vent)
 - 2.6. Continuous Positive Airway Pressure (CPAP)
 - 2.7. Pressure Support Ventilation (PSV)
 - 2.8. Expiratory Resistance (P_{aw})
 - 2.9. Inspiratory Plateau Pressure (P_{pi})
3. Differentiate the physiological factors affecting volume exchange including lung-thorax compliance and airway resistance.
4. Calculate:
 - 4.1. Breathing frequency
 - 4.2. % inspiratory time
 - 4.3. % expiratory time
 - 4.4. I:E ratio

- 4.5. Liters per minute
- 4.6. Tidal volume
- 4.7. Minute volume
5. Differentiate between changes in alveolar (intrapulmonary) and intrathoracic (intrapleural) pressure during spontaneous ventilation, continuous positive pressure breathing, and intermittent positive pressure breathing by using a graph of pressure vs. time.
6. Summarize the causes and clinical signs of the following harmful effects of positive pressure ventilation.
 - 6.1. Cardiovascular effect
 - 6.2. Barotrauma
 - 6.3. Effect on gas distribution
 - 6.4. Effect on renal function and fluid balance
 - 6.5. Metabolic effects
 - 6.6. Cerebral vascular effects
 - 6.7. Oxygen toxicity
7. Infer, in physiological terms, the means of reducing mean intrapulmonary and intrathoracic pressure during mechanical ventilation.
8. Differentiate various modes and techniques (respiratory rates, % Insp. Time, I:E ratio, flow rates, pressure control, pressure support, PEEP, SIMV) to reduce mean intrapulmonary and thoracic pressure.

Management of Mechanically Ventilated Patients

Goal: Demonstrate proficiency in estimating the ventilation and oxygen requirements of patients requiring mechanical ventilation; be proficient in physical assessment, basic and advanced cardiopulmonary monitoring techniques, and in the evaluation of pertinent laboratory data. These data and techniques are applied to provide proper and safe management of the patient.

1. Differentiate essential safety principles to be utilized whenever mechanical ventilation is instituted.
2. Estimate the patient's ventilatory and oxygenation requirements.
 - 2.1. Body-weight formula
 - 2.2. F_iO_2 estimate equation
3. Correctly alter the parameters of ventilation and oxygenation according to proper therapeutic standards.
4. Recognize the clinical and physiologic techniques utilized in the monitoring of patients being controlled during mechanical ventilation.
5. Examine the common complications associated with mechanical ventilation and the treatment of acute and chronic respiratory failure including.
 - 5.1. Cardiovascular complications
 - 5.2. Gastrointestinal complications
 - 5.3. Electrolyte and fluid abnormalities
 - 5.4. Neurological complications
 - 5.5. Pulmonary complications
6. Demonstrate proficiency in the physical evaluation of patients relative to the initiation, maintenance, and liberation of various therapeutic mechanical ventilation modalities.
7. Demonstrate competency in the monitoring of the following parameters on patients being mechanically ventilated.
 - 7.1. Temperature of inspired gas

- 7.2. Specific alarm systems
- 7.3. Oxygen concentrations
- 7.4. Tidal volume
- 7.5. Respiratory rates
- 7.6. Flow rates
- 7.7. I:E ratios
8. Describe the physiologic rationale, goals, definitions, methods of application, indications, contraindications, and complications of PEEP, CPAP, PS, PCV, PRVC, A/C, BiPAP, Bi-level, APRV, and SIMV demonstrate proficiency in its application and utilization.
9. Distinguish the physiological and psychological prerequisites to restoration of spontaneous ventilation from a period of mechanical ventilation; demonstrate your ability to properly.
 - 9.1. Prepare and evaluate the patient.
 - 9.2. Establish a weaning schedule.
 - 9.3. Utilize the appropriate weaning modes.
 - 9.4. Evaluate weaning procedure.
 - 9.5. Provide the appropriate follow-up when weaning list and describe the advantages and the disadvantages of various weaning techniques.
 - 9.6. How to assess the patient for extubation.
 - 9.7. Explain why some patients cannot be weaned.
10. Identify the hazards and complications associated with mechanical ventilation and demonstrate the appropriate steps that can be initiated to prevent these hazards and complications.
11. List and explain the various weaning methods and procedures (PS, SIMV, CPAP, and BiPAP).
12. Explain and demonstrate correct procedures for the cleaning, calibration, and sterilization of equipment used with mechanical ventilators.
13. Describe the procedure, methods, and reasons for obtaining dynamic and static compliance.
14. Examine how to troubleshoot the patient-ventilator system.

Protocols in the ICU

Goal: Demonstrate proficiency in developing useful and proper protocols in the intensive care environment and apply this information to the patient's pathophysiologic condition to result in proper and safe management.

1. Examine methods used for monitoring the quality of respiratory care.
2. Explain how respiratory care protocols enhance the quality of respiratory care services.
3. Describe evidence-based medicine.
4. Describe how evidence-based protocols improve outcomes.
5. Evaluate methods for preparing an RC protocol.
6. Explain the benefits of disease specific protocols.
 - 6.1. ARDS-Net
 - 6.2. Extubation
 - 6.3. Asthma

Pharmacologic Management of the Critical Care Patient

Goal: Demonstrate and recognize the importance of specific drugs used in the management of critically ill patients. Use the knowledge of the indications and contraindications, mode of action, potential adverse effects, and the most appropriate methods to monitor recommend the effects of these drugs.

1. Neuromuscular Blocking Agents
 - 1.1. Describe terms that pertain to skeletal muscle relaxants.
 - 1.2. Describe neuromuscular blocking agents (NMBAs).
 - 1.3. Interpret the uses of NMBAs.
 - 1.4. Describe uses of NMBAs and mechanical ventilation.
 - 1.5. Identify methods of monitoring neuromuscular blockade.
2. Diuretic Agents
 - 2.1. Describe terms pertaining to diuretic agents.
 - 2.2. Describe the various groups of diuretics.
 - 2.3. Recognize the indications for diuretic therapy.
 - 2.4. Identify the most common adverse effects associated with the use of diuretics.
3. Analgesic, Sedatives and Hypnotics
 - 3.1. Compare physiologic and psychological bases of pain and the classes of analgesics used to treat pain.
 - 3.2. Discuss indications for the use of both local and general anesthesia.
 - 3.3. Describe the concept of conscious sedation and indications and guidelines for use.
 - 3.4. Distinguish drugs that stimulate the CNS and respiratory system and describe the indications for application.

Special Management Strategies

Goal: Demonstrate the knowledge and skills to monitor the critically ill patient with acute lung injury. Use the CDC surveillance tool to assess morbidity and mortality. Recognize the use of special ventilation techniques for minimizing ventilation complications.

1. Describe the physiologic states of acute lung injury.
2. Develop a method for using lung protective strategies in management of a critical ill patient.
3. Describe the ventilator surveillance tool.
4. Use the ventilator surveillance tool calculator for estimating complications and outcomes.
5. Describe the procedure for prone positioning in ventilated patients with adult respiratory distress syndrome.
6. List potential problems associated with placing the patient in a prone position during mechanical ventilation.
7. Discuss several theories that describe how prone positioning improves ventilation-perfusion in adult respiratory distress syndrome.

Course Content

This course will be presented and delivered in a formal lecture with student discussions, selected multimedia aids, and guest speakers. The laboratory sessions will utilize exercises and computer simulation problems.

Special Features of the Course

Moodle is used to enhance the interaction with the student.

The course will utilize laboratory sessions to practically apply the knowledge obtained through lecture sessions.

Course Texts

Required

- Kacmarek, R. Egan's Fundamentals of Respiratory Care, 11th ed. Elsevier, 2016. ISBN: 9780323341363
- Cairo, J.M. Pilbeam's Mechanical Ventilation: Physiological and Clinical Applications. 6th. Elsevier, 2016. ISBN 978-0-323-32009

Recommended

- Cairo, J.M. and Hinski, S.T. Workbook for Pilbeam's Mechanical Ventilation, 6th ed. Elsevier, 2016. ISBN: 9780323320986

Research, Writing, and Examination Requirements

Presentation

Students will either present a research article related to the critical care management of the critically ill patient or outline a unit on special ventilatory techniques. The articles related to the resource administration in the ICU are also acceptable. The special ventilatory techniques can be outlined from the texts or two or three research articles. Students will submit a minimum of three questions with their presentation. Scoring rubric and schedule are posted on Moodle.

Quizzes

The course will have five (5) quizzes covering the units presented during class. All quizzes will consist of multiple-choice format, matching, true-false, or short-answer essay type questions. The laboratory exams will be a practical evaluation that requires higher-level critical thinking skills. The final exam laboratory will be a comprehensive evaluation.

Laboratory

The laboratory grade will be the average of the three examinations. These grades will be calculated into the course grade.

Means of Assessment

Students are assessed through quizzes, a presentation, and laboratory exams. Quizzes will consist of matching, multiple choice, or true-false questions based on select units' readings and lecture presentations. Students post online for grading and present their research article. All quizzes are conducted through Moodle. Laboratory assessments are applied lecture topics consisting of practical simulations, written, and computer-based simulations.

Grading Policy

Grade Determinations

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| Quizzes (5) | 50% |
| Presentation | 10% |
| Laboratory grade | 40% |

Laboratory Grading:

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| Exam 1 and 2 | 60% |
| Comprehensive final examination | 40% |

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| A | Student must show superior theoretical knowledge and demonstrated laboratory skills. | 93 – 100 |
| B+ | Student must merit high quality classroom work and theoretical knowledge and demonstrated laboratory skills. | 88 – 92.9 |
| B | Student must show above average knowledge and laboratory skills. | 83 – 87.9 |
| C+ | Student meets the standard of achievement with reasonable knowledge and demonstrated laboratory skills. | 78 – 82.9 |
| F | Student fails to meet minimum course standards. | <78 |
| N | Incomplete – Student has not completed course requirements. | |

Missed Quizzes and Late Work

Missed quizzes and late work, including laboratory, will be penalized with a grade being no greater than seventy-eight percent (78%). Quizzes are scheduled during the last two weeks of semester but before last scheduled class. All late coursework must be completed before the last scheduled class. If a quiz or laboratory exam is not completed before the last scheduled class day, a grade of zero (0) will be recorded.

Attendance Policy and Academic Integrity

BCC Attendance Policy

All students are expected to attend punctually every scheduled meeting of each course in which they are registered. Attendance and lateness policies and sanctions are to be determined by the instructor or program policy. The instructor will keep attendance for administrative and counseling purposes. Class attendance and student participation are essential to successful completion of this course.

Course Attendance Policy

Attendance and punctuality in all class sessions is required. Attendance for lecture and laboratory will be factored into the total grade for the course. One (1) point will be deducted from the total grade for every absence. If the student is 20 minutes late, a half-point (0.5) will be deducted from the total grade. If you are late, be sure to see the professor that class so the lateness is not counted as an absence.

Academic Integrity

Academic dishonesty is a serious violation of BCC policy and personal ethics and will be treated as such if reason for suspicion should arise. Students should be careful to avoid plagiarism, falsification, and compliance. Academic dishonesty also includes cheating on examinations. Refer to the BCC student code of conduct and student handbook for additional information.

Departmental Policy Statements

1. Acceptable quality of work and mature behavior is always expected from every student. Students are regarded as professionals and are expected to conduct themselves accordingly.
2. High standards of professional performance demand that students maintain good academic progress throughout their course of study in the program.

3. Students demonstrating chronic tardiness or absenteeism will be placed on academic warning or probation and may be subjected to termination from the program.
4. Absence from a class during a scheduled exam will be subject to the policy of the instructor for that specific course. If the student is going to miss a scheduled exam, it is expected that the student will contact the instructor ahead of time by e-mail or phone to the department office.
5. All students are required to adhere to the policies and procedures of the school as outlined in the college catalogue.
6. Additional department policies are in the Respiratory Care Program – Student Policies and Procedures Manual.

Student and Faculty Support Services

1. The program faculty maintains office hours for counseling and is available to provide tutorial assistance to students.
2. Students must make appointments in advance to meet with the respective instructors.
3. Students may also obtain assistance from the College Tutoring Center. Appointments must be made in advance through this center.
4. The College has a personal counseling center for those students who may need personal assistance. Appointments are made directly through this center.
5. Any problems, concerns, or questions should be directed to the course instructor or the student's advisor.
6. Statement on Civility
 - a. Refer to the Standards of Conduct Subsection found in the Student Judicial Affairs Policies & Procedures Section found in the Student Handbook.
7. Academic Integrity
 - a. Refer to the Academic Integrity Subsection; found in the Academic Regulations, Academic Policies Section found in the Academic Policies & Regulations Area of the College Catalog.
8. Other possible College, Divisional, or Departmental Policy Statements to be referenced
 - a. ADA statement.
 - i. Students with documented disabilities who require accommodations by the American with Disabilities Act (ADA) can request support services from the Office of Specialized Service of Bergen Community College located in room L-115 of the Pitkin Learning Center. (<http://www.bergen.edu/oss>)
 - b. Sexual Harassment statement.
 - c. Statement on acceptable use of BCC technology.
 - d. Statement on the purpose and value of faculty office hours.
9. Student and Faculty Support Services
 - a. List support services, e.g., the Writing Center, the Math Lab, the Tutorial Center, Online Writing Lab (OWL), Office of Specialized Services, etc.
10. BCC Library
 - a. The Sidney Silverman Library is committed to providing a quiet, welcoming, respectful atmosphere conducive to study and research in an environment that is comfortable, clean, and safe. The use of the library will be beneficial in providing resources on researching topic information, citation styles, finding current articles among many other media services available.

