RSPC A270: VENTILATORS AND RESPIRATORY MANAGEMENT

Item	Value
Curriculum Committee Approval Date	11/15/2023
Top Code	121000 - Respiratory Care/Therapy
Units	3 Total Units
Hours	90 Total Hours (Lecture Hours 36; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)

Course Description

Principles and techniques in the management of patients requiring ventilatory support. Includes mechanical descriptions of ventilators in common use (including laboratory demonstrations and hands on practice), as well as patient assessment for need for ventilatory support along with assessment for changes in ventilatory support techniques. PREREQUISITE: RSPC A260. COREQUISITE: RSPC A276. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Describe and apply life support mechanical ventilators in the patient setting to include theory of operation, modalities, settings, compliance, waveform analysis, changes, hazards, and patient assessment.

Course Objectives

- 1. Describe the indications for the following modes and provide appropriate initial settings based on a variety of clinical scenarios: A/C,PC,SIMV,PRVC,CPAP, PCIRV and APRV.
- 2. Determine the proper ventilator alarm settings and appropriately adjust given patient scenarios.
- 3. Use calculations and predictive equations to determine the appropriate tidal volume and RR for a ventilated patient.
- 4. Trouble shoot ventilator malfunctions and correct alarm conditions.
- 5. Correctly set-up, change, and deliver therapeutic treatments and gas mixtures through a ventilator circuit.
- 6. Complete a thorough assessment of a ventilator patient and enter the findings in the patient's medical record (complete the ventilator flowsheet).
- 7. Assess ph, PCO2, and PO2 to make changes in ventilator parameters.
- 8. Use calculations to achieve a desired PCO2 and PO2, compute Vd/Vt and P/F ratio.
- 9. Determine dynamic and static compliance using peak and plateau pressure
- 10. Describe how changes in elastic and airway resistance affect peak and plateau pressures.
- 11. Describe other physiologic signs that should be monitored in the mechanically ventilated patient.
- 12. Describe and appropriately initiate methods for improving oxygenation in the severely hypoxic patient.
- 13. Describe and apply ventilator changes to decrease a patient's work of breathing, correct hypoxemia, hypercapnia and airtrapping, and adjust for changes in airway resistance or compliance.
- 14. Use the graphics of a ventilated patient to determine when abnormal conditions exist and their cause.
- 15. Identify the indications and hazards of PEEP and correctly titrate.
- 16. Describe assessments and methodologies used to evaluate a patient's readiness to wean and identify satisfactory weaning measurements.
- 17. Take corrective / alternative actions when a patient fails a spontaneous breathing trial and management of subsequent failed weaning attempts.
- 18. Describe the steps taken to assess an obstructed, blown, or displaced airway and the equipment used to exchange or replace.
- 19. Identify the steps in extubation, perform assessment and management of patient scenarios after procedure.
- 20. Describe indications for non-invasive ventilation and determine appropriate initial settings and adjustments based on a variety of clinical settings.
- 21. Describe procedures and protocols used to prevent the incident of ventilator-associated infections.
- 22. Describe the special considerations that must be made when performing intra or inter-hospital transport of a ventilator patient.
- 23. Describe special considerations and best practices used when managing ventilation in various pulmonary pathologies.
- 24. Describe how and when to implement lung protective strategies.
- 25. Describe the practices and protocols that may be used when providing mechanical support to pediatric patients.

Lecture Content

Constant flow, sine wave, and volume ventilators Typically monitored parameters Commonly used critical care ventilators Servo Avea Puritan Bennett Phillips-Respironics Troubleshooting Volume loss Pressure loss Malfunction Alarms and monitors Proper settings Assessment and adjustment of alarms Treatment of alarm conditions Ventilator circuits and related components Non-heated HME placement Heated wire Humidification options and placement Closed suction systems Maintenance and Changing Aerosol Therapy Heliox Delivery Infection Control Documentation Patient assessment and ventilator adjustment Modifications based on physical assessment Slope / Rise Time Trigger Automatic tube compensation Auto-flow / Peak flow Modifications based on blood gases Equations for changes in PaCO2 Equations for changes in PaO2 Significance of pH Influence of electrolytes Significance of deadspace (Vd/Vt) Use of ventilator graphics Scalars Loops Application to clinical conditions Air leaks High peak pressures Auto-PEEP Flow starvation Response to bronchodilators Excessive tidal volumes p; Continuous positive airway pressure (CPAP) Positive end expiratory pressure (PEEP) Indications for use Hazards Hemodynamic Intracranial Intrathoracic Titration Cardiac output Saturation of mixed venous blood Static compliance Volumetric CO2 PEEP and the morbidly obese patient Weaning from Mechanical Support Medical versus surgical patients

Assessment of weaning readiness Tests of mechanical capability (weaning parameters) PO1 Negative inspiratory force Maximum inspiratory pressure Forced vital capacity Rapid shallow breathing index (f/Vt) Weaning methodologies SIMV Ventilator liberation T-piece trials Therapist implemented patient specifc (TIPS) Spontaneous breathing trials Management of patients who fail weaning attempts Management of obstructed, blown, or displaced airway and the equipment used to exchange or replace. Extubation Use of non-invasive ventilation (NIV) Clinical applications Initial settings Adjustments for the hypoxemic patient Adjustments for the hypercapnic patient Hazards Ventilator-associated infections Epidemiology of VAP Criteria for determining VAP Methods for reducing VAP ET tube management Oral Care Bundles Transport of ventilated patients Role of the RCP during transport Credentials and training of transport RCP's Equipment Gas laws at altitude Pharmacologic Management and Interventions Inhaled Pulmonary Vasodilators Cardiovascular Analgesics Neuromuscular Blocking Agents Narcotic and Benzodiazapine Agonists Nutritional balance in ventilated patients Effects of illness on nutritional needs Ventilating the patient with Acute Respiratory Distress Syndrome (ARDS) Epidemiology of ARDS Clinical criteria (Berlin Definition) Lung protective strategies Airway pressure release ventilation (APRV) High frequency oscillation (HFO) Other methods for the profoundly hypoxic patient Pressure control ventilation with inverted ratio (PCIRV) Recruitment maneuvers Prone position ventilation Ventilatory managment of the Brain-injured patient Ventilator adjustments in brain-injured patients Transport of brain-injured patients Ventilatory support for pediatric patients Etiology of respiratory failure in pediatric patients Methods for managing respiratory failure High flow nasal cannula Non-invasive ventilation Mechanical ventilation

Lab Content

Complete weekly lab assignments pertaining to content identified in course objectives. Mechanical Ventilation Indications Mechanical Ventilation Classifications Basic Mechanical Ventilation Calculations Ventilator Set-Up and Determination of Initial Settings EST and circuit set up Modes and Alarms Patient Data Variety of ventilators Completion of the Ventilator Flowsheet Ventilator Management and Determination of Changes Patient Physical Assessment Blood Gas Measurements Airway Pressures Interpretation and Application of Ventilator Graphics Scalars Loops Troubleshooting and Problem Solving Ventilator Weaning and Discontinuation Non-invasive Ventilation Circuit set up Initial settings Adjustments Practice transport of Patient on Mechanical Ventilation Practice patient case studies focussed on ventilator management techniques used to improve oxygenation and ventilation Practice, successfully complete required skill check-offs, and document on ventilator flowsheet. Variety of ventilators

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- Lab (04)
- DE Live Online Lab (04S)

Instructional Techniques

Lectures, labs, demonstrations, homework, case studies, high fidelity paient simulations.

Reading Assignments

Students will read on average 5-6 hours per week from assigned textbooks, course materials, and laboratory exercises.

Writing Assignments

Students wlll spend approximately 3-4 hours per week on writing assignments such as homework and case studies.

Out-of-class Assignments

Students will spend approximately 3-4 hours per week on homework assignments and case studies.

Demonstration of Critical Thinking

Content based written and objective examinations, short quizzes, laboratory exercises and practicum, case studies, high fidelity simulations.

Required Writing, Problem Solving, Skills Demonstration

Written examinations, case studies, lab skills / ventilator check-offs.

Eligible Disciplines

Respiratory technician: Any bachelor's degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required Cairo, J. . Pilbeam's Mechanical Ventilation, 8th ed. Elsevier, 2023