RSPT 50C: THERAPEUTICS & INTRODUCTION TO MECHANICAL VENTILATION

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2024
Units:	4
Hours:	3 lecture, 3 laboratory per week (72 total per quarter)
Prerequisite:	RSPT 50B.
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 explain concepts and theory related to the initiation, monitoring, and discontinuing of ventilatory support.
- The student will be able to perform procedures pertaining to mechanical ventilation by completing all lab competencies and a lab practical with a 70% or higher.

Description

Topics to be covered include respiratory failure, introduction to invasive and non-invasive mechanical ventilation. 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. Define acute respiratory failure.
2. Discuss the causes of respiratory failure.
3. Differentiate between Type I, Type II, and chronic respiratory failure.
4. Discuss the indications for ventilatory support.
5. Classify ventilators and describe how they work.
6. Classify and define different modes of ventilation.
7. Identify the physiologic effects of ventilatory support.
8. Initiate and manage invasive ventilatory support.
9. Discuss the application of noninvasive ventilation (NIV).
10. Discuss the principle of monitoring the patient in the intensive care unit.
11. Describe discontinuing ventilatory support.
12. Troubleshoot and problem-solve both patient-related and ventilator-related problems.
13. Describe diagnostic and supportive ICU procedures.

Course Content

1. Define acute respiratory failure
    a. Definition
    b. Sign and symptoms
    c. Arterial blood gas analysis
2. Discuss the causes of respiratory failure
    a. Hypoxemic respiratory failure (Type I)
    b. Hypercapneic respiratory failure (Type II)
    c. Chronic respiratory failure (Type I and Type II)
3. Differentiate between Type I, Type II, and chronic respiratory failure
    a. Hypoxemic respiratory failure (Type I)
        i. Ventilation/perfusion mismatch
        ii. Shunt
        iii. Alveolar hypoventilation
        iv. Diffusion impairment
        v. Perfusion/diffusion impairment
        vi. Decreased inspired oxygen
        vii. Venous admixture
        viii. Differentiating the causes of acute hypoxemic respiratory failure
    b. Hypercapneic respiratory failure (Type II)
        i. Insidious exposure
        ii. Increased carbon dioxide production
        iii. Impairment in respiratory control
        iv. Impairment in respiratory effectors
    c. Chronic respiratory failure (Type I and Type II)
        i. Acute-on-chronic respiratory failure
        ii. Complications of acute respiratory failure
        iii. Clinical presentation
4. Indications for ventilatory support
    a. Inadequate alveolar ventilation
    b. Inadequate lung expansion
    c. Inadequate muscle strength
    d. Increased work of breathing
5. Ventilators
    a. How they work
        i. Input power
        ii. Power transmission and conversion
        iii. Control system
    b. Output waveforms
        i. Pressure
        ii. Volume
        iii. Flow
    c. Operator interface
        i. Input displays
        ii. Output displays
    d. Types of ventilators
        i. Critical care
            1. Hamilton G-5 ventilator
            2. Drager Evita Infinity V500 ventilator
            3. Maquet Servo-i and Servo-u ventilators
            4. Vocsn multifunction ventilator
        ii. Conventional
        iii. Subacute

1. Respironics Trilogy ventilator
iv. Home care
1. Respironics Trilogy ventilator
v. Patient transport
1. Carefusion LTV 1200 ventilator
vi. Noninvasive
1. Respironics BiPAP V60

6. Modes of ventilation
a. Control variables
i. Pressure control
ii. Volume control
b. Breath sequence
i. Spontaneous breaths
ii. Mandatory breaths
iii. Continuous mandatory ventilation (CMV)
iv. Intermittent mandatory ventilation (IMV)
v. Continuous spontaneous ventilation (CSV)
vi. Breathing patterns
c. Targetting scheme
i. Open loop control
ii. Closed loop control
7. Physiologic effects of ventilatory support
a. Pressure and pressure gradients
b. Effects of mechanical ventilation on ventilation
c. Effects of mechanical ventilation on oxygenation
d. Effects of mechanical ventilation on lung mechanics
e. Minimizing adverse pulmonary effects of positive pressure mechanical ventilation
f. Physiologic effects of ventilatory modes
g. Cardiovascular effects of positive pressure mechanical ventilation
h. Effects of positive pressure mechanical ventilation on other body systems
i. Complications of mechanical ventilation
8. Initiating and adjusting invasive ventilatory support
a. Goals
b. Initial ventilator settings
c. Adjusting ventilatory support
d. Oxygenation
e. Ventilation
9. Application of noninvasive ventilation (NIV)
a. History and development of NIV
b. Indications for NIV
c. Patient selection
d. Equipment selection
e. Management of NIV
f. Complications of NIV
10. Monitoring the patient in the intensive care unit
a. Respiratory monitoring
b. Cardiac monitoring
c. Neurologic monitoring
d. Renal and liver function monitoring
e. Nutritional monitoring
f. Global monitoring indices
11. Discontinuing ventilatory support
a. Ventilator dependence
b. Patient evaluation
c. Methods
i. Monitoring the patient during weaning
ii. Extubation
12. Troubleshoot and problem-solve both patient-related and ventilator-related problems
a. Patient-related problems
b. Ventilator-related problems
c. Common alarm situations
d. Use of graphics to identify ventilator problems
e. Patient safety
13. Diagnostic and supportive ICU procedures
a. Brochoscopy
b. Extracorpeal Membrane Oxygenation (ECMO)
c. Inhaled gas mixtures
i. Nitric oxide
ii. Helium-oxygen mixtures

Lab Content

1. Ventilators
a. How they work
i. Input power
ii. Power transmission and conversion
iii. Control system
b. Output waveforms
i. Pressure
ii. Volume
iii. Flow
c. Operator interface
i. Input displays
ii. Output displays
d. Types of ventilators
i. Critical care
1. Hamilton G-5 ventilator
2. Drager Evita Infinity V500 ventilator
3. Maquet Servo-i and Servo-u ventilators
4. Vocsn multifunction ventilator
ii. Conventional
iii. Subacute care
1. Respironics Trilogy ventilator
iv. Home care
1. Respironics Trilogy ventilator
v. Transport
1. Carefusion LTV 1200 ventilator
vi. Noninvasive
1. Respironics BiPAP V60
2. Modes of ventilation
a. Control variables
i. Pressure control
ii. Volume control
b. Breath sequence
i. Spontaneous breaths
ii. Mandatory breaths

iii. Continuous mandatory ventilation (CMV)
iv. Intermittent mandatory ventilation (IMV)
v. Continuous spontaneous ventilation (CSV)
vi. Breathing pattern
c. Targetting scheme
i. Open loop control
ii. Closed loop control
d. Initiating and adjusting invasive ventilatory support
i. Goals
e. Initial ventilator settings
f. Adjusting ventilatory support
g. Oxygenation
h. Ventilation
3. Application of noninvasive ventilation (NIV)
a. History and development of NIV
b. Indications for NIV
c. Patient selection
d. Equipment selection
e. Management of NIV
f. Complications of NIV
4. Monitoring the patient in the intensive care unit
a. Respiratory monitoring
b. Cardiac monitoring
c. Neurologic monitoring
d. Renal and liver function monitoring
e. Nutritional monitoring
f. Global monitoring indices
5. Discontinuing ventilatory support
a. Ventilator dependence
b. Patient evaluation
c. Methods
i. Monitoring the patient during weaning
ii. Extubation
6. Troubleshooting and problem-solving
a. Patient-related problems
b. Ventilator-related problems
c. Common alarm situations
d. Use of graphics to identify ventilator problems
e. Patient safety
7. Diagnostic and supportive ICU procedures
a. Bronchoscopy
b. Extracorporeal Membrane Oxygenation (ECMO)
c. Inhaled gas mixtures
i. Nitric oxide
ii. Helium-oxygen mixtures

Special Facilities and/or Equipment

1. Ventilators, ventilator tubing, lung simulators, and simulation patient scenarios.
2. When taught online/hybrid, students must have access to a computer with internet access.

Method(s) of Evaluation

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

Lab performance
Written exams, which may include quizzes, midterms, final exam
Laboratory final exam: one-on-one return demonstration, one hour in length per student
Lab compentencies

Method(s) of Instruction

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

Lecture
Discussion
Laboratory demonstrations
Instructional videos
Lab competencies demonstrated in skills

Representative Text(s) and Other Materials

Kacmarek, Stoller, and Heuer. Egan's Fundamentals of Respiratory Care, 12th ed.. 2021.

Kacmarek, Stoller, and Heuer. Workbook for Egan's Fundamentals of Respiratory Care, 12th ed.. 2021.

Hinski, Sandra T.. Respiratory Care Clinical Competency Lab Manual. 2014.

Although older than five years, the Hinski lab manual is the latest edition.

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

1. Reading assignments from textbook, Egan's Fundamentals of Respiratory Care
2. Workbook assignments from Workbook for Egan's Fundamentals of Respiratory Care
3. Competencies related to course content
4. Respiratory-related practice seminars and webinars
5. Tutor assignments - STEM learning resources

Discipline(s)

Respiratory Technologies