Mechanical Ventilation (RSPT 2314)

Credit: 3 semester credit hour (2 hour lecture, 3 hour lab)

Prerequisite/Co-requisite: RSPT 1113, RSPT 1207, RSPT 1261, RSPT 1262, RSPT 1325, RSPT 1329, RSPT 1331, RSPT 1335, RSPT 1360

Course Description

The study of mechanical ventilation with emphasis on ventilator classification, methods, principles, and operational characteristics. Includes indications, complications, and physiologic effects/principles of mechanical ventilation. Emphasizes initiation, management, and weaning of ventilatory support.

Required Textbook and Materials

1. *Mechanical Ventilation Physiological and Clinical Applications* by Susan P. Pilbeam and Jim Cairo
   a. ISBN number 13 978-0-323-03236-0
2. *Workbook For Mechanical Ventilation Physiological and Clinical Applications* by Susan P. Pilbeam and Jim Cairo
   a. ISBN# 978-0-323-03296-4
3. Package of #882 scantrons, #2 pencils, and flash drive.

Course Objectives

Upon completion of this course the student will be able to:

1. Describe mechanical ventilation as related to spontaneous and artificial ventilation with emphasis on ventilator classification, methods, principles, and operational characteristics.
2. Identify Indications, complications, and physiologic effects/principles of mechanical ventilation.
3. Initiation, management, and weaning of ventilatory support.
4. Identify and assemble necessary equipment for mechanical ventilation.
5. Perform and demonstrate competency in verification of Ventilator operation;

Course Outline

A. Review of oxygenation and acid-base status:

1. Normal values for:
   a. arterial blood gas measurements
   b. mixed venous blood gas measurements
   c. hemoximetry
2. Normal PaO2 based on age.
3. PaO2 values at varying altitudes.
4. Determine Oxygenation status:

a. P(A-a)O2 value
b. PaO2/PAO2 ratio
c. PaO2/FIO2 ratio
d. CaO2

5. P50
   a. normal
   b. abnormal
6. Interpreting an arterial blood gas measurement.
   a. Calculating a change in pH based on a change in PaCO2.
   b. The bicarbonate
   c. the pH (hydrogen ion content)
   d. the PaCO2.
7. A PaCO2 value estimated based on:
   a. change in a patient's alveolar ventilation
   b. CO2 production.
8. Calculating changes in bicarbonate based on changes on:
   a. pH
   b. PaCO2.

B. Basic terms and Concepts of mechanical ventilation

1. Graphs of changes in:
   a. Intrapulmonary pressure
   b. spontaneous ventilation
   c. positive pressure breath.
2. Converting mm Hg to cm H2O.
3. Calculating a time constant.
4. Comparing several time constants and which will receive more volume during inspiration.

5. A figure showing:
   a. abnormal compliance
   b. airway resistance
   c. determine which lung unit will fill more quickly or with a greater volume.
6. Respiratory mechanics
   a. Transpulmonary pressure
   b. transrespiratory pressure
   c. transairway pressure
   d. transthoracic pressure
   e. elastance
   f. compliance
   g. resistance.
7. Changes in pressure measured on the manometer during inspiration with a mechanical ventilator:

- a. lung compliance
- b. peak pressure.

8. Formulas for calculating:
   - a. compliance
   - b. resistance.
9. Mouth pressure.
10. The value for intraalveolar pressure during:
    - a. normal quiet breathing during the phases of:
      1. inspiration
      2. exhalation.
11. Airway conditions as related to increased resistance.
12. Advantages of negative pressure ventilation.
13. Pressure terms and definitions:
    - a. Peak inspiratory pressure
    - b. baseline pressure
    - c. PEEP
    - d. plateau pressure.
14. The measurement of plateau pressure.
15. The percentage of passive filling (or emptying) for:
    - a. 1 time constant
    - b. 2 time constants
    - c. 3 time constants
    - d. 5 time constants
16. Calculating the transairway pressure
    - a. given the peak inspiratory pressure
    - b. given plateau pressure of 20 cm H_2O
    - c. given flow rate.

C. How ventilators work.

1. The basic types of power sources used for mechanical ventilators.
   - a. electric
   - b. pneumatic
   - c. combined electric and pneumatic
2. Control system
   - a. A closed loop and an open loop system.
   - b. User interface.
3. A ventilator's pneumatic circuits.
   - a. internal
     1. single
     2. double
   - b. external
     1. main inspiratory line
     2. adapter
     3. expiratory line

4. expiratory valve

4. Power transmission and conversion system
    a. drive mechanism
    b. compressors
    c. volume displacements designs
    d. flow control valves

D. How a breath is delivered.

1. The equation of motion
    a. pressure
    b. flow
    c. volume
    d. time
2. Factors controlled and measured by the ventilator during inspiration
    a. pressure
    b. volume
    c. flow
    d. time
3. Inspiratory Waveform Control:
    a. pressure controlled
    b. volume controlled
    c. Flow , volume, and pressure waveforms at the mouth:
        1. rectangular
        2. exponential
        3. sinusoidal
        4. ramp
4. Four Phases of a breath
    a. change from exhalation to inspiration
    b. inspiration
    c. change form inspiration to exhalation
    d. exhalation
5. Trigger variable
    a. time triggering
    b. patient triggering
        1. pressure triggering
        2. flow triggering
        3. volume triggering
6. The limit variable
    a. pressure limiting
    b. volume limiting
    c. flow limiting
7. Maximum safety pressure
    a. pressure limiting
    b. pressure cycling

8. The cycling mechanism
    a. volume cycled ventilation
    b. set volume vs. actual volume
        1. tubing compressibility
        2. system leaks
    c. time cycled ventilation
    d. flow cycled ventilation
    e. pressure cycled ventilation
    d. Inflation hold
9. Types of breath:
    a. mandatory
    b. spontaneous.
10. Expiratory Phase
    a. definition of expiration
    b. baseline pressure
    c. time-limited exhalation
    d. continuous gas flow
    e. Negative end-expiratory pressure (NEEP)
    f. expiratory hold
    g. expiratory retard
    h. continuous positive airway pressure (CPAP) and positive end expiratory pressure (PEEP)

E. Noninvasive positive pressure ventilation works.

1. Noninvasive ventilation and the basic noninvasive techniques.
2. The clinical and physiological benefits of noninvasive positive pressure ventilation (NPPV).
3. Criteria NPPV in the acute and chronic care settings.
    a. selection
    b. exclusion
4. Ventilators used for noninvasive ventilation.
5. Humidification used during noninvasive ventilation (NPPV).
6. FIO2 delivered by a portable pressure-targeted ventilator.
7. CO2 rebreathing during Noninvasive Positive Pressure Ventilation administration from a portable pressure-targeted ventilator.
8. The various types of interfaces used for Noninvasive Positive Pressure Ventilation (NPPV).
    a. advantages
    b. disadvantages
9. Initiating Noninvasive Positive Pressure Ventilation NPPV.
10. Indicators of success for patients receiving Noninvasive Positive Pressure Ventilation NPPV.

11. Ventilator changes based on observation of the:
    a. patient's respiratory rate
    b. acid- base,
    c. oxygenation status.
12. Complications of Noninvasive Positive Pressure Ventilation NPPV.
13. Solutions for complications of Noninvasive Positive Pressure Ventilation.
14. Weaning a patient from Noninvasive Positive Pressure Ventilation.

F. Establish the need for mechanical ventilation.

1. Acute respiratory failure
    a. recognize the patient in distress
    b. define respiratory failure
    c. recognize hypoxia and hypercapnia
2. Patient history and diagnosis
    a. central nervous system disorders
    b. neuromuscular disorders
    c. increase work of breathing
3. Physiological measurements in acute respiratory failure
    a. ventilator mechanics
        1. maximal inspiratory pressure
        2. vital capacity
        3. peal expiratory flow rate
        4. respiratory rate and minute ventilation

        failure of oxygenation
4. Criteria for mechanical ventilation
    a. apnea
    b. acute respiratory failure
    c. impending respiratory failure
    d. refractory hypoxic respiratory failure
        1. increased work of breathing
        2. ineffective breathing pattern
5. Alternatives to Invasive Ventilation
    a. high flow oxygen device
    b. Non-invasive positive pressure ventilation (NPPV)
6. Intubation without ventilation
    a. airway onbstruction
    b. protect the airway
    c. facilitate removal of secretions
7. Ethical considerations
    a. patient choice
    b. advance directive
    c. living will
    d. DNR status
8. Case scenarios

a. drug and alcohol overdose
b. Guillain-Barre' Syndorme
c. status asthmaticus
d. kyphoscoliosis and pneumonia
e. COPD

G. Select the ventilator and the mode.

1. Ventilator and mode selection based on:
   a. patient's history
   b. physical assessment
   c. patient interface
   d. control variable
   e. breath type
   f. mode
2. Methods of therapeutic intervention:
   a. positive of negative pressure ventilation
   b. invasive or noninvasive ventilation
   c. volume or pressure ventilation
   d. full or partial ventilator support.
3. Mode of Ventilation and breath delivery
   a. type of breath
   b. targeted control variable
   c. timing of breath delivery
4. Factors that affect pressure during volume ventilation
   a. patient lung characteristics
   b. inspiratory flow pattern
   c. volume setting
   d. positive end-expiratory pressure
   e. auto-peep
5. Factors that affect volume delivery during pressure ventilation
   a. pressure setting
   b. pressure gradient
   c. patient lung characteristics
   d. inspiratory time
   e. patient effort
6. Difference in function for:
   a. continuous mandatory ventilation
   b. Assist/Control ventilation
   c. volume targeted continuous mandatory ventilation
   d. pressure targeted continuous manadatory ventilation
   e. synchronized intermittent mandatory ventilation
   f. spontaneous modes
      1. spontaneous breathing
      2. Continuous positive airway breathing

3. pressure support ventilation

7. Terminology:
   a. trigger
   b. cycle
   c. limit
8. Graphics related to modes of ventilation
   a. volume-targeted
   b. continuous mandatory ventilation
   c. pressure-targeted continuous mandatory ventilation
   d. volume targeted synchronized intermittent mandatory ventilation
   e. pressure targeted synchronized intermittent mandatory ventilation
   f. pressure support ventilation.
9. Special Modes
   a. pressure augmentation
   b. pressure regulated volume control
   c. volume support
   d. mandatory minute ventilation
   e airway pressure release ventilation
   f. bilevel positive airway pressure
   g. proportional assist ventilation.
   h. close loop ventilation

H. Initial ventilator settings.

1. Initial ventilator settings for volume ventilation:
   a. calculating tubing compliance.
   b. volume loss caused by tubing compliance.
   c. calculating minute ventilation
   d. calculating total cycle time
   e. calculating inspiratory time
   f. calculating expiratory time,
   g. calculating flow in L/sec
   h. calculating tidal volume
   i. flow waveform
   j. inspiratory to expiratory ratios given the necessary patient data
   k. pressure limit
   l. inflation hold
   m. inspiratory and expiratory pressure
2. Calculate the desired FIO2 needed to achieve a desired PaO2 based on arterial blood gases.
3. Flow patterns
   a. rate of gas flow
   b. flow patterns
      1. constant flow
      2. ascending ramp
      3. sine flow

4. descending ramp

4. Calculations based on patient's sex, height, and ideal body weight:
   a. initial minute ventilation
   b. tidal volume
   c. rate of volume ventilation
5. Mechanical deadspace considerations
   a. adding tubing
   b. large heat moisture exchangers
6. Inspiratory hold and plateau.
7. Settings based on the patient's lung pathology, body temperature, metabolic rate, altitude, and acid- base balance:
   a. Initial mode
   b. minute ventilation
   c. tidal volume
   d. frequency
   e. Positive End Expiratory Pressure (PEEP)
8. Peak inspiratory pressure
9. Plateau pressure
10. Selection and initial settings for the various modes of pressure ventilation:
    a. bi-level positive airway pressure
    b. pressure support ventilation
    c. pressure control ventilation
    d. servo controlled (dual modes) ventilation.
11. Pressure support ventilation from a pressure-time graph.
    a. Measure pressure plateau from pressure-time and flow-time waveforms during pressure-controlled mechanical ventilation.
12. The mode of ventilation based on:
    a. trigger
    b. target
    c. cycle criteria.

13. Case scenarios for ventilator adjustment
    a. myocardial infarction
    b. patient triggering additional breaths
14. Initial settings during pressure ventilation
    a. setting baseline pressure and end expiratory pressure
    b. determine tidal volume delivery
15. Initial settings during pressure support ventilation
    a. Tidal volume
    b. respiratory rate
    c. decrease work of breathing associated with breathing through an artificial airway
16. Initial settings for pressure control ventilation

a. Pressure set to plateau pressure during volume ventilation
b peak pressure minus five if plateau pressure unavailable
c. rate
d. inspiratory time
e. inspiratory to expiratory time

17. Initial settings for bilevel positive airway pressure ventilation
    a. nonintubated and intubated patiuents
    b. inspiratory positive airway pressure
    c. expiratory positive airway pressure
    d. oxygen flow
    e. observe use of accessory muscles
        1. inspiratory effort
        2. presence of auto positive end expiratory pressure (auto-PEEP)
18. Dual control pressure ventilation modes with volume targeting
    a. volume assured pressure support
    b. pressure regulated volume control
19. Volume support
    a. spontaneous mode

I. Final considerations in ventilator setup.

1. Pros and cons of using the sigh mode.
2. Sigh with the concept of a recruitment maneuver in adult respiratory distress syndrome.
3. Extrinsic positive end- expiratory pressure in patients with airflow obstruction and air trapping who have trouble triggering a breath.
4. Equation for the desired FIO2 setting.
5. Capabilities of an adult ventilator.
6. Initial ventilator settings from the guidelines to manage different patient problems.
7. Maintain adequate humidification.

J. Initial assessment of the mechanically ventilated patient.

1. Operational verification procedure.
2. Recommended times when an oxygen analyzer is used to measure the FIO2 during mechanical ventilation.
3. Causes of an increase in:
    a. transairway pressure
    b. peak pressure
    c. plateau pressure.
4. Calculate:
    a. alveolar volume from tidal volume
    b. dead space values.

5. Pressure-time and flow-time curves obtained during pressure-controlled continuous mandatory ventilation to determine:
   a. plateau pressure.
6. A system leak from a volume-time curve.
7. Physical examination and radiographical data to determine:
   a. pneumonia
   b. pneumothorax
   c. asthma
   d. pleural effusion
   e. emphysema
8. A lung compliance problem or an airway resistance problem is present using:
   a. ventilator flow sheet
   b. time
   c. volume
   d. peak inpsiratory pressure
   e. plateau pressure
9. A static pressure-volume curve for static compliance and dynamic compliance to determine changes in:
   a. compliance
   b. resistance.
10. Alveolar ventilation based on:
    a. ideal body weight
    b. tidal volume
    c. respiratory rate.
11. A cuff leak by listening to breath sounds.
12. Inappropriate endotracheal tube cuff pressures.
13. Inappropriate tube size.
14. Flow sheet information on a patient on pressure control ventilation and recommend methods to determine changes in:
    a. compliance
    b. airway resistance
15. The technique for measuring endotracheal tube cuff pressure using:
    a. manometer
    b. syringe
    c. three-way stopcock
16. The two methods of dealing with a cut pilot tube without changing the endotracheal tube.
    a. needle and stopcock
    b. syringe
17. Non-invasive monitoring of pulse oximetry, VD/VT ratio, capnography, transcutaneous O2/CO2 monitoring.
18. Noninvasive monitoring of ECG, hemodynamics, and fluid balance.
19. Review Radiograph

K. Ventilator graphics.

1. Ventilator variables from pressure, flow, and volume scalars in the following modes:
   a. volume controlled continuous mandatory ventilation
   b. volume controlled synchronized intermittent mandatory ventilation plus pressure support
   c. ventilation and continuous mandatory ventilation, pressure-controlled
   d. continuous mandatory ventilation
   e. pressure controlled synchronized intermittent mandatory ventilation
   f. pressure support ventilation.
2. Ventilator variables and ventilator parameters and their values from the following loops:
   a. flow- volume
   b. pressure-volume
3. Ventilator scalars and loops with the following:
   a. changes in compliance
   b. changes in airway resistance
   c. inappropriate sensitivity setting
   d. inadequate inspiratory flow
   e. auto-PEEP
   f. leaks
   g. active exhalation during pressure support ventilation
   h. an inspiratory pressure spike during pressure support ventilation.
4. Airway resistance and compliance from information obtained from scalars and loops during ventilation.
5. The changes that occur in scalars and loops during volume-targeted and pressure-targeted ventilation when:
   a. airway resistance increases
   b. lung compliances decreases.
6. A compliance value obtained during pressure control ventilation;
   a. determine whether the compliance is normal
   b. determine tidal volume delivery
   c. ways to adjust the set pressure to gain a desired tidal volume.

L. Noninvasive assessment of respiratory function

1. Devices used to measure:
   a. airway pressure
   b. volume
   c. flow
2. Measuring:
   a. Static compliance

   b. dynamic compliance
   c. airway resistance
   d. mean airway pressure.
3. The effects of changes on measurement of the work of breathing in:
   a. airway resistance
   b. and respiratory system compliance
4. Pathological conditions that alter lung compliance and airway resistance
   a. ARDS
   b. restrictive diseases
5. The pressure-time product
   a. management of mechanically ventilated patients.

M. Methods to improve ventilation and other techniques in patient-ventilator management.

1. Ventilator adjustments to reduce work of breathing and improve ventilation based on:
   a. patient diagnosis
   b. arterial blood gas results
   c. ventilator parameters.
2. Specific size endotracheal tube and patient will need:
   a. appropriate suction catheter size
   b. length
   c. amount of suction pressure
3. The benefits of:
   a. closed-suction catheters
   b. open suction technique.
4. Instilling normal saline to loosen secretions before suctioning.
   a. pros and cons
5. Ventilator associated pneumonia protocol
   a. endotracheal tube that can provide continuous aspiration of subglottic secretions.
   b. silent aspiration with cuffed endotracheal tube
6. Sputum descriptions and physical findings in a patient, and provide a possible cause for the findings.
   a. mucoid
   b. mucopurulent
   c. green
   d. brown
   e. rusty
   f. bloody
   g. pink-frothy
7. Identify presence of change or change in cardiopulomonary abnormalities

8. The parameters that is useful in establishing the presence of a respiratory infection.
   a. fever
   b. WBC
9. Prone positioning in ventilated patients with Adult Respiratory Distresss Syndrome.
   a. Potential problems associated
   b. Theories about how ventilation-perfusion is improved with
10. Protocols for using metered dose inhalers and small volume nebulizers powered by external flowmeters during mechanical ventilation.
    a. A change in medication based on the patient's response to a beta agonist during mechanical ventilation.
11. The equipment needed for the in-house transport of a mechanically ventilated patient.
    a. Complications associated with the in-house transport of a mechanically ventilated patient.
12. Patient-centered mechanical ventilation and how it might be assessed by the respiratory therapist.
13. Non-invasive assessment of cardiac monitoring
14. Review chest radiograph

N. Improve oxygenation and the management of ARDS.

1. The desired FIO2 needed to achieve a desired PaO2
   a. based on current ventilator settings
   b. blood gases.
2. Determine the gas delivery method, metering, and clinical analyzing devices.
2. The percent shunt,
3. Continuous positive airway pressure (CPAP) and PEEP.
   a. indications
   b. contraindications
4. Primary goal of PEEP and the conditions in which high levels of PEEP are used.
   a. Optimum PEEP level from a PEEP study with:
      provided arterial blood gasses (ABG's)
   b. hemodynamic data.
   c. Increase in peak inspiratory pressure that occurs when PEEP is increased.
   d. The appropriate way to establish an optimum PEEP level in a patient with acute respiratory distress syndrome (ARDS) using:
   e.. recruitment-decruitment maneuver
   f. deflection point

- g. A patient with a unilateral lung disease receives PEEP/CPAP therapy.
- h The effects of PEEP in a patient with an untreated pneumothorax.
- i. pressure increased

5. Adjustments in PEEP and ventilator settings based on:
   - a. assessment of the patient
   - b. ventilator parameters
   - c. ABG's.
6. Indicators of an optimum PEEP level.
   - a. Static compliance
   - b. hemodynamic data
   - c. ABG (arterial blood gases)
7. Parameters to measure following the administration of PEEP.
   - a. blood pressure
   - b. heart rate
   - c. static compliance
   - d. cardiac output
8. CPAP to mechanical ventilation with PEEP using:
   - a. patient assessment
   - b. ABG's (arterial blood gases)
9. PaO2/FIO2 ratio.
   - a. acute lung injury
   - b. acute respiratory distress syndrome
10. ARDS
    - a. Setting the PEEP level high
    - b. tidal volume setting
    - c. maximum plateau value
11. Weaning criteria from:
    - a. PEEP
    - b. CPAP.
12. Inverse ratio ventilation
    - a. conventional volume ventilator.
13. Based on the inflection point on the deflation curve for a patient with ARDS.
    - a. PEEP setting
    - b. pressure-volume loop
    - c. pulmonary perfusion

O. The effects of Positive Pressure ventilation on the Cardiovascular, cerebral, renal, and other organ systems.

1. Cardiac output and venous return.
2. The effects of positive pressure ventilation on:
   - a. gas distribution
   - b. pulmonary blood flow in the lungs.

c. increases intracranial pressure.

3. Effects of positive pressure ventilation on renal and endocrine function.
4 Assessing a patient's nutritional status
5. Techniques that can be used to reduce some of the complications associated with mechanical ventilation.

P. The effects of positive pressure ventilation on the pulmonary system

1. Barotraumas or extralveolar air based on patient assessment.
2. Appropriate action in patients with barotraumas.
3. Acute respiratory distress syndrome to establish an optimum PEEP and ventilation strategy.
4. Chest wall rigidity can alter transpulmonary pressures and acceptable plateau pressures.
5. Types of ventilator induced lung injury caused by opening and closing of alveoli and overdistention of alveoli
6. Clinical findings in hyperventilation and hypoventilation.
7. Ventilator settings in patients with hyperventilation and hypoventilation.
8. Patient with air trapping.
9. Strategies to reduce auto-PEEP.
10. Reduce the work of breathing during mechanical ventilation.
11. Reduce the risk of ventilator- associated pneumonia.
12. Responses to an increase in mean airway pressure in ventilated patient.
13. Effects of positive pressure ventilation on pulmonary gas distribution and pulmonary gas distribution and pulmonary perfusion in relation to normal spontaneous breathing.

Q. Perform troubleshooting and problem solving

1. The steps for protecting a patient when problems occur.
2. Possible causes for each of the following alarm situations:
   a. low pressure alarm
   b. high pressure alarm
   c. low PEEP/CPAP alarms
   d. apnea alarm
   e. low or high tidal volume alarm
   f. low or high minute volume alarm
   g. low or high respiratory rate alarm
   h. low FIO2 alarm
   i. Low sources gas pressure
   j. power input alarm
   k. ventilator inoperative alarm

- l. technical error message.

3. Troubleshooting using a graphic from a patient-ventilator
   - a. flow-time
   - b. volume-time
4 Description of a patient situation and recommend a solution.
   - a. leak
   - b. obstruction
   - c. ventilator in-operative
5. Patient-ventilator dyssynchrony:
   - a. signs
   - b. symptom
6. Externally powered nebulizer can affect ventilator function.
   - a. increased flow
   - b. increased volume
7. Electrolyte imbalances\
8. Respiratory infection.
   - a. signs
   - b. symptoms
9. Problems associated with devices used for noninvasive positive pressure ventilation.
   - a. nasal mask
   - b. full face mask
   - c. ETT
   - d. trach
10. The presence of auto-PEEP
    - a. increased baseline
11. Findings from patient assessment for:
    - a. a right main stem intubation
    - b. pneumothorax.
12. Problems caused by a heated humidification system during ventilation.
    - a. increased temperature
    - b. decreased temperature
13. Assess a patient's response to bronchodilator therapy.
    - a. ventilator flow-volume loop

R. Determine the discontinuation of and weaning from mechanical ventilation

1. The weaning parameters a
   - a. acceptable values for ventilator discontinuation.
2. The three standard modes of weaning in relation to their success in discontinuing ventilation.
   - a. SIMV with pressure support
   - b. Pressure support with PEEP
   - c. CPAP/BIPAP
   - 3. Clinical use of closed loop modes of weaning

4. Discontinuing a spontaneous breathing trial in a clinical situation.
    a. respiratory distress
    b. cardiovascular unstable
5. Criteria used to determine whether a patient is ready for extubation.
    a. tidal volume
    b. vital capacity
    c. maximal inspiratory pressure
    d. maximal expiratory pressure
6. Postextubation difficulties from a clinical case description.
7. Treatment for postextubation difficulties.
    a. cool mist
    b. racemic epinephrine
    c. re-intubation
8. First recommendation for weaning a patient from mechanical ventilation established by the task force formed by the :
    a. American College of Chest Physicians
    b. Society of Critical Care Medicine
    c. American Association for Respiratory Care.
9. Irreversible respiratory disorder that requires long term ventilation.
10. The parameter used in the primary index of drive to breathe.
11. Adjustments in ventilator setting during use of a standard weaning mode based on:
    a. patient assessment.
12. Spontaneous breathing trials
13. Sedatives and the respiratory system.
    a. depression of the respiratory center
14. The use of nonphysician protocols as key components of:
    a. efficient and effective patient weaning.
15. The types of patients who might benefit from a tracheostomy.
    a. ventilator dependence
    b. neuromuscular diseases
    c. paralysis
16. The function of long term care facilities in the management of ventilator-dependent patients.
    a. weaning
    b. transition to home or nursing home
17. The probable cause of failure to wean.
    a. weak muscles
    b. unstable cardiopulmonary system
    c. poor nutrition
    d. psychological dependence

S. Special applications of mechanical ventilation

1. Airway pressure-release ventilation (APRV) compared with other forms of ventilation.
    a. benefits
    b. disadvantages
2. APRV in patients with:
    a. acute lung injury/acute
    b. respiratory distress syndrome.
3. Weaning a patient from APRV.
4. High frequency oscillatory ventilation settings.
    a. The chest wiggle factor
5. Heliox
    a. obstruction
    b. status asthmatics
6. Nitric Oxide
    a. Pulmonary hypertension

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Grade Scale

93 – 100	A
85 – 92	B
77 – 84	C
68 -76	D
< 68	F

Course Evaluation

TEST 1	100	(10%)	______	
TEST 2	100	(10%)	______	
TEST 3	100	(10%)	______	
TEST 4	100	(10%)	______	
TEST 5	100	(10%)	______	
Final (comprehensive)	150	(15%)	______	(grade x 1.5)
Lab	250	(25%)	______	(grade x 2.5)
HW NOTEBOOK	100	(10%)	______	
TOTAL POINTS:	**1000**		______	**(TOTAL/1000)**

Course Requirements

1. Complete all review questions at the back of each chapter.
2. Complete all lab and workbook assignments
3. Complete all lab competencies

Course Policies

Attendance. If you do not attend class you are missing some very valuable information. Test will include both textbook material and anything mentioned in class.

Homework Assignments –Please turn in homework assignments at the start of the next class meeting. NO LATE WORK ACCEPTED!!!! If you have an excused absence you may e-mail your work to me before the class starts. If the absence is not excused you will receive a zero.

Absences – According to LIT policy students with approved absences shall be allowed to make up examinations and written assignments without penalty. This privilege does not extend to unapproved absences. The determination of whether an absence is excused or approved is the responsibility of the instructor, except in the case of approved absence for an Institute-sponsored activity. If absences seriously interfere with performance the instructor may recommend to the Department Chair that the student be dropped from the course. You may be asked to present documentation to the instructor as to why the absence was necessary for the next class meeting that you attend, (i.e. doctor excuse, funeral pamphlet, note from child's doctor, etc.).

Make-up Exam - You may make-up an exam only if the absence is excused by the instructor. The make-up exam will be taken on the next class day that you return.

Class Roll – will be taken on the first and fourth class days. If your name is not on the class roster on the fourth class day, you will be asked to leave class until this matter is taken care of.
NO EATING, NO DRINKING, TURN OFF BEEPERS, TURN OFF CELL PHONES, NO DISRUPTIVE BEHAVIOUR, AND NO CHILDREN ALLOWED IN CLASS PLEASE!

Disabilities Statement

The Americans with Disabilities Act of 1992 and Section 504 of the Rehabilitation Act of 1973 are federal anti-discrimination statutes that provide comprehensive civil rights for persons with disabilities. Among other things, these statutes require that all students with documented disabilities be guaranteed a learning environment that provides for reasonable accommodations for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Special Populations Coordinator at (409) 880-1737 or visit the office in Student Services, Cecil Beeson Building.

Course Schedule

Classroom: This course schedule is tentative and may be adjusted to facilitate student learning

Week	Topic	Required Reading
Week 1	Oxygenation and Acid-base Evaluation	Chapter 1
Week 2	Basic terms and Concepts of mechanical Ventilation How Ventilators Work	Chapters 2 and 3
Week 3	How a Breath Is Delivered	Chapter 4

Week	Topic	Required Reading
Week 4	TEST I Turn in homework 1-4 Establishing The Need For Mechanical Ventilation	Chapter 5
Week 5	Selecting the Ventilator and the Mode Initial Ventilator Settings	Chapters 6 and 7
Week 6	TEST II Turn in homework 5-8 Final Considerations In Ventilator Setup	Chapter 8
Week 7	Initial Assessment of the Mechanically Ventilated Patient Ventilator Graphics	Chapters 9 and 10
Week 8	Noninvasive Assessment of respiratory and cardiac function	Chapter 11
Week 9	TEST III Turn in homework 9-12 Methods to Improve Ventilation and Other Techniques in Patient-Ventilator Management	Chapter 13
Week 10	Improving Oxygenation and Management of ARDS Frequently Used Pharmacological Agents in Ventilated patients: Sedatives, Analgesics, and Paralytics.	Chapters 14 and 15
Week 11	TEST IV Turn in homework 13-15 Effects of Positive Pressure Ventilation on the Cardiovascular, Cerebral, Renal, and Other Organ Systems	Chapter 16
Week 12	Effects of Positive Pressure Ventilation on the Pulmonary System Troubleshooting and Problem Solving	Chapters 17 and 18
Week 13	TEST V Turn in homework 16-18 Basic Concepts of Noninvasive Positive Pressure Ventilation	Chapter 19
Week 14	Discontinuation form Ventilation and Long-Term Ventilation	Chapter 20
Week 15	Long Term Ventilation Special Techniques in Ventilatory Support	Chapters 21 and 22
Week 16	Review for Final Exam	

Lab Schedule

Week	Lab assignment	Required reading

Week	Lab assignment	Required reading
Week One	Pre-test, practice ABG interpretation, case scenarios	Homework assignment- ABG interpretation packet Workbook – Chapter One
Week Two	Calculations to include: Minute Ventilation Alveolar Minute ventilation Ideal Body weight Tidal volume Time Constants Total Cycle Time Inspiratory and Expiratory time Compliance and resistance Introduction to ventilator settings and terminology	Workbook- Chapters two and three.
Week Three	Introduce the PLV 100 and PB 7200 to illustrate basic principles and underlying mechanical ventilators for the last five decades.	Work book – Chapter 4
Week Four	BIRD MARK 7 to demonstrate flow variable, pressure cycled ventilation. Classification of different ventilators from the lab or clinical environment according to their primary modes, and breath deliver sequence	Workbook – Chapter 5
Week Five	Measure the VC and MIP either before intubation and mechanical ventilation or as part of the weaning evaluation. Use IPPB for some positive pressure experience.	Workbook – Chapters 6 and 7
Week Six	Jeopardy-style game for ventilator modes Test I	Workbook – Chapter 8
Week Seven	The students construct a series of total cycle time-proportional time windows to illustrate and calculate the changes to T_I and T_E when f, peak flow, and I:E ratios change. Assign the student five patient cases with initial orders. Graphics, pressure, volume, and flow. Flow and pressure scalar identification with mode	Workbook – Chapter 9 and 10
Week Eight	NPPV with test lung, CPAP, A mode, A/C, C mode NPPV video Ventilator alarm identification in the clinic is	Workbook – Chapter 11

Week	**Lab assignment**	**Required reading**
	often confusing because so many variables are in play. Groups set up two to four ventilators with test lungs to simulate one of the following alarm conditions. Have the other group(s) detect and correct the alarm condition. Repeat conditions, demonstrating when alarm conditions can overlap.	
Week Nine	Simulation of alarm conditions, desired FIO2, introduction of peep, case studies	Workbook – Chapter 13
Week Ten	Graphics, pressure, volume, and flow. Flow and pressure scalar identification with mode	Work Book – Chapters 14 and 15
Week Eleven	Suctioning a ventilator patient safely, PE, transport MRI safety.	Workbook – Chapter 16
Week Twelve	Continuous Flow CPAP without a ventilator, Case study ARDS.	Workbook – Chapters 17 and 18
Week Thirteen	Students to develop jeopardy game questions for effects of mechanical ventilation on the cardiovascular system, neurological system, renal system, gastrointestinal system, and hepatic system	Workbook – Chapter 19
Week Fourteen	Evaluate flow time curves on ventilator graphics for Auto-PEEP. The four weaning strategies	Workbook – Chapter 20
Week Fifteen	Simulate patient, patient circuits, ventilator problems in the lab.	Workbook – Chapters 21 and 23
Week Sixteen	Dataarc competencies Test II	

Contact Information

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