Neonatal/ Pediatric Mechanical Ventilation (RSPT 2319)

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


Co-requisite: RSPT: 2413, RSPT: 2255, RSPT: 2361

Course Description
A study of therapeutic procedures to achieve adequate spontaneous and artificial ventilation of the neonatal and pediatric patient. Includes indications, complications, and physiological effects of ventilatory support.

Required Textbook and Materials
1. Comprehensive Perinatal & Pediatric Respiratory Care by Kent Whitaker
   a. ISBN# 978-0-7668-1373-1
2. Mechanical Ventilation Physiological and Clinical Applications by Susan P. Pilbeam and Jim Cairo
   a. ISBN number 13 978-0-323-03236-0
3. Workbook For Mechanical Ventilation Physiological and Clinical Applications by Susan P. Pilbeam and Jim Cairo
   a. ISBN# 978-0-323-03296-4
4. A package of #882 Scantrons and #2 pencils

Course Objectives
Upon completion of this course, the student will be able to:
1. Perform, analyze, and interpret the assessment of oxygenation and ventilation
2. Identify and discuss neonatal and pediatric advanced life support
3. Describe the concepts of mechanical ventilation
4. Perform and describe the management of the patient-ventilator system
5. Identify common ventilators and monitors
6. Describe special procedures and nonconventional ventilator techniques.
7. Discuss and critically analyze case scenarios

Course Outline
1. Review of Oxygenation and acid-base status

Approved 11/2010
a. oxygenation
b. ventilation
c. hemoximetry

2. Neonatal Advanced Life Support
3. Pediatric Advanced Life Support
4. Concepts of mechanical ventilation
   a. Goals of mechanical ventilation
   b. Terminology
      1. peak inspiratory pressure (PIP)
      2 Positive end expiratory pressure (PEEP)
      3. frequency
      4. inspiratory time
      5. mean airway pressure
      6. tidal volume
      7. Minute ventilation
      8. deadspace
      9. alveolar ventilation
     10. opening pressure
     11. driving pressure
     12. functional residual capacity
     13. diffusion time
     14. flow rate

5. The relationships that exist between ventilator parameters.
   a. Compliance
      1. How lung compliance is measured.
      2. Static compliance
      3. Dynamic compliance
      4. Values in the neonate.
      5. Determinants of pulmonary compliance.
      6. Compliance of the thorax and how it is developed.
      7. The relationship between the lungs and thorax that determines the overall compliance.
      8. The lung compliance curve.
      9. Lung disorders that alter lung compliance.
   b. Resistance
      1. The factor that is responsible for airway resistance changes.
      2. The airway resistance in the normal newborn, and how to measure resistance.
      3. Increase resistance in the neonatal airway
   c. Time Constants
      1. Three time constants and expiratory time.
      2. Calculate a minimal expiratory time needed.
      3. Changes in resistance and compliance change time constants
6. Perform and describe the management of the patient-ventilator system.
   a. The indications for ventilator support of the neonate and child.
   b. Partial ventilator support
   c. Full ventilator support.
   d. Describe how the following initial ventilator parameters are determined:
      1. Mode
      2. peak inspiratory pressure
      3. set rate
      4. sensitivity
      5. PEEP
      6. FIO2
      7. inspiratory flow
      8. inspiratory time
      9. I:E ratio
      10. tidal volume.
   e. Volume versus pressure controlled ventilation
   f. Ventilator settings based on:
      1. blood gases
      2. clinical evaluation.
   g. Hazards and effects of mechanical ventilation
   h. Humidification
   i. Nebulization and MDI’s
   j. Pulmonary hygiene
   k. Suctioning
   l. Oxygen devices and analyzation
   m. Pharmacology
   n. Airway management
   o. Trach care
   p. Sputum characteristics
   q. Patient positioning
   r. Fluid balance with and without an indwelling catheter

8. **Weaning and Discontinuance of Mechanical Ventilation**
   a. Weaning of the neonatal and pediatric patient from mechanical ventilation.
   b. Extubation of the neonatal and pediatric patient.
   c. Medical Ethics

9. **Identify common ventilators and monitors**
   a. Identify and discuss, for each of the following ventilators, the classification, control switches and timers, internal mechanisms, and features:
      1. Servo I
      2. PB 840
      3. Drager Avea
b. Calculating FiO₂ and flow rate when given the necessary information and data.

c. Intermittent ventilator monitoring
   1. ventilator parameters
   2. alarm systems
   3. chest x-ray
   4. capillary and arterial blood gas analysis

c. Continuous ventilator monitoring
   1. transcutaneous monitoring
   2. pulse oximetry
   3. capnography and End Tidal CO₂
   4. Airway graphics

10. Special procedures and nonconventional ventilator techniques.
   a. Surfactant replacement therapy.
      1. History
      2. Indications
      3. Administration techniques
      4. Outcomes
   b. High Frequency ventilation (HFV).
      1. Rates of ventilation
      2. Indications
      3. Clinical uses
      4. Hazards
   c. Conventional ventilator is used in conjunction with:
      High Frequency Jet ventilation (HFJV)
      High Frequency Oscillation (HFO).
   d. Theories of gas flow characteristics associated with high frequency jet ventilation (HFJV) and high frequency oscillation (HFO).
   e. inhaled nitric oxide
      1. treatment of the newborn and pediatric patient in respiratory failure.
      2. The safety of inhaled nitric oxide
      3. Adverse effects
   f. Heliox
      1. pediatric patients with airflow obstruction.
      2. Extra Corporal Life Support( ECLS):
      3. History
      4. Venoarterial vs. Venovenous bypass
      5. Components of the ECLS circuit
      6. Use of mechanical ventilation during ECLS
      7. selecting patients for ECLS
      9. Initiated,
      10. Indications for termination,
11. Complications associated with its use.

11. **Negative pressure ventilation:**
   1. History
   2. Methods of delivery
   3. Current uses
   4. Advantages and disadvantages

12. **Partial liquid ventilation.**
   a. History
   b. Use

13. **Patient/Clinical case studies and algorithms**
   a. Algorithms
   b. Analyze:
      1. subjective history
      2. objective data
      3. assessment
      4. form the treatment plan.

**Grade Scale**
A = 93 – 100 %
B = 85 - 92 %
C = 77 - 84 %
D = 68 - 76 %
F = less than 68 %

**Course Evaluation**

<table>
<thead>
<tr>
<th>Course</th>
<th>Points</th>
<th>Student Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam I</td>
<td>100</td>
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<tr>
<td>Exam II</td>
<td>100</td>
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<tr>
<td>Exam III</td>
<td>100</td>
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<tr>
<td>Final Exam</td>
<td>250</td>
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<tr>
<td>Lab (three test 50 point each)</td>
<td>150</td>
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<tr>
<td>Home Work</td>
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<tr>
<td>Total</td>
<td>700</td>
<td>700 /700</td>
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**Course Requirements**
1. You must attend class
2. Homework is due at the beginning of the next class
3. No late work will be accepted.
4. Three exams
5. Comprehensive Final
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!

Remediation – Refer to the Respiratory Care student handbook.

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

Course Schedule

Lecture

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reference (required reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neo/pediatric arterial blood gas</td>
<td>Comprehensive Perinatal &amp; Pediatric</td>
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</table>
## RSPT 2319
### Course Syllabi

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reference (required reading)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Interpretation</td>
<td>Respiratory Care</td>
</tr>
<tr>
<td>2</td>
<td>Review of neonatal and Pediatric Diseases</td>
<td>Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>3</td>
<td>Concepts of Mechanical ventilation</td>
<td>Chapter 14 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>4</td>
<td>Concepts of mechanical ventilation-Ventilator Commitment</td>
<td>Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>5</td>
<td>Test #1 / Management of Patient ventilator systems</td>
<td>Chapter 15 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>6</td>
<td>Management of Patient ventilator systems</td>
<td>Chapter 15 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<tr>
<td>7</td>
<td>Management of Patient ventilator systems</td>
<td>Chapter 15 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>8</td>
<td>Common ventilators and Monitors</td>
<td>Chapter 16 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>9</td>
<td>Test #2, troubleshooting and Problem solving</td>
<td>Chapter 15 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>10</td>
<td>Special procedures and nonconventional ventilator techniques</td>
<td>Chapter 17- Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<tr>
<td>11</td>
<td>Ventilatory graphics</td>
<td>Chapter 22 - Mechanical Ventilation Physiological and Clinical Applications</td>
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<tr>
<td>12</td>
<td>Test #3- Special Procedures</td>
<td>Chapter 17- Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<tr>
<td>13</td>
<td>Special Procedures / Clinical Case studies</td>
<td>Chapter 17 – Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<tr>
<td>14</td>
<td>Clinical Case studies</td>
<td>Chapter 22 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<td>15</td>
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<td>Chapter 22- Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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<td>16</td>
<td>Clinical Case studies- Exam #4</td>
<td>Chapter 22- Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
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### Lab:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required reading</th>
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<tbody>
<tr>
<td>1</td>
<td>ABG exercises</td>
<td>Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>2</td>
<td>Case scenarios (disease)</td>
<td>Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>3</td>
<td>Terminology</td>
<td>Chapter 14 - Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
<tr>
<td>4</td>
<td>Identifying and label parts of ventilator</td>
<td>Comprehensive Perinatal &amp; Pediatric Respiratory Care</td>
</tr>
</tbody>
</table>
### Week | Topic | Required reading
--- | --- | ---
5 | Scenarios (commitment and management) | Chapter 15 - Comprehensive Perinatal & Pediatric Respiratory Care
6 | Test #1 | Chapter 15 - Comprehensive Perinatal & Pediatric Respiratory Care
7 | Identifying setting buttons on ventilator | Chapter 15 - Comprehensive Perinatal & Pediatric Respiratory Care
8 | Troubleshooting and problem solving | Chapter 16 - Comprehensive Perinatal & Pediatric Respiratory Care
9 | Test #2 | Chapter 15 - Comprehensive Perinatal & Pediatric Respiratory Care
10 | Graphic analysis | Chapter 17 - Comprehensive Perinatal & Pediatric Respiratory Care
11 | Graphic analysis | Chapter 22 - Mechanical Ventilation Physiological and Clinical Applications
12 | NPPV- Special procedures | Chapter 17 - Comprehensive Perinatal & Pediatric Respiratory Care
13 | Clinical case scenarios | Chapter 17 – Comprehensive Perinatal & Pediatric Respiratory Care
14 | Clinical case scenarios | Chapter 22 - Comprehensive Perinatal & Pediatric Respiratory Care
15 | Clinical case scenarios | Chapter 22 - Comprehensive Perinatal & Pediatric Respiratory Care
16 | Check offs | Dataarc © Competency

### Contact Information
**INSTRUCTOR:** Gwen Walden  
**OFFICE:** 239- MPC  
**PHONE:** 880-8852 (OFFICE), 409-960-2919 (CELL)  
**E-MAIL:** gwen.walden@lit.edu  
**OFFICE HOURS:** posted outside office door. Additional times available with appointment. Available for remediation or tutoring.