

Neonatal/ Pediatric Mechanical Ventilation (RSPT 2319)



Credit: 3 semester credit hour (2 hour lecture, 4 hour lab)

Prerequisite : RSPT: 1113, RSPT: 1207, RSPT: 1461, RSPT: 1325, RSPT: 1329, RSPT: 1331. RSPT: 1335, RSPT: 1360

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

Course Description

A study of mechanical ventilation for the neonatal and pediatric patient.

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 diseases.
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 cases scenarios

1. Embryological Development of the Cardiopulmonary System Development and Care Of The Fetus: Conception to Birth

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The student will be able to:

- a. Describe/ identify the process of fertilization to implantation.
- b. Identify and differentiate between the germ layers.
- c. Explain the development of the pulmonary system.
- d. Describe and discuss the embryonic period, pseudoglandular period, canalicular period, and sacular and alveolar periods
- e. Recall the basic understanding and knowledge of surface tension
- f. Explain the basic knowledge and understanding of LaPlace's law, and the role of surfactant.
- g. Discuss or identify how surfactant is produced at what gestational age surfactant appears.
- h. Discuss or identify the L/S ratio and other methods of determining lung maturity.
- i. Explain the conditions that delay or accelerate surfactant production in the fetus.
- j. Discuss or identify fetal lung fluid that includes amount, composition, and function.
- k. Explain the hazards of lung fluid retention.
- l. Discuss and describe the development of the cardiovascular system that includes early embryologic development, development of the cardiac chambers, and the formation of major vessels and cardiac valves.
- m. Discuss and describe fetal circulation that includes blood flow and shunts.
- n. The student will be able to discuss the development of baroreceptors and chemoreceptors.
- o. Discuss and describe the development and function of intrauterine structures that includes the placenta, umbilical cord, amnion, amniotic fluid.

2. Assessment of Fetal Growth and Development

Labor, Delivery, and Physiological Changes after Birth

- a. Discuss/ identify the methods used for assessment of fetal growth that includes ultrasonography, doppler assessment of blood velocities, amniocentesis, fetal heart rate monitoring, and fetal scalp pH.
- b. Compare the delivery date or estimated date of confinement by methods that include the Nagele's rule, fundal height, quickening, and determination of fetal heartbeat.
- c. Explain the biophysical tests of fetal well being that includes the contraction stress test, the nonstress test, vibroacoustic stimulation, monitoring fetal movement, assessment of amniotic fluid volume, the biophysical profile, meconium presence in amniotic fluid, chorionic villus sampling, cordocentesis, biochemical methods of assessment, and MRI

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- d. Define parturition.
- e. Discuss or identify the stages of normal labor and delivery that includes stage I of labor, stage II of labor, and stage III of labor.
- f. Explain abnormal labor delivery that includes premature labor and delivery, tocolysis, dystocia, problems associated with the umbilical cord, placental abnormalities, cesarean delivery, multiple gestations, and the role of RT.
- g. Discuss/describe the adaptation to extrauterine life that includes the factors responsible for the first breath, and the change from fetal to adult circulation.
- h. Relate and be able to discuss when to resuscitate and causes of primary and secondary apnea.
- i. Show/identify the effects of asphyxia on the lungs.
- j. Identify the techniques of resuscitation and stabilization that includes preparation for resuscitation, neonatal resuscitation and supplies, basics of neonatal resuscitation, and the ABC's of resuscitation.
- k. Describe or identify the steps in resuscitation that include thermoregulation, maintenance of the airway, evaluation, positive pressure ventilation, evaluation of HR, Chest compressions, intubation, medications, Apgar score.
- l. Explain the management of serum glucose that includes sources of fetal and neonatal glucose, serum values, clinical signs of hypoglycemia, causes of hypoglycemia, measurement of serum glucose, and treatment of hypoglycemia.
- m. Explain how to obtain umbilical vessel blood samples during resuscitation that includes arterial sampling through the umbilical stump.
- m. Describe/identify placement of an umbilical artery catheter (UAC), indications, procedure for placement, and complications.
- n. Explain the assessment of the neonatal and pediatric patient.
- o. Discuss or identify anatomical and physiological considerations that include the cardiopulmonary system, metabolism, and other factors.
- p. Explain how to do a physical assessment of the neonate that includes history, gestational age assessment, physical examination to determine gestational age, and classification of the neonate.
- q. Describe or identify how to do a quiet physical examination of a neonate, hands-on examination.
- r. Describe or identify the neurological examination for neonates that includes the neonatal reflex tests.
- s. Explain how to perform a physical assessment of the pediatric patient that includes history, examination of the pediatric pulmonary system, localization of the disease, assessing adequacy of gas exchange, determining the nature of respirations, rate of

respirations, depth of respirations, rhythm of breathing, and the ease of breathing.

- t. Discuss or identify neonatal and pediatric pulmonary function testing that includes indications for PFT's, contraindications for PFT's, PFT's on neonates, and pulmonary function profile.
- u. Discuss or describe pulmonary function test, pediatric patients that includes the accuracy of the equipment, practitioner testing, interpretation of the results, and determination of total lung volume, DLCO tests, and arterial blood gas analysis.

3. Respiratory Care Procedures

- a. Discuss or describe the use of airway clearance devices that includes indications contraindications, hazards, and techniques.
- b. Explain several new airway clearance devices such as Positive Expiratory Pressure, Forced exhalation Technique, autogenic drainage, high frequency chest compressions, flutter valve therapy, traditional chest physiotherapy, auscultation, postural drainage, percussion, vibration, and removal of secretions.
- c. Discuss/ identify aerosolized drug therapy that includes particle amount and size, particle characteristics, anatomy of the airways, ventilator pattern, small volume nebulizers, MDI's, DPI, indications, equipment, hazards and complications.
- d. Identify, label, describe or discuss the Small Particle generator (SPAG) that includes ribavirin, indications, contraindications, and hazards.
- e. Explain how to remove secretions with suctioning that includes indications, equipment, procedure, hazards.
- f. Explain oxygen therapy that includes indications, hazards, and equipment.

4. General Considerations of Continuing Care

- a. Compare thermoregulation, physiology of heat loss, cold stress, and response to hyperthermia.
- b. Explain thermoregulation in the delivery room, nursery, and incubators vs. open warmers.
- c. Identify the developmental needs of the high risk neonate that includes physiological considerations, the effects of overstimulation, behavioral based care, environmental controls, and parental involvement.
- d. Explain skincare of the premature neonate that includes physiologic factors, and skin care recommendations.
- e. Explain fluid and electrolyte balance that includes distribution of body water, distribution of solutes, balance principle, components of intake and output, estimating fluid deficit, and insensible water

loss, functions of electrolytes, electrolyte disorders, maintenance of electrolytes, and monitoring of fluid and electrolytes.

- f. Describe neonatal jaundice that includes the physiology, causes of jaundice, pathologic jaundice, and complications and treatment.
- g. Describe and discuss necrotizing enterocolitis (NEC) that includes the etiology, and clinical signs and treatment.

5. Pharmacology in Neonatal and Pediatric Respiratory Care

- a. Explain the placental drug transfer that includes the physiological factors, mechanisms of placental drug transfer, and the effects on the fetus.
- b. Summarize the neonatal and pediatric pharmacokinetics that includes absorption, distribution, metabolism, and excretion.
- c. Identify and describe medications that include antibiotics, penicillins, cephalosporins, aminoglycosides, macrolides, quinolones, tetracyclines and chloramphenicol, sulfonamides, antifungals, antivirals, and vancomycin
- d. Identify environmental exposure concerns with exposure to ribavirin.
- e. Identify/describe cardiovascular medications such as adenosine, atropine, digoxin, indomethacin, alprostadil prostaglandin E1, Dopamine, Dobutamine, and Tolazoline.
- f. Identify and describe diuretics that include Acetazolamide, chlorothiazide, Furosemide, and Spironolactone.
- g. Identify and describe aerosolized respiratory drugs that include albuterol, Metaproterenol Sulfate, Trebutaline Sulfate, Racemic Epinephrine, Atropine, Ipratropium Bromide, Glycopyrrolate, beclamethasone, Flunisolide, Dexamethasone, Triamcinolone, cromolyn sodium, and pentamidine.
- h. Explain intravenous respiratory drugs that include Caffeine Citrate, Theophylline, and Aminophylline.
- i. Identify and describe the anticonvulsants that include Phenobarbital, Phenytoin Sodium, Felbamate, Valproic Acid, Carbamazepine, and Dexamethasone.
- j. Identify and describe the sedation and control of ventilation drugs that include Chloral Hydrate, Diazepam, Midazolam, Morphine Sulfate, fentanyl Citrate, Pancuronium Bromide, and Succinylcholine Chloride.
- k. Identify the effects of maternal drug abuse on the fetus.

6. Assessment of Oxygenation and Ventilation

- a. Describe and discuss arterial blood gas analysis that includes indications and considerations in obtaining samples in neonates and pediatrics

- b. Explain arterial blood gas assessment that includes PaO₂, PaCO₂, pH, respiratory disorders, metabolic disorders, HCO₃, and Base excess/deficit.
- c. Identify/ describe transcutaneous monitoring that includes the functional design and mechanics, clinical uses, limitations, complications and hazards.
- d. Identify and describe pulse oximetry and its clinical uses.
- e. Explain capnography/Capnometry that includes the basics, and physiological factors.

7. Causes and Care of Illness In Perinatal And Pediatric Patients
Perinatal Lung Disease and Other Problems of Prematurity

- a. Identify the consequences of premature birth that includes Respiratory Distress Syndrome, Bronchopulmonary Dysplasia, Pulmonary Dymaturity Syndrome, Retinopathy of prematurity, intaventricular hemorrhage, and intracranial hemorrhage.
- b. Explain the processes of intrauterine origin such as asphyxia, meconium aspiration syndrome, barotraumatic diseases.
- c. Explain other respiratory diseases such as persistent pulmonary hypertension of the neonate, transient tachypnea, and apnea.

8. Causes of Persistent Perinatal Illness

- a. Identify and discuss the etiology of bacteria, virus, and protozoa.
- b. Describe and discuss the diagnosis and treatment of infection, prevention of infection, and fetal immunities.
- c. Identify and describe congenital anomalies of the pulmonary system that includes tracheoesophageal anomalies, choanal atresia, diaphragmatic hernia, and Pierre-Robin Syndrome.
- d. Identify the cardiac system anomalies that include Patent Ductus Arterious, Atrial Septal defect, Ventricular septal defect, Complete Transposition of the Great vessels, Subaortic Stenosis, Coarctation of the Aorta, Tricuspid Atresia, Anomalous Venous Return, Truncus Arterious, and Hypoplastic Left-Heart Syndrome.

9. Pediatric Diseases Requiring Respiratory Care

- a. Describe and discuss the ventilator diseases that include Acute Respiratory Distress Syndrome, Asthma, and Cystic Fibrosis.
- b. Explain the neuromuscular disorders that include spinal muscular atrophies, muscular dystrophies, Acquired neuromuscular Disorders.
- c. Compare other causes of neurological disorders that include Myasthenia Gravis, Spinal Cord Injuries, Head Injury, Near Drowning, and Reye's syndrome.
- d. Identify/explain infectious lung diseases that include Pneumonia and Bronchiolitis.

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- e. Describe and discuss the diseases of the upper airway that includes Epiglottitis, Croup, and Aspiration Syndromes.
- f. Explain the inhalation of noxious gases that include smoke inhalation, and chlorine inhalation.
- g. Define/identify Sudden Infant Death Syndrome.

10. Interpretation of Chest X-rays

- a. Recall the basic concepts of X-Rays, X-Ray projections, mechanics of the X-Ray device, densities seen on X-Ray, diagnostic usefulness and limitations, and anatomic considerations.
- b. Explain the method of interpretation that includes the systematic approach to reading chest X-Rays.
- c. Identify radiographic findings in neonatal lung pathology that includes Respiratory Distress Syndrome, Atelectasis, Transient Tachpnea of The Newborn, Neonatal Pneumonia, Meconium Aspiration, Diaphragmatic hernia, Congenital lobar Ephysema, Pneumothorax, Pneumomediastinum, Pneumopericardium, pulmonary Interstitial Emphysema, and Bronchopulmonary Dysplasia.
- d. Identify radiographic findings in pediatric lung pathology that includes Adult Respiratory Distress syndrome, Foreign Body Aspiration, Cystic Fibrosis, Asthma, Epiglottitis, and Croup.

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

Course Description

A study of development and care of the fetus from conception to birth. Care of the neonatal and pediatric patient. Causes and care of illness in Perinatal and pediatric patients. 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. Study of transporting the neonatal and pediatric patient. Learn how to set-up and manage home care infants and pediatric patients. Study the care of the parents, the stages of grief, and hospice care.

Required Textbook and Materials

1. *Comprehensive Perinatal & Pediatric Respiratory Care* by Kent Whitaker
 - a. ISBN# 978-0-7668-1373-1

4. A package of #882 Scantrons and #2 pencils

Grade Scale

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

Course Evaluation

Exam I	100
Exam II	100
Exam III	100
Exam IV	100
Exam V	100

Exam VI (Quizzes) Daily pop quizzes will be given at the start of class. If you are late for class this pop quiz will not be made up. The average of the daily pop quiz grades will count as 1 exam. You may drop 2 daily pop quiz grades prior to average.

	100
Final Exam	150
<u>Lab</u>	<u>250</u>
Total	1000

Course Requirements

1. You must attend class
2. Assignments are due at the beginning of the next class
3. No late work will be accepted.
4. Five 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!

Technical Requirements (for courses using Blackboard)

The latest technical requirements, including hardware, compatible browsers, operating systems, software, Java, etc. can be found online at:

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https://help.blackboard.com/en-us/Learn/9.1_2014_04/Student/015_Browser_Support/015_Browser_Support_Policy A functional broadband internet connection, such as DSL, cable, or WiFi is necessary to maximize the use of the online technology and resources.

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. You may also visit the online resource at <http://www.lit.edu/depts/stuserv/special/defaults.aspx>

Student Code of Conduct Statement

It is the responsibility of all registered Lamar Institute of Technology students to access, read, understand and abide by all published policies, regulations, and procedures listed in the *LIT Catalog and Student Handbook*. The *LIT Catalog and Student Handbook* may be accessed at www.lit.edu or obtained in print upon request at the Student Services Office. Please note that the online version of the *LIT Catalog and Student Handbook* supersedes all other versions of the same document

Course Schedule – This schedule for lecture and lab is tentative due to unforeseen circumstances.

Lecture

Week	Topic	Reference (required reading)
1 1/16,18	Embryological development of Cardiopulmonary System	Comprehensive Perinatal & Pediatric Respiratory Care. Chap 1
2 1/23,25	Assessment of fetal Growth and development. Labor , Delivery, and Physiological Changes after birth	Comprehensive Perinatal & Pediatric Respiratory Care. Chap 2 and 3
3 1/30,2/1	Assessment of fetal Growth and development. Labor , Delivery, and Physiological Changes after birth	Comprehensive Perinatal & Pediatric Respiratory Care. Chapter 4 and 5
4 2/6,8	Lecture test one in class	Chapters 1-5
5 2/13,15	Respiratory care procedures. General considerations of Continuing Care	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 6 and 7

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6 2/20,2/22	Pharmacology in Neonatal and Pediatric Respiratory Care. Assessment of Oxygenation and Ventilation	Comprehensive Perinatal & Pediatric Respiratory Care Chap. 8 and 9
7 2/27,3/1	Lecture Test two in Lab Perinatal lung disease and other problems of of prematurity. Causes of persistent perinatal illness	Comprehensive Perinatal & Pediatric Respiratory Care. Chap 10 and 11
8 3/6,8	Pediatric diseases requiring Respiratory Care. Interpretation of CXR's	Comprehensive Perinatal & Pediatric Respiratory Care Chapterr 12 and 13
9 3/12-3/16	Spring Break	
10 3/20,22	Lecture test three in Lab Concepts of mechanical ventilation. Management of the patient ventilator System	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 14 and 15
11 3/27,29	Management of the patient ventilator System	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 15
12 4/3,5	Management of the patient ventilator System	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 15
13 4/10,4/12	Common Ventilators and monitors Special procedures and ventilator techniques.	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 16 and 17
14 4/17,19	Lecture test four in Lab Perinatal transport Home care	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 18 and 19
15 4/24,26	Home Care Care of the parents	Comprehensive Perinatal & Pediatric Respiratory Care Chapter 19 and 20
16 5/1,3	Lecture test 5 in lab Review for Final Exam	Comprehensive Perinatal & Pediatric Respiratory Care
17 5/7-10	Final Exam	Comprehensive Perinatal & Pediatric Respiratory Care
5/11	Graduation	9:00 <i>Montagne Center</i>

Lab:

Week	Topic	Lab assignment
1	Embryological development of Cardiopulmonary System	Quiz 1 Chapter 1 objectives
2	Assessment of fetal Growth and development.	Quiz 2 Chapter 2 Objectives

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	Labor , Delivery, and Physiological Changes after birth	
3	Assessment of fetal Growth and development. Labor , Delivery, and Physiological Changes after birth	Quiz 3 Chapter 3 Objectives Draw and trace fetal circulation
4	NRP	NRP practice skills
5	Respiratory care procedures. General considerations of Continuing Care	Quiz 4 Equipment demonstrations and procedures, Dataarc
6	Pharmacology in Neonatal and Pediatric Respiratory Care. Assessment of Oxygenation and Ventilation	Quiz 5 Worksheet ABG interpretation, CBG's
7	Lecture Test two in Lab Perinatal lung disease and other problems of of prematurity. Causes of persistent perinatal illness	Quiz 6 scenarios
8	Pediatric diseases requiring Respiratory Care. Interpretation of CXR's	Quiz 7 scenarios
9	Spring break	
10	Lecture test three in Lab Concepts of mechanical ventilation. Management of the patient ventilator System	Quiz 8 Demonstration of neo/pedi ventilation Lab assignments
11	Management of the patient ventilator System	Quiz 9 Lab assignments, scenarios
12	Management of the patient ventilator System	Lab assignments, scenarios
13	Common Ventilators and monitors Special procedures and ventilator techniques.	Quiz 10 You tube videos, rental ventilators(for month of April)
14	Lecture test four in Lab Perinatal transport Home care	Quiz 11 Transport exercise, Home care exercise with equipment
15	Home Care Care of the parents	Quiz 12 Home care set-up Care of parents exercise
16	Check offs	Dataarc © Competency

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Contact Information

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