

## Neonatal/Pediatric Cardiopulmonary Care (RSPT 2353)



**Credit:** 3 semester credit hours (3 hours lecture)

**Prerequisite/Co-requisite:** RSPT 1113, RSPT 1207, RSPT 1261, RSPT 1262, RSPT 1325, RSPT 1329.

### Course Description

A study of acute care, monitoring, and management of the neonatal/pediatric patient

### Required Textbook and Materials

1. Comprehensive Perinatal & Pediatric Respiratory Care,  
Kent Whitaker, ISBN -13: 978-07668-1373-1
2. A package of #882 Scantrons and #2 pencils
3. Notebook with college rule paper

### Course Objectives

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

1. Identify the embryological development of the cardiopulmonary system and explain the assessment of fetal growth and development (SCANS: F1, F5, F6, F10, F11, C8, C7)
2. Discuss the stages of labor, delivery (SCANS: F4, C4, C15)
3. Describe the physiological changes after birth of the newborn (SCANS: F6, F12, C5, C6, C7)
4. Demonstrate the techniques of resuscitation (SCANS: F6, F8, F9, F12, F13, F15, F16, C3, C5, C6, C7, C9, C10, C12, C14, C15, C16, C19, C12)
5. Explain techniques for stabilizing and assessing the neonatal and pediatric patient (SCANS: F6, F8, F9, F10, F12, F15, C5, C7, C10, C12)
6. Explain and differentiate between respiratory care procedures (SCANS: F6, F8, F9, F10, C7, C10, C12)
7. Explain the general considerations of continuing care (SCANS: F6, F8, F9, F11, C5, C8, C7)
8. Identify and calculate pharmacology in neonatal and pediatric respiratory care patients (SCANS: F1, F5, F6, F10, F11, C8, C7)
9. Discuss how to assess oxygenation and ventilation (SCANS: F6, F8, F9, F10, F11, C5, C8, C7)
10. Discuss and identify perinatal lung disease and other problems of prematurity (SCANS: F1, F4, F5, F6, F10, F11, C4, C8, C7)
11. Identify the causes of persistent perinatal illness (SCANS: F4, C4, C15)
12. Describe and discuss pediatric diseases (SCANS: F6, F12, C5, C6, C7)

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13. Discuss the basic concepts of interpreting chest x-Rays (SCANS: F4, C4, C15)

### **SCANS Skills and Competencies**

Beginning in the late 1980's, the U.S. Department of Labor Secretary's Commission on Achieving Necessary Skills (SCANS) conducted extensive research and interviews with business owners, union leaders, supervisors, and laborers in a wide variety of work settings to determine what knowledge workers needed in order to perform well on a job. In 1991 the Commission announced its findings in *What Work Requires in Schools*. In its research, the Commission determined that "workplace know-how" consists of two elements: foundation skills and workplace competencies.

### **Course Outline**

#### **Unit One: Embryological Development of the Cardiopulmonary System**

##### **A. Development and Care of the Fetus: Conception to Birth**

1. Fertilization and implantation
2. Germ layers.
3. Development of the pulmonary system.
4. The embryonic period, pseudoglandular period, canalicular period, and saccular and alveolar periods.
5. Surface tension
6. LaPlace's law and surfactant.
7. Surfactant production (gestational age)
8. L/S ratio and lung maturity.
9. Fetal lung fluid - amount, composition, and function
10. Hazards of lung fluid retention
11. Development of the cardiovascular system including early embryologic development, development of the cardiac chambers, and the formation of major vessels and cardiac valves
12. Fetal circulation and shunts.
13. Baroreceptors and chemoreceptors
14. Development and function of intrauterine structures - the placenta, umbilical cord, amnion, amniotic fluid

##### **B. Assessment of Fetal Growth and Development Labor, Delivery, and Physiological Changes after Birth**

1. Methods to assess fetal growth - ultrasonography, doppler assessment of blood velocities, amniocentesis, fetal heart
2. Estimation of delivery date
3. Rate monitoring and fetal scalp pH
4. Nagele's rule, fundal height, quickening, and determination of fetal heartbeat.
5. Biophysical tests of fetal well being - 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
- 6. Parturition
- 7. Stages of normal labor and delivery
- 8. Abnormal labor delivery - premature labor and delivery, tocolysis, dystocia,
- 9. Problems associated with the umbilical cord, placental abnormalities, cesarean delivery, multiple gestations,
- 10. Role of the RT
- 11. Adaptation to extrauterine life
- 12. Factors responsible for the first breath
- 13. The change from fetal to adult circulation

**Unit two care of The Neonatal Pediatric Patient**

**C. Techniques of Resuscitation and Stabilization**

- 1. Resuscitation and causes of primary and secondary apnea
- 2. Effects of asphyxia on the lungs
- 3. Techniques of resuscitation and stabilization that includes preparation for resuscitation, neonatal resuscitation and supplies, basics of neonatal resuscitation, and the ABC's of resuscitation
- 4. Steps in resuscitation - thermoregulation, maintenance of the airway, evaluation, positive pressure ventilation, evaluation of HR, Chest compressions, intubation, medications, Apgar score
- 5. Management of serum glucose - fetal and neonatal glucose, serum values, clinical signs of hypoglycemia, causes of hypoglycemia, measurement of serum glucose, and treatment of hypoglycemia.
- 6. Umbilical vessel blood samples during resuscitation - arterial sampling, umbilical stump
- 7. Placement of an umbilical artery catheter (UAC), indications, procedure for placement, and complications
- 8. Assessment of the neonatal and pediatric patient
- 9. Anatomical and physiological considerations - the cardiopulmonary system, metabolism, and other factors
- 10. Physical assessment of the neonate - history, gestational age assessment, physical examination to determine gestational age, and classification of the neonate
- 11. Describe how to do a quiet physical examination of a neonate and a hands-on examination
- 12. The student will be able to describe the neurological examination for neonates that includes the neonatal reflex tests
- 13. Physical assessment of the pediatric patient – medical history
- 14. 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

15. Neonatal and pediatric pulmonary function testing - indications for PFT's, contraindications for PFT's, PFT's on neonates, and pulmonary function profile
16. Pulmonary function testing on pediatric patients - the accuracy of the equipment, practitioner testing, interpretation of the results, and determination of total lung volume, DLCO tests, and arterial blood gas analysis

**D. Respiratory Care Procedures**

1. Airway clearance devices - indications contraindications, hazards, techniques
2. New airway clearance devices - 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
3. 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
4. Small Particle generator (SPAG ) - ribavirin, indications, contraindications, and hazards
5. Removal of secretions – suctioning, indications, equipment, procedure, hazards
6. Oxygen therapy - indications, hazards, and equipment

**E. General Considerations of Continuing Care**

1. Thermoregulation, physiology of heat loss, cold stress, and response to hyperthermia
2. Thermoregulation in the delivery room, nursery, and incubators vs. open warmers
3. Developmental needs of the high risk neonate - physiological considerations, the effects of overstimulation, behavioral based care, environmental controls, and parental involvement
4. Skincare of the premature neonate - physiologic factors, and skin care recommendations
5. Fluid and electrolyte balance - 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
6. Neonatal jaundice - physiology, causes of jaundice, pathologic jaundice, and complications and treatment
7. Necrotizing enterocolitis (NEC) - the etiology, and clinical signs and treatment

**F. Pharmacology in Neonatal and Pediatric Respiratory Care**

1. Placental drug transfer - the physiological factors, mechanisms of placental drug transfer, and the effects on the fetus
2. Neonatal and pediatric pharmacokinetics - absorption, distribution, metabolism, and excretion
3. Medications - antibiotics, penicillins, cephalosporins, aminoglycosides, macrolides, quinolones, tetracyclines and chloramphenicol, sulfonamides, antifungal, antiviral, and vancomycin
4. Environmental exposure concerns – ribavirin
5. Cardiovascular medications - adenosine, atropine, digoxin, indomethacin, alprostadil prostaglandin E1, Dopamine, Dobutamine, and Tolazoline
6. Diuretics - Acetazolamide, Chlorothiazide, Furosemide, and Spironolactone
7. Aerosolized respiratory drugs - Albuterol, Metaproterenol Sulfate, Terbutaline Sulfate, Racemic Epinephrine, Atropine, Ipratropium Bromide, Glycopyrrolate, Beclomethasone, Flunisolide, Dexamethasone, Triamcinolone, Cromolyn Sodium, and Pentamidine
8. Intravenous respiratory drugs - Caffeine Citrate, Theophylline, and Aminophylline
9. Anticonvulsants that include Phenobarbital, Phenytoin Sodium, Felbamate, Valproic Acid, Carbamazepine, and Dexamethasone
10. Sedation and control of ventilation drugs - chloral Hydrate, Diazepam, Midazolam, Morphine Sulfate, Fentanyl Citrate, Pancuronium Bromide, and Succinylcholine Chloride
11. Maternal drug abuse on the fetus

**G. Assessment of Oxygenation and Ventilation**

1. Arterial blood gas analysis - indications and considerations in obtaining samples in neonates and pediatrics
2. Arterial blood gas assessment - PaO<sub>2</sub>, PaCO<sub>2</sub>, pH, respiratory disorders, metabolic disorders, HCO<sub>3</sub>, and Base excess/deficit
3. Transcutaneous monitoring - the functional design and mechanics, clinical uses, limitations, complications and hazards
4. Pulse oximetry and its clinical uses
5. Capnography/Capnometry that includes the basics, and physiological factors

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

1. Consequences of premature birth that includes Respiratory Distress Syndrome, Bronchopulmonary Dysplasia, Pulmonary Dysmaturity Syndrome, Retinopathy of prematurity, intraventricular hemorrhage, and intracranial hemorrhage
2. Intrauterine origin - asphyxia, meconium aspiration syndrome, barotraumatic diseases

3. Respiratory diseases such as persistent pulmonary hypertension of the neonate, transient tachypnea, and apnea

**I. Causes of Persistent Perinatal Illness**

1. Etiology of bacteria, virus, and protozoa
2. Diagnosis and treatment of infection, prevention of infection, and fetal immunities
3. Congenital anomalies of the pulmonary system - tracheoesophageal anomalies, choanal atresia, diaphragmatic hernia, and Pierre-Robin Syndrome
4. Cardiac system anomalies - 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

**J. Pediatric Diseases Requiring Respiratory Care**

1. Ventilator diseases - Acute Respiratory Distress Syndrome, Asthma, and Cystic Fibrosis.
2. Neuromuscular disorders that include spinal muscular atrophies, muscular dystrophies, Acquired neuromuscular disorders
3. Causes of neurological disorders - Myasthenia Gravis, Spinal Cord Injuries, Head Injury, Near Drowning, and Reye's syndrome
4. Infectious lung diseases that include Pneumonia and Bronchiolitis
5. Diseases of the upper airway - Epiglottitis, Croup, and Aspiration Syndromes
6. Inhalation of noxious gases - smoke inhalation, and chlorine inhalation
7. Sudden Infant Death Syndrome

**K. Interpretation of Chest X-rays**

1. 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
2. Describe the method of interpretation - the systematic approach to reading chest X-Rays
3. Radiographic findings in neonatal lung pathology - Respiratory Distress Syndrome, Atelectasis, Transient Tachypnea of The Newborn, Neonatal Pneumonia, Meconium Aspiration, Diaphragmatic hernia, Congenital lobar Emphysema, Pneumothorax, Pneumomediastinum, Pneumopericardium, pulmonary Interstitial Emphysema, and Bronchopulmonary Dysplasia
4. Radiographic findings in pediatric lung pathology - Adult Respiratory Distress syndrome, Foreign Body Aspiration, Cystic Fibrosis, Asthma, Epiglottitis, and Croup

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**Grade Scale**

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

**Course Evaluation**

Final grades will be calculated according to the following criteria:

3 exams = 55%

Final exam = 35%

Homework

Notebook

Attendance = 10%  
= 100%

**Course Requirements**

1. Composition of notebook: will be graded on order/completeness and accuracy of assignments and exams. Additional assignments may be given throughout the semester. These should also be included with the notebook.
2. Text book chapters are to be read before class to allow for class participation and discussion. Test will include both read textbook material and anything mentioned in class via discussion or lecture notes.
3. Homework assignments are due at the start of the next class meeting.

**Course Policies**

1. No food or drink, or use of tobacco products in class
2. Beepers, telephones, headphones, and other electronic devices must be turned off while in class
3. No children allowed in the classroom
4. No late assignments will be accepted
5. Abide by LIT policies
6. Abide by policies within the Respiratory Care Handbook
7. Abide by instructor specific policies; this will be distributed on the first class day.

**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

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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**

Week	Topic	Required Reading
1	Embryological development	Chapter 1 – Comprehensive Perinatal and Pediatric Respiratory Care
2	Assessment of fetal growth and development	Chapter 2 – Comprehensive Perinatal and Pediatric Respiratory Care
3	Labor, Delivery, and Physiological changes after birth	Chapter 3 – Comprehensive Perinatal and Pediatric Respiratory Care
4	Exam #1/ Techniques of resuscitation and stabilization	Chapter 4 – Comprehensive Perinatal and Pediatric Respiratory Care
5	Assessment of the neonatal and pediatric patient	Chapter 5 – Comprehensive Perinatal and Pediatric Respiratory Care
6	Respiratory Care Procedures	Chapter 6 – Comprehensive Perinatal and Pediatric Respiratory Care
7	General consideration of Continuing Care	Chapter 7 – Comprehensive Perinatal and Pediatric Respiratory Care
8	Pharmacology in Neonatal and Pediatric Respiratory Care	Chapter 8 – Comprehensive Perinatal and Pediatric Respiratory Care
9	Assessment of Oxygenation and ventilation	Chapter 9 – Comprehensive Perinatal and Pediatric Respiratory Care
10	Exam #2/ Perinatal Lung disease	Chapter 10 – Comprehensive Perinatal and Pediatric Respiratory Care
11	Causes of Persistent Perinatal illness	Chapter 11 – Comprehensive Perinatal and Pediatric Respiratory Care
12	Pediatric Diseases Requiring Respiratory Care	Chapter 12 – Comprehensive Perinatal and Pediatric Respiratory Care
13	Interpretation of Chest X- rays	Chapter 13 – Comprehensive Perinatal and Pediatric Respiratory Care
14	Exam #3/ review	Chapter 21 – Comprehensive Perinatal and Pediatric Respiratory Care
15	Case studies	Chapter 21 – Comprehensive Perinatal and Pediatric Respiratory Care
16	Final	

This schedule may be adjusted to facilitate student learning.

**Contact Information:**

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**Office hours:** Posted outside office. Additional times are available with appointment.