RESP-2320: PEDIATRIC/NEONATAL RESPIRATORY CARE

Cuyahoga Community College

Viewing: RESP-2320 : Pediatric/Neonatal Respiratory Care

Board of Trustees:
June 2020

Academic Term:
Fall 2020

Subject Code
RESP - Respiratory Care

Course Number:
2320

Title:
Pediatric/Neonatal Respiratory Care

Catalog Description:
Presentation of theory and its practical application to pediatric and neonatal respiratory disease states. Includes pathophysiology, etiology, patient assessment and treatment using equipment unique to this specialty area.

Credit Hour(s):
2

Lecture Hour(s):
2

Lab Hour(s):
0

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
RESP-2300 Basic Therapeutic Procedures, and concurrent enrollment in RESP-2310 Mechanical Ventilation.

Outcomes

Course Outcome(s):
Examine factors which can safely assist a neonate to breathe effectively following a high risk delivery.

Objective(s):

1. Summarize the phases of fetal lung development, the role of pulmonary surfactant and its production and the unique characteristics of fetal circulation and hemodynamic transition that occur during and shortly after the birth process.
2. Participate in the Neonatal Resuscitation Program, utilizing training procedure established by the American Heart Association.
3. Explain the care of a neonate including factors which may indicate a high risk delivery, patient assessment techniques, thermoregulation, resuscitation and airway management.
4. Discuss the theory and application of supplemental oxygen, nasal continuous positive airway pressure, and mechanical ventilation as they apply to the pediatric and neonatal patient.
5. Identify the most common conditions which produce distress in the neonate and discuss the pathophysiology, assessment techniques, treatment and clinical presentation of these states.
6. Describe the pathophysiology and identify the incidence, symptoms and treatment of the most common cardiac defects seen at birth: patent ductus arteriosis, atrial septal defect, ventricular septal defect, transposition of the great vessels and tetralogy of fallot.
7. Identify and explain the harmful physiologic consequences associated with the use of supplemental oxygen and/or positive pressure, the clinical presentation and methods used to prevent and treat them.

8. Discuss the etiology, clinical presentation, assessment and treatment of croup, epiglottitis bronchiolitis and cystic fibrosis in the pediatric patient.
9. Summarize the role and function of the transport team, its members and responsibilities needed to produce a successful transport of the pediatric or neonatal patient.

Course Outcome(s):

Inventory features of neonatal ventilators so the respiratory practitioner can utilize appropriate functions to optimally ventilate diverse pathologies.

Objective(s):

1. Discuss the theory and application of supplemental oxygen, nasal continuous positive airway pressure, and mechanical ventilation as they apply to the pediatric and neonatal patient.
2. Identify and discuss the operation, features, limitations and advantages of currently available mechanical ventilators used in the treatment and care of pediatric and neonatal patients.
3. Discuss the etiology, clinical presentation, assessment and treatment of croup, epiglottitis bronchiolitis and cystic fibrosis in the pediatric patient.
4. Summarize the role and function of the transport team, its members and responsibilities needed to produce a successful transport of the pediatric or neonatal patient.

Course Outcome(s):

Interpret patient data and symptoms related to unique lung and cardiac defects in order for the respiratory practitioner to treat high risk neonates.

Objective(s):

1. Explain the care of a neonate including factors which may indicate a high risk delivery, patient assessment techniques, thermoregulation, resuscitation and airway management.
2. Discuss the theory and application of supplemental oxygen, nasal continuous positive airway pressure, and mechanical ventilation as they apply to the pediatric and neonatal patient.
3. Identify the most common conditions which produce distress in the neonate and discuss the pathophysiology, assessment techniques, treatment and clinical presentation of these states.
4. Describe the pathophysiology and identify the incidence, symptoms and treatment of the most common cardiac defects seen at birth: patent ductus arteriosis, atrial septal defect, ventricular septal defect, transposition of the great vessels and tetralogy of fallot.
5. Identify and explain the harmful physiologic consequences associated with the use of supplemental oxygen and/or positive pressure, the clinical presentation and methods used to prevent and treat them.
6. Summarize the role and function of the transport team, its members and responsibilities needed to produce a successful transport of the pediatric or neonatal patient.

Course Outcome(s):

Analyze the qualities of the transport, respiratory practitioner and their functions as they relate to being a member of this specialized team.

Objective(s):

1. Summarize the role and function of the transport team.
2. Compare and contrast the team members and their respective needed to produce a successful transport of the pediatric or neonatal patient.

Course Outcome(s):

Contrast the differences between skills of an acute care pediatric therapist versus a pediatric home care therapist.

Objective(s):

1. Discuss the etiology, clinical presentation, assessment and treatment of croup, epiglottitis bronchiolitis and cystic fibrosis in the pediatric patient.
2. Describe the therapy modalities offered to the pediatric/neonatal patient given.

Course Outcome(s):

Demonstrate competency in the Neonatal Resuscition Program (NRP).

Objective(s):

1. Participate in the Neonatal Resuscitation Program, utilizing training procedure established by the American Heart Association.
2. Summarize the role and function of the transport team, its members and responsibilities needed to produce a successful transport of the pediatric or neonatal patient.

Methods of Evaluation:

1. Quizzes
2. Examinations

Course Content Outline:

1. Fetal growth and development
   a. Lung development
      i. embryonic
      ii. pseudoglandular stage
      iii. canalicular
      iv. terminal sac stage
   b. Surfactant
      i. effects on lung compliance
      ii. production pathways
   c. Cardiovascular development
      i. anatomy of fetal circulation
      ii. function of placenta
      iii. oxygenation of fetal blood
      iv. systemic vascular resistance
      v. pulmonary vascular resistance
      vi. anatomic shunts
         1. ductus vensus
         2. foramen ovale
         3. ductus arteriosus
   d. transitional circulation
      i. removal of lung fluid
      ii. clamping of umbilical vessels
      iii. changes in pulmonary vascular resistance
      iv. reversal/closure of anatomical shunts
   e. baroreceptors
   f. chemoreceptors
   g. placenta
   h. umbilical cord
   i. functions of amniotic fluid
2. Labor delivery and physiological changes after birth
   a. Assessment of the neonate
      i. prenatal risk factors
         1. maternal age
         2. severe hypertension
         3. diabetes
         4. gestational age
         5. intrauterine growth retardation
         6. multiple pregnancy
      ii. intrapartum risk factors
         1. abruptio placenta
         2. placenta previa
         3. maternal hypotension
         4. maternal fever
         5. fetal drug depression
         6. prolapsed cord
         7. fetal distress
      iii. cesarean delivery

1. indications
2. complications

iv. gestational age (Dubowitz)
v. birth weight
vi. apgar; infant scoring system
vii. meconium stained amniotic fluid
viii. tachypnea
ix. bradycardia
x. cyanosis
1. central
2. peripheral

xi. grunting/flaring/retracting
xii. asphyxiam
xiii. apnea
1. primary
2. secondary

b. Thermoregulation
i. surface area vs. body mass
ii. methods of heat loss
1. radiation
2. convection
3. conduction
4. evaporation

c. Method of heat production
i. physical
ii. chemical

d. Neutral thermal environment
e. Effects of cold stress
i. oxygen consumption
ii. carbon dioxide production
iii. acid-base
iv. ventilatory pattern

f. Resuscitation technique
i. close chest compression
ii. ventilation
1. intubation technique
2. assessment of ventilation
3. medications

3. Ventilatory support systems
a. Oxygen administration
i. indications
ii. delivery systems
iii. goals
iv. hazards

b. Continuous positive airway pressure
i. indications
ii. goals
iii. complications
iv. delivery systems

c. Mechanical ventilation
i. indications
ii. mean airway pressures
iii. time cycled/pressure limited ventilation
iv. ventilator characteristics
1. partial support
2. constant pressure generator
3. continuous flow circuit

4. Mechanical ventilators

a. Time cycled/pressure limited ventilators
    i. advantages
    ii. characteristics
b. Characteristics of common ventilators
c. High frequency
    i. jet ventilation
    ii. oscillation
d. Ventilatory management
    i. initial settings
    ii. hazards of mechanical ventilation
    iii. weaning

5. Neonatal distress
    a. Idiopathic respiratory distress syndrome
        i. clinical significance
        ii. contributing factors
            1. birth weight
            2. gestational age
            3. diabetic mother
            4. cesarean section
            5. "B" twin
        iii. clinical symptoms
            1. cyanosis in room air
            2. tachypnea
            3. g.f.r. (grunting, flaring, retracting)
            4. decreased air entry
            5. fine rales
        iv. chest radiographic appearance
        v. physiologic changes
            1. decreased lung compliance
            2. deadspace ventilation
            3. right to left shunt
            4. decreased lung volume
            5. decreased functional residual capacity
            6. increased minute volume
            7. work of breathing
        vi. probable cause
        vii. treatment
            1. oxygen administration
            2. continuous positive airway pressure
            3. weaning concerns
            4. blood gas goals
            5. acid-base goals
    b. Persistent fetal circulation
        i. circulation routes
        ii. contributing factors
        iii. clinical signs
            1. cyanosis
            2. acidosis
            3. retractions
            4. tachypnea
            5. hypoxemia with oxygen administration
            6. murmur
        iv. differential diagnosis
            1. hyperoxia test
            2. preductal vs. postductal atrial oxygen tension
        v. respiratory treatment
            1. mechanical ventilation protocol
            2. maintenance of arterial blood gases
            3. monitoring oxygenation

vi. pharmacologic therapy
vii. prognosis
viii. complications of ventilatory management

c. Diaphragmatic hernia
i. pathophysiology
ii. signs/symptoms
iii. respiratory concerns
iv. treatment

d. Transient tachypnea
i. pathophysiology
ii. signs/symptoms
iii. respiratory concerns
iv. treatment

e. Beta hemolytic streptococcus pneumonia
i. etiology
ii. signs/symptoms
iii. respiratory concerns
iv. treatment

f. Sepsis
i. etiology
ii. signs/symptoms
iii. respiratory concerns
iv. treatment

6. Congenital heart defects
a. General information
i. definition
ii. etiology
iii. incidence
iv. associated factors

b. Patent ductus arteriosis
i. incidence
ii. pathophysiology
iii. signs/symptoms
iv. treatment

c. Atrial septal defect
i. incidence
ii. pathophysiology
iii. signs/symptoms
iv. treatment

d. Ventricular septal defect
i. incidence
ii. pathophysiology
iii. signs/symptoms
iv. treatment

e. Coarctation of the aorta

f. Tricuspid atresia

g. Anomalous venous return

7. Iatrogenic disorders
a. Bronchopulmonary dysplasia (B.P.D.)
i. etiology
1. high FI02
2. positive pressure ventilation
3. time

ii. four stages
1. acute phase of Infant Respiratory Distress Syndrome (IRDS)
2. 4-10 days after onset of IRDS
3. 2-3 weeks after birth
4. after one month

iii. treatment

b. Retinopathy of prematurity (ROP)
    i. incidence
    ii. two stages
        1. vasoconstriction
        2. new growth and hemorrhage
    iii. etiology
    iv. oxygen administraton concerns
        1. arterial oxygen tension
        2. FI02
c. Oxygen toxicity
    i. pathophysiology
    ii. etiology
        1. oxygen concentration
        2. length of exposure
        3. individual susceptibility
    iii. treatment
d. Volutrauma
    i. incidence
    ii. clinical significance
        1. mechanical ventilation requirements
        2. borderline ventilation/oxygenation
        3. severe cardiac/pulmonary disease
    iii. etiology
    iv. may develop pneumomediastinum, pneumopericardium
    v. pulmonary interstitial emphysema
    vi. clinical signs/symptoms
        1. sudden onset of irritability
        2. rapid deterioration in appearance
        3. cyanosis
        4. decreased breath sounds
        5. a shift in PMI (point of maximum impulse)
    vii. diagnosis
    viii. treatment
        1. needle aspiration
        2. chest tube
        3. oxygen administration
e. Apnea
    i. etiology
    ii. treatment

8. Pediatric disease
a. croup
    i. incidence
    ii. etiology
    iii. signs/symtoms
    iv. treatment
b. Epiglottitis
    i. incidence
    ii. etiology
    iii. signs/symtoms
    iv. treatment
c. Bronchiolitis
    i. incidence
    ii. etiology
    iii. signs/symtoms
    iv. treatment
        1. riboviron
        2. SPAG-2
d. Sudden infant death syndrome

   i. possible risk factors
   ii. treatment
e. Cystic fibrosis
   i. incidence
   ii. etiology
   iii. signs/symptoms
   iv. prognosis
   v. diagnostic tests
   vi. treatment
f. Human immunodeficiency virus
   i. clinical signs
   ii. diagnosis and treatment
g. Cytomegalovirus
   i. transmission
   ii. symptoms
h. Congenital anomalies
   i. tracheo-esophageal fistula
   ii. choanal atresia
   iii. diaphragmatic hernia
   iv. Pierre-Robin syndrome
i. Asthma
   i. pathophysiology
   ii. signs
   iii. treatment
j. Neuromuscular disorders
   i. Myasthenia Gravis
   ii. Guillain-Barre syndrome
k. Reyes syndrome
   i. pathophysiology
   ii. treatment

9. Assessment of oxygenation and ventilation
   a. Arterial blood gases (ABGS)
      i. umbilical catheter
      ii. radial arterial line
   b. Capillary sample
      i. clinical uses
      ii. limitations
   c. Assessment of ABGS
      i. respiratory
         1. alkalosis
         2. acidosis
      ii. metabolic
         1. alkalosis
         2. acidosis
   d. Transcutaneous monitoring
      i. clinical uses
      ii. limitations
   e. Pulse oximetry
      i. clinical uses
      ii. limitations
   f. Capnography
      i. clinical uses
      ii. limitations
   g. Extracorporeal membrane oxygenation (ECMO)
10. Pediatric/neonatal transports:
   a. Team members
      i. physician
      ii. respiratory therapist
      iii. nurse/paramedic
   b. Team skill requirements

i. intubation
ii. chest tube placement
iii. working knowledge of pediatric/neonatal disease
iv. placement of umbilical artery and venous catheters.
v. cardiopulmonary resuscitation with manual ventilation

c. Initial patient evaluation
i. general clinical observations
ii. respiratory evaluation
iii. cardiovascular evaluation
iv. maternal history

d. Conditions requiring immediate intervention
i. asystole
ii. apnea
iii. hypotension
iv. acidosis
v. hypoglycemia
vi. pneumothorax

e. Support measures used during transport
i. manual ventilation
ii. continuous positive airway pressure (CPAP)
iii. oxyhood
iv. maintenance of neutral thermal environment
v. intravenous therapy (glucose, blood, etc.)
vi. fmonitoring of vital signs
vii. suctioning

11. Respiratory support measures in the home
a. Oxygen therapy
b. Aerosol therapy
c. Apnea monitoring
i. discharge planning:
1. psychosocial assessment
2. review of costs
3. parent teaching
4. community support
5. assurance of working telephone
6. identification of any language problem

ii. support for monitor pt.:
1. 24 hr. call
2. visits by health care company
3. monthly evaluation at ped. out pt. clinic
4. monthly pneumogram
5. local support system

iii. criteria for discontinuation of monitor

d. Mechanical ventilation
i. patient selection criteria.
1. family evaluation
2. medical stability
3. home health care company

ii. discharge planning for home ventilator:
1. care plan
2. reimbursement
3. parent teaching
4. home assessment
5. preparation of home

12. Neonatal Resuscitation Program certification
a. Initial steps in resuscitation
b. Equipment
c. Ventilation

d. Compressions
e. Intubation
f. Medications

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Resources

Walsh, B.K., Czervinske, M.P. (2019) *Perinatal and Pediatric Respiratory Care*, St. Louis: Elsevier.

Cairo, J.M., Pilbeam, S.P. (2017) *Mosby's Respiratory Care Equipment*, St. Louis: Elsevier.

Hess, D.R., et al. (2019) *Respiratory Care Principles and Practice*, New York: McGraw Hill.

Kacmarek, R.M., et al. (2020) *Egan's Fundamentals of Respiratory Care*, St. Louis: Elsevier .

Anerican Academy of Pediatrics, Editor Gary M Weiner. (2016) *Textbook of Neonatal Resuscitation (NRP)*, Elk Grove Village: American Academy of Peditrics.

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