Respiratory System in Pediatrics

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Sheila Connelly, MSN, RN, CPN, PCU 200 NPDS
Shelley Meissbach, MSN, RN, CPN, Acute Care NPDS
Miranda Schmidt, MSN-Ed, RN, NPD-BC, CCRN-K, Float Teams NPDS
Froiland Ascano, DNP, MSc, APRN, NPD-BC, CPNP-AC, CCRN, Systems-Level NPDS

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Objectives:

- Identify key characteristics that make the pediatric respiratory system different than adults
- Explore common conditions associated with pediatric illness
- Review and identify specific characteristics of pediatric anatomy as it differs from adults
- Differentiate between Respiratory Distress and Respiratory Failure
- Discuss nursing interventions in care that are priority to support respiratory system in pediatrics
- Distinguish respiratory disorders specific to pediatrics
- Apply learned concepts to practice and to nursing care plan

Key Pediatric Differences in the Respiratory System

- Lack of or insufficient surfactant [2]
- Smaller airways and underdeveloped cartilage [2]
- Obligatory nose breather (infant) [2]
- Less well-developed intercostal muscles [2]
- Brief periods of apnea common (newborn) [2]
- Faster respiratory rate; increased metabolic needs [2]
- Eustachian tubes relatively horizontal [2]
- Tonsillar tissue enlarged [2]
- More flexible larynx, susceptible to spasm [2]

Developmental Aspects of the Respiratory System

- Infant:
  - Airway narrow and easily occluded [2]
  - Obligatory nose-breathers, abdominal breathers [2]
  - Produces little respiratory mucus; coughs usually nonproductive = infants more susceptible to respiratory infections [2]
  - Acute sense of smell; mucous membranes are highly vascular [2]

Common Respiratory Disease-RSV

- Risk Factors & Symptoms
  - Most prevalent during first 2 years of life
  - Major cause of hospitalization for high-risk infants (prematurity, solid organ transplant, congenital heart disease, chronic lung disease)
  - Tachypnea, retractions, low grade fever, poor PO intake, thick & copious nasal secretions)
  - Typically lasts 7-10 days
- Nursing Interventions
  - Humidified O2
  - Frequent suctioning
  - Cluster care to allow for rest
  - IV fluids if low PO intake

Common Respiratory Disease-Influenza

- Risk Factors & Symptoms
  - High-grade fever, chills, body aches, cough, congestion, sore throat
  - Typically lasts 5-7 days
- Nursing Interventions
  - Symptom management (antipyretics & pain medications)
  - Encouraging PO intake or starting IV fluids
  - Cluster care to allow for rest

Common Respiratory Disease-Rhinovirus

- Risk Factors & Symptoms
  - Sore throat, runny nose, coughing, sneezing
  - Typically lasts 7-10 days
  - “Common cold”
- Nursing Interventions
  - Symptom management (antipyretics & pain medications)
  - Encouraging PO intake or starting IV fluids
  - Cluster care to allow for rest

Respiratory Distress vs. Respiratory Failure

	Respiratory Distress[1,2,4]
Definition/ Classification	Ultimately the result of decreased pulmonary surfactant, incomplete structural development of lung and a highly compliant chest wall
Onset	Self-limiting disease symptoms peak in 3 to 4 days
Clinical Manifestations	1. Expiratory Grunting 2. Sternal, suprasternal, substernal and intercostal retractions progressing to paradoxical seesaw retractions 3. Inspiratory nasal flaring 4. Tachypnea less than 60 breaths/minute 5. Hypothermia 6. Cyanosis when child is in room air (infants with severe disease may be a cyanotic even when given oxygen) increasing the need for oxygen. 7. Decreased breath sounds 8. Pulmonary edema
Contributing Factors	• Absence of or causes that decrease surfactant • Cardiac defects • Sepsis • Airway obstruction • Intraventricular Hemorrhage • Hypoglycemia • Acute Blood Loss

<u>As the disease progresses:</u>

- Seesaw retractions
- Peripheral Edema
- Muscle tone decreases
- Cyanosis increases
- Body temperature dops
- Short periods of apnea
- Bradycardia may occur
- Changes in distribution of blood throughout the body result in pale gray skin color
- Diminished breath sounds

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Respiratory Distress vs. Respiratory Failure[2]

	Respiratory Failure
Definition/ Classification	Characterized by hypercapnia or hypoxemia (PaCO2 >50 mmHg) or Pa O2 <60mmHg
Onset	Rapidly – Minutes to hours or days
Clinical Manifestations	1. Hypoxemia – Restlessness, Agitation, Dyspnea, Disorientation, Confusion, Loss of Consciousness, Delirium 2. Hypercapnia – Headache, somnolence, Dizziness, Confusion 3. Tachypnea, - initially when no longer able to compensate – Bradypnea 4. Accessory muscle use 5. Asynchronous respirations
Contributing Factors	Prolonged Respiratory Distress left untreated + lack of compensatory mechanisms within patient

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Nursing Assessment Pearls [2]

#	Location	Actions	Severity
1.	Respiratory Rate & Rhythm	• Observe Respirations • Count for 1 full minute (NOTE: Level of activity) • Determine if rate is appropriate for patient age	SEE HFNC Pathway
2.	Respiratory Rhythm & Depth	• *Rhythm:* Regular, Irregular or Periodic • *Depth:* Normal, Hypopnea (too shallow), Hyperpnea (too deep)	• Normal = OK • Hypopnea, Hypernea, Irregular or Periodic = Potential for weakening in Respiratory status
3.	Breath Sounds	• Auscultate for a full minute in all lung fields • NOTE: Airflow, any adventitious sounds – crackles, wheezes or stridor.	• No presence of adventitious sounds = OK • All other sounds – Concerning for inadequate support
4.	Respiratory Effort	• Normal, Difficult or Labored	• Normal – ok • Difficult or Labored – Concern for distress
5.	Document	• Character of Dyspnea, labored breathing: Continuous, Intermittent, Worsening, Sudden onset • Relation of activity: Rest, Exertion, Crying, Feeding, Pain, Positioning or Orthopnea	• Document all assessments and provider notifications.

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Nursing Interventions and Support

#	Actions
1.	Maintenance of oxygen to prevent hypoxia
2.	Maintenance of Respiration with ventilatory support if necessary
3.	Maintenance of normal body temperature
4.	Maintenance of fluid, electrolyte and acid-base balance
5.	Maintenance of nutrition – IV fluids as prescribed
6.	Antibiotics as ordered, to treat infection
7.	Constant observation for complications – Respiratory Failure, Pneumothorax,
8.	Care appropriate for small, premature infant or neonate
9.	Prevent hypotension
10.	Maintain a hematocrit of 40-45%

Key Medications-Oxygen[4]

- Necessary and important for many respiratory conditions
- A physician's order is needed
- The order for oxygen may be "as needed" - "titrate to achieve oxygen saturation/O2 sat levels >/= %"
- Can administer via many modes

Nursing considerations:

- Maximize gas exchange
- Volumes r/t mode
- Assisted ventilation
- Pressures r/t mode of administration
- Vigilant assessment/reassessment

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Key Medications-Bronchodilators[4]

relaxes smooth muscle to produce dilation & relieves bronchospasm

Common drugs:

- Albuterol-Ventolin
- Albuterol - Proventil
- Salmeterol-Serevent
- Ipratropium bromide – Atrovent
  - (Be careful near eyes)
- Theophylline (IV)

MDI USE

MDI with Spacer & Mask

Conditions:

- Asthma
- Cystic Fibrosis
- Pneumonia
- Bronchitis

Nursing considerations:

- Short-term vs long-term use
- Teach patient correct use of device

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Key Medications- Inhaled Corticosteroids[4]

Anti-inflammatory

Common drugs:

- Fluticasone - Flovent
- Fluticasone - Flonase
- Triamcinolone – Azmacort

Conditions:

- Asthma

Nursing considerations:

- Teach appropriate use, MDI vs Nebulizer
- Rinse or gargle after dose

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Key Medications-Antibiotics[4]

Common drugs:

- Penicillin
- Amoxicillin
- Azithromycin
- Cephalexin
- Vancomycin
- Erythromycin
- Gentamicin
- Piperacillin sodium

Conditions

Bacterial infections; confirmed

- Strep A, otitis media,
- pneumonia, meningitis

Prophylaxis of infections, CF

Nursing Considerations:

- Doses are weight dependent
- Observe for allergic reaction
- Take entire course of medication

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Key Medication-Antipyretics[4]

Interrupts synthesis of inflammatory prostaglandins

Common Drugs:

- Ibuprofen
- Acetaminophen
- Aspirin
- Ketorolac

Conditions:

- Viral infections
- Bacterial infections
- Fever
- Pain

Nursing Considerations:

- Liver Function
- Kidney Function
- Reassessment

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