Respiratory System in Pediatrics

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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
• Smaller airways and underdeveloped cartilage
• Obligatory nose breather (infant)
• Less well-developed intercostal muscles
• Brief periods of apnea common (newborn)
• Faster respiratory rate; increased metabolic needs
• Eustachian tubes relatively horizontal
• Tonsillar tissue enlarged
• More flexible larynx, susceptible to spasm
Developmental Aspects of the Respiratory System

• Infant:
  • Airway narrow and easily occluded²
  • Obligatory nose-breathers, abdominal breathers²
  • Produces little respiratory mucus; coughs usually nonproductive
    = infants more susceptible to respiratory infections²
  • Acute sense of smell; mucous membranes are highly vascular²
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

<table>
<thead>
<tr>
<th>Respiratory Distress&lt;sup&gt;1,2,4&lt;/sup&gt;</th>
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<tbody>
<tr>
<td><strong>Definition/Classification</strong></td>
</tr>
<tr>
<td><strong>Onset</strong></td>
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</table>
| **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 |

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As the disease progresses:  
- Seesaw retractions  
- Peripheral Edema  
- Muscle tone decreases  
- Cyanosis increases  
- Body temperature drops  
- Short periods of apnea  
- Bradycardia may occur  
- Changes in distribution of blood throughout the body result in pale gray skin color  
- Diminished breath sounds
# Respiratory Failure

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

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<tr>
<th>#</th>
<th>Location</th>
<th>Actions</th>
<th>Severity</th>
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</table>
| 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, Hyperpnea, 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. |
# Nursing Interventions and Support

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

• 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 \( \geq \% \)”
• 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
Key Medications-Bronchodilators
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
Key Medications- Inhaled Corticosteroids
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
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
Key Medication-Antipyretics

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
References:


