

# Pediatric Pulmonary Pathology

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## Disorders of the Upper Airways

- Croup
- Tonsil infections
- Aspiration of foreign bodies
- Obstructive sleep apnea syndrome

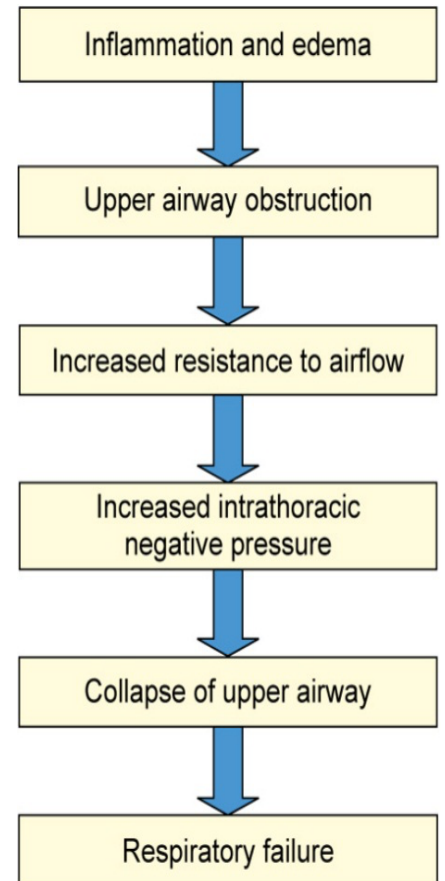
## Disorders of the Lower Respiratory System

- Respiratory distress syndrome (RDS) of newborn
- Bronchopulmonary dysplasia
- Bronchiolitis
- Pneumonia
- Aspiration pneumonitis
- Bronchiolitis obliterans
- Asthma
- Acute respiratory distress syndrome (ARDS)
- Cystic fibrosis
- Sudden Infant Death Syndrome (SIDS)

## Disorders of the Upper Airways

### Croup

- Acute laryngotracheobronchitis
- Common in children from 6 months to 5 years
- Commonly caused by a virus
  - Causes subglottic edema
- Spasmodic croup
  - Older children; sudden night onset without prior illness
- Bacterial laryngotracheitis
  - Most common life-threatening form
  - High fever
- Usually occurs after an episode of rhinorrhea, sore throat, low-grade fever, inspiratory stridor, and hoarse voice
- Causes seal-like barking cough
  - Self-limiting condition
- Most resolve within 24-48 hours
- Severe cases are treated with nebulized epinephrine



## **Disorders of the Upper Airways - continued**

### **Acute epiglottitis**

- Severe, rapidly progressive, life-threatening infection of the epiglottis and surrounding area
- Historically caused by *Haemophilus influenzae* type B
  - 80%-90% decreased incidence due to HIB vaccination
- Manifestations:
  - High fever
  - Irritability
  - Sore throat
  - Inspiratory stridor
  - Muffled voice
  - Severe respiratory distress
- Treatment
  - Emergency airway and antibiotics

### **Tonsillar infections**

- Incidence of tonsillitis secondary to GABHS (group A strep) and MRSA has risen in the past 15 years
- Complication of infectious mononucleosis
- Can lead to upper airway obstruction

### **Aspiration of foreign bodies**

- Foreign body aspiration in children occurs frequently between the ages of 1 and 3
- Manifestations:
  - Coughing
  - Choking
  - Gagging
  - Wheezing
  - Symptoms depend on foreign body size
- Aspirated foreign bodies can be removed by bronchoscopy

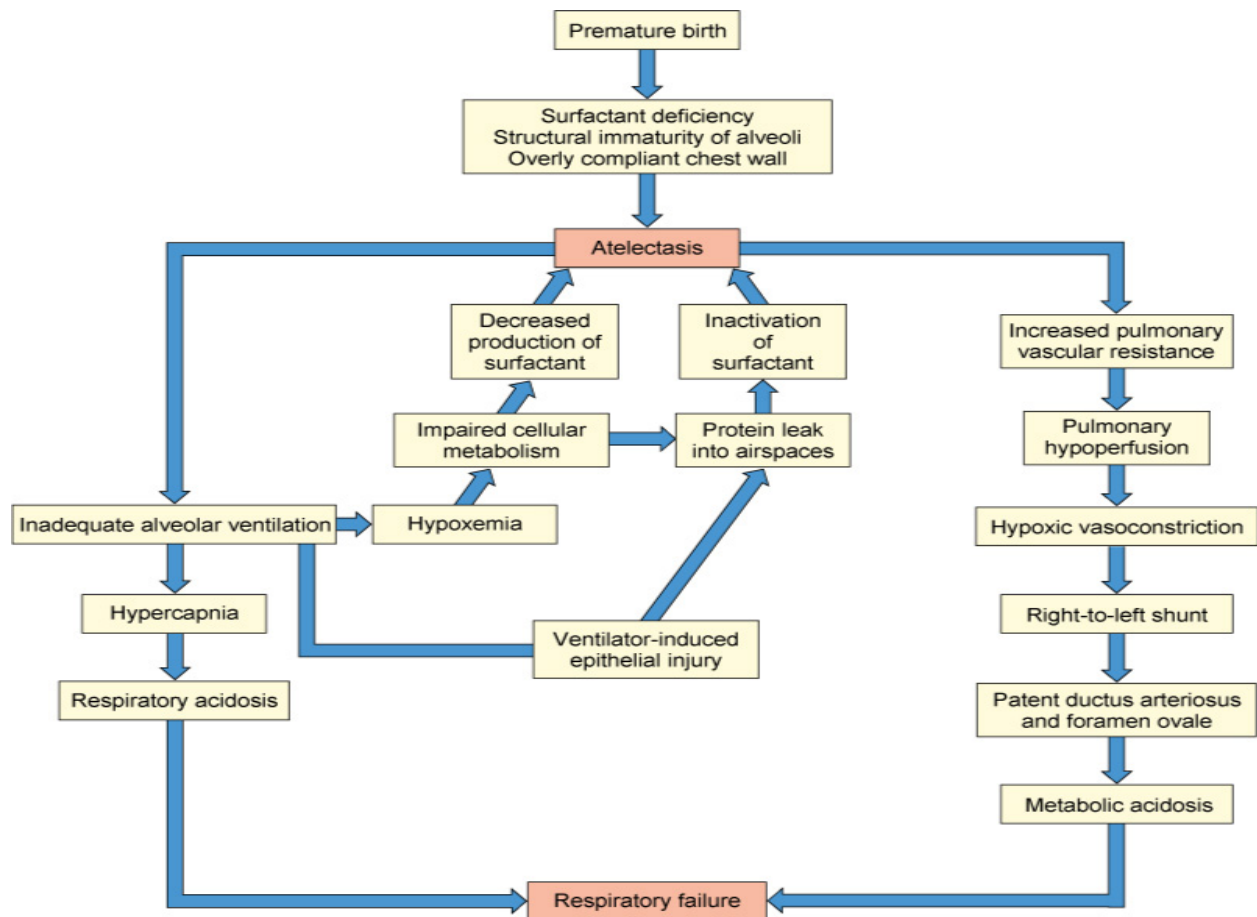
### **Obstructive sleep apnea syndrome**

- Partial or complete upper airway obstruction during sleep
  - Obstructive sleep apnea disrupts normal ventilation and sleep patterns
    - The most common cause for childhood obstructive sleep apnea is adenotonsillar hypertrophy
    - Likely in children who have had a clinically significant episode of RSV bronchiolitis in infancy
  - Manifestations:
    - Snoring and labored breathing during sleep
    - Daytime sleepiness
    - Chronic mouth breathing
  - Treatment: tonsillectomy and adenoidectomy, or CPAP

## Disorders of the Lower Respiratory System

### Respiratory Distress Syndrome (RDS) of Newborn

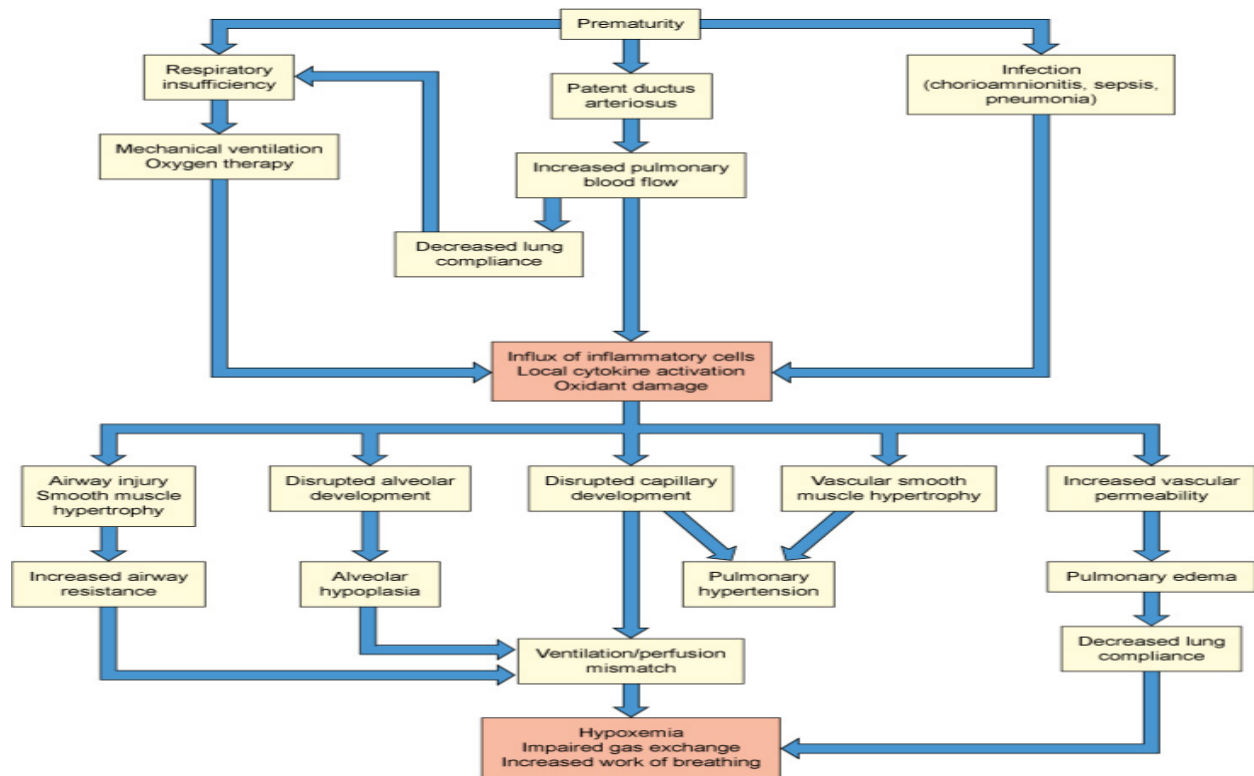
- Also known as hyaline membrane disease (HMD)
  - Poor lung structure and lack of adequate surfactant
  - Primarily a disease of preterm infants
  - Causes widespread atelectasis, respiratory distress, and pulmonary hypertension
- Pulmonary hypertension causes continued shunting of blood away from the lungs (ductus arteriosus)
- Symptoms:
  - Tachypnea
  - Expiratory grunting
  - Nasal flaring
  - Dusky skin
- Treatment
  - Prevention of preterm birth
  - Mechanical ventilation, surfactant administration, glucocorticoid administration to women in preterm labor



## Disorders of the Lower Respiratory System - continued

### Bronchopulmonary dysplasia

- Chronic disease; result of acute respiratory disease in the neonatal period
- Caused by premature birth, immature lungs, infections, genetics, poor formation of alveoli, ventilator support at birth, etc.
- Manifestations:
  - Hypoxemia
  - Hypercapnia
  - Elevated work of breathing
  - Bronchospasm
  - Mucus plugging
  - Pulmonary hypertension
- Bronchopulmonary dysplasia is not as common because of the availability of exogenous surfactant and antenatal glucocorticoids



### Bronchiolitis

- Most common associated pathogen is respiratory syncytial virus (RSV)
- Major reason for hospitalization of infants and young children
- Manifestations
  - Rhinorrhea
  - Tight cough
  - Decreased appetite, lethargy, and fever
  - Wheezing

## **Disorders of the Lower Respiratory System - continued**

### **Pneumonia**

- Bacterial pneumonia
  - Most common: streptococci and staphylococci
  - Pneumococcal (*Streptococcus pneumoniae*) pneumonia is the most common cause of community-acquired bacterial pneumonia
  - May follow viral illness or viral pneumonia
- Viral pneumonia
  - Most common viral pneumonia in young children is RSV (respiratory syncytial virus)
  - Also parainfluenza, influenza, and adenovirus
- Atypical (*Mycoplasma pneumoniae*)
  - Most common cause of community-acquired pneumonia for school age and young adults
  - Onset is usually gradual, resembling a typical upper respiratory infection but with low-grade fever and prominent cough
  - Usually not severe and self-limiting

### **Aspiration pneumonitis**

- Caused by a foreign substance, such as food, meconium, secretions (saliva or gastric), or environmental compounds, entering the lung and resulting in inflammation of the lung tissue
- Leading cause of death in children who are neurologically compromised
- Lung damage depends on volume and pH of aspirate

### **Bronchiolitis obliterans**

- Fibrotic obstruction of the respiratory bronchioles and alveolar ducts secondary to intense inflammation
- Most often occurs as a sequela of a severe viral pulmonary infection
- Progression of disease demonstrates:
  - Increasing tachypnea
  - Dyspnea
  - Cough
  - Sputum production
  - Crackles
  - Wheezing
  - Increased APD
  - Hypoxemia

## **Disorders of the Lower Respiratory Track - continued**

### **Asthma**

- Characterized by bronchial hyper reactivity and reversible airflow obstruction, usually in response to an allergen (Type I hypersensitivity reaction)
- Most prevalent chronic disease in childhood
- Results from a complex interaction between *genetic* susceptibility and *environmental* factors (e.g., allergens including air pollution, dust mites, cockroach antigen, cat exposure, tobacco smoke) and infections, particularly viral (e.g., rhinovirus and RSV)
- Manifestations:
  - Cough
  - Expiratory wheeze
  - Shortness of breath, tachypnea
  - Nasal flaring
  - Use of accessory muscles
  - Exercise intolerance

### **Acute Respiratory Distress Syndrome (ARDS)**

- Life-threatening condition resulting from a direct pulmonary insult (pneumonia, aspiration, near drowning, smoke inhalation) or a systemic insult (sepsis or multiple trauma)
- Inflammatory response activation causes alveolocapillary injury
- Hallmark is lung inflammation leading to fluid in air spaces and alveolar collapse
- Manifestations:
  - Develops acutely after the initial insult, usually within 24 hours
  - Progressive respiratory distress, severe hypoxemia, decreased pulmonary compliance
  - Hyperventilation
- Treatment:
  - Mechanical ventilation
  - Supportive care

### **Cystic fibrosis**

- Autosomal recessive multisystem disease
- Exocrine or mucus-producing glands secrete abnormally thick mucus because of defective epithelial ion transport
- In the lungs, thick secretions obstruct the bronchioles and predispose the lungs to chronic infections
- Chronic inflammation leads to hyperplasia of goblet cells, bronchiectasis, pneumonia, hypoxia, fibrosis, etc.

## **Disorders of the Lower Respiratory Track - continued**

### **Sudden Infant Death Syndrome (SIDS)**

- Defined as “sudden death of an infant under 1 year of age which remains unexplained”
- Incidence
  - Lower during first month of life, increases in the second month, and peaks at 3 to 4 months
  - More common in male infants
- Seasonal variation
  - Possible relationship to respiratory infections
- Wide range of risk factors
- Etiology unknown