



Alterations of Pulmonary Function in Children

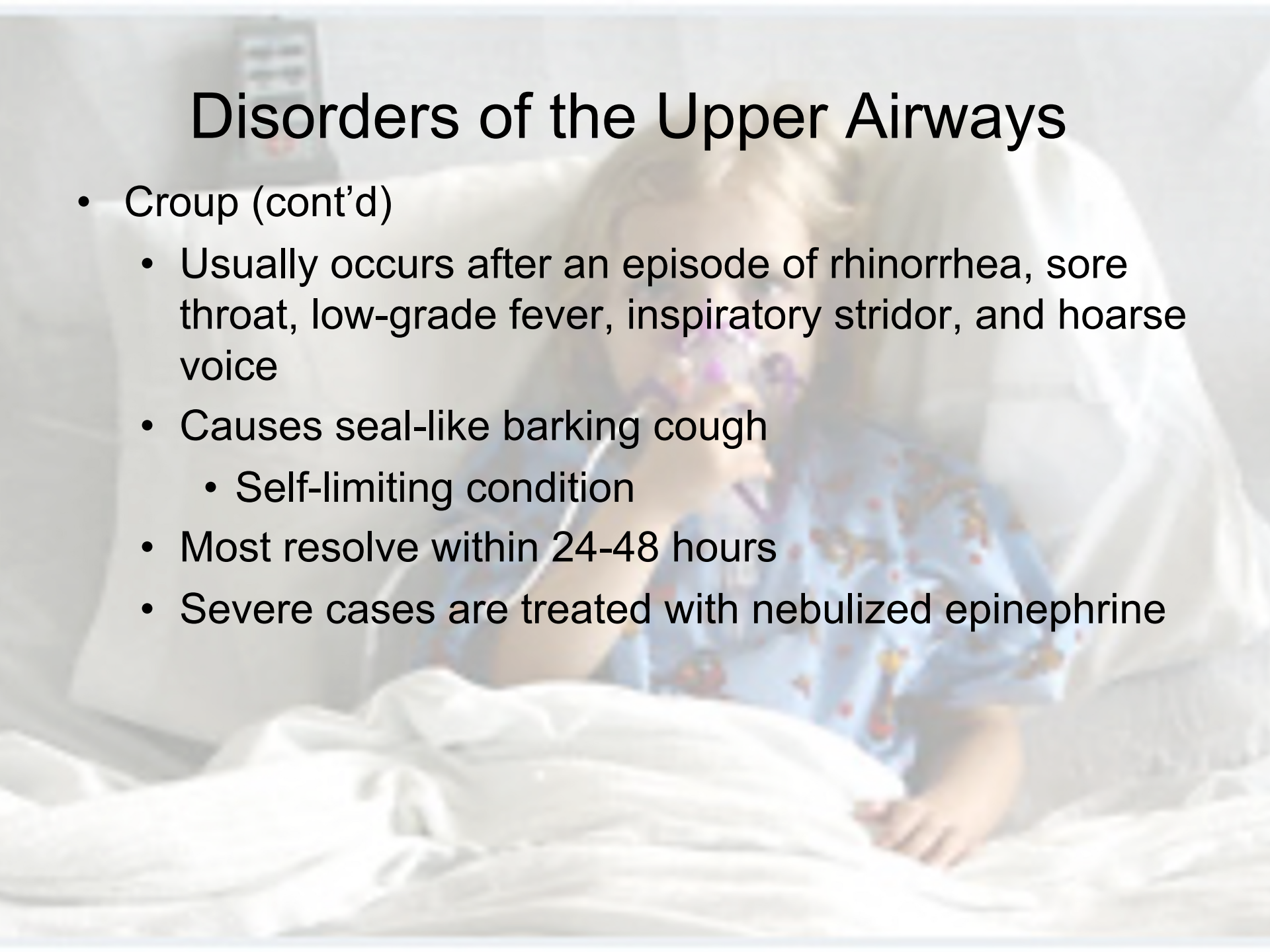
Dr. Gary Mumaugh

Disorders of the Upper Airways

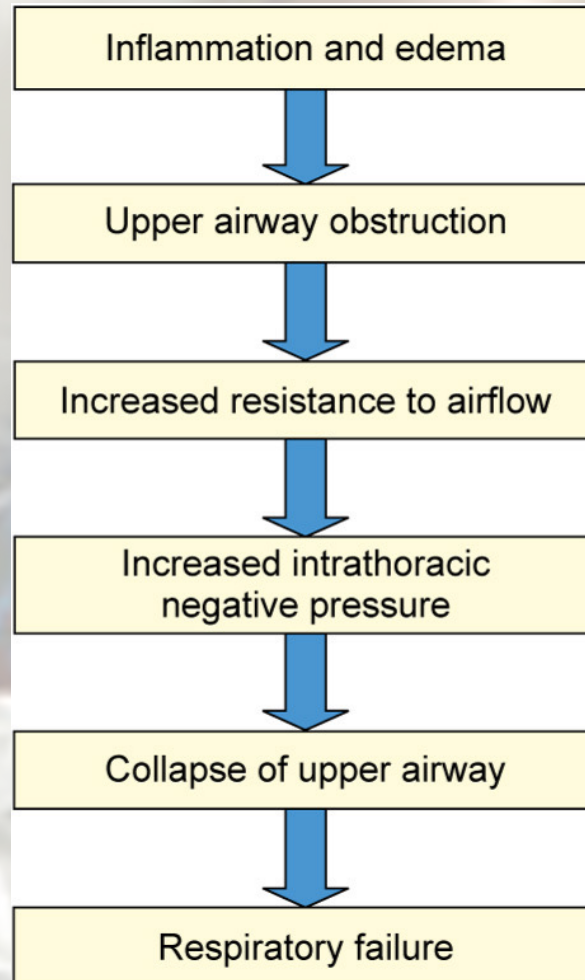
- Croup
 - Acute laryngotracheobronchitis
 - Common in children from 6 months to 5 years
 - Commonly caused by a virus
 - Causes subglottic edema
 - Spasmodic croup
 - Older children; sudden night onset without prior illness
 - Bacterial laryngotracheitis
 - Most common life-threatening form
 - High fever

Disorders of the Upper Airways

- Croup (cont'd)
 - 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



Upper Airway Obstruction with Croup



Disorders of the Upper Airways

- 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

Disorders of the Upper Airways

A young child with blonde hair is lying in a hospital bed, wearing a blue patterned hospital gown. The child is wearing a purple nasal cannula. The background is a plain, light-colored wall.

- Acute epiglottitis (cont'd)
 - Manifestations:
 - High fever
 - Irritability
 - Sore throat
 - Inspiratory stridor
 - Muffled voice
 - Severe respiratory distress
 - Treatment
 - Emergency airway and antibiotics

Disorders of the Upper Airways

A young child with blonde hair is lying in a hospital bed, wearing blue patterned pajamas. The child has a nasal cannula in their nose. The background is a plain, light-colored wall. The image is slightly faded to allow text to be overlaid.

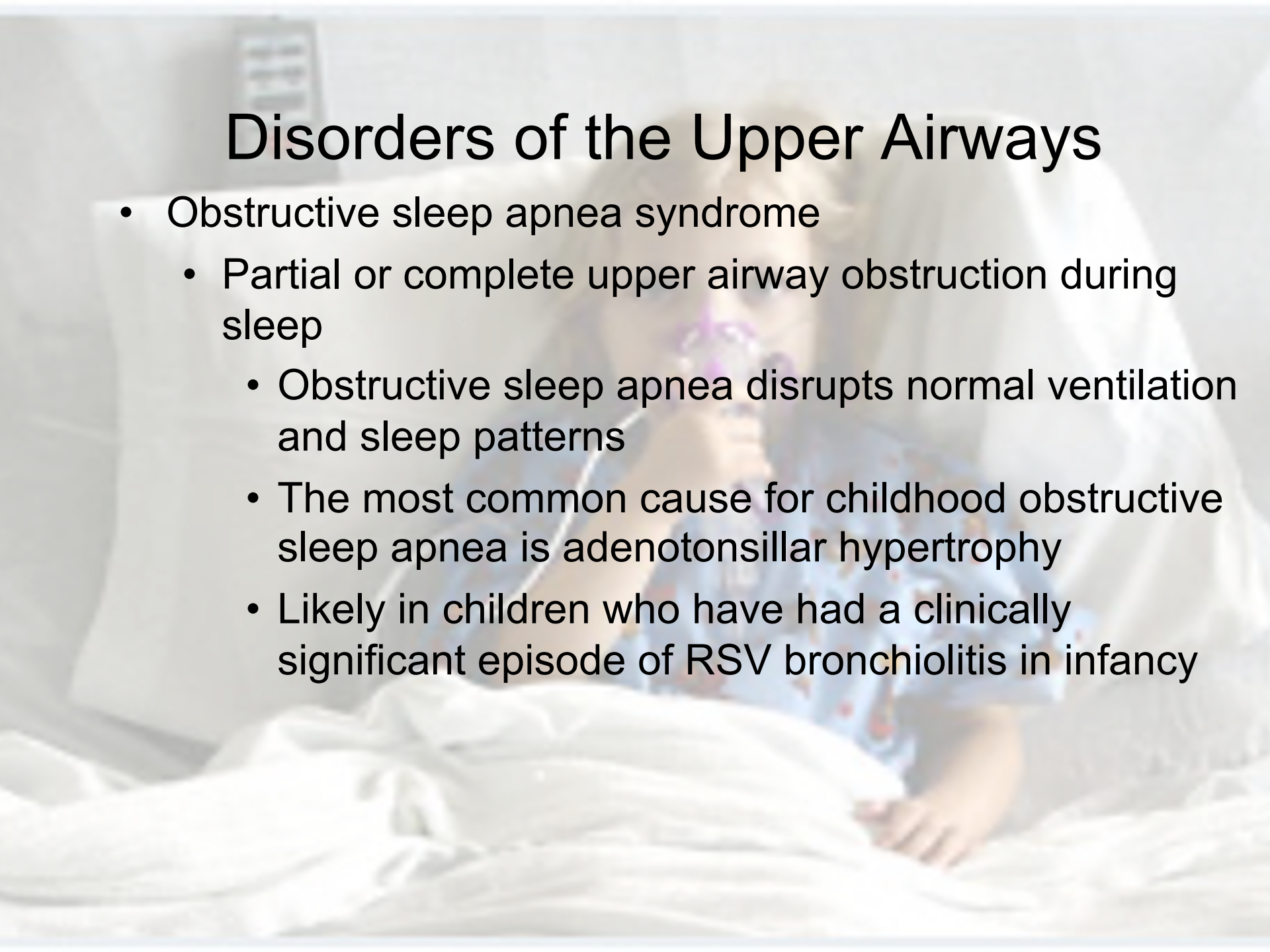
- Tonsillar infections
 - Incidence of tonsillitis secondary to GABHS (group A strep) and MRSA has risen in the past 15 years
 - Complication of infectious mononucleosis
 - Can lead to upper airway obstruction

Disorders of the Upper Airways

- 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

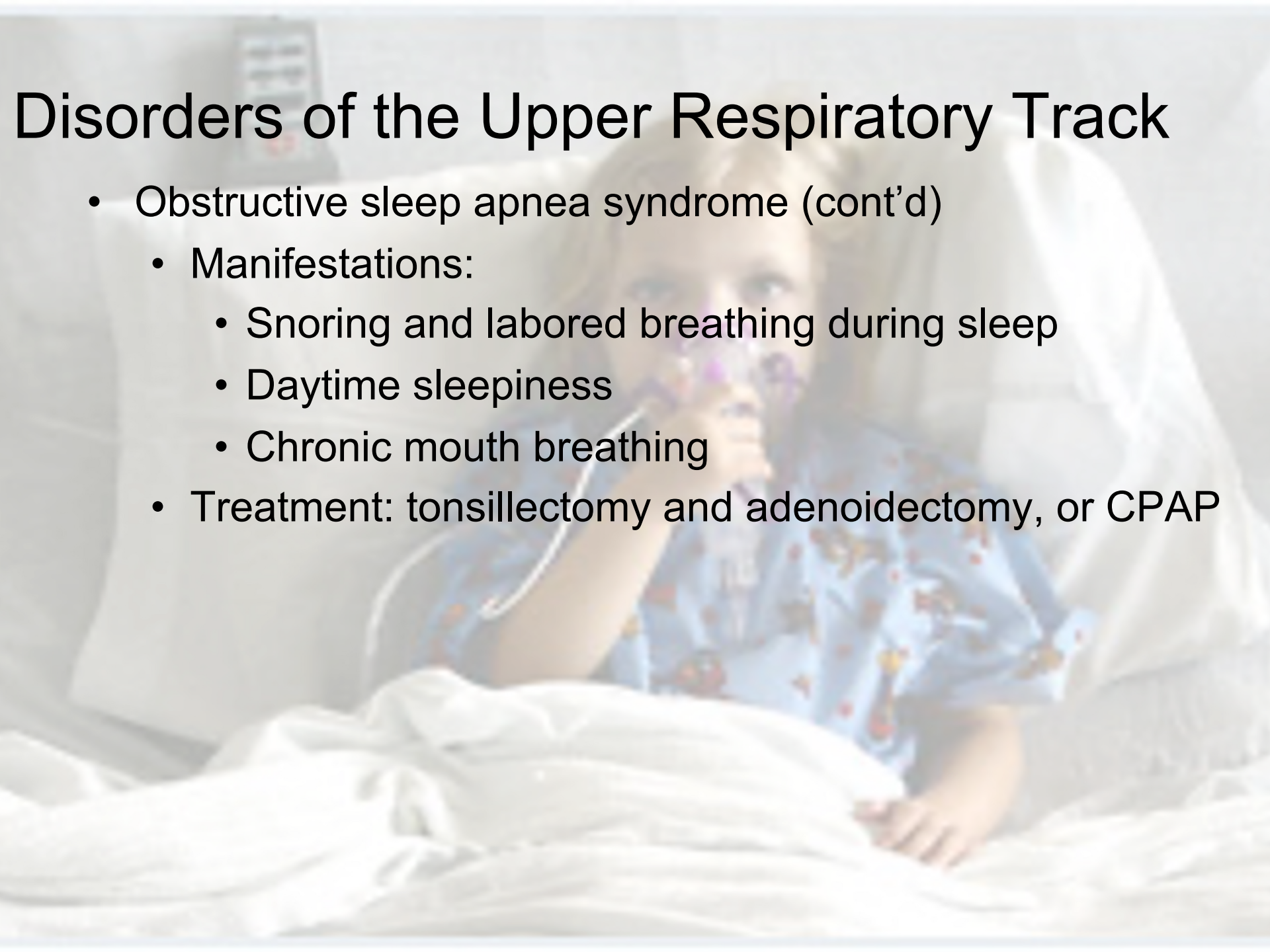
Disorders of the Upper Airways

- 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



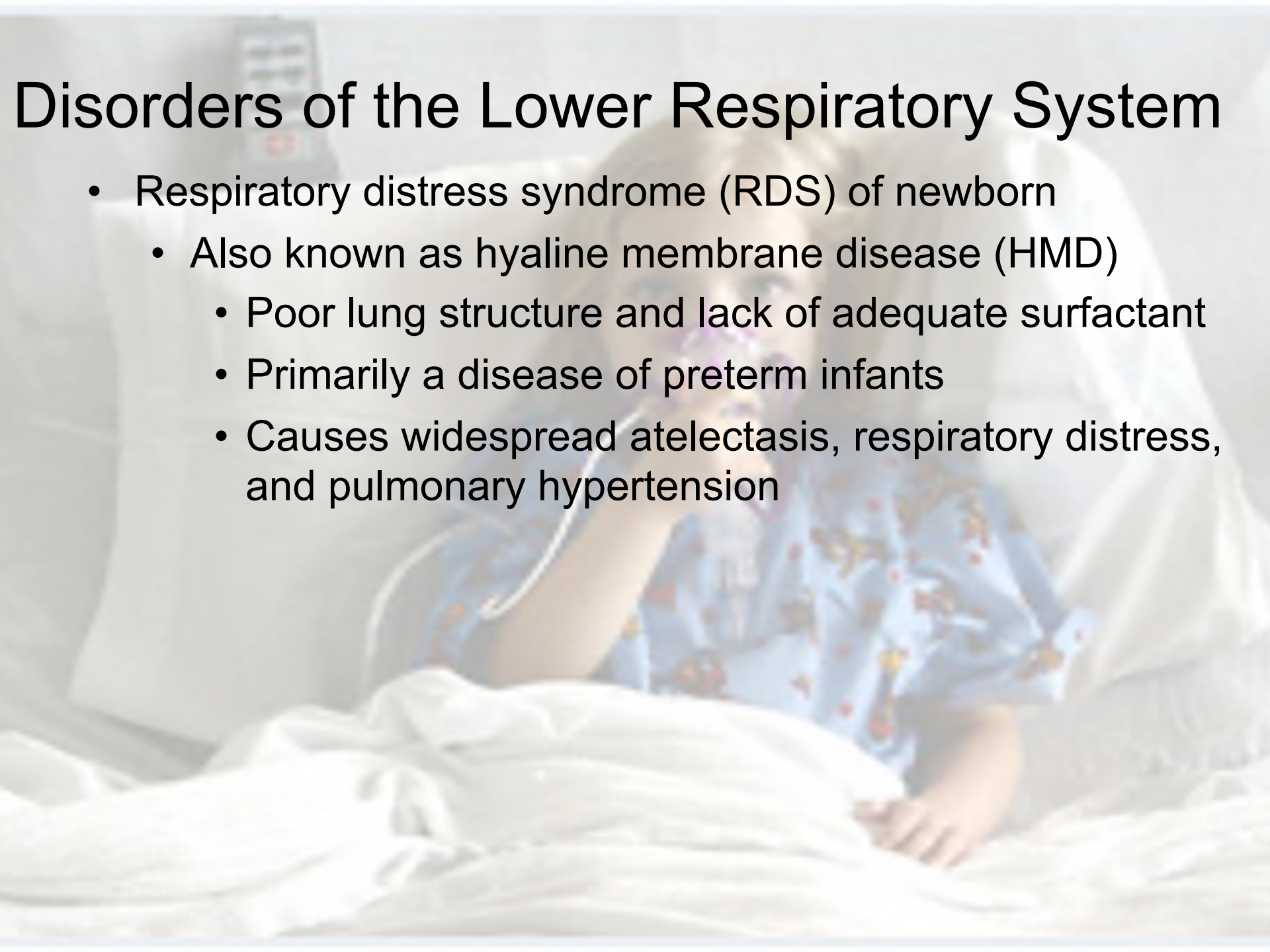
Disorders of the Upper Respiratory Track

- Obstructive sleep apnea syndrome (cont'd)
 - Manifestations:
 - Snoring and labored breathing during sleep
 - Daytime sleepiness
 - Chronic mouth breathing
 - Treatment: tonsillectomy and adenoidectomy, or CPAP



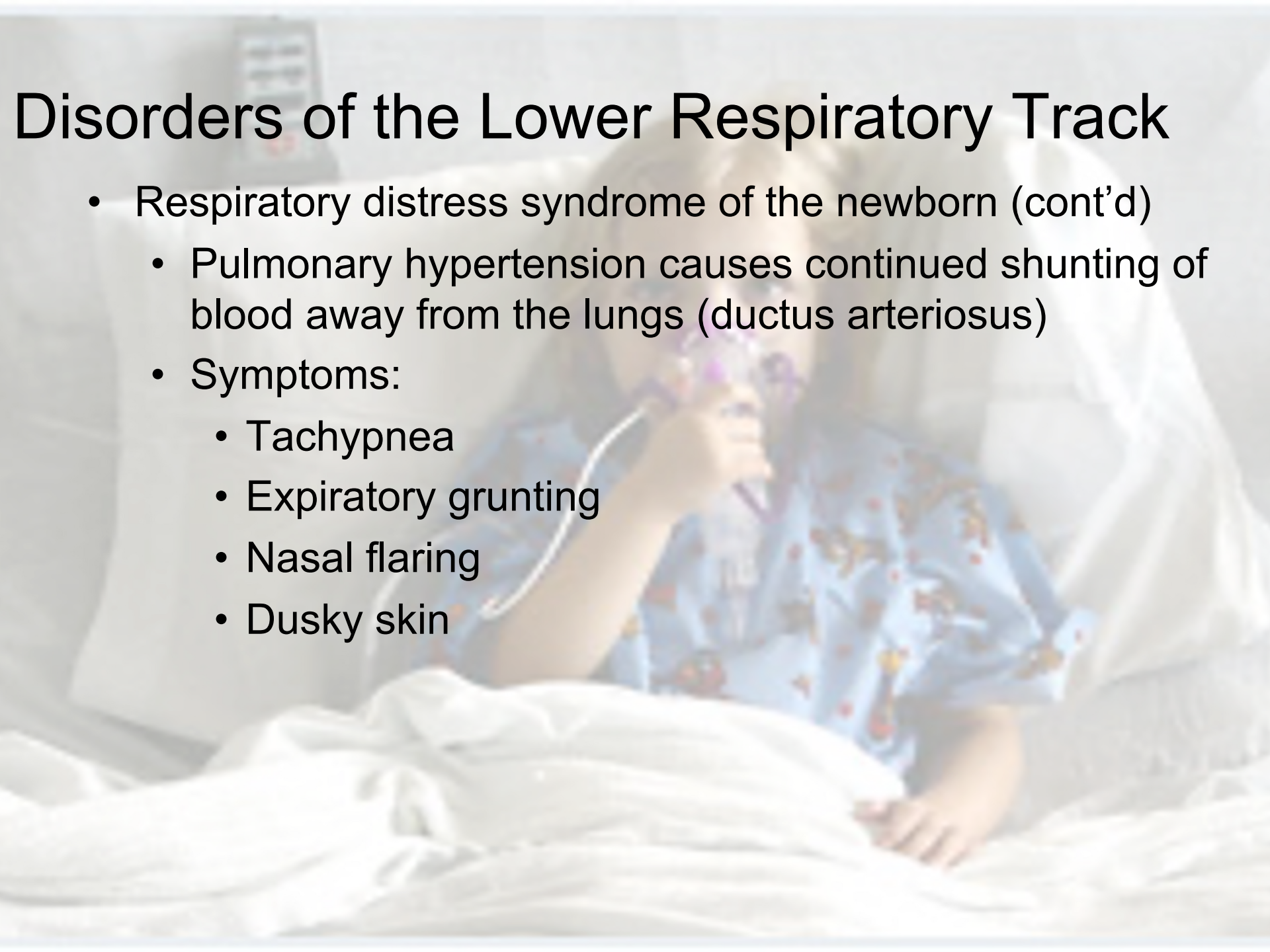
Disorders of the Lower Respiratory System

- 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



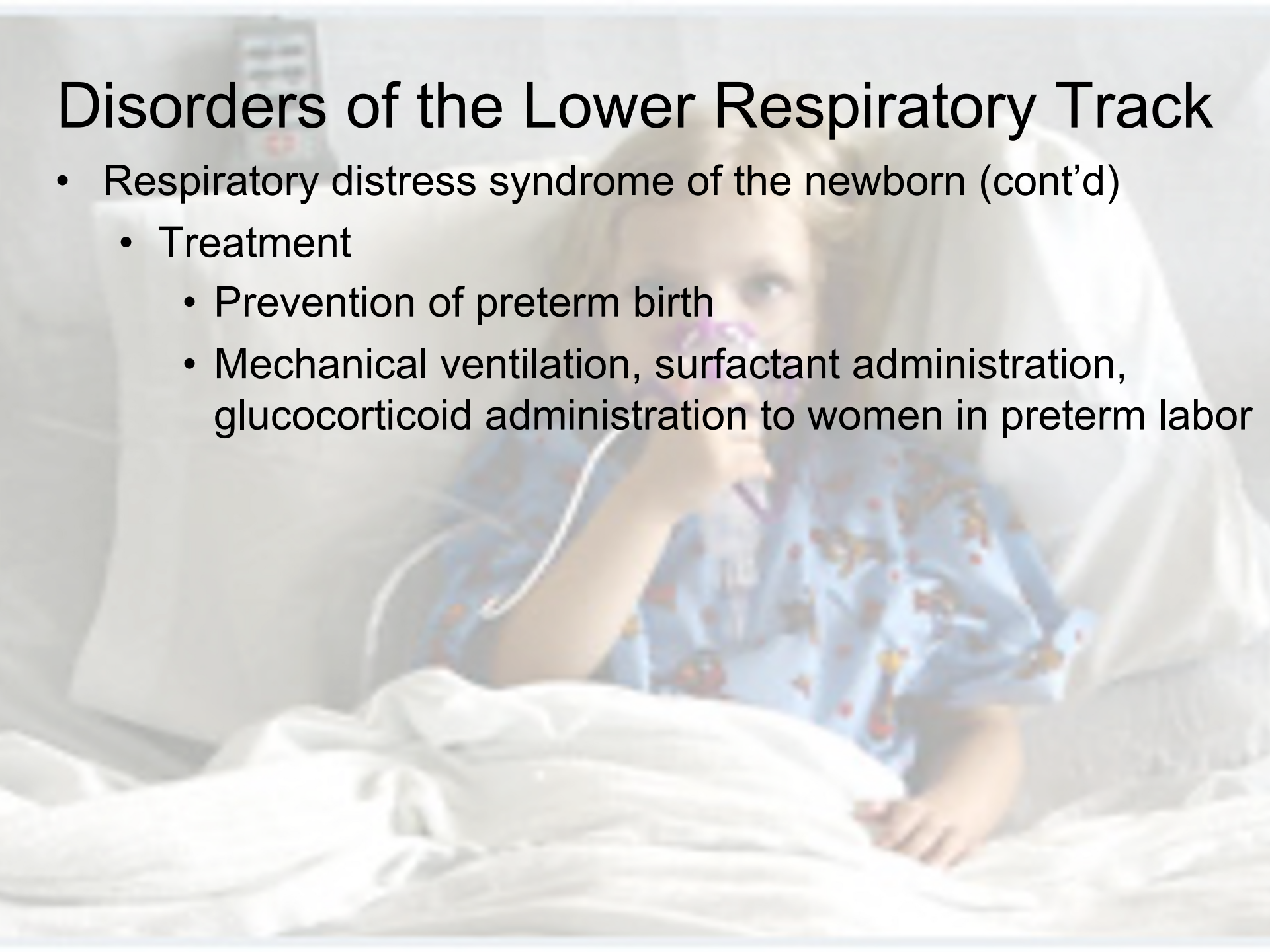
Disorders of the Lower Respiratory Track

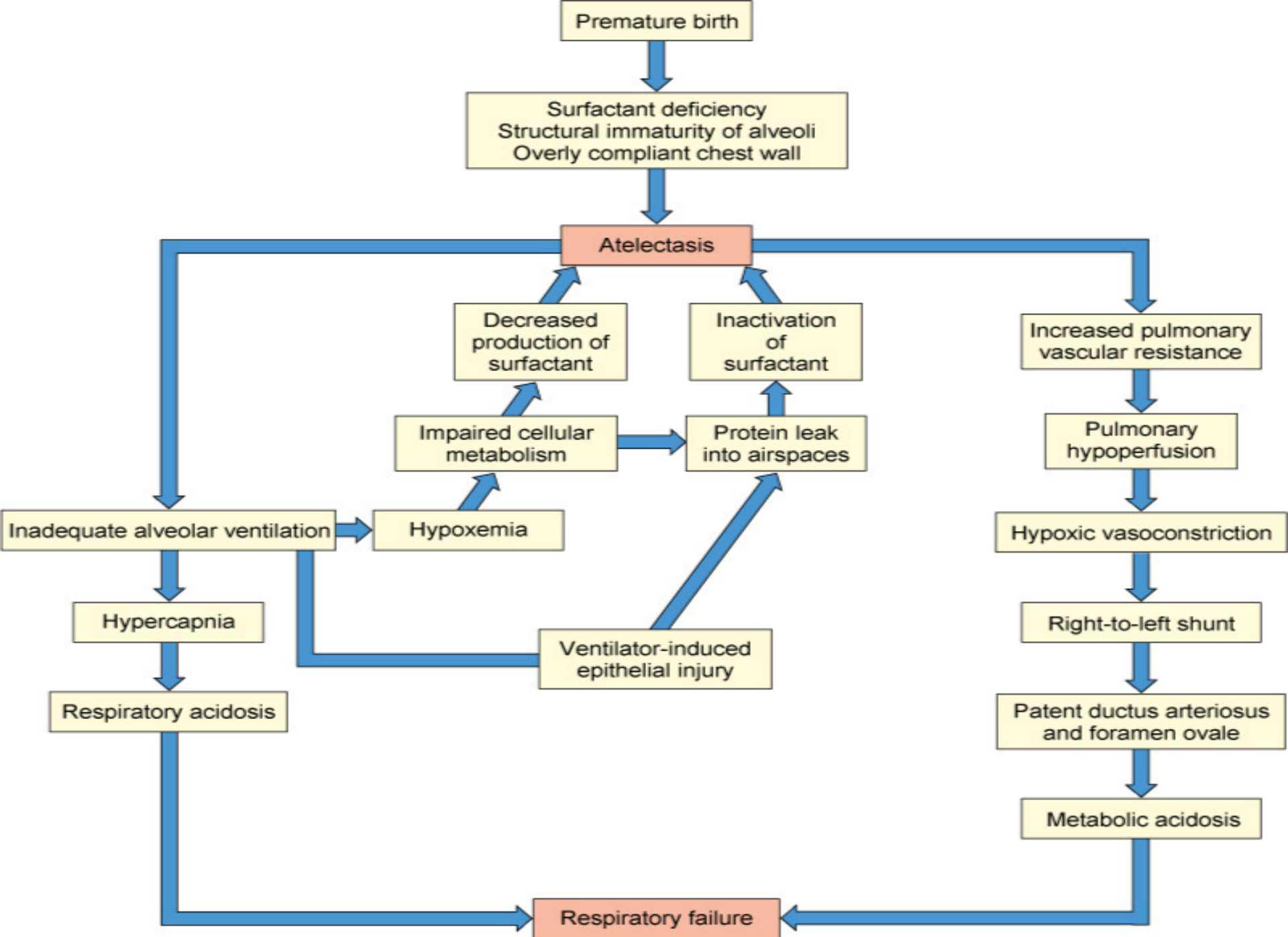
- Respiratory distress syndrome of the newborn (cont'd)
 - Pulmonary hypertension causes continued shunting of blood away from the lungs (ductus arteriosus)
 - Symptoms:
 - Tachypnea
 - Expiratory grunting
 - Nasal flaring
 - Dusky skin



Disorders of the Lower Respiratory Track

- Respiratory distress syndrome of the newborn (cont'd)
 - Treatment
 - Prevention of preterm birth
 - Mechanical ventilation, surfactant administration, glucocorticoid administration to women in preterm labor





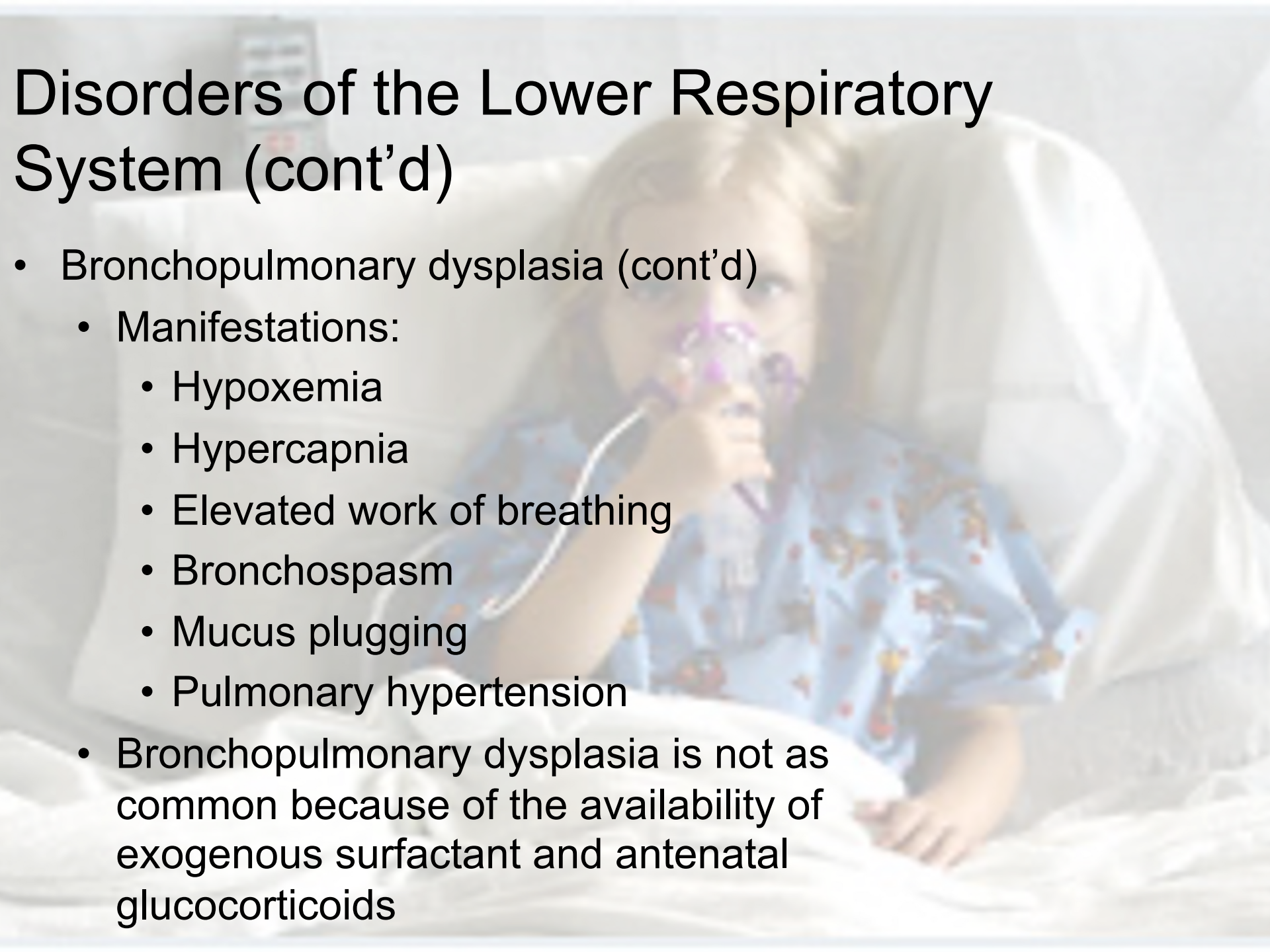
Disorders of the Lower Respiratory System

A young child with blonde hair is lying in a hospital bed, wearing blue patterned pajamas. The child has a nasal cannula in their nose. The background is a blurred hospital room with white linens and a medical monitor visible in the upper left.

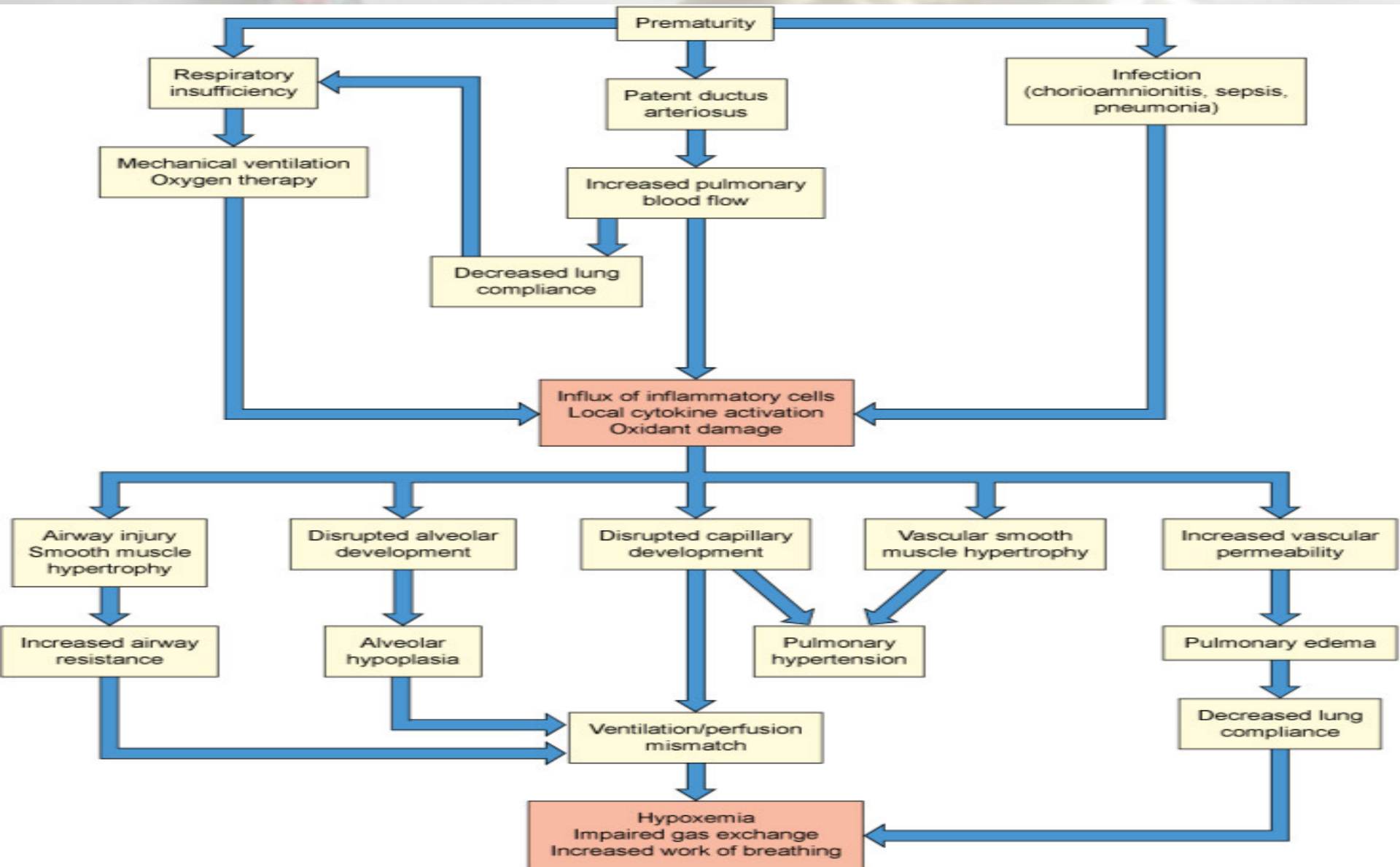
- Bronchopulmonary dysplasia
 - Chronic disease; result of acute respiratory disease in the neonatal period
 - Caused by premature birth, immature lungs, infections, genetics, poor formation of alveoli, ventilatory support at birth, etc.

Disorders of the Lower Respiratory System (cont'd)

- Bronchopulmonary dysplasia (cont'd)
 - 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



Bronchopulmonary Dysplasia



Disorders of the Lower Respiratory Track

A young child with blonde hair is lying in a hospital bed, wearing a blue patterned hospital gown and a nasal cannula. The child is looking towards the camera. The background is a blurred hospital room.

- Respiratory Infections:
 - 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 Track

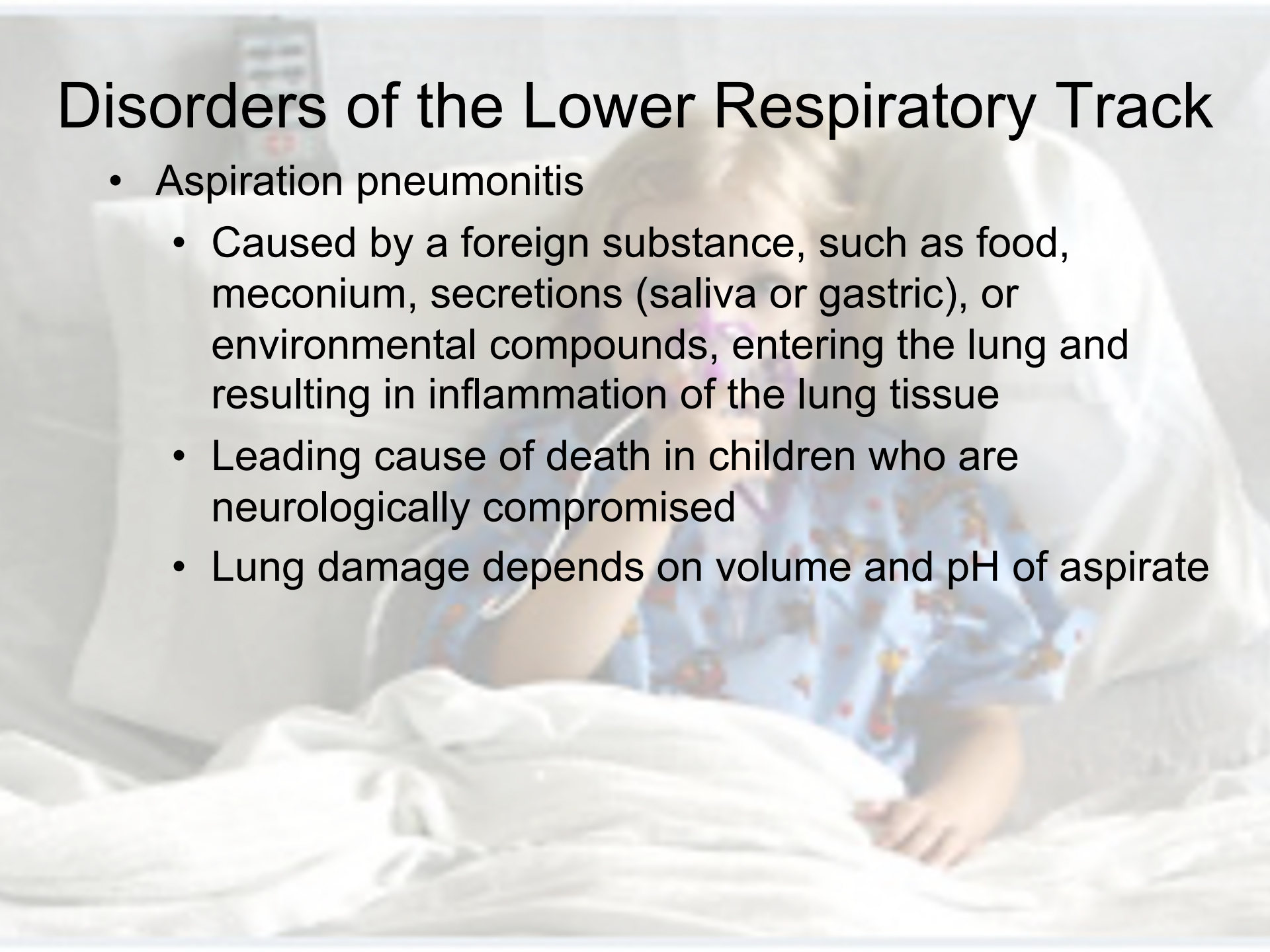
- Respiratory infections (cont'd)
 - Pneumonia
 - Bacterial pneumonia
 - Most common: streptococci and staphylococci
 - Pneumococcal (*Streptococcus pneumoniae*) pneumonia is the most common cause of community-acquired bacterial pneumonia
 - May follow viral illness or viral pneumonia
 - Viral pneumonia
 - Most common viral pneumonia in young children is RSV (respiratory syncytial virus)
 - Also parainfluenza, influenza, and adenovirus

Respiratory

- Respiratory infections (cont'd)
 - Pneumonia (cont'd)
 - 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

Disorders of the Lower Respiratory Track

- 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



Disorders of the Lower Respiratory Track

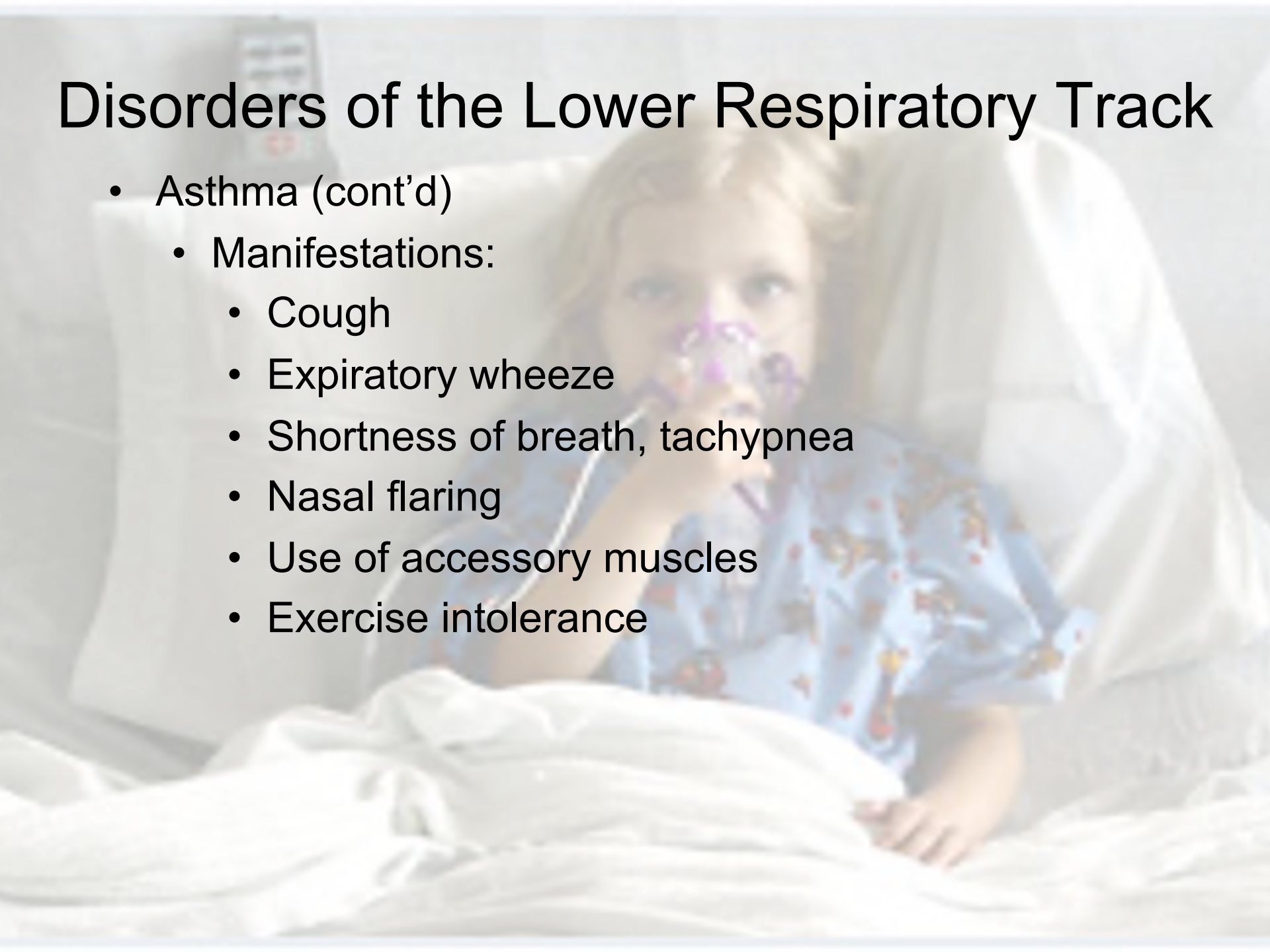
- Bronchiolitis obliterans
 - Fibrotic obstruction of the respiratory bronchioles and alveolar ducts secondary to intense inflammation
 - Most often occurs as a sequelae of a severe viral pulmonary infection
 - Progression of disease demonstrates:
 - Increasing tachypnea
 - Crackles
 - Wheezing
 - Dyspnea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

Disorders of the Lower Respiratory Track

- Asthma
 - Characterized by bronchial hyperreactivity 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)

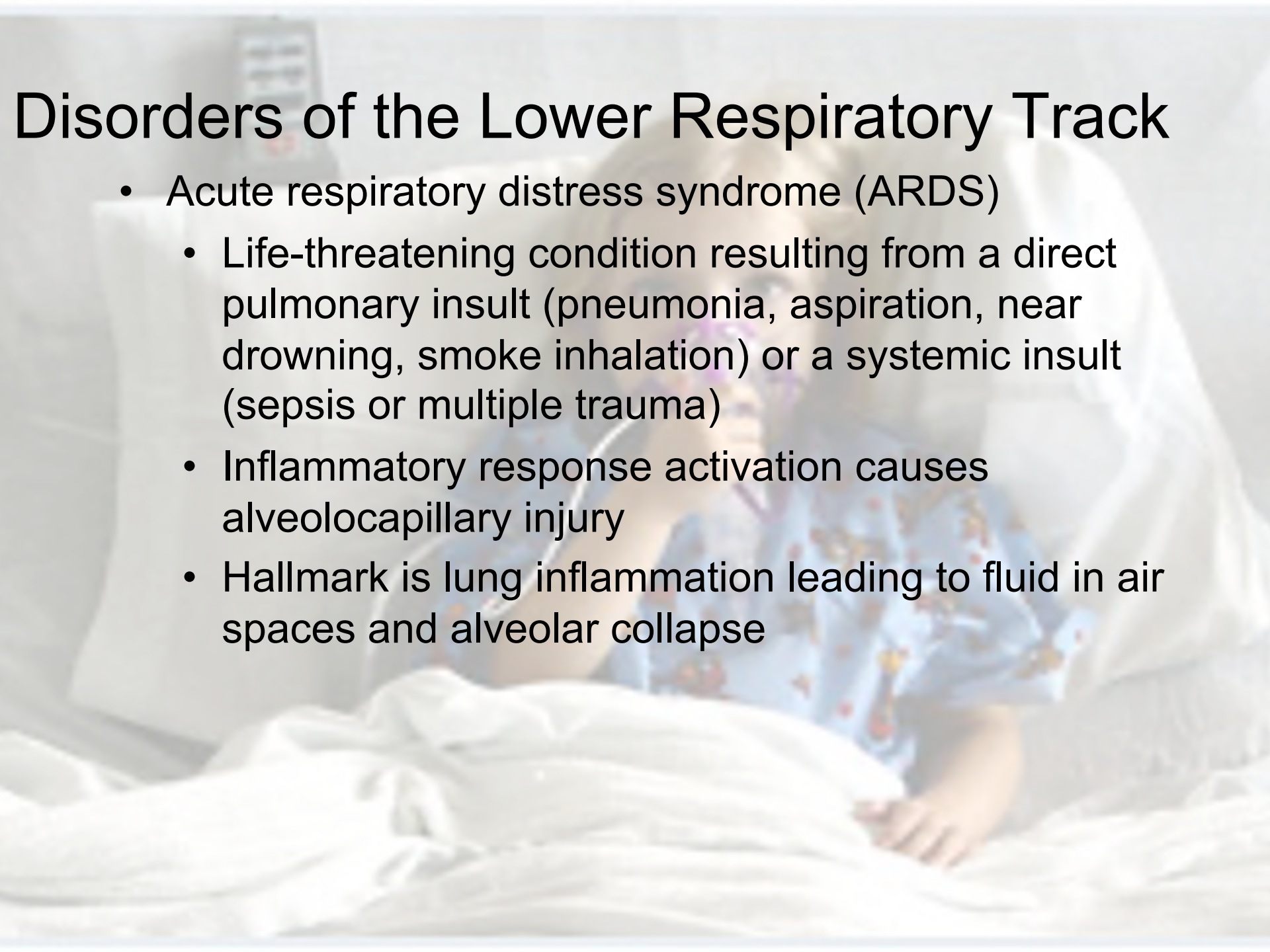
Disorders of the Lower Respiratory Track

- Asthma (cont'd)
 - Manifestations:
 - Cough
 - Expiratory wheeze
 - Shortness of breath, tachypnea
 - Nasal flaring
 - Use of accessory muscles
 - Exercise intolerance



Disorders of the Lower Respiratory Track

- 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



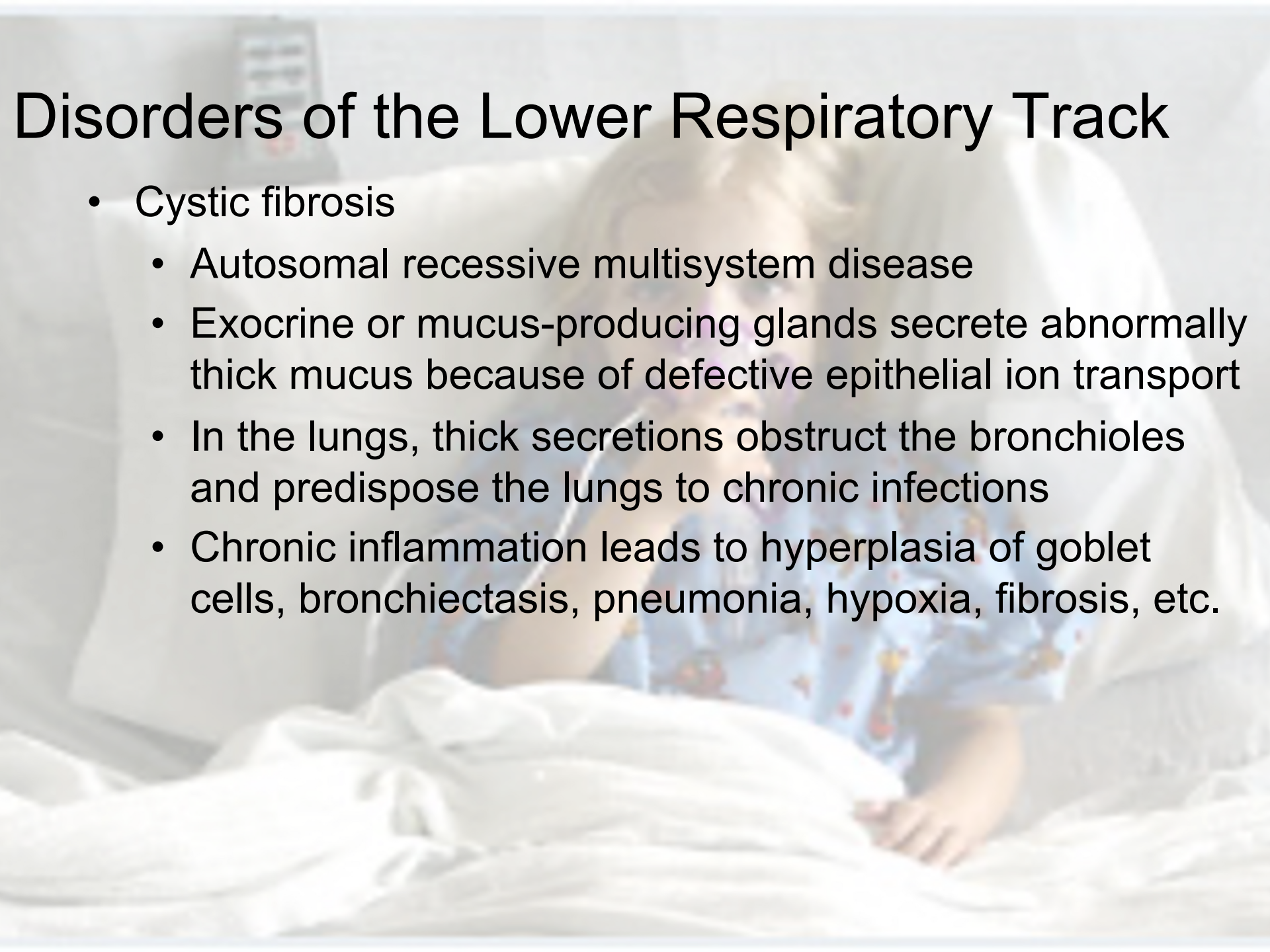
Disorders of the Lower Respiratory Track

A young child is lying in a hospital bed, wearing a blue patterned hospital gown. The child has a nasal cannula (oxygen tube) in their nose. The background is a blurred hospital room setting.

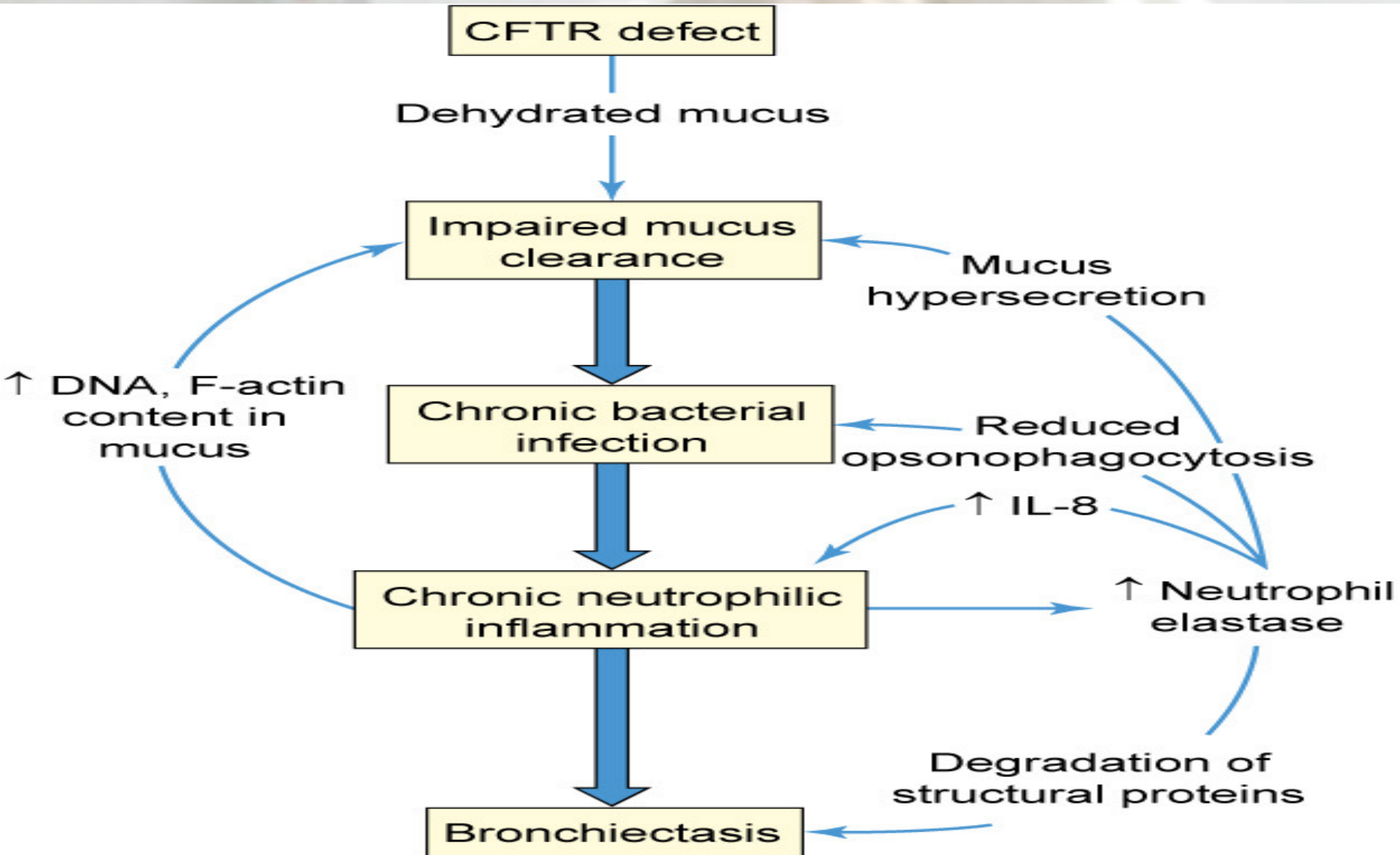
- Acute respiratory distress syndrome (ARDS)
 - Manifestations:
 - Develops acutely after the initial insult, usually within 24 hours
 - Progressive respiratory distress, severe hypoxemia, decreased pulmonary compliance
 - Hyperventilation
 - Treatment:
 - Mechanical ventilation
 - Supportive care

Disorders of the Lower Respiratory Track

- 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.



Cystic Fibrosis



Sudden Infant Death Syndrome (SIDS)

A young child is lying in a hospital bed, wearing a blue patterned hospital gown and a purple nasal cannula. The child is looking towards the camera. The background is a plain, light-colored wall.

- 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

Sudden Infant Death Syndrome (SIDS)

- Seasonal variation
 - Possible relationship to respiratory infections
- Wide range of risk factors
- Etiology unknown

