ACUTE ASTHMA EXACERBATIONS IN CHILDREN

- Major cause of acute illness in children
- Even children with mild or intermittent baseline asthma can have severe exacerbations requiring ICU admission
- Mortality is rare, but morbidity can be high, with some children requiring days or weeks of hospitalization and recovery

CHEST®

EVALUATION

- Rapid clinical evaluation followed by rapid initiation of first line treatment
- Routine CXR & blood gas not indicated

SIGNS OF SEVERITY

Subjective signs & symptoms

- Shortness of breath
- Work of breathing
- Diminished or absent breath sounds
- Inability to speak or count to 10
- Level of alertness
- Anxiety or diaphoresis

Objective signs

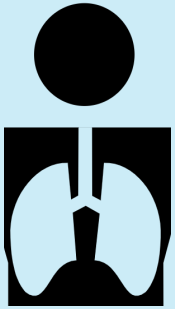
- Respiratory rate
- Heart rate
- Pulse oximetry

PATHOPHYSIOLOGY

- **Bronchial smooth muscle spasm**
- **Airway inflammation**
- **Increased mucous production**

↓ leading to

- Increased pulmonary resistance
- Small airway collapse
- Dynamic hyperinflation & air trapping



Cardiopulmonary interactions

- Decreased RV preload, increased biventricular afterload, and decreased ventricular filling leads to reduced cardiac output
- Exacerbated by medications
- Signs
  - Tachycardia
  - Diastolic hypotension
  - **Pulsus paradoxus**
    Exaggeration of normal decrease in arterial pressure that occurs during inspiration

Increased work of breathing

- Turbulent airflow
- Increased respiratory muscle workload, including active exhalation
- Positive pressure ventilation reduces airway collapse and can off-load work of breathing

Hypoxemia

- Due to ventilation-perfusion mismatching from heterogeneous areas of premature closure and obstruction

FIRST LINE TREATMENTS

- Should be used on all children with status asthmaticus
- **Continuous albuterol**
  - Inhaled β_2-agonist
  - Nebulized at 10-20 mg/h
- **Corticosteroids**
  - Solumedrol or prednisone (2-4 mg/kg/d ÷ q6-12h)
  - Alternatively, Decadron
- **Supplemental oxygen**
  - To maintain sats >92%
- **IV fluid bolus**
  - Consider 20-40 mL/kg
  - Dehydration often underestimated in children with status asthmaticus

SECOND LINE TREATMENTS

- When first line treatments ineffective
- No evidence of superiority of one vs another; often several used simultaneously
- **IV magnesium**
  - Smooth muscle dilator
  - 25-75 mg/kg (up to 2 g total) over 20 min
- **Nebulized ipratropium**
  - Anticholinergic
  - 0.25-0.5 mg every 20 min for 3 doses
- **Noninvasive positive pressure**
  - Via HFNC (1-3 mL/kg; 2 mL/kg ≈ CPAP+5 cmH_20), CPAP, or BiPAP
  - Can improve work of breathing but decreases inhaled medication delivery
- **IV terbutaline**
  - IV β_2-agonist delivered via continuous infusion

RESCUE THERAPIES

- Unproven and some carry significant morbidity
- **Helium-oxygen**
  - Lower density & higher viscosity leads to less turbulent airflow
  - Requires 60%-80% helium
- **Intubation**
  - Can be lifesaving, although most children can be treated noninvasively
  - Consider ventilator modes with decelerating flow patterns & PEEP matching auto-PEEP
- **Inhaled anesthetics**
  - Bronchodilators (eg, halothane, isoflurane)
  - Requires gas scavenging system
- **Extracorporeal support**
  - Last resort therapy and carries significant morbidities in this population