Initial Management of All Pediatric Respiratory Patients

- Stabilize ABCs and c-spine (Airway, Breathing, and Circulation)
- If exam consistent with tension pneumothorax, consider emergent needle decompression then placement of chest tube (if experienced/skilled practitioner available)
- Obtain weight (actual or use of weight/length based tool)
- Monitor:
  - Heart Rate (HR), Blood pressure (BP), Oxygen Saturation (SpO2), mental status, temperature, perfusion, urine output, bedside glucose
- Perform history & physical exam
- Provide oxygen if patient is hypoxic or in acute distress
  - O2 blow by if in mild distress
  - O2 15L NRB or partial rebreather for moderate to severe distress
  - O2 15L BVM for severe distress/arrest
- Consult pediatric expert for assistance with care of the acutely and critically ill patient, to individualize the care of patient, if patient does not improve and needs to be transferred and as needed for further support and consult.

Management for Respiratory Distress for All Pediatric Patients

**Determine if patient is critically ill**
- Cyanosis
- Marked stridor
- Retractions, nasal flaring
- Inability to speak
- S/S worsening resp. distress
- Severe distress
- Unconscious
- Wheezing

**YES**

- Maintain position of comfort
- Provide supplemental O2 to maintain SpO2 > 94%
- If wheezing and ≥ 2 y/o with known or suspected history of asthma, administer albuterol HHN or mask (repeat x 2)
  - 2.5 mg/3 mL (max single dose 5 mg) **AND** Atrovent (ipratropium)
    - (may repeat x 2)
  - 0.5 mg/2.5 mL
- If wheezing and < 2 y/o with no suspected history of asthma, perform nasal suctioning on child as indicated
- Establish vascular access
- Place on cardiac and pulse ox monitor
- Administer corticosteroids
  - Methylprednisolone (solumedrol) 2 mg/kg (max 125 mg single dose) IV/IO
  - Oral prednisone if appropriate
- Croup:
  - Dexamethasone 0.6 mg/kg IM/IV/IO
  - Racemic epinephrine 2.25% solution neb
    - < 4 years old: 0.05 mL/kg/dose diluted in 3 mL NS over 15 minutes every 1-2 hours
    - > 4 years old: 0.5 mL/dose diluted in 3 mL NS over 15 minutes every 1-2 hours
  - In the event that racemic epinephrine is not available, epinephrine 1:1000 can be used as a substitute. Use epinephrine 1:1000, 0.25-0.5 mg/kg (max 5 mL/dose) in 3 mL and provide as a nebulizer over 15 minutes

**REASSESS**

**NO**

- Maintain position of comfort
- Provide supplemental O2 to maintain SpO2 > 94%
- If wheezing and ≥ 2 y/o with known or suspected history of asthma, administer MDI with spacer 2-4 puffs OR
  - Albuterol HHN or mask (repeat x 2)
  - 2.5 mg/3 mL (max single dose 5 mg) **AND** Atrovent (ipratropium) (repeat x 2)
  - 0.5 mg/2.5 mL
- If wheezing and < 2 y/o with no suspected history of asthma, perform nasal suctioning on child as indicated
- Administer corticosteroids as needed
  - Prednisone 1-2 mg/kg (max 60 mg/day) PO
- Croup:
  - Consider single dose dexamethasone 0.6 mg/kg PO/IM
  - Cool mist nebulizer treatment

**REASSESS**
- Intubation if indicated
- Ventilator settings
  - Tidal volume: 6-10 mL/kg
  - I-time: 0.5-1.0
  - Respiratory rate: set based on age
  - PEEP: 3-5 mm H₂O
  - Peak Inspiratory Pressure: 20-30 mm H₂O
- For more information, see: Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition
- Admit patient
- Consult Pediatric Care Medical Specialist to assist with individualizing admission orders
- Sample admission orders (see next page)

Poor, impending or actual respiratory arrest

- Albuterol 1 hour continuous nebulizer
  - 0.5 mg/kg/hr (max 25mg/hr)
- Monitor End Tidal CO₂ (EtCO₂) if possible/available
- Consider magnesium 25 mg/kg (max 2 gm) slow IV infusion over 30 minutes
- Consider terbutaline
- Monitor closely for deterioration
- Obtain CXR if febrile
  - Consider antibiotics for suspected pneumonia

Poor, minimal response to treatment

- Albuterol 1 hour continuous nebulizer
  - 0.3 mg/kg/hr (max 25mg/hr)
- Monitor End Tidal CO₂ (EtCO₂) if possible/available
- Consider magnesium 25 mg/kg (max 2 gm) slow IV infusion over 30 minutes
- Consider terbutaline
- Monitor closely for deterioration
- Obtain CXR if febrile
  - Consider antibiotics for suspected pneumonia

REASSESS

Poor, impending or actual respiratory arrest

- Albuterol 2.5 mg/3mL nebulizer treatment q 1-2 hours
- Sample admission orders (see next page)

POOR, IMPENDING OR ACTUAL RESPIRATORY ARREST

- Intubation if indicated
- Ventilator settings
  - Tidal volume: 6-10 mL/kg
  - I-time: 0.5-1.0
  - Respiratory rate: set based on age
  - PEEP: 3-5 mm H₂O
  - Peak Inspiratory Pressure: 20-30 mm H₂O
- For more information, see: Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition
- Admit patient
- Consult Pediatric Care Medical Specialist to assist with individualizing admission orders
- Sample admission orders (see next page)

Poor, minimal response to treatment

- Albuterol 1 hour continuous nebulizer
  - 0.5 mg/kg/hr (max 25mg/hr)
- Monitor End Tidal CO₂ (EtCO₂) if possible/available
- Consider magnesium 25 mg/kg (max 2 gm) slow IV infusion over 30 minutes
- Consider terbutaline
- Monitor closely for deterioration
- Obtain CXR if febrile
  - Consider antibiotics for suspected pneumonia

REASSESS

Fair, slight improvement, not returned to baseline

- Albuterol 1 hour continuous nebulizer
  - 0.5 mg/kg/hr (max 25 mg/hr)
- Obtain CXR if febrile
  - Consider antibiotics for suspected pneumonia

REASSESS

Improved, returned to baseline

- Observe for 1-2 hour
- Discharge if symptoms resolved and no signs of distress
- Follow up plan:
  - MDI with spacer 2-4 puffs every 4 hours as needed
  - Continue steroids

Minimal response or fair/slight improvement but not returned to baseline

- Albuterol 2.5 mg/3mL nebulizer treatment q 1-2 hours
- Sample admission orders (see next page)
Sample Pediatric Respiratory Admission Orders

Admitting physician: ____________________________

Diagnosis: ____________________________________________

Condition: □ Critical □ Serious □ Stable

Weight (kg): ___________ Height (cm): ___________

Allergies: ____________________________________________

Pulse Oximetry:
• Obtain pulse oximetry on admission to unit
• If \( \text{SpO}_2 \) > 90%, obtain spot check pulse oximetry readings with each treatment, with vital signs or if patient exhibits decline in respiratory status
• If \( \text{SpO}_2 \) < 90%, provide oxygen and begin continuous pulse oximetry monitoring

Supplemental Oxygen Orders:
• If \( \text{SpO}_2 \) < 90% on room air, apply oxygen to maintain \( \text{SpO}_2 \) 91-94%
  o Nasal Cannula
  o Aerosol Mask
• Titrate oxygen to maintain pulse oximetry >90%
• Wean oxygen if oxygen saturation maintains 94%.
  o Decrease oxygen by ½ liter per minute (LPM) and reassess patient 5-10 minutes after change in oxygen
  o Do not decrease oxygen more frequently than every 60 minutes

Ventilator settings: _______________________________________
  o For more information, see: Use of Strategic National Stockpile (SNS) Ventilators in the Pediatric Patient: Instructional Guidelines with Training Scenarios, 2nd edition

Peak Expiratory Flow Rate (PEFR)
• Peak Flow will be done on admission for patients > 5 years of age to determine patient’s compliance/ability to effectively perform
• Check Peak Flow before and after breathing treatments.

AVERAGE PREDICTED PEAK EXPIRATORY FLOW RATES FOR NORMAL CHILDREN

<table>
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<tr>
<th>Height</th>
<th>PEFR (L/min)</th>
<th>70% PEFR</th>
<th>Height</th>
<th>PEFR (L/min)</th>
<th>70% PEFR</th>
<th>Height</th>
<th>PEFR (L/min)</th>
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<td>In</td>
<td>Cm</td>
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<td>150</td>
<td>360</td>
<td>252</td>
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</table>
Medications:

- **Albuterol**
  - MDI via spacer device
    - 2 puffs every 3 hours (6-11 months old)
    - 4 puffs every 3 hours (>12 months old)
  - Nebulizer ______mg every ____ hrs (0.5mg/kg/hr, max dose 30mg/hr)
  - Continuous
    - If patient requires treatment prior to two hour interval, administer Albuterol continuous nebulizer for two hours and begin continuous pulse oximetry monitoring
    - Albuterol 0.5mg/kg/hr (max dose 10mg/hr)

- **Ipratropium bromide (Atrovent):**
  - 0.5mg to be given with 2nd and 3rd doses of Albuterol

- **Corticosteroids:**
  - Prednisolone Sodium Phosphate (Orapred): ____mg PO STAT (2mg/kg loading dose-max 60mg/dose) then ___mg PO every 12 hours (1mg/kg maintenance dose-max 30mg/dose) x 5 days
  - Methylprednisone (Solumedrol): ____mg IV STAT (2mg/kg loading dose-max 60mg/dose) then _____mg IV every 6 hours (1mg/kg maintenance dose-max 30mg/dose) x 4 doses

- **Topical anesthetic for IV start and lab draws:**
  - Apply topically once 30-90 minutes prior to painful procedures (maximum 1gm, 10 centimeter area squared, or application time of 2 hours)

- **Antibiotics:**

- **Analgesics/Antipyretics:**
  - Acetaminophen (Tylenol) (15mg/kg/dose)_____mg PO/GT every 4 hrs PRN for temperature ≥ 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
  - Acetaminophen (Tylenol) (20mg/kg/dose)_____mg PR every 4 hrs PRN for temperature ≥ 38.6°C/101.5°F or discomfort (max dose 3000mg/day)
  - Ibuprofen (Motrin) (10mg/kg/dose) ____mg PO/GT every 6 hours PRN for temperature ≥ 38.6°C/101.5°F or discomfort

- See **Sample Pediatric Standard Admission Orders** for additional examples for diet, IV, labs etc.

- Asthma Score (see next page)
**General Information**

Unlike adults, cardiac arrest in children most often occurs secondary to respiratory insufficiency. Once the child proceeds to a cardiac event, the likelihood of resuscitating that child is dismal. Rapid airway assessment and intervention is imperative. Several conditions manifest as respiratory distress in children including: airway obstruction, upper airway disease (croup, epiglottitis), and lower airway disease (asthma, bronchiolitis, and pneumonia). Signs and symptoms of impending respiratory collapse include:

- Cyanosis
- Tachycardia
- Bradycardia
- Shallow respiration
- Decreasing LOC/restlessness
- Hypotension

Pediatric asthma may present differently from the adult form. Children may not wheeze, but continuously cough for 20-30 minutes after excitement or exercise, or may abruptly vomit. Due to the small diameter of their airways, even incremental edema/bronchoconstriction may cause severe air exchange problems. The inability of pediatric patients to increase their tidal-volumes often results in markedly increased respiratory rate which dehydrates airways and accelerates the development of mucous plugs. Hypoxemia & hypercarbia lead to acidosis and bradycardia. Treat aggressively.

**Asthma Score**

- Intended for use with patients > 2 years old who are being treated for asthma or an asthma exacerbation
- Not intended for patients who:
- Are being treated for bronchiolitis, pneumonia, croup, reactive airway disease
- Have chronic lung disease, cystic fibrosis, airway anomalies, cardiac disease, foreign body or neurologic disorders
- Calculate the asthma score upon admission, prior to each aerosol treatment, and during the weaning process
- Wean if score of 0-1 and/or peak expiratory flow rate (PEFR) greater than 70% predicted → see Asthma Weaning Guidelines on next page.
- Treatment should be given for a score of 2 or higher and/or PEFR less than 70% predicted.

<table>
<thead>
<tr>
<th>ASTHMA SCORE</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory Rate (Count for a full minute)</td>
<td>0-12 mos: &lt; 40</td>
<td>0-12 mos: 40-50</td>
<td>0-12 mos: &gt; 50</td>
</tr>
<tr>
<td></td>
<td>1-5 y/o: &lt; 30</td>
<td>1-5 y/o: 30-40</td>
<td>1-5 y/o: &gt; 40</td>
</tr>
<tr>
<td></td>
<td>6-9 y/o: &lt; 25</td>
<td>6-9 y/o: 25-30</td>
<td>6-9 y/o: &gt; 30</td>
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<tr>
<td></td>
<td>&gt;15 y/o: &lt; 20</td>
<td>&gt;15 y/o: 20-24</td>
<td>&gt;15 y/o: &gt; 24</td>
</tr>
<tr>
<td>Retractions</td>
<td>None</td>
<td>Suprasternal/Subcostal/ Intercostal</td>
<td>Using neck or abdominal muscles (belly breathing) if atypical for child</td>
</tr>
<tr>
<td>Breath Sounds</td>
<td>Normal, equal, Mild expiratory wheeze</td>
<td>Wheeze throughout expiration Localized decreased breath sounds</td>
<td>Wheeze throughout inspiration &amp; expiration Multiple areas with decreased breath sounds</td>
</tr>
</tbody>
</table>

Adapted from: Cincinnati Children’s Hospital Medical Center Respiratory Assessment/Care Record, 2002; Kelly et al, Improved Outcomes for Hospitalized Asthmatic Children Using a Clinical Pathway, 2000.
<table>
<thead>
<tr>
<th>Asthma Weaning Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOTE</strong>: Initial asthma phase should be chosen on the patient’s clinical presentation (e.g., the frequency of initial treatments needed to show improvement), with some assistance with asthma score. For example, a patient with asthma score of 2-3 would likely start in phase II or III. If patient has an asthma score of 4 or more, consider starting patient in phase I or II.</td>
</tr>
</tbody>
</table>

### PHASE I: Continuous Albuterol treatment
- Assess Asthma Score every 1-2 hours
- If score less than 2 for two consecutive assessments, wean to Phase II
- If worsening score or has not met weaning criteria after 6 hours, RT to call physician

### PHASE II: Every 2 hour Albuterol treatment
- Assess Asthma Score before and after every treatment
- If score less than 2, wean to Phase III
- If worsening score (score increased by 2 or more) or has not met weaning criteria after 8 hours, RT to call physician

### PHASE III: Every 3 hour Albuterol treatment
- Assess Asthma Score before and after every treatment
- Transition to MDI with spacer +/- mask or mouthpiece if able to comply
  - **ALL MDI ALBUTEROL IS 4-6 PUFFS PER TREATMENT (in 30 second intervals)**
- If score less than 2, wean to Phase IV
- If worsening score (score increased by 2 or more) or has not met weaning criteria after 12 hours, RT to call physician

### PHASE IV: Every 4 hour Albuterol treatment
- Assess Asthma Score before and after every treatment
- If worsening score (score increased by 2 or more) or has not met discharge criteria after 12 hours, RT to call physician
- If patient has met discharge criteria after 2 beta-agonist treatments at q 4 hours, RT to call physician

### Discharge Criteria: Must meet all 5 discharge criteria
1. SpO2 > 92% (goal = 91-94%)
2. Off of supplemental oxygen for at least 6 hours (must include one sleep period—this may be a nap*)
3. Normal respiratory rate
4. End expiratory wheeze only
5. Minimal → no retractions

*A nap is at least 30 continuous minutes of sleep*