**Asthma Care Guideline**

**Inclusion Criteria:**
- Primary diagnosis of status asthmatics, asthma exacerbation
- Failure to respond to outpatient therapy or ED treatment

**Exclusion Criteria:**
- PICU status (see criteria)
- 1st episode of wheezing
- Hx of cardiac or neuromuscular disease, MRCP, Cystic Fibrosis, Chronic Lung Disease (BPD)

**Assessment:**
- Respiratory status, O₂ saturation w/ vital signs, vital signs, immunization status
- Peak flows to be done pre/post aerosols min. BID (age > 5 & able to cooperate)
- Continuous pulse oximetry ONLY if on supplemental O₂ or in distress

**Interventions:**
- Oxygen for respiratory distress or to keep O₂ saturations ≥ 93%
- Albuterol inhalation therapy – routine q 4 hr and q 2 hr PRN; MDI is preferred delivery method
- Continue or start an inhaled corticosteroid (ICS) for persistent mild, moderate, or severe asthma.
- IV fluids only if clinically indicated (i.e. dehydration, poor oral intake, respiratory distress precluding orals)
- Systemic corticosteroids: prednisolone or prednisone at 2 mg/kg/day, divided q 12-24 hr PO or OR IV Solumedrol 0.5 – 1 mg/kg/dose q 6hrs IV (Max: 240mg/24 hrs). If dexamethasone given in ED, consider second dose oral as inpatient.
- Adjust home controller medications as appropriate for asthma severity
- Begin asthma education / teaching
- Ambulate as tolerated

**Continued Care Considerations**
- Wean oxygen to keep O₂ sats ≥ 90%, when free of respiratory distress
- Wean Albuterol to q 2-4 hr PRN
- Establish peak flow-based or symptom based Asthma Action Plan and review/teach patient/family
- Saline lock IV once tolerating oral fluids
- Transition to oral corticosteroids at 2mg/kg/day (Max: 120 mg/day) daily or bid dosing
- Initiate or continue preventative / controller medications appropriate to asthma severity

**Discharge Considerations**
- Prescribe discharge medication:
  - Long term controller including an inhaled corticosteroid
  - Quick relief medication (Albuterol)
  - Oral steroids (2mg/kg/day) BID dosing should be prescribed to complete a 4-7 day course. A taper may be needed for longer courses
  - Rx for Oral corticosteroid for future exacerbations
- Utilize aerochamber/MDI if developmentally able
- Re-label all meds for home use
- Asthma Action Plan to be provided for home(s), school, and PCP
- Follow up w/ PCP within 1 week of discharge
- Refer to Asthma Specialist if: patient has had a life-threatening asthma exacerbation, is refractory to therapy, is non-compliant with therapy, > 2 bursts oral steroids in 1 yr, other conditions that complicate asthma or it’s dx (sinusitis, nasal polyps, aspergillosis, severe rhinitis, vocal cord dysfunction, GERD, CLD), or has moderate to severe persistent disease
- An alternative to Asthma Specialist is the CHOC Breathmobile

**Discharge Criteria**
- Off supplemental oxygen
- Albuterol treatments not needed more frequently than q 4 hr
- Tolerating oral fluids and medications
- FEV1 or peak flow ≥ 70% of personal best or predicted (if developmentally able)
- Discharge education completed

**Criteria for PICU status**
- Need for q 1 hr or continuous albuterol
- Newt need for terbutaline drip
- If heliox administered in ED
- If repeated doses of parenteral epinephrine or magnesium sulfate given in ED
- An inappropriate PCO₂ by ABG or CBG
- SaO₂ < 90% on supplemental O₂
- Requires non-rebreather mask for O₂
- S&S of impending respiratory failure
- Presence of pulsa paradoxus
- Presence of mental status changes

**Recommendations/Considerations**
- There is evidence for single dose IM dexamethasone being sufficient but consider continuing corticosteroids if patient is hospitalized (Gordon, S, et al – see references)
- CXR is NOT indicated according to NHLBI guidelines. Consider ONLY if fever > 39, chest pain, severe distress or severe hypoxia
- Avoid initiation of long acting beta; agonists, or leukotriene inhibitors as monotherapy.
- Levalbuterol (Xopenex): use as alternative to Albuterol in patients with adverse reaction to Albuterol or strong parent preference
- Ipratropium (Atrovent): consider 500 mcg nebulized q 6 hr in conjunction with Albuterol for patients with severe respiratory distress
- May increase steroid dosage and/or frequency for severe or failure to respond to therapy
- Use of an H₂ blocker (IV Famotidine or po Ranitidine) for all patients on high dose steroids or if not taking POs well
- Call RRT if patient shows rapid deterioration, increasing distress, cyanosis, mental status change, pulsa paradoxus, respiratory tiring, sense of doom, or impending failure.

**Patient/Family Education**
- Asthma action plan
- Asthma education should include but not be limited to: asthma disease process, medications, MDI and spacers, nebulizer (if applicable), peak flow (5 y/o & older), asthma triggers, asthma video/education booklet.
- Patients at high risk for non-compliance: refer to “Understanding Childhood Asthma Class”

Reassess the appropriateness of Care Guidelines as condition changes and 24 hrs after admission. This guideline is a tool to aid clinical decision making. It is not a standard of care. The physician should deviate from the guideline when clinical judgment so indicates.
### Classifying Asthma Severity and Initiating Treatment in Children 0 – 4 Years of Age

#### Components of Severity

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Classification of Asthma Severity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Intermittent</strong></td>
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<tr>
<td></td>
<td><strong>Mild</strong></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>0</td>
</tr>
<tr>
<td>Short acting beta2-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Interference w/ normal activity</td>
<td>None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk</th>
<th>Exacerbations requiring oral systemic corticosteroids</th>
<th>0-1/yr (see note)</th>
<th>&gt; 2 exacerbations in 6 months requiring oral systemic corticosteroids, or &gt; 4 wheezing episodes / 1 year lasting &gt; 1 day AND risk factors for persistent asthma</th>
</tr>
</thead>
</table>

#### Recommended Step for Initiating Therapy

<table>
<thead>
<tr>
<th>Step</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3 and consider short course of oral systemic corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preferred: SABA PRN</td>
<td>Preferred: Low-dose ICS</td>
<td>Preferred: Medium-dose ICS</td>
</tr>
<tr>
<td></td>
<td>Alternative: Cromolyn or Montelukast</td>
<td>Alternative: Medium-dose ICS</td>
<td>Alternative: Medium-dose ICS + either LABA or Montelukast</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step 4 Preferred:  High-dose ICS + either LABA or Montelukast AND oral systemic corticosteroid</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step 5 Preferred: High-dose ICS + either LABA or Montelukast</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step 6 Preferred: High-dose ICS + either LABA or Montelukast AND oral systemic corticosteroid</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Step up if needed (first check adherence, inhaler technique, environmental control)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assess control Step down if possible (and asthma is well controlled at least 3 months)</td>
</tr>
</tbody>
</table>

Each step: Patient education and environmental control

Quick relief medication for all patients
- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms.
- With viral respiratory infection: SABA q 4-6 hrs up to 24 hrs (longer w/ physician consult). Consider short course of oral systemic corticosteroids if exacerbation is severe or patient has history of previous severe exacerbations.
- Caution: Frequent use of SABA may indicate the need to step up treatment.

Key: EIB: exercise-induced bronchospasm; FEV1: forced expiratory volume in 1 sec; FVC: forced vital capacity; ICS: inhaled corticosteroid; LABA: inhaled long-acting beta2-agonist; SABA: inhaled short-acting beta2-agonist

Notes:
- Level of severity is determined by both impairment and risk;
- Assess impairment by caregiver’s recall of the previous 2-4 weeks;
- Assign severity to the most severe category in which any feature occurs;
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- If clear benefit is not observed within 4-6 wks & patient/family medication technique & adherence are satisfactory, consider adjusting therapy or alternative diagnosis.

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### Components of Severity

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Intermittent</th>
<th>Classification of Asthma Severity</th>
<th>Persistent</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
<td>2 days/week but not daily</td>
<td>Daily</td>
<td>Throughout the day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤ 2x/month</td>
<td>3-4x/month but not nightly</td>
<td>&gt;1x/week but not nightly</td>
<td>Often 7x/week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
<td>&gt; 2 days/week but not daily</td>
<td>Daily</td>
<td>Several times per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interference w/ normal activity</td>
<td>None</td>
<td>Minor limitation</td>
<td>Some limitation</td>
<td>Extremely limited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung function</td>
<td>· Normal FEV₁ between exacerbations · FEV₁ &gt;80% predicted · FEV₁/FVC &gt;85%</td>
<td>· FEV₁ ≥80% predicted · FEV₁/FVC &gt;80%</td>
<td>· FEV₁ = 60-80% predicted · FEV₁/FVC = 75-80%</td>
<td>· FEV₁ ≤50% predicted · FEV₁/FVC &lt;75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/yr (see notes)</td>
<td>≥ 2/year (see notes)</td>
<td>Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV₁₂.</td>
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<td></td>
</tr>
</tbody>
</table>

### Risk

#### Recommended Step for Initiating Therapy

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3, medium dose ICS option</th>
<th>Step 3, medium dose ICS option, or step 4 and consider short course of oral systemic corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred: Low-dose ICS + either LABA, LTRA, or Theophylline</td>
<td>Preferred: Low-dose ICS + either LABA, LTRA, or Theophylline</td>
<td>Preferred: High-dose ICS + LABA</td>
<td>Preferred: Medium-dose ICS + LABA</td>
</tr>
<tr>
<td>Alternative: Cromolyn, LTRA, Nedocromil, or Theophylline</td>
<td>Alternative: Medium-dose ICS + either LABA or Theophylline</td>
<td>Alternative: High-dose ICS + either LTRA or Theophylline</td>
<td>Alternative: High-dose ICS + oral systemic corticosteroid</td>
</tr>
<tr>
<td>Step 4</td>
<td>Step 5</td>
<td>Step 6</td>
<td></td>
</tr>
<tr>
<td>Preferred: High-dose ICS + LABA</td>
<td>Preferred: High-dose ICS + oral systemic corticosteroid</td>
<td>Preferred: High-dose ICS + oral systemic corticosteroid</td>
<td></td>
</tr>
<tr>
<td>Alternative: High-dose ICS + either LTRA or Theophylline</td>
<td>Alternative: High-dose ICS + oral systemic corticosteroid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In 2-6 weeks, evaluate the level of asthma control that is achieved, and adjust therapy accordingly.

### Stepwise Approach for Managing Asthma in Children 5–11 Years of Age

**Intermittent Asthma**

- Consult with asthma specialist if step 4 care or higher is required.
- Consider consultation at step 3

**Persistent Asthma: Daily Medication**

- Consult with asthma specialist if step 4 care or higher is required.
- Consider consultation at step 3

**Step 1**

- Preferred: SABA PRN
  - Alternative: SABA PRN, SABA MDI

**Step 2**

- Preferred: Low-dose ICS
  - Alternative: Medium-dose ICS

**Step 3**

- Preferred: Medium-dose ICS + LABA
  - Alternative: High-dose ICS + LABA

**Step 4**

- Preferred: High-dose ICS + oral systemic corticosteroid
  - Alternative: High-dose ICS + oral systemic corticosteroid

**Step 5**

- Preferred: High-dose ICS + oral systemic corticosteroid
  - Alternative: High-dose ICS + oral systemic corticosteroid

**Step 6**

- Preferred: High-dose ICS + LABA + oral systemic corticosteroid
  - Alternative: High-dose ICS + LABA + oral systemic corticosteroid

**Step up if needed**

- (first check adherence, inhaler technique, environmental control, and comorbid conditions)
- Assess control
- Step down if possible

Steps 2-4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma

**Quick relief medication for all patients**

- SABA as needed for symptoms. Intensity of treatment depends on severity of symptoms: up to 3 treatments at 20-minute intervals as needed. Short course of oral systemic corticosteroids may be needed.
- Caution: increasing use of SABA or use > 2 days a week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step up treatment

**Key:**

- EIB: exercise-induced bronchospasm; FEV₁: forced expiratory volume in 1 sec; FVC: forced vital capacity; ICS: inhaled corticosteroid; LABA: inhaled long-acting beta₂-agonist; LTRA: leukotriene receptor antagonist; SABA: inhaled short-acting beta₂-agonist

**Notes:**

- Level of severity is determined by both impairment and risk; assess impairment by patient’s/caregiver’s recall of the previous 2-4 weeks & spirometry; assign severity to the most severe category in which any feature occurs; In general, more frequent and intense exacerbations (e.g. requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity; for treatment purposes, patients who had > 2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

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# Estimated Daily Inhaled Corticosteroid Dosages for Children

<table>
<thead>
<tr>
<th>Drug</th>
<th>Low Daily Dose</th>
<th>Medium Daily Dose</th>
<th>High Daily Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Child 0-4</td>
<td>Child 5-11</td>
<td>≥ 12 yrs</td>
</tr>
<tr>
<td>Beclamethasone HFA (QVAR) 40 or 80 mcg/puff</td>
<td>NA</td>
<td>80-160 mcg</td>
<td>80-240 mcg</td>
</tr>
<tr>
<td>Budesonide DPI (Pulmicort) Flexhaler 90 or 180 mcg/inhalation</td>
<td>NA</td>
<td>180-400 mcg</td>
<td>180-600 mcg</td>
</tr>
<tr>
<td>Budesonide inhaled suspension for nebulization (Pulmicort Respules) 0.25, 0.5, 1 mg</td>
<td>0.25-0.5 mg</td>
<td>0.5 mg</td>
<td>NA</td>
</tr>
<tr>
<td>Fluticasone HFA/MDI (Flovent) 44, 110, or 220 mcg</td>
<td>88 mcg</td>
<td>88-176 mcg</td>
<td>88-264 mcg</td>
</tr>
<tr>
<td>Mometasone DPI (Asmanex) Twisthaler 110 or 220 mcg/ inhalation</td>
<td>NA</td>
<td>110mcg</td>
<td>220mcg</td>
</tr>
</tbody>
</table>

**ICS/LABA**
- Fluticasone/Salmeterol DPI (Advair Diskus) 100 mcg/50 mcg, 250 mcg/50 mcg, 500 mcg/50 mcg
  - Safety and efficacy not established
  - 1 inhalation BID
  - 1 inhalation BID

- Fluticasone/Salmeterol HFA/MDI (Advair HFA) 45 mcg/21 mcg, 115 mcg/21 mcg, 230 mcg/21 mcg
  - Safety and efficacy not established
  - Safety and efficacy not established
  - 2 inhalations BID

- Budesonide/Formoterol HFA/ MDI (Symbicort) 80 mcg/4.5 mcg,160 mcg/4.5 mcg
  - Safety and efficacy not established
  - 2 inhalations BID
  - 2 inhalations BID

* Dose depends on severity of Asthma
+ Start with Advair 100mcg/50mcg w/o prior ICS use, Adjust accordingly if on ICS
× Use Symbicort 80mcg/4.5mcg if on low-med ICS, use Symbicort 160/4.5 is on med-high ICS

**Key:** LABA: Long acting beta2-agonist; ICS: Inhaled corticosteroid

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References
Asthma Care Guideline


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Authors: Troy McGuire, MD
Sameer Pathare, MD
Allison June, PharmD
Elyse McClean, MSN, RN, CNS, CPN
Maisie Crookes, BSc, RN AE-C
Dani Hoyle, RCP, RRT-NPS
Patty Huddleson, BSN, RN, CPHQ, CCP