MONITORING

Asthma in Children

Table 1. Common Asthma Triggers and Avoidance Strategies

<table>
<thead>
<tr>
<th>Common asthma triggers</th>
<th>Avoidance strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic dust mite allergens</td>
<td>Wash bed linens and blankets once a week in hot water and dry in a hot dryer or sun. Encase pillows and mattresses in air tight covers. Remove carpets, especially in sleeping areas. Use vinyl, leather, or plain wooden furniture instead of fabric covered furniture</td>
</tr>
<tr>
<td>Tobacco smoke</td>
<td>Stay away from tobacco smoke. Patients and parents should not smoke</td>
</tr>
<tr>
<td>Allergens from animals with fur</td>
<td>Remove animals from the home, or at least from the sleeping area</td>
</tr>
<tr>
<td>Cockroach allergens</td>
<td>Clean the home thoroughly and often; make every effort to reduce the availability of food. Use pesticide spray to reduce the availability of food. Use pesticide spray</td>
</tr>
<tr>
<td>Outdoor pollen and mold</td>
<td>Close windows and doors and remain indoors when pollen and mold counts are highest</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Do not avoid physical activity. Symptoms can be prevented by taking short- or long-acting inhaled beta-2-agonist or sodium chromoglycate before strenuous exercise</td>
</tr>
<tr>
<td>Medication: avoid or use with caution</td>
<td>Aspirin, non steroidal anti-inflammatory drugs, beta-blockers (oral or intra-dermal dosage is essential)</td>
</tr>
<tr>
<td>Viral upper respiratory tract infections, influenza</td>
<td>For the child with recurrent, severe asthma exacerbations related to viral ILIs, consider limiting exposure to viral infections. Use respiratory vaccines for children with persistent asthma who are not allergic to eggs</td>
</tr>
<tr>
<td>Occupational asthma</td>
<td>Consider this in all adults with new onset asthma e.g. tannins, allergens from grain and others</td>
</tr>
<tr>
<td>Emotions</td>
<td>Avoid emotional and psychological stress</td>
</tr>
<tr>
<td>Foods</td>
<td>Food allergies (e.g. peanut), food additives</td>
</tr>
</tbody>
</table>

CLASSIFICATION OF ASTHMA BY LEVEL OF CONTROL

Table 2. Management of Asthma in Children

<table>
<thead>
<tr>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO2 &gt; 95%</td>
<td>PEF &gt; 80%</td>
<td>Able to talk comfortably</td>
</tr>
<tr>
<td>PEF &gt; 80%</td>
<td>Able to talk phrases</td>
<td></td>
</tr>
<tr>
<td>HR ≤ 100</td>
<td>RR ≤ 30</td>
<td>Able to talk phrases</td>
</tr>
<tr>
<td>Normal (4.6-6 kPa, 35-45 mmHg) PaCO2</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>SpO2 ≥ 95%</td>
<td>SpO2 ≥ 92%</td>
<td>SpO2 &lt; 92%</td>
</tr>
<tr>
<td>OCS 1-2 mg/kg</td>
<td>OCS 1-2 mg/kg</td>
<td>OCS 2 mg/kg (Max 40mg)</td>
</tr>
<tr>
<td>Nebulized ipratropium bromide 125-250μg</td>
<td>Nebulized ipratropium bromide 2.5mg-5mg</td>
<td>Assess response after treatment</td>
</tr>
<tr>
<td>Nebulized salbutamol 125-250μg</td>
<td>Nebulized salbutamol 2.5mg-5mg</td>
<td>Nebulized salbutamol 2.5mg-5mg</td>
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Traditionally, the degree of symptoms, airflow limitation, and lung function variability have allowed asthmas to be classified by severity (e.g., in the National Asthma Education and Prevention Program), which has been helpful in identifying patients who are most likely to benefit from particular interventions. However, it is important to recognize that asthma severity includes both the severity of the underlying disease and its responsiveness to treatment. In addition, severity is not an unchanging feature of an individual patient's asthma, but may change over months or years.

Therefore, for ongoing management of asthma, classification of asthma by level of control is more relevant and useful (Figure 2).
Management of Acute Asthma in Children in Hospital

- History, physical examination (auscultation, use of accessory muscles, heart rate, respiratory rate, PEF or FEV1, oxygen saturation, arterial blood gas if patient is in extremis).

Initial Treatment
- Oxygen to achieve O2 saturation ≥90% (95% in children)
- Inhaled rapid-acting β2-agonist continuously for one hour.
- Systemic glucocorticosteroids if no immediate response, or patient recently took oral glucocorticosteroid, or if episode is severe. Sædation is contraindicated in the treatment of an exacerbation.

Reassess after 1 Hour
- Physical Examination, PEF, O2 saturation and other tests as needed.

Criteria for Moderate Episode:
- PEF > 80%
- SaO2 > 95%
- Minimal/Absent signs and symptoms
- Sufficient medications (bronchodilator and anti-inflammatory) can be obtained
- Outpatient care can be obtained
- Action/Management plan written
- Education re spacer and inhaler devices provided
- Follow up arranged

Criteria for Severe Episode:
- History of risk factors for near fatal asthma
- PEF < 80%
- Physical exam; severe symptoms at rest, chest retraction
- No improvement after initial treatment

Treatment:
- Oxygen
- Inhaled β2-agonist and inhaled anticholinergic
- Systemic glucocorticosteroids
- Intravenous magnesium

Reassess after 1-2 Hours

Incomplete Response within 1-2 Hours:
- Risk factors for near fatal asthma
- Physical exam; symptoms severe, drowsiness, confusion
- PEF < 30% or PEF 45-50% of predicted
- O2 saturation not improving

Poor Response within 1-2 Hours:
- Risk factors for near fatal asthma
- Physical exam; symptoms severe, drowsiness, confusion
- PEF < 30% or PEF 45-50% of predicted
- O2 saturation not improving

Admit to Intensive Care
- Oxygen
- Inhaled β2-agonist + anticholinergic
- Systemic glucocorticosteroids
- Consider intravenous β2-agonist
- Consider intravenous theophylline
- Possible intubation and mechanical ventilation

Admit to Acute Care Setting
- Oxygen
- Inhaled β2-agonist + anticholinergic
- Systemic glucocorticosteroids
- Monitor PEF, O2 saturation, pulse

Admit to Intensive Care
- Oxygen
- Inhaled β2-agonist + anticholinergic
- Systemic glucocorticosteroids
- Monitor PEF, O2 saturation, pulse

Admission
- Continuous inotropic support
- Consider high flow oxygen
- Consider adding a combination inhaler
- Patient education: Take medication correctly
- Review action plan
- Close medical follow-up

Reassess at intervals

Improvement: Criteria for Discharge Home
- PEF > 80%
- Sustained on oral/inhaled medication

Home Treatment:
- Continue inhaled β2-agonist
- Consider, in most cases, oral glucocorticosteroids
- Consider adding a combination inhaler
- Patient education: Take medication correctly
- Review action plan
- Close medical follow-up

Levels of severity of acute asthma exacerbations in adults

Near fatal asthma: Raised PaCO2 and/or requiring mechanical ventilation with raised inflation pressures (Richards 1993, Innes 1998)

Life threatening asthma:
- Any one of the following in a patient with severe asthma
  - PEF < 33% best or predicted
  - SaO2 ≤ 92%
  - PaCO2 > PaO2 + 8 kPa
  - normal PaCO2 (4.6-6.0 kPa)
  - alcohol or drug abuse
  - obesity
  - depression
  - psychosis
  - other psychiatric illness or deliberate self-harm

Acute severe asthma:
- Any one of:
  - PEF < 33.5% best or predicted
  - PaCO2 < 4 kPa
  - PaO2 < PaCO2 + 8 kPa
  - PaCO2 > 6.5 kPa
  - PaO2 < 8 kPa

Moderate asthma exacerbation:
- Increasing symptoms
- PaCO2 50-75% best or predicted
- No features of acute severe asthma

Brittle asthma:
- Type 1: wide PEF variability (>40% diurnal variation for 50% of the time over a period >150 days) despite intense therapy
- Type 2: sudden severe attacks on a background of apparently well controlled asthma