Management of Asthma in Children and Adults

Purpose
To improve asthma management in children and adults.

Key Recommendations/Messages
• Assess and Monitor - assess and document asthma severity, identify triggers, conduct medical history and physical exam, assess medication use. Schedule a medical appointment for asthma at least every six months.
• Pharmacological Therapy - use stepwise approach to gaining control as quickly as possible and provide a rescue plan for acute exacerbations.
• Control Factors that Contribute to Severity- asthma exacerbations may be caused by a variety of triggers including allergens, pollutants, foods and drugs.
• Patient Education - education is an essential part of the overall management of asthma. Education includes the development of an asthma action plan.
• Asthma in all age groups may present only as repeated coughing, especially at night, with exercise and with viral illnesses, but these are particularly common patterns of presentation of asthma in children.

High Risk Populations/Disparities
• In the elderly, the diagnosis of asthma is often not made or is missed. It is now becoming increasing recognized that undiagnosed asthma is a frequent cause of treatable respiratory symptoms.
• Workers who are exposed to inhalant chemicals or allergens in the workplace can develop asthma and may be misdiagnosed as having bronchitis or chronic obstructive disease.
• More boys develop asthma during childhood; the prevalence of asthma in girls surpasses boys during adolescence.
• Among 20-30-year old’s, the prevalence in women is nearly twice as high as in men.
• According to the New York State Department of Health Prevention Agenda (2013 – 2017), Monroe County has the highest emergency department visits for asthma in Western and Central New York.
  o According to the New York State Department of Health Statewide Planning and Research Cooperative System (SPARCS) 2010-2012 SPARCS Data, within the “crescent” of Rochester, asthma admission rates are about 40% higher than the state average. A child or adult living in this area is more than nine times more likely to be hospitalized for their asthma compared to a similar individual living in the 14534 (Pittsford) zip code.
  o Three zip codes stand out for asthma hospitalizations: 14605, 14604 and 14621. These three zip codes combined comprise the bulk of all the asthma hospitalizations in the County. In fact, the asthma admissions for these zip codes are nearly double the state rate. When broken down by race, the Health Department data shows that the admission rate for blacks is nearly twice that of whites.
• For tree, grass, and weed pollen, pollen counting stations in Rochester reported that the annual mean daily concentrations met or exceeded the National Allergy Bureau threshold for high concentration of pollen on 25% or more days per season. (New York State Asthma Surveillance, October 2013).

Guidelines are intended to be flexible. They serve as reference points or recommendations, not rigid criteria. Guidelines should be followed in most cases, but there is an understanding that, depending on the patient, the setting, the circumstances, or other factors, care can and should be tailored to fit individual needs.

Four Components of Asthma Care

1. Assessment and Monitoring of Asthma Severity and Control

Assessment and monitoring of asthma are tied to the concepts of severity, control and responsiveness and the domains of impairment and risk.

For assessing asthma severity and asthma control by impairment and risk, see age specific charts.

Medical history and physical exam:
Assess and document asthma severity and control, including impairment and risk domains.
Spriometry recommended for patients ≥ 5 years:
(1) at time of initial assessment; (2) after treatment has begun and symptoms and peak expiratory flow (PEF) have stabilized; (3) during periods of loss of asthma control and (4) at least every 1–2 years.
Identify or review triggers and precipitating factors
(e. g. allergens, exercise, upper respiratory infection, tobacco smoke, chemicals, weather, strong emotions).
Assess family, psychosocial, occupational history including stressors.
Assessment medication use, including CAM*. At every visit, review beta-agonist use.
Assess for co-morbidities (rhinitis, sinusitis, GERD**, obesity, ABPA***, OSA****, stress or depression).
Conduct physical exam focusing on upper and lower airways, nose and skin.
Assess impact of asthma on patient and family, patient and family perception of disease, and knowledge and skills for self-management.
* complementary alternative medication, ** gastroesophageal reflux disease, *** allergic bronchopulmonary aspergillosis, **** obstructive sleep apnea

Recommended Approach to Care Management

Initial asthma visit
Assess severity using both the impairment and risk domains (See Classifying Asthma Severity and Initiating Treatment in specific age charts).
Perform spirometry measurement (FEV₁, FVC, FEV₁/FVC) in all patients ≥ 5 years old before and after the patient inhales a SABA.
Assess skills for self-management, including medication administration technique.
Prescribe appropriate pharmacological therapy based on severity assessment (See age specific stepwise chart).
Develop and review Asthma Action Plan and provide education.
Monitor at least at 2–6-week intervals until control is achieved.

Chronic maintenance asthma visit
Assess asthma control based on impairment and risk (See Classifying Asthma Control and Adjusting Therapy in specific age charts).
Perform spirometry measurement (FEV₁, FVC, FEV₁/FVC) in all patients ≥ 5 years old at least every 1–2 years when asthma is stable, more often when asthma is unstable, or when clinically indicated by a change in the patient’s condition or medication.
Consider validated questionnaires to assess impairment such as the Asthma Control Test (ACT) (www.asthmacontrol.com).
and the Asthma Control Questionnaire (ACQ) (www.qoltech.co.uk/index.htm).
Step up or step-down treatment based on assessment of control (See age specific stepwise chart).
Update and review written Asthma Action Plan.
Provide education, emphasizing medication adherence and medication administration technique.
Review methods of reducing exposure to relevant allergens and irritants.
Identify or review triggers and precipitating factors
(e. g. allergens, exercise, upper respiratory infection, tobacco smoke, chemicals, weather, strong emotions).
Assess family, psychosocial, occupational history including stressors.
Assessment medication use, including CAM*. At every visit, review beta-agonist use.
Assess for co-morbidities (rhinitis, sinusitis, GERD**, obesity, ABPA***, OSA****, stress or depression).
Conduct physical exam focusing on upper and lower airways, nose and skin.
Assess impact of asthma on patient and family, patient and family perception of disease, and knowledge and skills for self-management.
* complementary alternative medication, ** gastroesophageal reflux disease, *** allergic bronchopulmonary aspergillosis, **** obstructive sleep apnea

Acute exacerbation asthma visit
Do not underestimate the severity of an exacerbation. Severe exacerbations can be life threatening and can occur in patients at any level of asthma severity or control.
Perform spirometry for patients ≥ 5 years during periods of loss of asthma control.
Prescribe appropriate pharmacological therapy based on assessment of severity and control (See age specific stepwise chart).
Provide a rescue plan of systemic corticosteroids or other medications if needed for acute exacerbations at any step.
Check patient’s inhaler, spacer/holding chamber, and peak flow technique.
Review symptom/peak flow monitoring.
Provide education, emphasizing medication adherence and medication administration technique.
Review methods of reducing exposure to relevant allergens and irritants.
Update and review written Asthma Action Plan.
Monitor closely until control is achieved.

Referrals

Asthma Specialist
Consider referral to asthma specialist such as an allergist or pulmonologist when:
Patient has had a life-threatening asthma exacerbation.
Patient is not meeting the goals of asthma therapy after 3 – 6 months of treatment. An earlier referral or consultation is appropriate if the physician concludes that the patient is unresponsive to therapy.
Signs and symptoms are atypical, or there are problems in differential diagnosis.
Other conditions complicate asthma, e.g., sinusitis, nasal polyps, ABPA, severe rhinitis, vocal cord dysfunction (VCD), GERD, chronic obstructive pulmonary disease (COPD).
Additional diagnostic testing is indicated (e.g., allergy skin testing, rhinoscopy, complete pulmonary function studies, provocative challenge, bronchoscopy).
Patient requires additional education and guidance on complications of therapy, problems with adherence, or allergen avoidance.
Patient is being considered for immunotherapy.
Patient requires step 4 care or higher (step 3 for children 0– 4 years of age). Consider referral if patient requires step 3 care (step 2 for children 0–4 years of age) (See age specific stepwise chart);
Patient has required more than two bursts of oral corticosteroids in 1 year or has an exacerbation requiring hospitalization.
Patient requires confirmation of a history that suggests that an occupational- al or environmental inhalant or ingested substance is provoking or con- tributing to asthma. Depending on the complexities of diagnosis, treat- ment, or the intervention required in the work environment, it may be appropriate in some cases for the specialist to manage the patient over a period of time or to co-manage with the primary care provider (PCP).

Behavioral Specialist
Refer patients with significant psychiatric, psychosocial, or family stressors, which adversely affect their asthma control, to a behavioral health professional for treatment.

Health Plan and Community Agencies
Contact individual health plan, local health department, or community agency for availability of:
Individualized case management;
Individualized asthma education;
Asthma classes/support groups;
Smoking cessation classes;
Assistance with durable medical equipment and medical supplies such as peak flow meters, spacers/holding chambers, nebulizers and compressors;
Home or school environmental assessment and remediation when possible.

Occupational Lung Disease
Notify the New York State Department of Health Occupational Lung Disease registry at 1-866-807-2130 for patients suspected of having occupational asthma/lung disease. Services may include education and workplace evaluation.

Managing Special Situations
Patients who have asthma may encounter situations that will require adjustments to their asthma management to keep their asthma under control, such as exercise induced bronchospasm (EIB), pregnancy, and surgery.
Four Components of Asthma Care (Continued)


Exercise-Induced Bronchospasm (EIB): EIB should be anticipated in all asthma patients. A history of cough, shortness of breath, chest pain or tightness, wheezing, or endurance problems during exercise suggests EIB.

Pregnancy: Maintaining adequate control of asthma during pregnancy is important for the health of the mother and her baby. Monitor asthma status during prenatal visits. Albuterol is the preferred short acting beta agonist (SABA). Inhaled corticosteroids (ICS), particularly budesonide, are the preferred long-term control medication because of documented safety and efficacy.

Surgery: Patients who have asthma are at risk for specific complications during and after surgery.

2. Education for a Partnership in Care

A partnership between the clinician and the person who has asthma (and the caregiver, for children) is required for effective asthma management. Asthma self-management education improves patient outcomes and can be cost effective. Asthma education and self-management support should be tailored to the needs and literacy levels of the patient and maintain sensitivity to cultural beliefs and ethnocultural practices.

Key Educational Messages: Teach and Reinforce at Every Opportunity

Basic Facts About Asthma

The contrast between airways of a person who has and a person who does not have asthma, the role of the inflammation.

What happens to the airways during an asthma attack.

Role of Medications

Understanding the Difference Between:

Long-Term Control Medications: Prevents symptoms, often by reducing inflammation. Must be taken daily. Do not expect long-term control medications to give quick relief.

Quick-Relief Medications: SABAs relax airway muscles to provide prompt relief of symptoms. Do not expect long-term asthma control. Using SABA >2 days a week indicates the need for starting or increasing long-term control medications.

Patient Skills

Taking medications correctly:

Inhaler technique (demonstrate to the patient and have the patient return the demonstration).

Use of devices, as prescribed (e.g., valved holding chamber (VHC) or spacer, nebulizer).

Identifying and avoiding environmental exposures that worsen the patient’s asthma, e.g., allergens, irritants, tobacco smoke.

Self-monitoring:

Assess level of asthma control.

Monitor symptoms and, if prescribed, PEF measures;

Recognize early signs and symptoms of worsening asthma.

Using a written asthma action plan to know when and how to:

Take daily actions to control asthma;

Adjust medication in response to signs of worsening asthma;

Seeking medical care as appropriate.

Asthma Action Plan

A written Asthma Action Plan based on peak flow and/or symptom monitoring, developed jointly with the patient, assists in managing asthma exacerbations. Update the Asthma Action Plan at every visit (at least every six months).

A written Asthma Action Plan should include:

Recommended doses and frequencies of daily controller medications and quick relief medications;

Information on what to do in case of an exacerbation (worsening symptoms and/or nocturnal awakenings);

Recommendations on avoidance of known allergens/irritants;

How to adjust medicines at home in response to particular signs, symptoms, and/or peak flow measurements;

A list of Peak Expiratory Flow (PEF) levels and/or symptoms indicating the need for acute care;

When and how to activate the EMS (Emergency Medical System) including emergency telephone numbers for the physician, and rapid transportation.

A copy of a patient’s written Asthma Action Plan should be:

Carried with the patient;

In the patient’s medical record;

Provided to the patient’s family;

Provided to the patient’s school/daycare;

Provided to other contacts of the patient as needed, including extended care and camp.

Free Asthma Action Plans:

Free Asthma Action Plans: (English and Spanish) are available at: www.health.state.ny.us/diseases/asthma/brochures.htm

3. Control of Environmental Factors and Co-morbid Conditions that Affect Asthma

Environmental Control Measures

If patients with asthma are exposed to irritants or inhalant allergens to which they are sensitive, their asthma symptoms may increase and precipitate an asthma exacerbation. Substantially reducing exposure to these factors may reduce inflammation, symptoms, and need for medication.

For the patient's environment the provider should:

Assess patient’s exposure to and clinical significance of: Irritants (e.g. tobacco-co smoke, smoke from wood burning stoves and fireplaces, dust generated by vacuum cleaning, and substances with strong odors and sprays, including volatile organic compounds [VOCs], chemicals); exercise or sports and allergens (e.g. animal dander, dust mites, cockroaches, mold, pollen, chemicals) and consider allergen testing. See Expert Panel Report 3 (EPR-3); Guidelines for the Diagnosis and Management of Asthma – Summary Report 2007. NIH Publication No 08-5846, October 2007, pages 26-27 (www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf).

Counsel, provide information and refer patients to appropriate services to reduce exposure to relevant allergens and irritants and prevent infections where possible.

For Example: Tobacco Smoke Exposure

Assess for smoking and exposure to second-hand smoke;

Routinely advise and encourage patients and families to quit smoking;

Strongly advise against smoking indoors or in automobiles;

Initiate and/or refer to smoking cessation interventions and counseling and consider pharmacotherapy for patients and household members;

Inform patients that smoking cessation information and FREE Stop Smoking Kits are available through the New York State Smoker’s Quitline. The toll-free number is 1-888-697-8487, or visit the website at www.nysmokefree.com.

Effective allergen avoidance requires a comprehensive approach (such as a multifaceted allergen-control education program provided in the home setting); single steps alone are generally ineffective.

Consider subcutaneous immunotherapy for patients who have allergies at steps 2-4 of care (mild or moderate persistent asthma) when there is a clear relationship between symptoms and exposure to an allergen to which the patient is sensitive.

Co-morbidity Management

Manage, if present, allergic bronchopulmonary aspergillosis (ABPA), gastroesophageal reflux disease (GERD), obesity or overweight patients, obstructive sleep apnea (OSA), mirtits/sinusitis, chronic stress/depression.
Four Components of Asthma Care (Continued)

4. Medications

Stepwise Approach to Asthma Management

(See Stepwise Approach for Managing asthma in age specific charts)

The stepwise approach incorporates all four components of care:

1. assessment of severity to initiate therapy or assessment of control to monitor and adjust therapy;
2. patient education;
3. environmental control measures, and management of co-morbid conditions at every step; and
4. selection of medication.

The type, amount, and scheduling of medication is determined by the level of asthma severity or asthma control.

Therapy is increased (stepped up) as necessary and decreased (stepped down) when possible. Gain control as quickly as possible, then decrease treatment to the least medication necessary to maintain control. The preferred approach is to start with more intensive therapy in order to more rapidly suppress airway inflammation and thus gain prompt control.

ICSs are the most consistently effective anti-inflammatory therapy for all age groups, at all steps of care for persistent asthma and the preferred first line treatment that results in improved asthma control.

Provide a rescue plan of systemic corticosteroids or other medications if needed for acute exacerbations at any step.

Spacers/holding chambers should be used with metered dose inhalers (MDIs).

Bibliography


www.alvesco.us
www.dulera.com


See Long-Term Control and Quick-Relief charts for medications and usual dosages.

Check for availability and the health plan/insurance formulary when applicable.
**Classifying Asthma Severity & Initiating Treatment in Children 0–4 Years of Age**

### Assessing severity and initiating therapy in children who are not currently taking long-term control medication

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity: Children 0–4 Years of Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impairment</td>
<td>Intermittent</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 beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
</tbody>
</table>

**Recommended Step for Initiating Therapy**

(See Stepwise Charts for Treatment Steps.)

- **Step 1:** In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.
- **Step 2:** Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time. Exacerbations of any severity may occur in patients in any severity category.

**Notes:**
- The level of severity is determined by both impairment and risk. Assess impairment domain by caregiver’s recall of previous 2–4 weeks. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. For treatment purposes, patients who had ≥ 2 exacerbations requiring oral systemic corticosteroids in the past 6 months, or ≥ 4 wheezing episodes in the past year, and who have risk factors for persistent asthma 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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### Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control*

<table>
<thead>
<tr>
<th>Lowest level of treatment required to maintain control (See Stepwise Charts for Treatment Steps.)</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent</td>
<td>Persistent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Step 2</td>
</tr>
</tbody>
</table>

**Recommended Step for Initiating Therapy**

(See Stepwise Charts for Treatment Steps.)

- **Step 1:** In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.

**Notes:**
- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

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### Assessing Asthma Control & Adjusting Therapy in Children 0–4 Years of Age

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control: Children 0–4 Years of Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impairment</td>
<td>Well Controlled</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤1x/month</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Risk</td>
<td>Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.</td>
</tr>
</tbody>
</table>

**Recommended Action for Treatment**

(See “Stepwise Approach for Managing Asthma” for treatment steps.)

The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.

- **Maintain current treatment.**
- **Regular follow up every 1–6 months.**
- **Consider step down if well controlled for at least 3 months.**

**Before step up in therapy:**

- **Review adherence to medication, inhaler technique, and environmental control.** If alternative treatment was used, discontinue it and use preferred treatment for that step.

**Notes:**
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by caregiver’s recall of previous 2–4 weeks. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. 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 not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.
Stepwise Approach for Managing Asthma in Children 0 – 4 Years of Age

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

**Step 1**
Preferred: SABA PRN

**Step 2**
Preferred: Low-dose ICS
Alternative: Cromolyn or Montelukast

**Step 3**
Preferred: Medium-dose ICS

**Step 4**
Preferred: Medium-dose ICS + either LABA or Montelukast

**Step 5**
Preferred: High-dose ICS + either LABA or Montelukast
Oral systemic corticosteroids

**Step 6**
Preferred: High-dose ICS + either LABA or Montelukast
Assess Control
Step down if possible (and asthma is well controlled at least 3 months)

Key: Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta₂-agonist; SABA, inhaled short-acting beta₂-agonist.

Notes:
* 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 weeks and patient/family medication technique and adherence are satisfactory, consider adjusting therapy or alternative diagnosis.

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 hours up to 24 hours (longer with 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.
Assessing severity and initiating therapy in children who are not currently taking long-term control medication

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity: Children 5–11 Years of Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week but not more than once on each day</td>
</tr>
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<td>Nighttime awakenings</td>
<td>≤ 2x/month</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Lung function</td>
<td>• Normal FEV1 between exacerbations</td>
</tr>
<tr>
<td></td>
<td>• FEV1/FVC &gt; 85%</td>
</tr>
</tbody>
</table>

Risk

Exacerbations requiring oral systemic corticosteroids

Recommended Step for Initiating Therapy

(See Stepwise Charts for Treatment Steps.)

Step 1

Step 2

Step 3, medium-dose ICS option, and consider short course of oral systemic corticosteroids

Step 3, medium-dose ICS option, or step 4

Recommended Action for Treatment

(See “Stepwise Approach for Managing Asthma” for treatment steps.)

The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.

Notes:

• Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient’s/caregiver’s recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.

• At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had 2 exacerbations requiring urgent care, hospitalization, or ICU admission may be considered the same as patients with persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control*

(See Stepwise Charts for Treatment Steps.)

Lowest level of treatment required to maintain control

Classification of Asthma Severity

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<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Lung Function: • FEV1 or peak flow</td>
<td>&gt; 80% predicted/personal best</td>
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<tr>
<td></td>
<td>&gt; 80%</td>
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<tr>
<td>Reduction in lung growth</td>
<td>0 – 1/year</td>
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<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.</td>
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Recommended Action for Treatment

(See “Stepwise Approach for Managing Asthma” for treatment steps.)

The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.

Notes:

• The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient’s/caregiver’s recall of previous 2–4 weeks and by spirometry or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.

• At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent care, hospitalization, or ICU admission) indicate poorer disease control. 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 not-well-controlled asthma, even in the absence of impairment levels consistent with persistent asthma.
**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**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred: Low-dose ICS</td>
<td>Preferred: Low-dose ICS + OR either LABA, LTRA, or Theophylline</td>
<td>Preferred: Medium-dose ICS + LABA</td>
<td>Preferred: [ \text{either LABA} ]</td>
<td>Preferred: High-dose ICS + LABA or oral systemic corticosteroid</td>
<td>Step up if needed</td>
</tr>
<tr>
<td>Alternative: Cromolyn, LTRA, or Theophylline</td>
<td>Alternative: Medium-dose ICS + LABA</td>
<td>Alternative: High-dose ICS + either LTRA</td>
<td>Alternative: [ \text{either LABA} ] \text{or LTRA}</td>
<td>Alternative: [ \text{either LABA} ]</td>
<td>(first, check adherence, inhaler technique, environmental control, and comorbid conditions)</td>
</tr>
</tbody>
</table>

Each Step: Patient education, environmental control, and management of comorbidities.

Steps 2–4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma (see notes).

**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: Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta2-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta2-agonist.

Notes:
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.

Notes:
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
Classifying Asthma Severity & Initiating Treatment in Youths ≥12 Years of Age & Adults

### Assessing severity and initiating treatment for patients who are not currently taking long-term control medications

#### Components of Severity

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Classification of Asthma Severity: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nighttime awakenings</td>
<td>Intermittent</td>
</tr>
<tr>
<td>≤ 2 days/week</td>
<td>≤ 2 days/week but not daily</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2x/month</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Lung function

- Norm. FEV₁/FVC
- FEV₁ > 80% predicted
- FEV₁/FVC normal
- FEV₁ > 60% but < 80% predicted
- FEV₁/FVC reduced 5%
- FEV₁ < 60% predicted
- FEV₁/FVC reduced 5%

### Risk

- Exacerbations requiring oral systemic corticosteroids
  - 0/1 year (see note)
  - ≥ 1 year (see note)
  - Consider severity & interval since last exacerbation. Frequency & severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV₁.

#### Recommended Step for Initiating Therapy

**Assessing Asthma Control & Adjusting Therapy in Youths ≥12 Years of Age & Adults**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4 or Step 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider short course of oral systemic corticosteroids</td>
<td>In 2 – 6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient’s/caregiver’s recall of previous 2 – 4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. 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.

### Lowest level of treatment required to maintain control

**Assessing severity and initiating treatment for patients who are not currently taking long-term control medications**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4 or Step 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain current step.</td>
<td>Regular follow-ups every 1– 6 months to maintain control.</td>
<td>Consider step down if well controlled for at least 3 months.</td>
<td>Consider short course of oral systemic corticosteroids.</td>
</tr>
</tbody>
</table>

**Recommended Action for Treatment**

(See “Stepwise Approach for Managing Asthma” for treatment steps.) The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.

#### Before step up in therapy:

- Review adherence to medication, inhaler technique, environmental control, and comorbid conditions.
- If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.

**Notes:**
- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient’s recall of previous 2 – 4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient’s asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. 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 not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.
- ATAAQ = Asthma Therapy Assessment Questionnaire®, ACQ = Asthma Control Questionnaire®, ACT = Asthma Control Test™, Minimal Important Difference: 1.0 for the ATAAQ; 0.5 for the ACQ, not determined for the ACT.

### Assessing Asthma Control & Adjusting Therapy in Youths ≥12 Years of Age & Adults

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Control: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nighttime awakenings</td>
<td>Intermittent</td>
</tr>
<tr>
<td>≤ 2 days/week</td>
<td>≤ 2x/month</td>
</tr>
<tr>
<td>2x/month</td>
<td>1–3x/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤ 2 days / week</td>
</tr>
<tr>
<td>Lung Function: FEV₁ or peak flow</td>
<td>&gt;80% predicted/personal best</td>
</tr>
<tr>
<td>Validated Questionnaires</td>
<td>ATAAQ</td>
</tr>
<tr>
<td>0</td>
<td>≤ 0.75*</td>
</tr>
<tr>
<td>≤ 0.5</td>
<td>≥ 1.5</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0 – 1/year</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>≤ 2/year (see note)</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

### Least extent of treatment recommended to maintain control

**Assessing severity and initiating treatment for patients who are not currently taking long-term control medications**

<table>
<thead>
<tr>
<th>Classification of Asthma Severity: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV₁/ FVC normal</td>
</tr>
<tr>
<td>FEV₁ &gt; 80% predicted</td>
</tr>
<tr>
<td>FEV₁ &gt; 60% but &lt; 80% predicted</td>
</tr>
</tbody>
</table>

**Key:**
- FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity; ICU, intensive care unit.

**Notes:**
- For population-based evaluations, clinical research, or characterization of a patient’s overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control, not the level of severity, once treatment is established.

**Risk**

- Exacerbations requiring oral systemic corticosteroids
  - 0/1 year (see note)
  - ≥ 1 year (see note)
  - Consider severity & interval since last exacerbation. Frequency & severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV₁.

### Stepwise Charts for Treatment Steps.

- **Step 1**
- **Step 2**
- **Step 3**
- **Step 4 or Step 5**

**Recommended Action for Treatment**

(See “Stepwise Approach for Managing Asthma” for treatment steps.) The stepwise approach is meant to assist, not replace, clinical decision making required to meet individual patient needs.
Stepwise Approach for Managing Asthma in Youths ≥12 Years of Age & Adults

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

- **Step 1** Preferred: Low-dose ICS
  - Alternative: Cromolyn, LTRA, or Theophylline

- **Step 2** Preferred: Low-dose ICS + LABA or Medium-dose ICS
  - Alternative: Low-dose ICS + either LTRA, Theophylline, or Zileuton

- **Step 3** Preferred: Medium-dose ICS + LABA
  - Alternative: High-dose ICS + LABA and Consider Omalizumab for patients who have allergies

- **Step 4** Preferred: High-dose ICS + LABA and Consider Oral corticosteroid for patients who have allergies

- **Step 5** Preferred: High-dose ICS + LABA + Oral corticosteroid and Consider Omalizumab for patients who have allergies

- **Step 6** Preferred: High-dose ICS + LABA + Oral corticosteroid and Consider Omalizumab for patients who have allergies

**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:**
- Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy. ICS, inhaled corticosteroid; LABA, inhaled long-acting beta2-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta2-agonist.

**Notes:**
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.

Each Step: Patient education, environmental control, and management of comorbidities.

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

Assess Control
Step down if possible (and asthma is well controlled at least 3 months)

Step up if needed (first, check adherence, environmental control, and comorbid conditions)
## Long-Term Control Medications
### Estimated Comparative Daily Doses for Inhaled Corticosteroids

**Key:** DPI, dry powder inhaler; HFA, hydrofluoroalkane; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group).

**Therapeutic Issues:**
- The most important determinant of appropriate dosing is the clinician's judgment of the patient's response to therapy. The clinician must monitor the patient's response on several clinical parameters and adjust the dose accordingly. Once control of asthma is achieved, the dose should be carefully titrated to the minimum dose required to maintain control.
- Preparations are not interchangeable on a mcg or per puff basis.
- This figure presents estimated comparable daily doses. See EPR-3 Full Report 2007 for full discussion.
- Some doses may be outside package labeling, especially in the high-dose range. Budesonide nebulizer suspension is the only inhaled corticosteroid (ICS) with FDA-approved labeling for children <4 years of age.
- For children <4 years of age: The safety and efficacy of ICSs in children <1 year has not been established. Children <4 years of age generally require delivery of ICS (budesonide and fluticasone HFA) through a face mask that should fit snugly over nose and mouth and avoid nebulizing in the eyes. Wash face after each treatment to prevent local corticosteroid side effects. For budesonide, the dose may be administered 1–3 times daily. Budesonide suspension is compatible with albuterol, ipratropium, and levalbuterol nebulizer solutions in the same nebulizer. Use only jet nebulizers, as ultrasonic nebulizers are ineffective for suspensions. For fluticasone HFA, the dose should be divided twice daily; the low dose for children <4 years of age is higher than for children 5–11 years of age due to lower dose delivered with face mask and data on efficacy in young children.
- Children <12 years of age (please refer to package insert for age appropriateness, drug interactions and potential adverse effects). Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

### Medication Table

<table>
<thead>
<tr>
<th>Medication</th>
<th>Child 0–4 years of Age</th>
<th>Child 5–11 years of Age</th>
<th>Child &gt;12 years &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Daily Dose</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beclomethasone HFA 40 or 80 mcg/puff</td>
<td>NA</td>
<td>80 – 160 mcg</td>
<td>80 – 240 mcg</td>
</tr>
<tr>
<td>Budesonide DPI 90, 180, or 200 mcg/inhalation</td>
<td>NA</td>
<td>180 – 400 mcg</td>
<td>180 – 600 mcg</td>
</tr>
<tr>
<td>Ciclesonide MDI 80 or 160 mcg/inhalation</td>
<td>NA</td>
<td>160 – 320 mcg</td>
<td>NA</td>
</tr>
<tr>
<td>Flovent (fluticasone furoate)</td>
<td>NA</td>
<td>NA</td>
<td>100 mcg</td>
</tr>
<tr>
<td>Flutomide (fluticasone propionate)</td>
<td>NA</td>
<td>NA</td>
<td>100 – 200 mcg</td>
</tr>
<tr>
<td>Mometasone DPI #110 or 220 mcg/inhalation</td>
<td>NA</td>
<td>110 mcg#</td>
<td>220 mcg</td>
</tr>
</tbody>
</table>

| Medium Daily Dose                 |                        |                         |                          |
|-----------------------------------|                        |                         |                          |
| Beclomethasone HFA 40 or 80 mcg/puff | NA                     | 160 – 320 mcg           | >240 – 480 mcg           |
| Budesonide DPI 90, 180, or 200 mcg/inhalation | NA                   | >400 – 800 mcg         | >600 – 1,200 mcg        |
| Ciclesonide MDI 80 or 160 mcg/inhalation | NA                 | >800 mcg               | 1,200 mcg               |
| Flovent (fluticasone furoate)     | NA                     | NA                      | >200 mcg                |
| Flutomide (fluticasone propionate) | NA                     | NA                      | >200 – 400 mcg          |
| Mometasone DPI #110 or 220 mcg/inhalation | NA              | >200 – 400 mcg         | >300 – 500 mcg          |

| High Daily Dose                   |                        |                         |                          |
|-----------------------------------|                        |                         |                          |
| Beclomethasone HFA 40 or 80 mcg/puff | NA                     | >320 mcg               | >480 mcg                |
| Budesonide DPI 90, 180, or 200 mcg/inhalation | NA                   | >800 mcg               | 1,200 mcg               |
| Ciclesonide MDI 80 or 160 mcg/inhalation | NA                 | >320 mcg               | >640 mcg                |
| Flovent (fluticasone furoate)     | NA                     | NA                      | >200 mcg                |
| Flutomide (fluticasone propionate) | NA                     | NA                      | >200 – 400 mcg          |
| Mometasone DPI #110 or 220 mcg/inhalation | NA              | >320 – 640 mcg         | >400 mcg               |

### Notes:
- # For children 4 to 11 years of age: Mometasone starting dose and maximum dose are the same, 110 mcg/day. See: www.asmanex.com.
# Long-Term Control Medications

## Usual Doses for Long-Term Control Medications*

<table>
<thead>
<tr>
<th>Medication</th>
<th>0–4 Years of Age</th>
<th>5–11 Years of Age</th>
<th>≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inhaled Corticosteroids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methyldipropionate</td>
<td>0.25 – 2 mg/kg daily in single dose in a.m. or qod as needed for control</td>
<td>0.25 – 2 mg/kg daily in single dose in a.m. or qod as needed for control</td>
<td>7.5 – 60 mg daily in a single dose in a.m. or qod as needed for control</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>Short-course &quot;burst&quot;: 1–2 mg/kg/day, maximum 60 mg/day for 3 – 10 days</td>
<td>Short-course &quot;burst&quot;: 1–2 mg/kg/day, maximum 60 mg/day for 3 – 10 days</td>
<td></td>
</tr>
<tr>
<td>Prednisone</td>
<td>≤ 4 mg/day; ≤ 5 mg/4 ml</td>
<td>≤ 4 mg/day; ≤ 5 mg/4 ml</td>
<td></td>
</tr>
<tr>
<td>Oral Systemic Corticosteroids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>2, 4, 8, 16, 32 mg tablets</td>
<td>2, 4, 8, 16, 32 mg tablets</td>
<td></td>
</tr>
<tr>
<td>Prednisolone</td>
<td>5 mg tablets; 1/10 mg/0.005 ml; 2 mg/0.01 ml</td>
<td>5 mg tablets; 1/10 mg/0.005 ml; 2 mg/0.01 ml</td>
<td></td>
</tr>
<tr>
<td>Prednisone</td>
<td>1, 2, 5, 10, 20, 50 mg tablets; ≤ 6 mg/day; ≤ 5 mg/4 ml</td>
<td>1, 2, 5, 10, 20, 50 mg tablets; ≤ 6 mg/day; ≤ 5 mg/4 ml</td>
<td></td>
</tr>
<tr>
<td>Inhaled Long-Acting Beta2-Agonists (LABAs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formoterol</td>
<td>DPI: 12 mcg/q 12 hours</td>
<td>DPI: 12 mcg/q 12 hours</td>
<td></td>
</tr>
<tr>
<td>Fluticasone/Salmeterol**</td>
<td>DPI: 100 mcg/50 mcg, 250 mcg/50 mcg, 500 mcg/25 mcg</td>
<td>DPI: 100 mcg/50 mcg, 250 mcg/50 mcg, 500 mcg/25 mcg</td>
<td></td>
</tr>
<tr>
<td>Budesonide/Formoterol</td>
<td>DPI or HFA</td>
<td>DPI or HFA</td>
<td></td>
</tr>
<tr>
<td>Combined Medication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cromolyn</td>
<td>1 ampule qid (I.C. &lt; 2 years of age)</td>
<td>1 ampule qid (I.C. &lt; 2 years of age)</td>
<td></td>
</tr>
<tr>
<td>Immunomodulators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mepolizumab</td>
<td>100 mg/1 ml SC q 4 weeks, for those 12 years of age and older</td>
<td>100 mg/1 ml SC q 4 weeks, for those 12 years of age and older</td>
<td></td>
</tr>
<tr>
<td>Omalizumab (Anti-IgE)</td>
<td>75 to 375 mcg SC q 2–4 weeks, depending on weight and pretreatment serum IgE level</td>
<td>150–375 mcg SC q 2–4 weeks, depending on weight and pretreatment serum IgE level</td>
<td></td>
</tr>
<tr>
<td>Reslizumab</td>
<td>3 mg/kg once every 4 weeks by intravenous infusion over 20–50 minutes</td>
<td>3 mg/kg once every 4 weeks by intravenous infusion over 20–50 minutes</td>
<td></td>
</tr>
<tr>
<td>Leukotriene Modifiers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montelukast</td>
<td>4 mg qhs (1–5 years of age)</td>
<td>5 mg qhs (6–14 years of age)</td>
<td>10 mg qhs</td>
</tr>
<tr>
<td>Leukotriene Receptor Antagonists (LTRAs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zafirlukast</td>
<td>10 mg tablet, 20 mg tablet</td>
<td>10 mg tablet, 20 mg tablet</td>
<td></td>
</tr>
<tr>
<td>Zileuton</td>
<td>600 mg</td>
<td>600 mg</td>
<td></td>
</tr>
<tr>
<td>5-Lipoxygenase Inhibitor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zileuton CB</td>
<td>600 mg extended-release tablet</td>
<td>600 mg extended-release tablet</td>
<td></td>
</tr>
<tr>
<td>Methyloxanthines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theophylline</td>
<td>Starting dose 10 mg/kg/day; usual maximum: 30 mg/kg/day</td>
<td>Starting dose 10 mg/kg/day; usual maximum: 30 mg/kg/day</td>
<td></td>
</tr>
<tr>
<td>Long-Acting Muscarinic Antagonists</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiotropium Bromide</td>
<td>This is indicated for children 6 years of age and older.</td>
<td>This is indicated for children 6 years of age and older.</td>
<td></td>
</tr>
</tbody>
</table>

Key: DPI, dry powder inhaler; EIA, exercise-induced asthma; HFA, hydrofluoroalkane; ICS, inhaled corticosteroids; IgE, immunoglobulin E; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); SABA, short-acting beta2-agonist.

** See www.advair.com

*** See www.dulera.com

NOTE: Doses are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use. For advisories and other relevant information see www.fda.gov/medwatch.

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).
### Quick-Relief Medications

**Usual Doses for Quick-Relief Medications**

For quick-relief medications for asthma exacerbations, other than Albuterol, see NAEPP EPR-3 Summary Report 2007, NIH Publication number 08-5846, pages 53-60. (www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf, page 53)

#### Usual Doses for Quick-Relief Medications*

*NOTE: Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

#### Key:
- CFC, chlorofluorocarbon; ED, emergency department; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; IM, intramuscular; MDI, metered-dose inhaler; NA, not available (either not approved, no data available, or safety and efficacy not established for this age group); PEF, peak expiratory flow; SABA, short-acting beta-2-agonist; VHC, valved holding chamber.
- "NOTE: Dosages are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use. For advisories and other relevant information see www.fda.gov/medwatch.

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).

---

**Medication**

### Inhaled Short-Acting Beta2-Agonists

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albuterol HFA MDI</strong>&lt;br&gt;90 mcg/puff; 60 puffs/canister or 200 puffs/canister</td>
<td>2 puffs every 4–6 hours, as needed for symptoms; 1–2 puffs 5 minutes before exercise</td>
</tr>
<tr>
<td><strong>Albuterol Nebulizer Solution</strong>&lt;br&gt;0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)</td>
<td>0.63 – 2.5 mg in 3 cc of saline q 4 – 6 hours, as needed</td>
</tr>
<tr>
<td><strong>Albuterol Sulfate Inhalation Powder</strong>&lt;br&gt;108 mcg/actuation; 200 actuations/canister</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Levalbuterol HFA</strong>&lt;br&gt;45 mcg/puff; 200 puffs/canister</td>
<td>NA &lt; 4 years of age</td>
</tr>
<tr>
<td><strong>Levalbuterol (∼albuterol) Nebulizer Solution</strong>&lt;br&gt;0.31 mg/3 mL, 0.63 mg/3 mL, 1.25 mg/0.5 mL, 1.25 mg/3 mL</td>
<td>0.31–1.25 mg in 3 cc, q 4–6 hours, as needed for symptoms</td>
</tr>
</tbody>
</table>

#### For Asthma Exacerbations

**Children ≤ 12 years of age**

**Children > 12 years of age & Adults**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albuterol MDI</strong>&lt;br&gt;90 mcg/puff</td>
<td>4 – 8 puffs every 20 minutes for 3 doses, then every 1–4 hours inhalation maneuver as needed. Use VHC; add mask in children &lt; 4 years.</td>
</tr>
<tr>
<td><strong>Albuterol Nebulizer solution</strong>&lt;br&gt;0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)</td>
<td>0.15 mg/kg (minimum dose 2.5 mg) every 20 minutes for 3 doses then 0.15 – 0.3 mg/kg up to 10 mg every 1–4 hours as needed, or 0.5 mg/kg/hour by continuous nebulization.</td>
</tr>
</tbody>
</table>

### Anticholinergics

### Systemic Corticosteroids

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*NOTE: Doses are provided for those products that have been approved by the U.S. Food and Drug Administration or have sufficient clinical trial safety and efficacy data in the appropriate age ranges to support their use. For advisories and other relevant information see www.fda.gov/medwatch.

Above list not all inclusive. Check for availability and health plan/insurance formulary when applicable. Use of spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).
The Common Ground Health Report *Barriers to Health Equity: Place-based Disparities in Clinical Care* reports data that shows the types of care utilized by the asthma population. The graphs below show large disparity gaps in ED visits for African Americans and Latinos compared to the white (non-Latino) population.

**Asthma-driven ED visit rate by race/ethnicity and geography (2014-2016)**

The rate of ED visits due to asthma are significantly higher for African American and Latino populations regardless of location.
Disparities exist in rate of rescue inhaler usage, with patients diagnosed with asthma who live in low-income zip codes of the City of Rochester accessing ICS medication less than their peers in the rest of Monroe County and in other areas of the Finger Lakes region. One potential explanation could be life circumstances that require patients with asthmatic living in poverty to choose between accessing their medications and paying for rent, food, transportation to their jobs or other essential living expenses.

**% of asthma patients with oral corticosteroid claim**

<table>
<thead>
<tr>
<th></th>
<th>Focus Area</th>
<th>Rest of Monroe County</th>
<th>Other Counties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>30%</td>
<td>36%</td>
<td>39%</td>
</tr>
<tr>
<td>Adults</td>
<td>40%</td>
<td>42%</td>
<td>44%</td>
</tr>
</tbody>
</table>

*All location-based differences are statistically significant (p<0.01)*

*Source: Common Ground Health Analysis of claims for asthma patients from 2014-2015*
The prevalence of immunotherapy treatment is approximately 3.5 times lower for patients with asthma living in poverty than those in more affluent areas of Monroe County or other counties.
The above chart shows the correlation between housing quality and asthma ED visit rate. Each dot represents a census tract within Rochester. The trend shows, the tracts with higher (worse) Healthy Home Index scores also tend to have higher rates of ED visits due to asthma.

Source (Healthy Home Index): City of Rochester Certificate of Occupancy records
Source (ED visit rate): NYSDOH SPARCS
Analysis by Common Ground Health
Management of Asthma in Children and Adults

Physician Resources

**American Lung Association**
Provides information including strategies for addressing asthma, educational materials, the Asthma Educator Institute and guides to asthma policies for home and school.

**New York State Department of Health**
Provides educational information for physicians to use in partnership with patients.
- An educational and communication tool to be used by physicians and their patients and families, designed to help families become proactive and anticipatory with respect to asthma exacerbations and their control.
  - Asthma Action Plan (in English and Spanish)
- Tools for physicians and patients to use together to improve their partnership in managing asthma.
  - Managing Asthma
  - Environmental Asthma Triggers
  - Peak Flow Meters and Logs
- **Asthma Program Publication Request Form** – Publications available free of charge to New York organizations. Print and mail to address on form. (Some publications available for download only.)

**United States Environmental Protection Agency**
Provides multimedia resources for use with patients to understand and manage environmental asthma triggers.

Patient Resources

**American Lung Association**
Offers online support and information about understanding and controlling asthma and creating asthma-friendly environments at home, the workplace and in schools.
- **Better Breathers Clubs** (in Canandaigua, Henrietta, Rochester and Webster)

**Center for Disease Control – National Asthma Control Program**
Helps patients with asthma achieve better health and improved quality of life.

**Kids Thrive 585**
A child-focused Rochester-area organization that provides resources and child-friendly web and printable material on asthma.

**NYS Healthy Neighborhoods Program**
**Monroe County Department of Health** provides in-home assessments and interventions to address asthma, tobacco cessation, indoor air quality, lead, fire safety, and other environmental health hazards in high-risk communities throughout the county. Eligible residents must reside in the following zip codes: 14605, 14608, 14609, 14611, and 14621. During an in-person visit, an outreach worker provides education, referrals and free products to help residents correct housing hazards. Call (585) 753-5073 to schedule an assessment.

**New York State Department of Health**
Provides educational information for families.
- Asthma Triggers at Home and in the Workplace
  - Have Asthma? Take A Look Around You (in English and Spanish)
  - Asthma Trigger Tracker and Key Questions (in English and Spanish)
  - Is Your Asthma Work-Related?
- Don’t Let Asthma Knock the Wind Out of Your Child!
  - Brochure (in English, Spanish, Creole and Chinese)

**United States Environmental Protection Agency**
Provides tools for parents, caregivers and children to understand and manage environmental asthma triggers.
Guidelines are intended to be flexible. They serve as reference points or recommendations, not rigid criteria. Guidelines should be followed in most cases, but there is an understanding that, depending on the patient, the setting, the circumstances, or other factors, care can and should be tailored to fit individual needs.

Management of Asthma in Children and Adults

References

Centers for Medicare & Medicaid Services (CMS) Meaningful Use Quality Measure. (A set of standards defined by the CMS Incentive Programs that governs the use of electronic health records and allows eligible providers to earn incentive payments by meeting specific criteria.) Available from: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/EHRIncentivePrograms/


Healthcare Effectiveness Data and Information Set (HEDIS). (A tool used by more than 90 percent of America's health plans to measure performance on important dimensions of care and service.) Available from: http://www.ncqa.org/HEDISQualityMeasurement.aspx


Quality Assurance Reporting Requirements (QARR). (Developed by the New York State Department of Health for consumers to evaluate the quality of health care services provided by New York State’s managed care plans.) Available from: http://www.health.ny.gov/health_care/managed_care/reports/

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