Clinical Guideline for the Diagnosis, Evaluation and Management of Adults and Children with Asthma

Color Key

- **Four Components of Asthma Care**
- **Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing Asthma in Children Aged 0–4 years**
- **Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing Asthma in Children Aged 5–11 years**
- **Classifying Asthma Severity, Assessing Asthma Control and the Stepwise Approach for Managing Asthma in Children ≥12 Years of Age & Adults**
- **Long-Term Control Medications: Estimated Comparative Daily Dosages**
- **Long-Term Control Medications: Usual Dosages**
- **Quick-Relief Medications**

Guidelines are intended to be flexible. They serve as recommendations, not rigid criteria. Guidelines should be followed in most cases, but depending on the patient, and the circumstances, guidelines may need to be tailored to fit individual needs.
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Criteria that suggest the diagnosis of asthma:

Consider a diagnosis of asthma and perform spirometry if any of these indicators are present*:

- The symptoms of dyspnea, cough and/or wheezing, especially nocturnal, difficulty breathing or chest tightness;
- With acute episodes: hyperinflation of thorax, decreased breath sounds, high pitched wheezing, and use of accessory muscles;
- Symptoms worsen during exercise or in presence of viral infections, inhaled allergens, irritants, weather changes, strong emotional response, stress, menstrual cycles;
- Reversible airflow obstruction: FEV₁>12% from baseline or increase in FEV₁ >10% of predicted after inhalation of bronchodilator, if able to perform spirometry;

*Eczema, hay fever, and/or a family history of asthma or atopic diseases are often associated with asthma, but they are not key indicators.

Goal of Therapy: Control of Asthma

Reduce Impairment

- Prevent chronic and troublesome symptoms (e.g., coughing or breathlessness in the daytime, in the night, or after exertion).
- Require infrequent use (<2 days a week) of inhaled short-acting beta₂-agonist (SABA) for quick relief of symptoms (not including prevention of exercise-induced bronchospasm [EIB]).
- Maintain (near) normal pulmonary function.
- Maintain normal activity levels (including exercise and other physical activity and attendance at school or work).
- Meet patients’ and families’ expectations of and satisfaction with asthma care.

Reduce Risk

- Prevent recurrent exacerbations of asthma and minimize the need for emergency department (ED) visits or hospitalizations.
- Prevent loss of lung function; for children, prevent reduced lung growth.
- Provide optimal pharmacotherapy with minimal or no adverse effects of therapy.
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.

**Components of Asthma Assessment**

**Medical history and physical exam:**
- Assess and document asthma severity and control, including impairment and risk domains.
- Spirometry 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.
- Assess medication use, including CAMP. At every visit, review beta-agonist use.
- Assess for co-morbidities (asthma, 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.goltech.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 inactivated influenza vaccine for all patients over 6 months of age, unless a vaccine contraindication exists.
- Provide 23-valent Pneumococcal Polysaccharide Vaccine (PPSV23) to adults 19 to 64 years (see: http://www.cdc.gov/vaccines/schedules/index.html).
- Provide 1 dose of PPSV23 to children aged ≥ 2 years requiring treatment with high-dose oral corticosteroid therapy. For the appropriate timing see the ACIP schedule at: http://www.cdc.gov/vaccines/schedules/hcp/child-adolescent.html
- Review methods of reducing exposure to relevant allergens and irritants.
- Provide education, emphasizing medication adherence and medication administration technique.
- Schedule an appointment for asthma at least every 6 months after asthma control is achieved and prior to predicted seasonal exacerbations.

**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 or its diagnosis, e.g., sinusitis, nasal polyposis, ABPA, severe rhinovirus, 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 allergic avoidance;
- Patient is being considered for immunotherapy;
- Patient requires step 4 care or higher (step 3 for children 0–4 years of age).
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- Patient requires step 4 care or higher (step 3 for children 0–4 years of age).

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

**Occupational Lung Disease**
- 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.

**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 EB, 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.

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 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;
 Informs 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.

Co-morbidity Management

Manage, if present, allergic bronchopulmonary aspergillosis (ABPA), gastroesophageal reflux disease (GERD), obesity or overweight patients, obstructive sleep apnea (OSA), rhinitis/sinusitis, chronic stress/depression.
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).

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

Check for availability and the health plan/insurance formulary when applicable.

Bibliography

- www.alvesco.us
- www.dulera.com
### 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></td>
<td>Well Controlled</td>
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<tr>
<td><strong>Impairment</strong></td>
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</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>
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<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>0–1/year</td>
</tr>
</tbody>
</table>

**Recommended Action for Treatment**

- Maintain current treatment.
- Regular follow-up every 1–6 months.
- Consider step down if well controlled for at least 3 months.
- Step up 1 step, and reevaluate in 2–6 weeks.
- If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.
- Consider short course of oral systemic corticosteroids.
- Step up 1–2 steps, and reevaluate in 2 week.
- If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy.
- For side effects, consider alternative treatment options.

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 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 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>
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</thead>
<tbody>
<tr>
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<td>Intermittent</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>0</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>≤ 2 days/week</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>0–1/year</td>
</tr>
</tbody>
</table>

**Recommended Step for Initiating Therapy**

(See Stepwise Charts for Treatment Steps.)

- Step 1
- Step 2
- Step 3 and consider short course of oral systemic corticosteroids

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:**
- 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</th>
<th>Classification of Asthma Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(See Stepwise Charts for Treatment Steps.)</em></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Step 2</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.
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

**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.

**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 beta_{2}-agonist; SABA, inhaled short-acting beta_{2}-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.

**Each Step:** Patient education, environmental control, and management of comorbidities.
Classifying Asthma Severity & Initiating Treatment in Children 5–11 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 5–11 Years of Age</th>
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<td>Intermittent</td>
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<tr>
<td>Symptoms</td>
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<tr>
<td>≤2 days/week</td>
<td>&gt;2 days/week but not daily</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
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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>Interference with normal activity</td>
<td>None</td>
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<tr>
<td>Lung function</td>
<td>Normal FEV1, between exacerbations</td>
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<td></td>
<td>FEV1/FVC &gt; 85%</td>
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<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
</tr>
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</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 greater underlying disease severity. For treatment purposes, patients who had 2 exacerbations requiring oral 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.

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</th>
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<tbody>
<tr>
<td>Intermittent</td>
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<tr>
<td>Step 1</td>
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<tr>
<td>Step 3</td>
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</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.

Assessing Asthma Control & Adjusting Therapy in Children 5–11 Years of Age

Assessment of Asthma Control:

<table>
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<tbody>
<tr>
<td></td>
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<td>Symptoms</td>
<td>≤2 days/week but not more than once on each day</td>
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<td>Interference with normal activity</td>
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<td>Short-acting beta-agonist use for symptom control (not prevention of EIB)</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Lung Function</td>
<td>FEV1, or peak flow ≥80% predicted/personal best</td>
</tr>
<tr>
<td></td>
<td>FEV1/FVC ≥80%</td>
</tr>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
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<tr>
<td>Reduction in lung growth</td>
<td>Evaluation requires long-term follow-up</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>

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 than 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 persistent asthma.

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 step.
• Regular followup every 1–6 months.
• Consider step down if well controlled for at least 3 months.
• Step up at least 1 step, and
• Reevaluate in 2–6 weeks.
• For side effects, consider alternative treatment options.
• Consider short course of oral systemic corticosteroids.
• Step up 1–2 steps, and
• Reevaluate in 2 weeks.
• For side effects, consider alternative treatment options.

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.  

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

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

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

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Preferred: Low-dose ICS</th>
<th>Alternative: Cromolyn, LTRA, or Theophylline</th>
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</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Preferred: Low-dose ICS + either LABA, LTRA, or Theophylline or Medium-dose ICS</td>
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</tr>
<tr>
<td>Step 3</td>
<td>Preferred: Medium-dose ICS + LABA Alternative: Medium-dose ICS + either LTRA or Theophylline</td>
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<td>Step 4</td>
<td>Preferred: High-dose ICS + LABA Alternative: High-dose ICS + either LTRA or Theophylline</td>
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<tr>
<td>Step 5</td>
<td>Preferred: High-dose ICS + LABA + oral systemic corticosteroid Alternative: High-dose ICS + either LTRA or Theophylline + oral systemic corticosteroid</td>
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</tr>
<tr>
<td>Step 6</td>
<td>Preferred: SABA PRN</td>
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</tr>
</tbody>
</table>

**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.

**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.
### 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

<table>
<thead>
<tr>
<th>Components of Severity</th>
<th>Classification of Asthma Severity: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interruption</strong></td>
<td>Mild</td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Short-acting β₂-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>Norm. FEV₁ between exacerbations</td>
</tr>
<tr>
<td></td>
<td>FEV₁/FVC normal</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.)

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

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

#### Components of Control

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Classification of Asthma Control: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Well Controlled</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2x/month</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</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 0</td>
</tr>
<tr>
<td>ACT</td>
<td>≥0.75*</td>
</tr>
<tr>
<td>≥20</td>
<td>16–19</td>
</tr>
</tbody>
</table>

#### Risk

<table>
<thead>
<tr>
<th>Risk</th>
<th>Classification of Asthma Control: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Evaluation requires long-term follow-up care.</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Medication side effects can vary in intensity from none to very troublesome and worsen.</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 to meet individual patient needs.

- Maintain current step.
- 🎁 Regular follow-ups every 1–6 months to maintain control.
- Consider step down if well controlled for at least 3 months.
- 🎁 Step up 1 step, and
- 🎁 Reevaluate in 2–6 weeks.
- 🎁 For side effects, consider alternative treatment options.
- 🎁 Consider short course of oral systemic corticosteroids.
- 🎁 Step up 1–2 steps, and
- 🎁 Reevaluate in 2 weeks.
- 🎁 For side effects, consider alternative treatment options.

#### 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.
- **ADAQ** = Asthma Therapy Assessment Questionnaire®; **ACQ** = Asthma Control Questionnaire®; **ACT** = Asthma Control Test™; Minimal Important Difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.
Stepwise Approach for Managing Asthma in Youths ≥12 Years of Age & Adults

Intermittent Asthma

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

Step 1
Preferred: SABA PRN

Step 2
Preferred: Low-dose ICS
Alternative: Cromolyn, LTRA, or Theophylline

Step 3
Preferred: Low-dose ICS + LABA or Medium-dose ICS
Alternative: Medium-dose ICS + either LTRA, Theophylline, or Zileuton

Step 4
Preferred: Medium-dose ICS + LABA
Alternative: Medium-dose ICS + either LTRA, Theophylline, or Zileuton

Step 5
Preferred: High-dose ICS + LABA 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.
## Long-Term Control Medications

### Estimated Comparative Daily Doses for Inhaled Corticosteroids

<table>
<thead>
<tr>
<th>Medication</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 Years of Age</td>
<td>Child 5–11 Years of Age</td>
<td>≥12 Years of Age &amp; Adults</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>Budesonide Inhaled Inhalation suspension for nebulization</td>
<td>0.25–0.5 mg</td>
<td>0.5 mg</td>
<td>NA</td>
</tr>
<tr>
<td>Budesonide MDI 80 or 160 mcg/puff</td>
<td>NA</td>
<td>80–160 mcg</td>
<td>160–320 mcg</td>
</tr>
<tr>
<td>Flunisolide MDI 80 mcg/puff</td>
<td>NA</td>
<td>160 mcg</td>
<td>320 mcg</td>
</tr>
<tr>
<td>Fluticasone Furoate HFA/MDI 44, 110, or 220 mcg/puff</td>
<td>NA</td>
<td>NA</td>
<td>100 mcg</td>
</tr>
<tr>
<td>Fluticasone Proponate DPI 50, 100, or 250 mcg/inhalation</td>
<td>176 mcg</td>
<td>88–176 mcg</td>
<td>88–264 mcg</td>
</tr>
<tr>
<td>Fluticasone Proponate DPI 110 or 220 mcg/inhalation</td>
<td>100–200 mcg</td>
<td>100–300 mcg</td>
<td>NA</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>

**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 deliver a lower dose 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 2 times 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).
### 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>See the above chart titled “Estimated Comparative Daily Dosages for Inhaled Corticosteroids.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Systemic Corticosteroids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Methyldiprinosolone</strong></td>
<td>2. 4. 8. 16. 32 mg tablets</td>
<td>0.25–2 mg/kg daily in single dose in a.m. or qid as needed for control Short-course “burst”</td>
<td>0.25–2 mg/kg daily in single dose in a.m. or qid as needed for control Short-course “burst”</td>
</tr>
<tr>
<td><strong>Prednisone</strong></td>
<td>5 mg tablets; 5 mg/5 cc; 15 mg/5 cc</td>
<td>1–2 mg/kg/day; maximum 60 mg/kg/day for 3–10 days</td>
<td>1–2 mg/kg/day; maximum 60 mg/kg/day for 3–10 days</td>
</tr>
<tr>
<td><strong>Formoterol</strong></td>
<td>D PI: 12 mcg/single-use capsule</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Salbutamol (1st-line)</strong></td>
<td>20 mcg/actuation</td>
<td>1 blister, q 12 hours</td>
<td>1 blister, q 12 hours</td>
</tr>
<tr>
<td><strong>Fluticasone/Beclomethasone</strong></td>
<td>DPI: 50 mcg/ blister</td>
<td>1 blister, q 12 hours</td>
<td>1 blister, q 12 hours</td>
</tr>
<tr>
<td><strong>Mometasone/Formoterol</strong></td>
<td>100–250 mcg/actuation D PI: 100–250 mcg/actuation</td>
<td>DPI only</td>
<td>DPI or HFA</td>
</tr>
<tr>
<td><strong>Budesonide/Formoterol</strong></td>
<td>DPI: 50 mcg/actuation</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td><strong>Mometasone/Formoterol</strong></td>
<td>DPI: 5 mcg/actuation, 20 mcg/actuation</td>
<td>Dose may be used for 4 years of age and older.</td>
<td>1 capsule, q 12 hours</td>
</tr>
<tr>
<td><strong>Cromolyn</strong></td>
<td>Subcutaneous injection: 100 mcg/vial</td>
<td>2 inhalations bid, dose depends on level of severity or control</td>
<td>2 inhalations bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td><strong>Immunomodulators</strong></td>
<td></td>
<td>DPI Diskus for ≥ 4 years of age</td>
<td>DPI or HFA</td>
</tr>
<tr>
<td><strong>Mepolizumab</strong></td>
<td>Subcutaneous injection, 100 mg/vial</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td><strong>Omalizumab (Anti IgE)</strong></td>
<td>Subcutaneous injection, 150 mg/1.2 ml</td>
<td>1 injection daily</td>
<td>1 injection daily</td>
</tr>
<tr>
<td><strong>Reslizumab</strong></td>
<td>100 mg/10 ml solution for intravenous infusion</td>
<td>2 inhalations bid, dose depends on level of severity or control</td>
<td>2 inhalations bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td><strong>Leukotriene Modifiers</strong></td>
<td></td>
<td>DPI only</td>
<td>DPI or HFA</td>
</tr>
<tr>
<td><strong>Zafirlukast</strong></td>
<td>10 mg tablet, 20 mg tablet</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td><strong>Zileuton CR</strong></td>
<td>600 mg</td>
<td>2,000 mg daily (give tablets qd)</td>
<td>2,000 mg daily (give two extended-release tablets bid)</td>
</tr>
<tr>
<td><strong>Zileuton</strong></td>
<td>600 mg</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>5-Lipoxygenase Inhibitor</strong></td>
<td></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>
</tr>
<tr>
<td><strong>Long-Acting Muscarinic Antagonists</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tiotropium Bromide</strong></td>
<td>Subcutaneous injection: 100 mcg/vial</td>
<td>1 injection bid, dose depends on level of severity or control</td>
<td>1 injection bid, dose depends on level of severity or control</td>
</tr>
</tbody>
</table>
| **Key:** DPI, dry powder inhaler; EIB, exercise-induced bronchoconstriction; 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 **NOTES:** 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 formulation 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)

*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).

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 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 Short-Acting Beta₂-Agonists</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albuterol HFA MDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>96 mcg/puff, 60 puffs/canister or 200 puffs/canister</td>
<td>2 puffs every 4–6 hours, as needed</td>
<td>2 puffs every 4–6 hours, as needed</td>
<td>2 puffs every 4–6 hours, as needed</td>
</tr>
<tr>
<td>Albuterol Nebulizer Solution</td>
<td>0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)</td>
<td>0.25–0.63 mg, q 8 hours</td>
<td>0.63–1.25 mg, q 8 hours</td>
</tr>
<tr>
<td>Albuterol Sulfate Inhalation Powder</td>
<td>108 mcg/actuation, 200 actuations/canister</td>
<td>NA</td>
<td>2 inhalations q 4–8 hours, as needed</td>
</tr>
<tr>
<td>Levalbuterol HFA</td>
<td>45 mcg/puff, 200 puffs/canister</td>
<td>NA &lt;4 years of age</td>
<td>2 puffs every 4–6 hours, as needed</td>
</tr>
<tr>
<td>Levalbuterol (R-albuterol) Nebulizer Solution</td>
<td>0.31–1.25 mg in 3 cc, q 4–6 hours</td>
<td>0.31–0.63 mg, q 4–6 hours</td>
<td>0.63–1.25 mg, q 4–6 hours</td>
</tr>
<tr>
<td><strong>For Asthma Exacerbations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albuterol MDI</td>
<td>96 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>
<td>4–8 puffs every 20 minutes up to 4 hours, then every 1–4 hours as needed.</td>
</tr>
<tr>
<td>Albuterol Nebulizer Solution</td>
<td>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 0.3 mg/kg/hour by continuous nebulization.</td>
<td>2.5–5 mg every 20 minutes for 3 doses, then 2.5–10 mg every 1–4 hours as needed, or 10–15 mg/hour continuously.</td>
</tr>
</tbody>
</table>

---

**Medication (continued)**

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 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>Anticholinergics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ipratropium HFA MDI</td>
<td>17 mcg/puffs, 200 puffs/canister</td>
<td>NA</td>
<td>2–3 puffs q 6 hours</td>
</tr>
<tr>
<td>Ipratropium HFA Nebulizer solution</td>
<td>0.25 mg/mL (0.025%)</td>
<td>NA</td>
<td>0.25 mg q 6 hours</td>
</tr>
<tr>
<td>Ipratropium with Albuterol Inhalation spray</td>
<td>20 mcg (ipratropium bromide)/100 mcg albuterol per actuation</td>
<td>NA</td>
<td>1 inhalation 4 times a day</td>
</tr>
<tr>
<td>Ipratropium with Albuterol Nebulizer solution</td>
<td>0.5 mg/3 mL ipratropium bromide and 2.5 mg/3 mL albuterol</td>
<td>NA</td>
<td>3 mL q 4–6 hours</td>
</tr>
<tr>
<td><strong>Systemic Corticosteroids</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>2, 4, 6, 8, 16, 32 mg tablets</td>
<td>Short course “burst”: 1–2 mg/kg/day, maximum 60 mg/day, for 3–10 days</td>
<td>Short course “burst”: 40–60 mg/day as single or 2 divided doses for 3–10 days</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>5 mg tablets, 5 mg/5 cc, 15 mg/5 cc</td>
<td>Short course “burst”: 1–2 mg/kg/day, maximum 60 mg/day, for 3–10 days</td>
<td></td>
</tr>
<tr>
<td>Prednisone</td>
<td>1, 2.5, 5, 10, 20, 50 mg tablets, 5 mg/cc, 5 mg/5 cc</td>
<td>Short course “burst”: 40–60 mg/day as single or 2 divided doses for 3–10 days</td>
<td></td>
</tr>
<tr>
<td>Repository injection (Methylprednisolone acetate)</td>
<td>40, 80 mg/mL</td>
<td>240 mg IM once</td>
<td>240 mg IM once</td>
</tr>
</tbody>
</table>

Key: CFC, chlorofluorocarbon; ED, emergency department; EIB, exercise-induced bronchoconstriction; HFA, hydrofluoralkane; 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 beta₂-agonist; VHC, valved holding chamber.
Developed by the New York State Consensus Asthma Guideline Expert Panel, and endorsed by the New York State Department of Health, New York City Department of Health and Mental Hygiene, New York Heath Plan Association, New York State Coalition of Prepaid Health Services Plans, Empire Blue Cross Blue Shield, Excellus, Medical Society of the State of New York, New York State Academy of Family Physicians, New York Chapter American College of Physicians, American Academy of Pediatrics, District II, New York State Thoracic Society, American Lung Association of New York, the New York State Society of Allergy, Asthma & Immunology, Inc., and Monroe County Medical Society.

Funding for this report was provided by the Centers for Disease Control and Prevention (CDC) National Center for Environmental Health grant, Comprehensive Asthma Control Through Evidence-Based Strategies and Public Health-Health Care Collaboration (Cooperative Agreement #5NU59EH000488-09-00). The contents are solely the responsibility of the authors and do not necessarily represent the official view of the CDC.