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.
# Contents

Criteria that suggest the diagnosis of asthma ................................................................. 3
Goal of Therapy: Control of Asthma ................................................................................. 3

Four Components of Asthma Care
  1. Assessment and Monitoring of Asthma Severity and Control ................................. 4
  2. Education for a Partnership in Care ........................................................................ 5
  3. Control of Environmental Factors and Co-morbid Conditions that Affect Asthma ................................. 5
  4. Medications ........................................................................................................... 6
Bibliography ................................................................................................................... 6

Classifying Asthma Severity & Initiating Treatment in Children 0–4 Years of Age ......................... 7
Assessing Asthma Control & Adjusting Therapy in Children 0–4 Years of Age ......................... 7
Stepwise Approach for Managing Asthma in Children 0–4 Years of Age ............................. 8

Classifying Asthma Severity & Initiating Treatment in Children 5–11 Years of Age ....................... 9
Assessing Asthma Control & Adjusting Therapy in Children 5–11 Years of Age ....................... 9
Stepwise Approach for Managing Asthma in Children 5–11 Years of Age ............................. 10

Classifying Asthma Severity & Initiating Treatment in Youths >12 Years of Age & Adults ............. 11
Assessing Asthma Control & Adjusting Therapy in Youths >12 Years of Age & Adults .......... 11
Stepwise Approach for Managing Asthma in Youths >12 Years of Age & Adults ................. 12

Medication Charts
  Long-Term Control Medications
    Estimated Comparative Daily Doses for Inhaled Corticosteroids .................................. 13
  Long-Term Control Medications
    Usual Doses for Long-Term Control Medications ..................................................... 13
  Quick-Relief Medications
    Usual Doses for Quick-Relief Medications .............................................................. 13

Acknowledgements ........................................................................................................ 14
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 CAM*. At every visit, review beta-agonist use.
- Assess co-morbidities (e.g., sinusitis, GERD**, ABPA***, obesity, ABPA****, 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.
- Review methods of reducing exposure to relevant allergens and irritants.
- Assess asthma control based on impairment and risk.
- Assess asthma on patient and family, patient and family perception of disease, and knowledge and skills for self-management.
- Review symptom/peak flow monitoring.
- Develop and review Asthma Action Plan and provide education.
- Monitor at least 2-6 week intervals until control is achieved.

**Chronic maintenance asthma visit**
- Assess asthma control based on impairment and risk (See Classifying Asthma Severity and Initiating Treatment in specific age charts).
- Perform spirometry measurement (FEV1, FVC, FEV/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).
- Update and review dustmobile Asthma Action Plan and provide education.
- Monitor at least 2-6 week intervals until control is achieved.

**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 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);
- Patient has had a life-threatening asthma exacerbation;
- Patient requires additional education and guidance on complications of therapy, problems with adherence, or allergen avoidance;
- 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 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); (See age specific stepwise chart);
- Patient has required more than two bursts of oral corticosteroids in a year or has an exacerbation requiring hospitalization;
- Patient requires confirmation of a history that suggests that an occupational or environmental inhalant or ingested substance is provoking or contributing to asthma. Depending on the complexities of diagnosis, treatment, 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, spaces/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 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.

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 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):
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), 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).

Bibliography


www.alvesco.us
www.dulera.com


## 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></td>
<td>Intermittent</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td></td>
</tr>
<tr>
<td>Short-acting ( \beta_2 )-agonist use for symptom control (not prevention of EIB)</td>
<td>2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>0</td>
</tr>
<tr>
<td>Risk Exacerbations requiring oral systemic corticosteroids</td>
<td>0–1/year (see note)</td>
</tr>
</tbody>
</table>

### 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.

### 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>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>≤1x/month</td>
</tr>
<tr>
<td>Risk 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 followup 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 weeks.
- If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy.
- 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 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.

### 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>Mild</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.

<table>
<thead>
<tr>
<th>Step</th>
<th>Intermittent Asthma</th>
<th>Persistent Asthma: Daily Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preferred: SABA PRN</td>
<td>Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.</td>
</tr>
<tr>
<td>2</td>
<td>Preferred: Low-dose ICS</td>
<td>Preferred: Medium-dose ICS</td>
</tr>
<tr>
<td></td>
<td>Alternative: Cromolyn or Montelukast</td>
<td>either LABA or Montelukast</td>
</tr>
<tr>
<td>3</td>
<td>Preferred: Medium-dose ICS</td>
<td>Preferred: High-dose ICS + either LABA or Montelukast</td>
</tr>
<tr>
<td>4</td>
<td>Preferred: Medium-dose ICS + either LABA or Montelukast</td>
<td>Oral systemic corticosteroids</td>
</tr>
<tr>
<td>5</td>
<td>Preferred: High-dose ICS + either LABA or Montelukast</td>
<td>Step up if needed (first, check adherence, inhaler technique, and environmental control)</td>
</tr>
<tr>
<td>6</td>
<td>Preferred: High-dose ICS + either LABA or Montelukast</td>
<td>Assess Control Step down if possible (and asthma is well controlled at least 3 months)</td>
</tr>
</tbody>
</table>

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

**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.
### 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>Impairment</th>
<th>Classification of Asthma Severity: Children 5–11 Years of Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Intermittent</td>
</tr>
<tr>
<td>Nighttime awakenings</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>≤2 days/week but not daily</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Risk

<table>
<thead>
<tr>
<th>Risk</th>
<th>Exacerbations requiring oral systemic corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–1/year (see note)</td>
<td>≤2 in 1 year (see note)</td>
</tr>
</tbody>
</table>

#### Recommended Step for Initiating Therapy

(See Stepwise Charts for Treatment Steps.)

- Step 1
- Step 2
- Step 3, medium-dose ICS option
- Step 3, medium-dose ICS option, or step 4 and consider short course of oral systemic corticosteroids

#### 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.

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

#### Classifying severity in patients after asthmatic 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>Intermittent</td>
<td>Persistent</td>
</tr>
<tr>
<td>Step 1</td>
<td>Step 2</td>
</tr>
<tr>
<td>ICS option</td>
<td>ICS option, or step 4</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.

### Assessing Components of Control

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Classification of Asthma Control: Children 5–11 Years of Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>Well Controlled</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2 days/week but not more than once on each day</td>
</tr>
<tr>
<td>Intermittent</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>Lung Function:</td>
<td>FEV1, or peak flow</td>
</tr>
<tr>
<td>Reduction in lung growth</td>
<td>0–1/year (see note)</td>
</tr>
</tbody>
</table>

#### Recommended Action for Treatment

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

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

### 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, 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.
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**
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).

**Step 1**
Preferred: SABA PRN

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

**Step 3**
Preferred: Medium-dose ICS + LABA
Alternative: Medium-dose ICS + LTRA or Theophylline

**Step 4**
Preferred: High-dose ICS + LABA
Alternative: High-dose ICS + either LTRA or Theophylline

**Step 5**
Preferred: High-dose ICS + LABA + oral systemic corticosteroid
Alternative: High-dose ICS + either LTRA or Theophylline + oral systemic corticosteroid

**Step 6**
Preferred: High-dose ICS + LABA + oral systemic corticosteroid
Alternative: High-dose ICS + either LTRA or Theophylline + oral systemic corticosteroid

**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; LTRA, leukotriene receptor antagonist; 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.

**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.
### 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></td>
<td>Intermittent</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td>Mild</td>
</tr>
<tr>
<td>Normal FEV₁/FVC</td>
<td>&gt;2 days/week</td>
</tr>
<tr>
<td>FEV₁ &lt; 80% predicted</td>
<td>2x/month</td>
</tr>
<tr>
<td>FEV₁/FVC normal</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>FEV₁ &gt; 80% predicted</td>
<td>None</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 5%</td>
<td>• Norm. FEV₁ between exacerbations</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 9%</td>
<td>• Short-acting beta₂-agonist use for symptom control (not prevention of EIB)</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 15%</td>
<td>• Interference with normal activity</td>
</tr>
<tr>
<td>Lung function</td>
<td>• Exacerbations requiring oral systemic corticosteroids</td>
</tr>
<tr>
<td>Risk</td>
<td>0–1/year (see note)</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

<table>
<thead>
<tr>
<th>Components of Control</th>
<th>Classification of Asthma Severity: Youths ≥12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well Controlled</td>
</tr>
<tr>
<td><strong>Impairment</strong></td>
<td>Symptoms</td>
</tr>
<tr>
<td>Normal FEV₁/FVC</td>
<td>&gt;2 days/week</td>
</tr>
<tr>
<td>FEV₁ &lt; 80% predicted</td>
<td>2x/month</td>
</tr>
<tr>
<td>FEV₁/FVC normal</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>FEV₁ &gt; 80% predicted</td>
<td>None</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 5%</td>
<td>• Lung function: FEV₁ or peak flow</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 9%</td>
<td>• Symptoms</td>
</tr>
<tr>
<td>FEV₁/FVC reduced 15%</td>
<td>• Lung function</td>
</tr>
</tbody>
</table>

**Recommended Action for Treatment**

*ACQ values of .76–1.4 are indeterminate regarding well-controlled asthma.

**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.
- *ATAQ = 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.

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

**Step 1**

**Preferred:** SABA PRN

**Step 2**

**Preferred:**
- Low-dose ICS
  - Alternatives: Cromolyn, LTRA, or Theophylline

**Step 3**

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

**Step 4**

**Preferred:**
- High-dose ICS + LABA
  - Consider: Omalizumab for patients who have allergies

**Step 5**

**Preferred:**
- High-dose ICS + LABA + oral corticosteroid
  - Consider: Omalizumab for patients who have allergies

**Step 6**

**Step up if needed**
- (first, check adherence, environmental control, and comorbid conditions)

**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 beta-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta-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.
### 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>0–4 Years of Age</td>
<td>5–11 Years of Age</td>
<td>≥12 Years of Age &amp; Adults</td>
</tr>
<tr>
<td>Budesonide DPI</td>
<td>90, 180, or 200 mcg/inhalation</td>
<td>180–400 mcg</td>
<td>180–600 mcg</td>
</tr>
<tr>
<td>Budesonide Inhalation suspension for nebulization</td>
<td>0.25–0.5 mg</td>
<td>0.5 mg</td>
<td>NA</td>
</tr>
<tr>
<td>Flunisolide MDI</td>
<td>80 mcg/puff</td>
<td>160 mg</td>
<td>320 mcg</td>
</tr>
<tr>
<td>Fluticasone Propionate DPI</td>
<td>100–200 mcg</td>
<td>100–300 mcg</td>
<td>NA</td>
</tr>
<tr>
<td>Mometasone DPI#</td>
<td>110 mcg/puff</td>
<td>220 mcg</td>
<td>440 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 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 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). Children <2 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></td>
<td></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>0.25–2 mg/kg daily in single dose</td>
<td>0.25–2 mg/kg daily in single dose</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>5 mg tablets; 5 mg/cc; 13 mg/cc</td>
<td>Short-course “burst”</td>
<td>Short-course “burst”</td>
</tr>
<tr>
<td>Prednisone</td>
<td>1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/mg; 5 mg/cc</td>
<td>1–2 mg/kg/day; maximum 60 mg/day for 3–10 days</td>
<td>1–2 mg/kg/day; maximum 60 mg/day for 3–10 days</td>
</tr>
<tr>
<td>Inhaled Long-Acting Beta2-Agonists (LABAs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salmeterol DPI 100 mcg/ blister</td>
<td>NA</td>
<td>1 blister, q 12 hours</td>
<td>1 blister, q 12 hours</td>
</tr>
<tr>
<td>Formoterol DPI 12 mcg/single-use capsule</td>
<td>NA</td>
<td>1 capsule, q 12 hours</td>
<td>1 capsule, q 12 hours</td>
</tr>
<tr>
<td>Combined Medication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluticasone/Salmeterol**</td>
<td>DPI Diskus for ≥4 years of age</td>
<td>DPI only</td>
<td>DPI or ICS</td>
</tr>
<tr>
<td>Fluticasone/Vilanterol DPI</td>
<td>NA</td>
<td>1 inhalation bid, dose depends on level of severity or control</td>
<td>1 inhalation daily</td>
</tr>
<tr>
<td>Budesonide/Formoterol</td>
<td>NA</td>
<td>2 puffs bid, dose depends on level of severity or control</td>
<td>2 puffs bid, dose depends on level of severity or control</td>
</tr>
<tr>
<td>Mometasone/Formoterol***</td>
<td>MDD 100 mg/5 mg, 200 mg/5 mcg</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Cromolyn</td>
<td>20 mcg/ampule</td>
<td>1 ampule qd (NA -2 years of age)</td>
<td>1 ampule qd</td>
</tr>
<tr>
<td>Immunomodulators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megolizumab</td>
<td>NA</td>
<td>100 mg/1 ml SC q 4 weeks, for 5 years of age and older with eosinophilic phenotype</td>
<td>100 mg/1 ml SC q 4 weeks, for 5 years of age and older with eosinophilic phenotype</td>
</tr>
<tr>
<td>Omalizumab (Anti-IgE)</td>
<td>NA</td>
<td>75 to 375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level</td>
<td>75 to 375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level</td>
</tr>
<tr>
<td>Reslizumab</td>
<td>100 mg/10 ml solution for intravenous infusion</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Leukotriene Modifiers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leukotriene Receptor Antagonists (LTRAs)</td>
<td>Montelukast</td>
<td>4 mg qhs (1–5 years of age)</td>
<td>5 mg qhs (6–14 years of age)</td>
</tr>
<tr>
<td>Sodium montelukast</td>
<td>4 mg or 5 mg chewable tablet</td>
<td>4 mg granule packets</td>
<td>10 mg tablet</td>
</tr>
<tr>
<td>Zafirlukast</td>
<td>10 mg tablet, 20 mg tablet</td>
<td>10 mg bid (7–11 years of age)</td>
<td>10 mg bid (20 mg tablet bid)</td>
</tr>
<tr>
<td>5-Lipoxygenase Inhibitor</td>
<td>Zileuton 600 mg</td>
<td>NA</td>
<td>2,400 mg daily (give tablets qd)</td>
</tr>
<tr>
<td>Zileuton CR</td>
<td>600 mg tablet extended-release tablet</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Methylinxanthines</td>
<td>Theophylline</td>
<td>Starting dose 10 mg/kg/day; usual maximum: +1 year of age: 0.2 mg in weeks +3 mg/kg/day +1 year of age: 16 mg/kg/day</td>
<td>Starting dose 10 mg/kg/day; usual maximum: 16 mg/kg/day</td>
</tr>
<tr>
<td>Liquids, sustained-release tablets, and capsules</td>
<td>Monitor serum concentration levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-Acting Muscarinic Antagonists</td>
<td>Tiotropium Bromide</td>
<td>2 inhalations qd</td>
<td>This is indicated for children 6 years of age and older.</td>
</tr>
<tr>
<td>Tiotropium Bromide</td>
<td>1.25 mcg per actuation</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

---

**Key:** DPI, dry powder inhaler; EIB, exercise-induced broncho-pasm; 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.advar.com

**See** www.dulera.com

---

**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).
## 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](www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf), page 53)

#### Inhaled Short-Acting Beta₂-Agonists

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 Years of Age</th>
<th>5–11 Years of Age</th>
<th>&gt;12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albuterol HFA MDI</strong></td>
<td>96 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>
<td>2 puffs every 4–6 hours, as needed for symptoms, 2 puffs 5 minutes before exercise</td>
</tr>
<tr>
<td><strong>Albuterol Nebulizer Solution</strong></td>
<td>0.63 mg/3 mL, 1.25 mg/3 mL, 2.5 mg/3 mL, 5 mg/mL (0.5%)</td>
<td>0.63–2.5 mg in 3 cc of saline q 4–6 hours, as needed</td>
<td>1.25–5 mg in 3 cc of saline q 4–8 hours, as needed</td>
</tr>
<tr>
<td><strong>Albuterol Sulfate Inhalation Powder</strong></td>
<td>108 mcg/actuation, 200 actuations/canister</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Levalbuterol HFA</strong></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 for symptoms, 2 puffs 5 minutes before exercise</td>
</tr>
<tr>
<td><strong>Levalbuterol (R-albuterol) Nebulizer Solution</strong></td>
<td>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>
<td>0.31–0.63 mg, q 8 hours, as needed for symptoms</td>
</tr>
</tbody>
</table>

#### For Asthma Exacerbations

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 Years of Age</th>
<th>5–11 Years of Age</th>
<th>&gt;12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Albuterol MDI</strong></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><strong>Albuterol Nebulizer solution</strong></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>

#### Anticholinergics

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 Years of Age</th>
<th>5–11 Years of Age</th>
<th>&gt;12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ipratropium HFA MDI</strong></td>
<td>17 mcg/puffs, 200 puffs/canister</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Ipratropium HFA Nebulizer solution</strong></td>
<td>0.25 mg/mL (0.025%)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Ipratropium with Albuterol Inhalation spray</strong></td>
<td>20 mcg (ipratropium bromide) 100 mcg albuterol per actuation</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Ipratropium with Albuterol Nebulizer solution</strong></td>
<td>0.5 mg/3 mL, ipratropium bromide and 2.5 mg/3 mL albuterol</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

#### Systemic Corticosteroids

<table>
<thead>
<tr>
<th>Medication</th>
<th>&lt;5 Years of Age</th>
<th>5–11 Years of Age</th>
<th>&gt;12 Years of Age &amp; Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Methylprednisolone</strong></td>
<td>2, 4, 6, 8, 16, 32 mg tablets</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>
</tr>
<tr>
<td><strong>Prednisolone</strong></td>
<td>5 mg tablets, 5 mg/5 cc, 15 mg/5 cc</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>
</tr>
<tr>
<td><strong>Prednisone</strong></td>
<td>1, 2.5, 5, 10, 20, 50 mg tablets, 5 mg/cc, 5 mg/cc</td>
<td>Short course &quot;burst&quot;: 40–60 mg/day as single or 2 divided doses for 3–10 days</td>
<td>Short course &quot;burst&quot;: 40–60 mg/day as single or 2 divided doses for 3–10 days</td>
</tr>
<tr>
<td><strong>Repository injection (Methylprednisolone acetate)</strong></td>
<td>40, 80 mg/ml</td>
<td>7.5 mg/kg IM once</td>
<td>240 mg IM once</td>
</tr>
</tbody>
</table>

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 beta₂-agonist; VHC, valved holding chamber.

*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 spacer/holding chamber is recommended with use of metered-dose inhaler (MDI).
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.