## Estimated Comparative Daily Dosages for Inhaled Steroids

### Adults

<table>
<thead>
<tr>
<th>Inhaled Steroid</th>
<th>Low Dose</th>
<th>Medium Dose</th>
<th>High Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beclomethasone dipropionate</strong></td>
<td>42 mcg/puff</td>
<td>84 mcg/puff</td>
<td>Budesonide DPI 200 mcg/dose</td>
</tr>
<tr>
<td>2-6 puffs—42 mcg</td>
<td>12-20 puffs—42 mcg</td>
<td>200-400 mcg</td>
<td>2-3 inhalations—10 mcg</td>
</tr>
<tr>
<td>2-6 puffs—84 mcg</td>
<td>6-10 puffs—84 mcg</td>
<td>400-600 mcg</td>
<td>3-6 inhalations—100 mcg</td>
</tr>
<tr>
<td>Budesonide DPI</td>
<td>200-400 mcg</td>
<td>400-600 mcg</td>
<td>3-6 inhalations—100 mcg</td>
</tr>
<tr>
<td>Flunisolide</td>
<td>500-1,000 mcg</td>
<td>1,000-2,000 mcg</td>
<td>&gt;2,000 mcg</td>
</tr>
<tr>
<td>2-4 puffs</td>
<td>4-8 puffs</td>
<td>&gt;8 puffs</td>
<td></td>
</tr>
<tr>
<td>Fluticasone MDI:</td>
<td>44, 110, 220 mcg/puff</td>
<td>2-6 puffs</td>
<td>&gt;10 puffs—110 mcg</td>
</tr>
<tr>
<td>DPI:</td>
<td>50, 100, 250 mcg/dose</td>
<td>2-6 inhalations—100 mcg</td>
<td>&gt;2 inhalations—250 mcg</td>
</tr>
<tr>
<td>Triamcinolone acetonide</td>
<td>400-1,000 mcg</td>
<td>1,000-2,000 mcg</td>
<td>&gt;2,000 mcg</td>
</tr>
<tr>
<td>4-10 puffs</td>
<td>10-20 puffs</td>
<td>&gt;20 puffs</td>
<td></td>
</tr>
</tbody>
</table>

### Children ≤12 years

<table>
<thead>
<tr>
<th>Inhaled Steroid</th>
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<td>200-400 mcg</td>
<td>1-2 inhalations—200 mcg</td>
</tr>
<tr>
<td>2-6 inhalations—50 mcg</td>
<td>2-6 inhalations—100 mcg</td>
<td>400-600 mcg</td>
<td>&gt;2 inhalations—200 mcg</td>
</tr>
<tr>
<td>Flunisolide</td>
<td>500-750 mcg</td>
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<td>2-3 puffs</td>
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<td>Fluticasone MDI:</td>
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<tr>
<td>Triamcinolone acetonide</td>
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<tr>
<td>4-8 puffs</td>
<td>8-12 puffs</td>
<td>&gt;12 puffs</td>
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- Clinician judgment of patient response is essential to appropriate dosing. Once asthma is controlled, medication doses should be carefully titrated to the minimum dose required to maintain control, thus reducing the potential for adverse effects.
- Data from in vitro and clinical trials suggest that different inhaled corticosteroid preparations are not equivalent on a per puff or microgram basis. However, few data directly compare the preparations. The Expert Panel developed recommended dose ranges for different preparations based on available data.
- Inhaled corticosteroid safety data suggest dose ranges for children equivalent to beclomethasone dipropionate 200-400 mcg/day (low dose), 400-800 mcg/day (medium dose), and >800 mcg/day (high dose).

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**UPDATE**

**Nurses: Partners in Asthma Care**


Page 3 Goals of Asthma Management

A sixth goal has been added: “Meet patients’ and families’ expectations of and satisfaction with asthma care.”

Page 6 Objective Measures of Lung Function

The EPR-2 emphasizes that all patients be taught to monitor symptoms to recognize early signs of deterioration and patients with moderate-to-severe asthma should use peak flow monitoring.

Page 8 Pharmacotherapy

The EPR-2 now categorizes medications into two general classes: long-term-control medications used to achieve and maintain control of persistent asthma and quick-relief medications used to treat acute symptoms and exacerbations.

Page 9 Classification of Asthma by Severity of Disease Before Treatment

Severity classifications have been changed. (Essentially, mild intermittent = original mild; mild persistent and moderate persistent = original moderate; severe persistent = original severe.) See the attached Figure 3 from the 1997 Practical Guide for the Diagnosis and Management of Asthma.

**Appendix A: Dosages and Side Effects of Medications for Chronic Asthma**

The attached Figure 4 and table, “Estimated Comparative Daily Dosages for Inhaled Steroids,” from the 1997 Practical Guide for the Diagnosis and Management of Asthma, reflect some changes in dosing, estimated comparative daily dosages, as well as new information on leukotriene modifiers and long-acting inhaled beta2-agonists.

**Appendix D: How To Use Your Peak Flow Meter (Patient Handout)**

To determine personal best, the patient is no longer instructed to take readings before inhaling a beta2-agonist and in the morning. Measurements should be taken after using an inhaled short-acting beta2-agonist and in the early afternoon.

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### Classification of Asthma Severity: Clinical Features Before Treatment

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<th>Severe Persistent</th>
<th>Days With Symptoms</th>
<th>Nights With Symptoms</th>
<th>PEV or FEV*</th>
<th>PEF Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continual</td>
<td>Frequent</td>
<td>≤60%</td>
<td>&gt;80%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>Moderate Persistent</th>
<th>3-6/month</th>
<th>3-4/month</th>
<th>≥80%</th>
<th>20-30%</th>
</tr>
</thead>
</table>

| Step 2 | Mild Persistent | ≤2/week | ≤2/month | ≥80% | <20% |

### NOTES:
- Percent predicted values for forced expiratory volume in 1 second (FEV₁) and percent of personal best for peak expiratory flow (PEF).
- Patients should be assigned to the most severe step in which any feature occurs. Clinical features for individual patients may overlap across steps.
- An individual’s classification may change over time.
- Patients at any level of severity of chronic asthma can have mild, moderate, or severe exacerbations of asthma. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms.
- Patients with two or more asthma exacerbations per week (i.e., progressively worsening symptoms that may last hours or days) tend to have moderate-to-severe persistent asthma.
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- A course of oral steroids may be needed at any time and at any step.
- Patients who use short-acting beta₂-agonist more than two times a week; steps 2 and 3 when patient uses short-acting beta₂-agonist on a daily basis or more than three to four times in 1 day. But before stepping up: Review patient inhaler technique, compliance, and environmental control (avoidance of allergens or other precipitant factors).
- A course of oral steroids may be needed at any time and at any step.
- Patients with exercise-induced bronchospasm should take two to four puffs of an inhaled beta₂-agonist 5 to 60 minutes before exercise.
- Referral to an asthma specialist for consultation or comanagement is recommended if there is difficulty maintaining control or if the patient requires step 4 care. Referral may be considered for step 3 care.
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- For a list of brand names, see glossary.

### Stepwise Approach for Managing Asthma in Adults and Children Over 5 Years Old: Treatment

#### Long-Term Control

- **Preferred treatments are in bold print.**

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<thead>
<tr>
<th>Step 4</th>
<th>Severe Persistent</th>
<th>Daily medications:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- Anti-inflammatory: inhaled steroid (high dose)* AND</td>
<td>Long-acting bronchodilator: either long-acting inhaled beta₂-agonist (adult: 2 puffs q 12 hours; child: 1-2 puffs q 12 hours), sustained-release theophylline, or long-acting beta₂-agonist tablets AND</td>
<td>Steroid tablets or syrup long term; make repeated attempts to reduce systemic steroid and maintain control with high-dose inhaled steroid.</td>
<td></td>
</tr>
</tbody>
</table>

**Step 2**

<table>
<thead>
<tr>
<th>Mild Persistent</th>
<th>Daily medication:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-inflammatory: inhaled steroid (medium dose)*</td>
<td>Long-acting bronchodilator: either long-acting inhaled beta₂-agonist (adult: 2 puffs q 12 hours; child: 1-2 puffs q 12 hours), sustained-release theophylline, or long-acting beta₂-agonist tablets.</td>
<td>No daily medication needed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Step 1 | Mild Persistent | No daily medication needed. | |

#### Quick-Relief

**All Patients**

Short-acting bronchodilator: inhaled beta₂-agonist (2-4 puffs) as needed for symptoms. Intensity of treatment will depend on severity of exacerbation.

### NOTES:
- The stepwise approach presents general guidelines to assist clinical decisionmaking. Asthma is highly variable; clinicians should tailor medication plans to the needs of individual patients.
- Gain control as quickly as possible. Either start with aggressive therapy (e.g., add a course of oral steroids or a higher dose of inhaled steroids to the therapy that corresponds to the patient’s initial step of severity); or start at the step that correspond to the patient’s initial severity and step up treatment, if necessary.
- Step down: Review treatment every 1 to 6 months. Gradually decrease treatment to the least medication necessary to maintain control.
- Step up: If control is not maintained, consider step up. Inadequate control is indicated by increased use of short-acting beta₂-agonists and in step 1 when patient uses a short-acting beta₂-agonist more than two times a week; steps 2 and 3 when patient uses short-acting beta₂-agonist on a daily basis or more than three to four times in 1 day. But before stepping up: Review patient inhaler technique, compliance, and environmental control (avoidance of allergens or other precipitant factors).
- A course of oral steroids may be needed at any time and at any step.
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**NHLBI Information Center**

P.O. Box 30105
Baltimore, MD 20824-0105
Telephone: (301) 251-1222
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### Stepwise Approach for Managing Asthma in Adults and Children Over 5 Years Old: Treatment

#### Long-Term Control

**Preferred treatments are in bold print.**

**Step 4**

**Severe Persistent**

- **Anti-inflammatory:** inhaled steroid (high dose)** and
- Long-acting bronchodilator; either long-acting inhaled beta₂-agonist (adult: 2 puffs q 12 hours; child: 1-2 puffs q 12 hours), sustained-release theophylline, or long-acting beta₂-agonist tablets AND
- Steroid tablets or syrup long term; make repeated attempts to reduce systemic steroid and maintain control with high-dose inhaled steroid.

**Step 3**

**Moderate Persistent**

- **Anti-inflammatory:** inhaled steroid (medium dose)*

**Step 2**

**Mild Persistent**

- **Anti-inflammatory:** either inhaled steroid (low dose)* or cromolyn (adult: 2-4 puffs tid-qid; child: 1-2 puffs tid-qid) or nedocromil (adult: 2-4 puffs bid-qid; child: 1-2 puffs bid-qid) (children usually begin with a trial of cromolyn or nedocromil).
- Sustained-release theophylline to serum concentration of 5-15 mcg/mL is an alternative, but not preferred, therapy. Zafirlukast or zileuton may also be considered for those ≥12 years old, although their position in therapy is not fully established.

**Step 1**

**Mild Intermittent**

- No daily medication needed.

**Quick-Relief**

**All Patients**

Short-acting bronchodilator: inhaled beta₂-agonist (2-4 puffs) as needed for symptoms. Intensity of treatment will depend on severity of exacerbation.

*See Estimated Comparative Daily Doses for Inhaled Steroids.

### NOTES:

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- Step up: If control is not maintained, consider step up. Inadequate control is indicated by increased use of short-acting beta₂-agonists and in step 1 when patient uses a short-acting beta₂-agonist more than two times a week; steps 2 and 3 when patient uses short-acting beta₂-agonist on a daily basis or more than three to four times in 1 day. Before stepping up: Review patient inhaler technique, compliance, and environmental control (avoidance of allergens or other precipitant factors).
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### Tables

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<tr>
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<th>PEF or FEV₁%</th>
<th>PEF Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>≤2/week</td>
<td>≤2/month</td>
<td>≥80%</td>
<td>&lt;20%</td>
</tr>
<tr>
<td>Step 2</td>
<td>3-6/week</td>
<td>3-4/month</td>
<td>≥80%</td>
<td>20-30%</td>
</tr>
<tr>
<td>Step 3</td>
<td>Daily</td>
<td>≥5/month</td>
<td>&gt;60%&lt;80%</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Step 4</td>
<td>Continual</td>
<td>Frequent</td>
<td>≤60%</td>
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</tr>
</tbody>
</table>

**NOTES:**

- Percent predicted values for forced expiratory volume in 1 second (FEV₁) and percent of personal best for peak expiratory flow (PEF) (relevant for children 6 years old or older who can use these devices).

- An individual’s classification may change over time.
- Patients at any level of severity of chronic asthma can have mild, moderate, or severe exacerbations of asthma. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung function and no symptoms.
- Patients with two or more asthma exacerbations per week (i.e., progressively worsening symptoms that may last hours or days) tend to have moderate-to-severe persistent asthma.

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<tbody>
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<td>Dipropionate 84 mcg/puff</td>
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National Asthma Education and Prevention Program

National Institutes of Health
National Heart, Lung, and Blood Institute
October 1998