Stepwise Approach to Managing Acute or Chronic Asthma Symptoms for

Infants and Young Children 5 Years of Age and Younger

Goals of therapy
- Minimal or no chronic symptoms day or night
- Minimal or no episodes
- PEF ≥ 80% of personal best, if used
- Minimal use of inhaled or oral short-acting $beta_2$- agonist (<1 per day)
- No or minimal adverse effects from medications

Clinical Features Before Treatment

	Days With Symptoms	Nights With Symptoms	Long Term Control—Daily Medications
Step 4 Severe Persistent	Continual	Frequent	**Inhaled steroid✪—high dose** **If needed, add systemic steroid** —2 mg/kg/day. Reduce to lowest daily or alternate-day dose that stabilizes symptoms.
Step 3 Moderate Persistent	Daily	≥5/month	**Inhaled steroid✪—medium dose** Once control is established 2-3 months, consider: **Inhaled steroid✪— lower medium dose and nedocromil** **OR Inhaled steroid✪—lower medium dose and theophylline —**10 mg/kg/day up to 16 mg/kg/day for children ≥1 year of age✣
Step 2 Mild Persistent	3-6/week	3-4/month	**Cromolyn** —1 ampule tid-qid by nebulizer✶ **OR Nedocromil** —1-2 puffs bid-qid by MDI (usually begin with one of above two drugs) **OR Inhaled steroid✪—low dose**
Step 1 Mild Intermittent	≤2/week	≤2/month	**No daily medications**

Quick-Relief Medications—As Needed for Symptoms

All Patients	**Inhaled short-acting $beta_2$-agonist✹** Initial therapy: single nebulizer treatment (0.05 mg/kg in 2-3 cc of saline—min 1.25 mg, max 2.5 mg) or spacer/holding chamber with face mask (2-4 puffs—give up to 3 treatments at 20-minute intervals, as needed) or oral $beta_2$-agonist.✹ (See practical guide for followup care.) With viral respiratory infection, administer q 4-6 hours up to 24 hours (longer with physician consult); consider prednisolone if patient has history of severe exacerbations. Course of prednisolone may be needed for severe exacerbations.

Starting Point
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 corresponds to the patient's initial severity and step up treatment, if necessary.

Step Down
Review treatment every 1 to 6 months. If control is sustained for at least 3 months, a gradual stepwise reduction in treatment may be possible.

Step Up
If control is not achieved, consider step up. Inadequate control is indicated by increased use of short-acting $beta_2$-agonists and in: step 1 when patient uses a short-acting $beta_2$-agonist more than two times a week; steps 2 and 3 when patient uses short-acting $beta_2$-agonist on a daily basis OR more than three to four times a 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 (prednisolone) may be needed at any time and step.

Referral
Referral to an asthma specialist for consultation or comanagement is *recommended* for patients requiring step 3 or 4 care. Referral may be *considered* for step 2 care.

Notes on classifying severity:
- Patients should be assigned to the most severe step in which *any* feature occurs.
- Patients at any level of severity can have mild, moderate, or severe exacerbations.
- 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.

Patient Education/Environmental Control—Help parents identify and control precipitants of asthma episodes. Provide education on self-management.

✪ Use spacer/holding chamber and face mask.

✣ For infants <1 year of age, consider only with careful monitoring to keep blood levels at 5-15 mcg/mL. Usual max mg/kg/day = 0.2 (age in weeks) + 5.

✶ Nebulizer preferred for cromolyn, but MDI may be used.

✹ As needed up to three times a day for moderate-to-severe asthma. Use three or more times a week for mild intermittent asthma and daily use for persistent asthma indicates need for more long-term-control medicine.

The stepwise approach presents general guidelines to assist clinical decision making. Asthma is highly variable; clinicians should tailor medication plans to the needs of individual patients.

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Estimated Comparative Daily Dosages for Inhaled Steroids:

Children ≤12 years

Inhaled Steroid	Low Dose	Medium Dose	High Dose
Beclomethasone dipropionate	84-336 mcg	336-672 mcg	>672 mcg
42 mcg/puff	**2-8 puffs—42 mcg**	**8-16 puffs—42 mcg**	**>16 puffs—42 mcg**
84 mcg/puff	**1-4 puffs—84 mcg**	**4-8 puffs—84 mcg**	**>8 puffs—84 mcg**
Budesonide DPI 200 mcg/dose	100-200 mcg	200-400 mcg **1-2 inhalations—200 mcg**	>400 mcg **>2 inhalations—200 mcg**
Flunisolide 250 mcg/puff	500-750 mcg **2-3 puffs**	1,000-1,250 mcg **4-5 puffs**	>1,250 mcg **>5 puffs**
Fluticasone	88-176 mcg	176-440 mcg	>440 mcg
MDI: 44, 110, 220 mcg/puff	**2-4 puffs—44 mcg**	**4-10 puffs—44 mcg** or **2-4 puffs—110 mcg**	**>4 puffs—110 mcg** or **>2 puffs—220 mcg**
DPI: 50, 100, 250 mcg/dose	**2-4 inhalations—50 mcg**	**2-4 inhalations—100 mcg**	**>4 inhalations—100 mcg** or **>2 inhalations—250 mcg**
Triamcinolone acetonide 100 mcg/puff	400-800 mcg **4-8 puffs**	800-1,200 mcg **8-12 puffs**	>1,200 mcg **>12 puffs**

- *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 effect.
- 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).

For more information on managing asthma, see the *Practical Guide for the Diagnosis and Management of Asthma,* National Institutes of Health, pub no. 97-4053, Bethesda, MD, 1997.