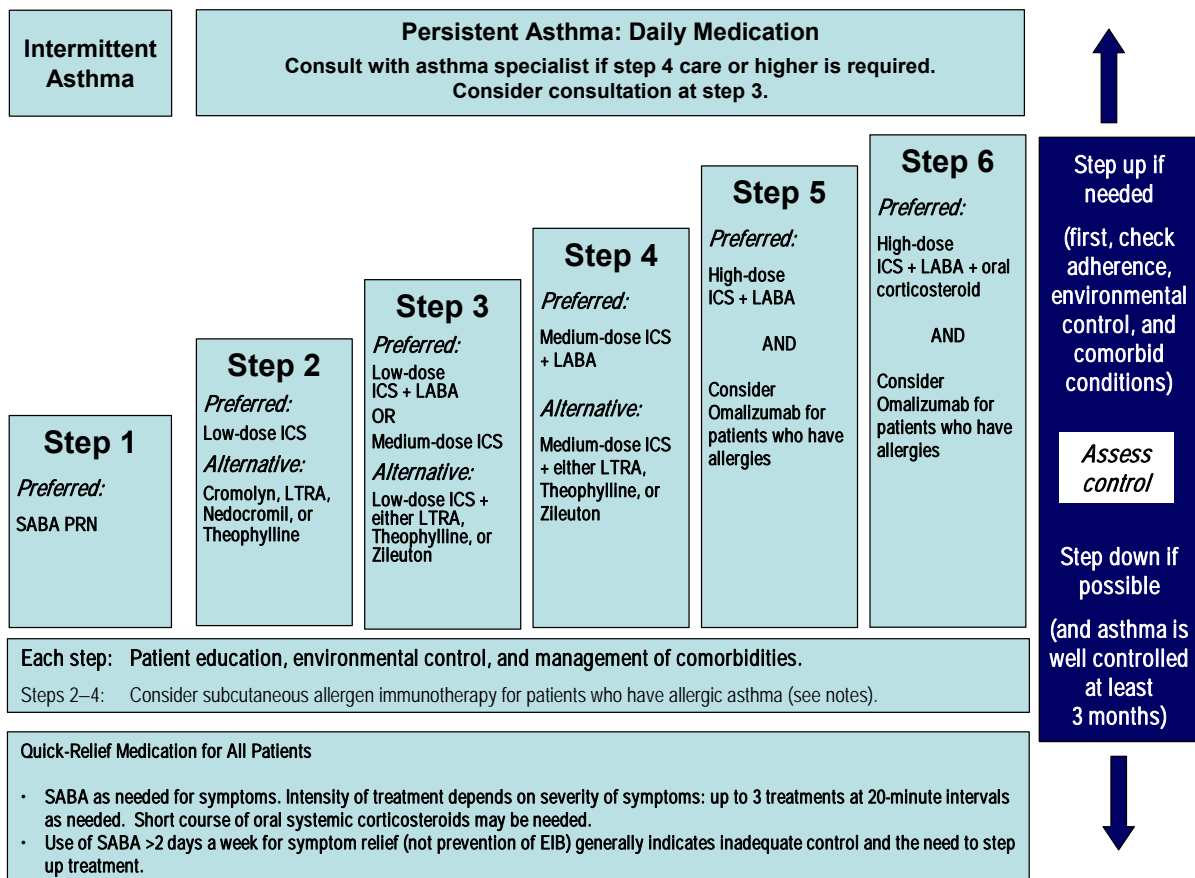


FIGURE 4–5. STEPWISE APPROACH FOR MANAGING ASTHMA IN YOUTHS ≥ 12 YEARS OF AGE AND ADULTS




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

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- Zileuton is a less desirable alternative due to limited studies as adjunctive therapy and the need to monitor liver function. Theophylline requires monitoring of serum concentration levels.
- In step 6, before oral systemic corticosteroids are introduced, a trial of high-dose ICS + LABA + either LTRA, theophylline, or zileuton may be considered, although this approach has not been studied in clinical trials.
- Step 1, 2, and 3 preferred therapies are based on Evidence A; step 3 alternative therapy is based on Evidence A for LTRA, Evidence B for theophylline, and Evidence D for zileuton. Step 4 preferred therapy is based on Evidence B, and alternative therapy is based on Evidence B for LTRA and theophylline and Evidence D for zileuton. Step 5 preferred therapy is based on Evidence B. Step 6 preferred therapy is based on (EPR—2 1997) and Evidence B for omalizumab.
- Immunotherapy for steps 2–4 is based on Evidence B for house-dust mites, animal danders, and pollens; evidence is weak or lacking for molds and cockroaches. Evidence is strongest for immunotherapy with single allergens. The role of allergy in asthma is greater in children than in adults.
- Clinicians who administer immunotherapy or omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.

FIGURE 4–6. CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

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

Components of Severity		Classification of Asthma Severity ≥12 years of age			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment Normal FEV ₁ /FVC: 8–19 yr 85% 20–39 yr 80% 40–59 yr 75% 60–80 yr 70%	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not daily, and not more than 1x on any day	Daily	Several times per day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
	Lung function	• Normal FEV ₁ between exacerbations • FEV ₁ >80% predicted • FEV ₁ /FVC normal	• FEV ₁ >80% predicted • FEV ₁ /FVC normal	• FEV ₁ >60% but <80% predicted • FEV ₁ /FVC reduced 5%	• FEV ₁ <60% predicted • FEV ₁ /FVC reduced >5%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year (see note)	≥2/year (see note)  Consider severity and interval since last exacerbation.   Frequency and severity may fluctuate over time for patients in any severity category. Relative annual risk of exacerbations may be related to FEV ₁ .		
Recommended Step for Initiating Treatment		Step 1	Step 2	Step 3	Step 4 or 5
(See figure 4–5 for treatment steps.)		In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.			

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

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- 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.

FIGURE 4–7. ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

Components of Control		Classification of Asthma Control (≥12 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	FEV ₁ or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best
	Validated questionnaires			
	ATAQ ACQ ACT	0 ≤0.75* ≥20	1–2 ≥1.5 16–19	3–4 N/A ≤15
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Progressive loss of lung function	Evaluation requires long-term followup care		
	Treatment-related adverse effects	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.		
Recommended Action for Treatment (see figure 4–5 for treatment steps)		<ul style="list-style-type: none"> Maintain current step. Regular followups every 1–6 months to maintain control. Consider step down if well controlled for at least 3 months. 	<ul style="list-style-type: none"> Step up 1 step and Reevaluate in 2–6 weeks. For side effects, consider alternative treatment options. 	<ul style="list-style-type: none"> Consider short course of oral systemic corticosteroids, Step up 1–2 steps, and Reevaluate in 2 weeks. For side effects, consider alternative treatment options.

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- *ACQ values of 0.76–1.4 are indeterminate regarding well-controlled asthma.
- Key: EIB, exercise-induced bronchospasm; ICU, intensive care unit

Notes:

- The stepwise approach is meant to assist, not replace, the clinical decisionmaking required to meet individual patient needs.
- 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.
- Validated Questionnaires for the impairment domain (the questionnaires do not assess lung function or the risk domain)
 - ATAQ = Asthma Therapy Assessment Questionnaire© (See sample in “Component 1: Measures of Asthma Assessment and Monitoring.”)
 - ACQ = Asthma Control Questionnaire© (user package may be obtained at www.qoltech.co.uk or juniper@qoltech.co.uk)
 - ACT = Asthma Control Test™ (See sample in “Component 1: Measures of Asthma Assessment and Monitoring.”)
 - Minimal Important Difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.
- Before step up in therapy:
 - Review adherence to medication, inhaler technique, environmental control, and comorbid conditions.
 - If an alternative treatment option was used in a step, discontinue and use the preferred treatment for that step.

FIGURE 4–8a. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS

Medication	Dosage Form	Adult Dose	Comments
Inhaled Corticosteroids (ICS) (See figure 4–8b, “Estimated Comparative Daily Dosages for Inhaled Corticosteroids.”)			
Systemic Corticosteroids			(Applies to all three corticosteroids)
Methylprednisolone	2, 4, 8, 16, 32 mg tablets	7.5–60 mg daily in a single dose in a.m. or qod as needed for control	<ul style="list-style-type: none"> ■ For long-term treatment of severe persistent asthma, administer single dose in a.m. either daily or on alternate days (alternate-day therapy may produce less adrenal suppression). Short courses or “bursts” are effective for establishing control when initiating therapy or during a period of gradual deterioration. ■ There is no evidence that tapering the dose following improvement in symptom control and pulmonary function prevents relapse.
Prednisolone	5 mg tablets, 5 mg/5 cc, 15 mg/5 cc	Short-course “burst”: to achieve control, 40–60 mg per day as single or 2 divided doses for 3–10 days	
Prednisone	1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc, 5 mg/5 cc		
Inhaled Long-Acting Beta₂-Agonists (LABA)			
Salmeterol	DPI 50 mcg/blister	1 blister q 12 hours	<ul style="list-style-type: none"> ■ Should not be used for symptom relief or exacerbations. Use with ICS. ■ Decreased duration of protection against EIB may occur with regular use. ■ Each capsule is for single use only; additional doses should not be administered for at least 12 hours. ■ Capsules should be used only with the Aerolizer™ inhaler and should not be taken orally.
Formoterol	DPI 12 mcg/single-use capsule	1 capsule q 12 hours	
Combined Medication			
Fluticasone/Salmeterol	DPI 100 mcg/50 mcg, 250 mcg/50 mcg, or 500 mcg/50 mcg	1 inhalation bid; dose depends on severity of asthma	<ul style="list-style-type: none"> ■ 100/50 DPI or 45/21 HFA for patient not controlled on low- to medium-dose ICS ■ 250/50 DPI or 115/21 HFA for patients not controlled on medium- to high-dose ICS
	HFA 45 mcg/21 mcg 115 mcg/21 mcg 230 mcg/21 mcg		
Budesonide/Formoterol	HFA MDI 80 mcg/4.5 mcg 160mcg/4.5 mcg	2 inhalations bid; dose depends on severity of asthma	<ul style="list-style-type: none"> ■ 80/4.5 for patients who have asthma not controlled on low- to medium-dose ICS ■ 160/4.5 for patients who have asthma not controlled on medium- to high-dose ICS

■

FIGURE 4–8a. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS FOR YOUTHS ≥ 12 YEARS OF AGE AND ADULTS (CONTINUED)

Medication	Dosage Form	Adult Dose	Comments
Cromolyn and Nedocromil			
Cromolyn	MDI 0.8 mg/puff	2 puffs qid	<ul style="list-style-type: none"> ■ 4–6 week trial may be needed to determine maximum benefit. ■ Dose by MDI may be inadequate to affect hyperresponsiveness. ■ One dose before exercise or allergen exposure provides effective prophylaxis for 1–2 hours. Not as effective for EIB as SABA. ■ Once control is achieved, the frequency of dosing may be reduced.
	Nebulizer 20 mg/ampule	1 ampule qid	
Nedocromil	MDI 1.75 mg/puff	2 puffs qid	
Leukotriene Modifiers			
Leukotriene Receptor Antagonists			
Montelukast	4 mg or 5 mg chewable tablet 10 mg tablet	10 mg qhs	<ul style="list-style-type: none"> ■ Montelukast exhibits a flat dose-response curve. Doses >10 mg will not produce a greater response in adults.
Zafirlukast	10 or 20 mg tablet	40 mg daily (20 mg tablet bid)	<ul style="list-style-type: none"> ■ For zafirlukast, administration with meals decreases bioavailability; take at least 1 hour before or 2 hours after meals. ■ Monitor for signs and symptoms of hepatic dysfunction.
5-Lipoxygenase Inhibitor			
Zileuton	600 mg tablet	2,400 mg daily (give tablets qid)	<ul style="list-style-type: none"> ■ For zileuton, monitor hepatic enzymes (ALT).
Methylxanthines			
Theophylline	Liquids, sustained-release tablets, and capsules	Starting dose 10 mg/kg/day up to 300 mg maximum; usual maximum 800 mg/day	<p>Adjust dosage to achieve serum concentration of 5–15 mcg/mL at steady-state (at least 48 hours on same dosage).</p> <ul style="list-style-type: none"> ■ Due to wide interpatient variability in theophylline metabolic clearance, routine serum theophylline level monitoring is important. ■ See next page for factors that can affect theophylline levels.
Immunomodulators			
Omalizumab	Subcutaneous injection, 150 mg/1.2 mL following reconstitution with 1.4 mL sterile water for injection	150–375 mg SC q 2–4 weeks, depending on body weight and pretreatment serum IgE level	<ul style="list-style-type: none"> ■ Do not administer more than 150 mg per injection site. ■ Monitor for anaphylaxis for 2 hours following at least the first 3 injections.
Key: DPI, dry powder inhaler; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; IgE, immunoglobulin E; MDI, metered-dose inhaler; SABA, short-acting beta ₂ -agonist			

FIGURE 4–8a. USUAL DOSAGES FOR LONG-TERM CONTROL MEDICATIONS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS (CONTINUED)

Factors Affecting Serum Theophylline Concentrations*			
Factor	Decreases Theophylline Concentrations	Increases Theophylline Concentrations	Recommended Action
Food	↓ or delays absorption of some sustained-release theophylline (SRT) products	↑ rate of absorption (fatty foods)	Select theophylline preparation that is not affected by food.
Diet	↑ metabolism (high protein)	↓ metabolism (high carbohydrate)	Inform patients that major changes in diet are not recommended while taking theophylline.
Systemic, febrile viral illness (e.g., influenza)		↓ metabolism	Decrease theophylline dose according to serum concentration. Decrease dose by 50 percent if serum concentration measurement is not available.
Hypoxia, cor pulmonale, and decompensated congestive heart failure, cirrhosis		↓ metabolism	Decrease dose according to serum concentration.
Age	↑ metabolism (1–9 years)	↓ metabolism (<6 months, elderly)	Adjust dose according to serum concentration.
Phenobarbital, phenytoin, carbamazepine	↑ metabolism		Increase dose according to serum concentration.
Cimetidine		↓ metabolism	Use alternative H ₂ blocker (e.g., famotidine or ranitidine).
Macrolides: erythromycin, clarithromycin, troleandomycin		↓ metabolism	Use alternative macrolide antibiotic, azithromycin, or alternative antibiotic or adjust theophylline dose.
Quinolones: ciprofloxacin, enoxacin, perfloxacin		↓ metabolism	Use alternative antibiotic or adjust theophylline dose. Circumvent with ofloxacin if quinolone therapy is required.
Rifampin	↑ metabolism		Increase dose according to serum concentration.
Ticlopidine		↓ metabolism	Decrease dose according to serum concentration.
Smoking	↑ metabolism		Advise patient to stop smoking; increase dose according to serum concentration.

*This list is not all inclusive; for discussion of other factors, see package inserts.

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FIGURE 4–8b. ESTIMATED COMPARATIVE DAILY DOSAGES FOR INHALED CORTICOSTEROIDS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS

Drug	Low Daily Dose Adult	Medium Daily Dose Adult	High Daily Dose Adult
Beclomethasone HFA 40 or 80 mcg/puff	80–240 mcg	>240–480 mcg	>480 mcg
Budesonide DPI 90, 180, or 200 mcg/inhalation	180–600 mcg	>600–1,200 mcg	>1,200 mcg
Flunisolide 250 mcg/puff	500–1,000 mcg	>1,000–2,000 mcg	>2,000 mcg
Flunisolide HFA 80 mcg/puff	320 mcg	>320–640 mcg	>640 mcg
Fluticasone HFA/MDI: 44, 110, or 220 mcg/puff DPI: 50, 100, or 250 mcg/inhalation	88–264 mcg 100–300 mcg	>264–440 mcg >300–500 mcg	>440 mcg >500 mcg
Mometasone DPI 200 mcg/inhalation	200 mcg	400 mcg	>400 mcg
Triamcinolone acetonide 75 mcg/puff	300–750 mcg	>750–1,500 mcg	>1,500 mcg

Key: DPI, dry powder inhaler; HFA, hydrofluoroalkane; MDI, metered-dose inhaler

Notes:

- **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. The stepwise approach to therapy emphasizes that once control of asthma is achieved, the dose of medication should be carefully titrated to the minimum dose required to maintain control, thus reducing the potential for adverse effect.
- Some doses may be outside package labeling, especially in the high-dose range.
- MDI dosages are expressed as the actuator dose (the amount of the drug leaving the actuator and delivered to the patient), which is the labeling required in the United States. This is different from the dosage expressed as the valve dose (the amount of drug leaving the valve, not all of which is available to the patient), which is used in many European countries and in some scientific literature. DPI doses are expressed as the amount of drug in the inhaler following activation.
- Comparative dosages are based on published comparative clinical trials (Adams et al. 2005; Barnes et al. 1998; Kelly 1998; Lasserson et al. 2005; Pedersen and O'Byrne 1997). The rationale for some key comparisons is summarized as follows:
 - The high dose is the dose that appears likely to be the threshold beyond which significant hypothalamic-pituitary-adrenal (HPA) axis suppression is produced, and, by extrapolation, the risk is increased for other clinically significant systemic effects if used for prolonged periods of time (Martin et al. 2002; Szefer et al. 2002).
 - The low- and medium-doses reflect findings from dose-ranging studies in which incremental efficacy within the low- to medium-dose ranges was established without increased systemic effect as measured by overnight cortisol excretion. The studies demonstrated a relatively flat dose-response curve for efficacy at the medium-dose range; that is, increasing the dose of high-dose range did not significantly increase efficacy but did increase systemic effect (Adams et al. 2001; Martin et al. 2002; Szefer et al. 2002).
 - The dose for budesonide DPI is based on recently available comparative data with other medications. These new data, including meta-analyses, show that budesonide DPI is comparable to approximately twice the microgram dose of fluticasone MDI or DPI (Adams et al. 2005; Barnes et al. 1998; Nielsen and Dahl 2000).

FIGURE 4–8b. ESTIMATED COMPARATIVE DAILY DOSAGES FOR INHALED CORTICOSTEROIDS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS (CONTINUED)

- The dose for beclomethasone in HFA inhaler should be approximately one-half the dose for beclomethasone in chlorofluorocarbon (CFC) inhaler for adults and children, based on studies demonstrating that the different pharmaceutical properties of the medications result in enhanced lung delivery for the HFA (a less forceful spray from the HFA propellant and a reengineered nozzle that allows a smaller particle size) and clinical trials demonstrating similar potency to fluticasone at 1:1 dose ratio (Boulet et al. 2004; Busse et al. 1999; Gross et al. 1999; Lasserson et al. 2005; Leach et al. 1998; Pedersen et al. 2002; Szeffler et al. 2002; Thompson et al. 1998).
- The dose for mometasone DPI is based on product information and current literature (Bousquet et al. 2000; Fardon et al. 2004; Kemp et al. 2000; O'Connor et al. 2001). Mometasone is approved for once daily administration. Mometasone furoate by dry powder achieved effects similar to twice the dose of budesonide by dry powder (Bousquet et al. 2000) and comparable to a slightly higher dose of fluticasone propionate by dry powder (O'Connor et al. 2001).
- The dose for flunisolide HFA is based on product information and current literature (Corren et al. 2001; Gillman et al. 2002; Richards et al. 2001).

■ Bioavailability

Both the relative potency and the relative bioavailability (systemic availability) determine the potential for systemic activity of an ICS preparation. As illustrated here, the bioavailability of an ICS is dependent on the absorption of the dose delivered to the lungs and the oral bioavailability of the swallowed portion of the dose received.

- Absorption of the dose delivered to the lungs:

- ◆ Approximately 10–50 percent of the dose from the MDI is delivered to the lungs. This amount varies among preparations and delivery devices.
- ◆ Nearly all of the amount delivered to the lungs is bioavailable.

- Oral bioavailability of the swallowed portion of the dose received:

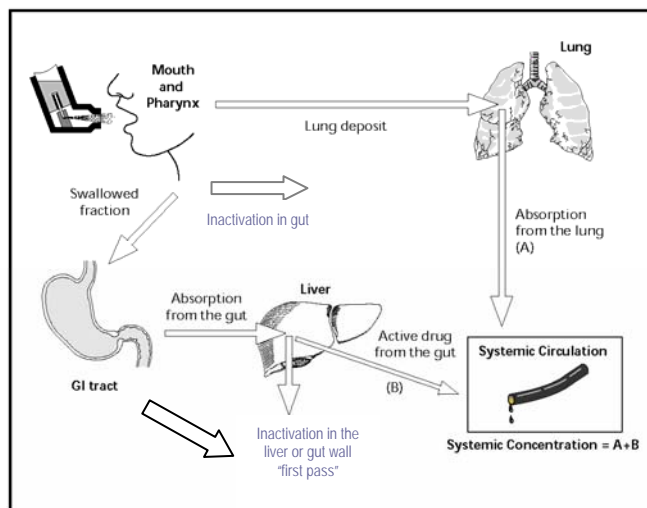
- ◆ Approximately 50–80 percent of the dose from the MDI without a spacer/holding chamber is swallowed.
- ◆ The oral bioavailability of this amount varies:

Either a high first-pass metabolism or the use of a spacer/holding chamber with an MDI can decrease oral bioavailability, thus enhancing safety (Lipworth 1995).

The approximate oral bioavailability of ICSs has been reported as: beclomethasone dipropionate 20 percent; flunisolide, 21 percent; triamcinolone acetonide, 10.6 percent; budesonide, 11 percent; fluticasone propionate, 1 percent; mometasone, <1 percent (Affrime et al. 2000; Chaplin et al. 1980; Check and Kaliner 1990; Clissold and Heel 1984; Davies 1993; Harding 1990; Heald et al. 1995; Martin et al. 1974; Mollmann et al. 1985; Szeffler 1991; Wurthwein and Rohdewald 1990).

■ Potential drug interactions

A number of the ICSs, including fluticasone, budesonide, and mometasone, are metabolized in the gastrointestinal tract and liver by CYP 3A4 isoenzymes. Potent inhibitors of CYP 3A4, such as ritonavir and ketoconazole, have the potential for increasing systemic concentrations of these ICSs by increasing oral availability and decreasing systemic clearance. Some cases of clinically significant Cushing syndrome and secondary adrenal insufficiency have been reported (Johnson et al. 2006; Samaras et al. 2005).



Adapted with permission from Barnes 1995.

FIGURE 4–8c. USUAL DOSAGES FOR QUICK-RELIEF MEDICATIONS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS

Medication	Dosage Form	Adult Dose	Comments
Inhaled Short-Acting Beta₂-Agonists (SABA)			
	<i>MDI</i>		<i>Applies to all four SABAs</i>
Albuterol CFC	90 mcg/puff, 200 puffs/canister	<ul style="list-style-type: none"> 2 puffs 5 minutes before exercise 	<ul style="list-style-type: none"> An increasing use or lack of expected effect indicates diminished control of asthma. Not recommended for long-term daily treatment. Regular use exceeding 2 days/week for symptom control (not prevention of EIB) indicates the need to step up therapy. Differences in potency exist, but all products are essentially comparable on a per puff basis. May double usual dose for mild exacerbations. Should prime the inhaler by releasing 4 actuations prior to use. Periodically clean HFA activator, as drug may block/plug orifice. Nonselective agents (i.e., epinephrine, isoproterenol, metaproterenol) are not recommended due to their potential for excessive cardiac stimulation, especially in high doses.
Albuterol HFA	90 mcg/puff, 200 puffs/canister	<ul style="list-style-type: none"> 2 puffs every 4–6 hours as needed 	
Pirbuterol CFC	200 mcg/puff, 400 puffs/canister		
Levalbuterol HFA	45 mcg/puff, 200 puffs/canister		
	<i>Nebulizer solution</i>		
Albuterol	0.63 mg/3 mL 1.25 mg/3 mL 2.5 mg/3 mL 5 mg/mL (0.5%)	1.25–5 mg in 3 cc of saline q 4–8 hours as needed	<ul style="list-style-type: none"> May mix with budesonide inhalant suspension, cromolyn or ipratropium nebulizer solutions. May double dose for severe exacerbations.
Levalbuterol (R-albuterol)	0.31 mg/3 mL 0.63 mg/3 mL 1.25 mg/0.5 mL 1.25 mg/3 mL	0.63 mg–1.25 mg q 8 hours as needed	<ul style="list-style-type: none"> Compatible with budesonide inhalant suspension. The product is a sterile-filled, preservative-free, unit dose vial.

■

FIGURE 4–8c. USUAL DOSAGES FOR QUICK-RELIEF MEDICATIONS FOR YOUTHS ≥12 YEARS OF AGE AND ADULTS (CONTINUED)

Medication	Dosage Form	Adult Dose	Comments
Anticholinergics			
Ipratropium HFA	MDI 17 mcg/puff, 200 puffs/canister	2–3 puffs q 6 hours	<ul style="list-style-type: none"> Evidence is lacking for anticholinergics producing added benefit to beta₂-agonists in long-term control asthma therapy.
	Nebulizer solution 0.25 mg/mL (0.025%)	0.25 mg q 6 hours	
Ipratropium with albuterol	MDI 18 mcg/puff of ipratropium bromide and 90 mcg/puff of albuterol 200 puffs/canister	2–3 puffs q 6 hours	<ul style="list-style-type: none"> Contains EDTA to prevent discoloration of the solution. This additive does not induce bronchospasm.
	Nebulizer solution 0.5 mg/3 mL ipratropium bromide and 2.5 mg/3 mL albuterol	3 mL q 4–6 hours	
Systemic Corticosteroids			Applies to the first three corticosteroids
Methylprednisolone	2, 4, 6, 8, 16, 32 mg tablets	<ul style="list-style-type: none"> Short course “burst”: 40–60 mg/day as single or 2 divided doses for 3–10 days 	<ul style="list-style-type: none"> Short courses or “bursts” are effective for establishing control when initiating therapy or during a period of gradual deterioration. The burst should be continued until symptoms resolve and the PEF is at least 80 percent of personal best. This usually requires 3–10 days but may require longer. There is no evidence that tapering the dose following improvement prevents relapse. May be used in place of a short burst of oral steroids in patients who are vomiting or if adherence is a problem.
Prednisolone	5 mg tablets, 5 mg/5 cc, 15 mg/5 cc		
Prednisone	1, 2.5, 5, 10, 20, 50 mg tablets; 5 mg/cc, 5 mg/5 cc		
(Methylprednisolone acetate)	Repository injection 40 mg/mL 80 mg/mL		
Key: CFC, chlorofluorocarbon; EIB, exercise-induced bronchospasm; HFA, hydrofluoroalkane; IM, intramuscular; MDI, metered-dose inhaler; PEF, peak expiratory flow			

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