

Asthma Clinical Guidelines

Adapted from the National Heart, Lung, and Blood Institute's (NHLBI)
National Asthma Education and Prevention Program (NAEPP) 2007 Expert Panel Report 3:
Guidelines for the Diagnosis and Management of Asthma

Goals of Asthma Treatment

Patients will:

- Be free from troublesome symptoms day and night, including sleeping through the night.
- Have the best possible lung function.
- Be able to participate fully in any activities of their choice.
- Not miss work or school because of asthma symptoms.
- Need fewer or no urgent care visits or hospitalizations for asthma.
- Use medications to control asthma with as few side effects as possible.
- Be satisfied with their asthma care.

It is also important to determine the patient's personal treatment goals and preferences for treatment. Ask how asthma interferes with the patient's life (e.g., inability to sleep through the night, play a sport), and incorporate the responses into personal treatment goals. Involve the patient in decision-making about treatment.

MaineHealth
AH! Asthma Health

Referral to an Asthma Specialist

Based on the opinion of the Expert Panel, referral for consultation or care to a specialist in asthma care is recommended when:

- Patient has had a life-threatening asthma exacerbation.
- Patient is not meeting the goals of asthma therapy after 3-6 months of treatment, or 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, aspergillosis, severe rhinitis, VCD, GERD, COPD).
- Additional diagnostic testing is indicated (e.g., allergy skin testing, 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). Consider referral if patient requires step 3 care (step 2 for children 0-4 years of age).
- Patient has required more than two bursts of oral corticosteroids in 1 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.

An asthma specialist is usually a fellowship-trained allergist or pulmonologist or, occasionally, a physician with expertise in asthma management developed through training and experience.

Patients with significant psychiatric, psychosocial, or family problems that interfere with their asthma therapy should be referred to an appropriate mental health professional for counseling or treatment.

Differential Diagnosis for Asthma

Infants and Children

Upper airway diseases

- Allergic rhinitis and sinusitis

Obstruction involving large airways

- Foreign body in trachea or bronchus
- Vocal cord dysfunction
- Vascular ring or laryngeal web
- Laryngotracheomalacia, tracheal stenosis, or bronchostenosis
- Enlarged lymph nodes or tumor

Obstructions involving small airways

- Viral bronchiolitis or obliterative bronchiolitis
- Cystic fibrosis
- Bronchopulmonary dysplasia
- Heart disease

Other Causes

- Recurrent cough not due to asthma
- Aspiration from swallowing mechanism dysfunction or gastroesophageal reflux

Adults

- Chronic Obstructive Pulmonary Disease (COPD) (e.g., chronic bronchitis or emphysema)
- Congestive heart failure
- Pulmonary embolism
- Laryngeal dysfunction
- Mechanical obstruction of the airways (benign and malignant tumors)
- Pulmonary infiltration with eosinophilia
- Cough secondary to drugs [angiotensin-converting enzyme (ACE) inhibitors]
- Vocal cord dysfunction (VCD)

Classifying Asthma Severity <12 years (The Chronic Disease)

Components of Severity*		Persistent							
		Intermittent		Mild		Moderate		Severe	
Impairment	Daytime symptoms	≤2 days/week		>2 days/week but not daily		Daily		Throughout the day	
	Nighttime awakenings	None	≤2x/month	1-2x/month	3-4x/month	3-4x/month	>1x/week	>1x/week	7x/week
	SABA ¹ use for symptom control ²	≤2 days/week		>2 days/week but not daily		Daily		Several times per day	
	Interference with normal activity	None		Minor limitation		Some limitation		Extremely limited	
	Lung function 5-11yrs	Normal FEV ₁ between exacerbations FEV ₁ >80% predicted FEV ₁ /FVC>85%		FEV ₁ >80% FEV ₁ /FVC>80%		FEV ₁ =60-80% FEV ₁ /FVC=75-80%		FEV ₁ <60% FEV ₁ /FVC<75%	
Risk	Exacerbations requiring oral corticosteroids	0-1/yr		0-4yrs: ≥2 exacerbations in 6 months requiring oral corticosteroids, or ≥4 wheezing episodes/year lasting >1 day AND risk factors for persistent asthma [†]					
				5-11yrs: ≥2 exacerbations in 1 year requiring oral corticosteroids [‡]					

* Level of severity is determined by both impairment and risk. Assess impairment domain by patient's/caregiver's recall of the previous 2-4 weeks and spirometry (if ≥5yrs of age). Severity may be assigned to the most severe category in which any feature occurs.

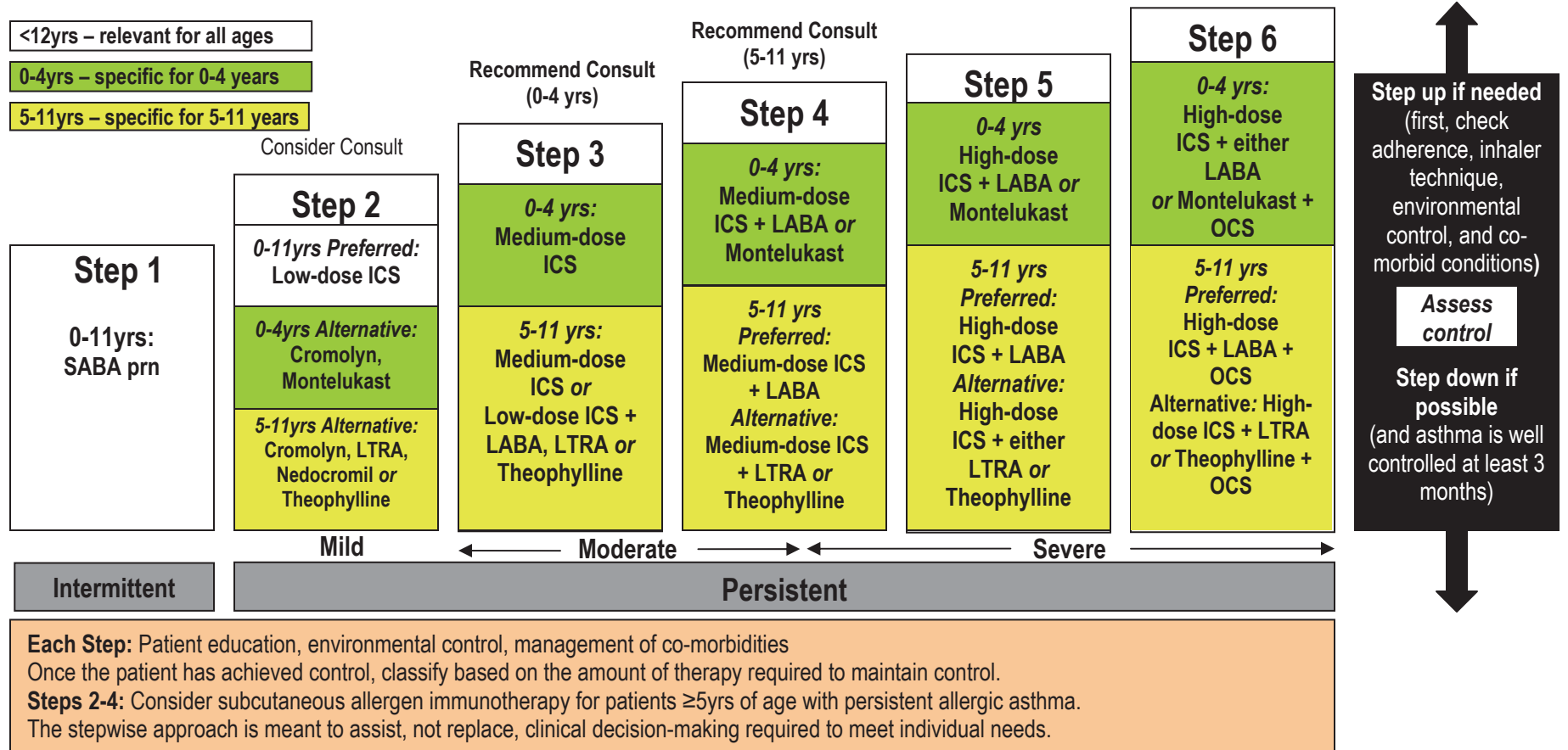
[†] Risk factors for developing persistent asthma among infants and young children who had four or more episodes of wheezing in the past year that lasted more than (1) one day and affected sleep: either (1) one of the following: parental history of asthma, a physician diagnosis of atopic dermatitis, or evidence of sensitization to aeroallergens, or (2) two of the following: evidence of sensitization to foods, >4 percent peripheral blood eosinophilia, or wheezing apart from colds.

[‡] At present, there are inadequate data to correspond frequency 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 ≥5yrs of age 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.

¹ Short-acting inhaled beta₂-agonist.

² Does not include SABA for prevention of exercise-induced bronchospasm.

Stepwise Approach to Management 0-4 & 5-11 years



Key: **Alphabetical order is used when more than one treatment option is listed within either preferred or alternative therapy.** ICS = inhaled corticosteroid; OCS = oral systemic corticosteroids; LABA = inhaled long-acting beta₂-agonist; LTRA = leukotriene receptor antagonist; SABA = inhaled short-acting beta₂-agonist

Classifying Asthma Severity ≥12 years (The Chronic Disease)

Components of Severity*		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment Normal FEV ₁ /FVC: 8-19 yrs 85% 20-39 yrs 80% 40-59 yrs 75% 60-80 yrs 70%	Daytime symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3-4x/month	>1x/week	7x/week
	SABA ¹ use for symptom control ²	≤2 days/week	>2 days/week but not daily	Daily	Several times per day
	Activity limits	None	Minor limitation	Some limitation	Extremely limited
	Lung function	Normal FEV ₁ between exacerbations FEV ₁ >80% FEV ₁ /FVC=normal	FEV ₁ >80% FEV ₁ /FVC=normal	FEV ₁ =60-80% FEV ₁ /FVC reduced 5%	FEV ₁ <60% predicted FEV ₁ /FVC reduced >5%
Risk	Flares needing OCS	Relative annual risk of exacerbations may be related to FEV ₁			
		0-1/yr	≥2 exacerbations in the past year requiring oral corticosteroids [†]		

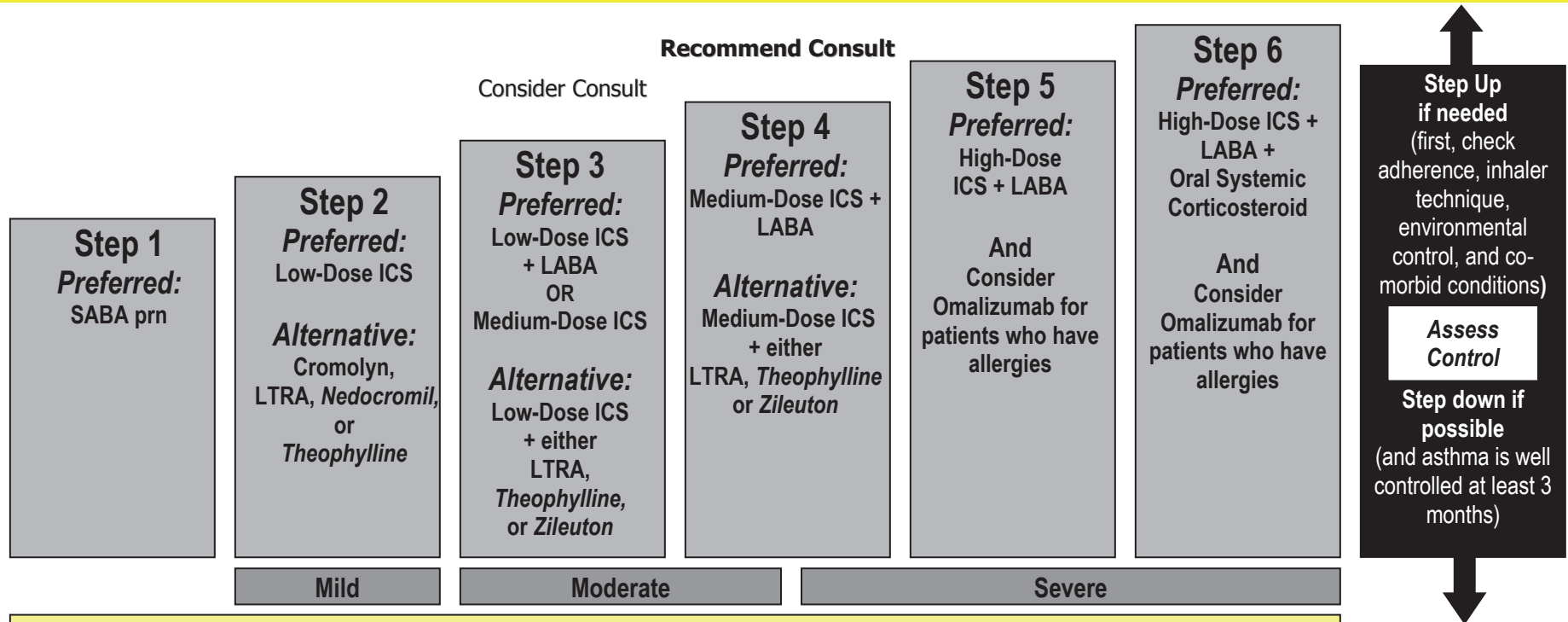
* Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2-4 weeks and spirometry. Severity may be assigned to the most severe category in which any feature occurs.

[†] 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.

¹ Short-acting inhaled beta₂-agonist

² Does not include SABA for prevention of exercise-induced bronchospasm

Stepwise Approach to Management ≥12 years



Each Step: Patient education, environmental control, and management of co-morbidities
 Once the patient has achieved control, classify based on the amount of therapy required to maintain control.
Steps 2-4: Consider subcutaneous allergen immunotherapy for patients who have persistent allergic asthma.
 The stepwise approach is meant to assist, not replace, clinical decision-making required to meet individual needs.

- If alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.
- 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.
- Immunotherapy for steps 2-4 based on evidence may be most helpful for those with house dust mite, animal dander or pollen allergy; evidence is weak or lacking for molds and cockroaches.

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

Determining Asthma Control <12 years

Components of Control		Classification of Asthma Control					
		Well Controlled	Not Well Controlled	Very Poorly Controlled			
		<table border="1" style="float: right; margin-left: auto;"> <tr> <td><12yrs – relevant for all ages</td> </tr> <tr> <td style="background-color: #92d050;">0-4yrs – specific for 0-4 years</td> </tr> <tr> <td style="background-color: #ffff00;">5-11yrs – specific for 5-11 years</td> </tr> </table>			<12yrs – relevant for all ages	0-4yrs – specific for 0-4 years	5-11yrs – specific for 5-11 years
<12yrs – relevant for all ages							
0-4yrs – specific for 0-4 years							
5-11yrs – specific for 5-11 years							
Impairment	Daytime symptoms	≤2 days/week but not more than once on each day	>2 days/week or multiple times on ≤2 days/week	Throughout the day			
	Nighttime awakenings *	≤1x/month	≥2x/month	≥2x/week			
	Short-acting beta ₂ -agonist use (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day			
	Activity limits	None	Some limitation	Extremely limited			
	Validated questionnaire: ACT** (4-11yrs)	≥20	16-19	≤15			
	Lung function	FEV ₁ or PEF>80% FEV ₁ /FVC>80%	FEV ₁ or PEF=60-80% FEV ₁ /FVC=75-80%	FEV ₁ or PEF<60% FEV ₁ /FVC<75%			
Risk	OCS use	0-1/year	2-3/year	>3/year			
Recommended Action for Treatment		<ul style="list-style-type: none"> • Maintain current step • Regular follow-up every 1-6 months • Consider step down if well controlled for at least 3 months 	<ul style="list-style-type: none"> • Step up (1 step); and • Re-evaluate 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 • Re-evaluate in 2 weeks • For side effects, consider alternative treatment options 			
			<ul style="list-style-type: none"> • If no clear benefit in 4-6 weeks, consider alternative diagnoses or adjusting therapy 	<ul style="list-style-type: none"> • If no clear benefit in 4-6 weeks, consider alternative diagnoses or adjusting therapy 			

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 patient's asthma is better or worse since the last visit.

* NHLBI (www.nhlbi.nih.gov) recommendations separate age groups for nighttime symptoms. Age groups have been combined for ease of application.

** ACT = Asthma Control Test (recommended by MaineHealth AH! Asthma Health Program for children 4-11yrs).

Determining Asthma Control ≥12 years

Components of Control		Classification of Asthma Control		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Daytime symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1-3 x/week	≥4x/week
	Short-acting beta ₂ -agonist use (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per day
	Activity limits	None	Some limitation	Extremely limited
	Lung function	FEV ₁ or PEF>80%	FEV ₁ or PEF=60-80%	FEV ₁ or PEF<60%
	Validated questionnaire: ACT	≥20	16-19	≤15
Risk	Exacerbations	0-1/year	≥2/year	
Recommended Action for Treatment		<ul style="list-style-type: none"> •Maintain current step •Regular follow-up 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 •Re-evaluate 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 •Re-evaluate in 2 weeks •For side effects, consider alternative treatment options

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 patient's asthma is better or worse since the last visit.

Key: FEV₁ = forced expiratory volume in 1 second; PEF = peak flow; ACT = Asthma Control Test (recommended by MaineHealth AH! Asthma Health Program); EIB = exercise-induced bronchospasm; OCS = oral corticosteroid.

Usual Dosages for Long-Term Control Medications

Medications	Dosage Form	Adult Dose	Child Dose	Comments
Inhaled Corticosteroids (see <i>Estimated Comparative Daily Dosages for Inhaled Corticosteroids</i>)				
Systemic Corticosteroids				
<i>Methylprednisolone (Medrol)</i>	2, 4, 8, 16, 32mg tablets	7.5-60mg daily in a single dose in a.m. or qod as needed for control	0.25-2mg/kg daily in a single dose in a.m. or qod as needed for control	
<i>Prednisolone (Prednisolone, Pediapred, Orapred)</i>	5mg tablets, 5mg/5cc, 15mg/5cc, 10 & 15mg oral dissolving tablets			
<i>Prednisone (Deltasone)</i>	1, 2.5, 5, 10, 20mg tablets			
Leukotriene Modifiers				
Leukotriene Receptor Antagonists:				
<i>Montelukast (Singulair)</i>	4mg oral granules, 4 or 5mg chewable tablet, 10mg tablet	10mg qhs	4mg qhs (6 mos-5yrs) 5mg qhs (6-14yrs) 10mg qhs (>14yrs)	
<i>Zafirlukast (Accolate)</i>	10 or 20mg tablet	20mg tablet bid	7-11 yrs: 10mg tablet bid	■ Monitor for signs and symptoms of hepatic dysfunction
5-Lipoxygenase Inhibitor: <i>Zileuton (Zyflo)</i>	600mg tablet	2,400mg daily (divided bid if sustained release tablet)	N/A	■ For zileuton, monitor hepatic enzymes (ALT)
Combination Medication				
<i>Fluticasone/Salmeterol (Advair)</i>	DPI 100mcg/50mcg, 250mcg/50mcg, 500mcg/50mcg	1 inhalation bid; dose depends on asthma severity	5-11yrs: 100mcg/50mcg, 1 inhalation bid	■ 100/50 DPI or 45/21 HFA for patients 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 45mcg/21mcg, 115mcg/21mcg, 230mcg/21mcg	2 inhalations bid; dose depends on asthma severity	N/A	
<i>Budesonide/Formoterol (Symbicort) HFA MDI</i>	80mcg/4.5mcg, 160mcg/4.5mcg	2 inhalations bid; dose depends on asthma severity	N/A	■ 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
Inhaled Long-Acting Beta₂ -Agonists				
<i>Salmeterol (Serevent)</i>	DPI 50mcg/puff	1 blister q 12 hours	N/A	■ Should not be used for acute symptom relief or exacerbations. Use <u>only</u> with inhaled corticosteroids (ICS).
<i>Formoterol (Foradil)</i>	DPI 12mcg/single-use capsule	1 capsule q 12 hours	N/A	
Cromolyn				
<i>Cromolyn (Intal)</i>	MDI 1mg/puff Nebulizer 20mg/ampule	2 puffs tid-qid 1 ampule tid-qid	2 puffs tid-qid (children ≥5yrs) 1 ampule tid-qid (children >2yrs)	■ May be used as exercise pre-treatment.
Methylxanthines				
<i>Theophylline (Theo-Dur, Uniphyll)</i>	Liquid, sustained-release tablets, and capsules	Starting dose 10mg/kg/day up to 300mg max; usual max 800mg/day	Starting dose 10mg/kg/day; usual max=16kg/mg/day; (formula to calculate max dose if <1 year of age: 0.2 x (age in weeks) +5=mg/kg/day)	■ Serum monitoring is important (serum concentration of 5-15mcg/mL at steady state).

Estimated Comparative Daily Dosages for Inhaled Steroids

Drug	Low Daily Dose			Medium Daily Dose			High Daily Dose		
	0-4yrs	5-11yrs	≥12yrs and Adult	0-4yrs	5-11yrs	≥12yrs and Adult	0-4yrs	5-11yrs	≥12yrs and Adult
Beclomethasone (QVAR) HFA: 40 or 80mcg puff	NA	80-160mcg	80-240mcg	NA	>160-320mcg	>240-480mcg	NA	>320mcg	>480mcg
Budesonide (Pulmicort Flexhaler) DPI: 90 or 180mcg/inhalation	NA	180-400mcg	180-600mcg	NA	>400-800mcg	>600-1,200mcg	NA	>800mcg	>1,200mcg
Budesonide Inhalation Suspension for Nebulization (Pulmicort Respules)	0.25-0.5mg	0.5mg	NA	>0.5-1.0mg	1.0mg	NA	>1.0 mg	2.0mg	NA
Ciclesonide (Alvesco) HFA* 80 mcg/ 160mcg/ inhalation	NA	NA	160-320 mcg	NA	NA	320-640 mcg	NA	NA	>640 mcg
Flunisolide (Aerobid) 250mcg/puff	NA	500-750mcg	500-1,000mcg	NA	1,000-1,250mcg	>1,000-2,000mcg	NA	>1,250mcg	>2,000mcg
Fluticasone (Flovent) HFA: 44, 110, or 220mcg/puff DPI: 50mcg/inhalation	88-176mcg	88-176mcg	88-264mcg	>176-352mcg	>176-352mcg	>264-440mcg	>352mcg	>352mcg	>440mcg
Mometasone (Asmanex) DPI: 110, 220mcg/inhalation	NA	4-11yrs 110mcg	220mcg	NA	4-11yrs 220mcg	440mcg	NA	NA	>440mcg
Triamcinolone acetonide (Azmacort) 100mcg/puff	NA	300-600mcg	300-750mcg	NA	>600-900mcg	>750-1,500mcg	NA	>900mcg	>1,500mcg

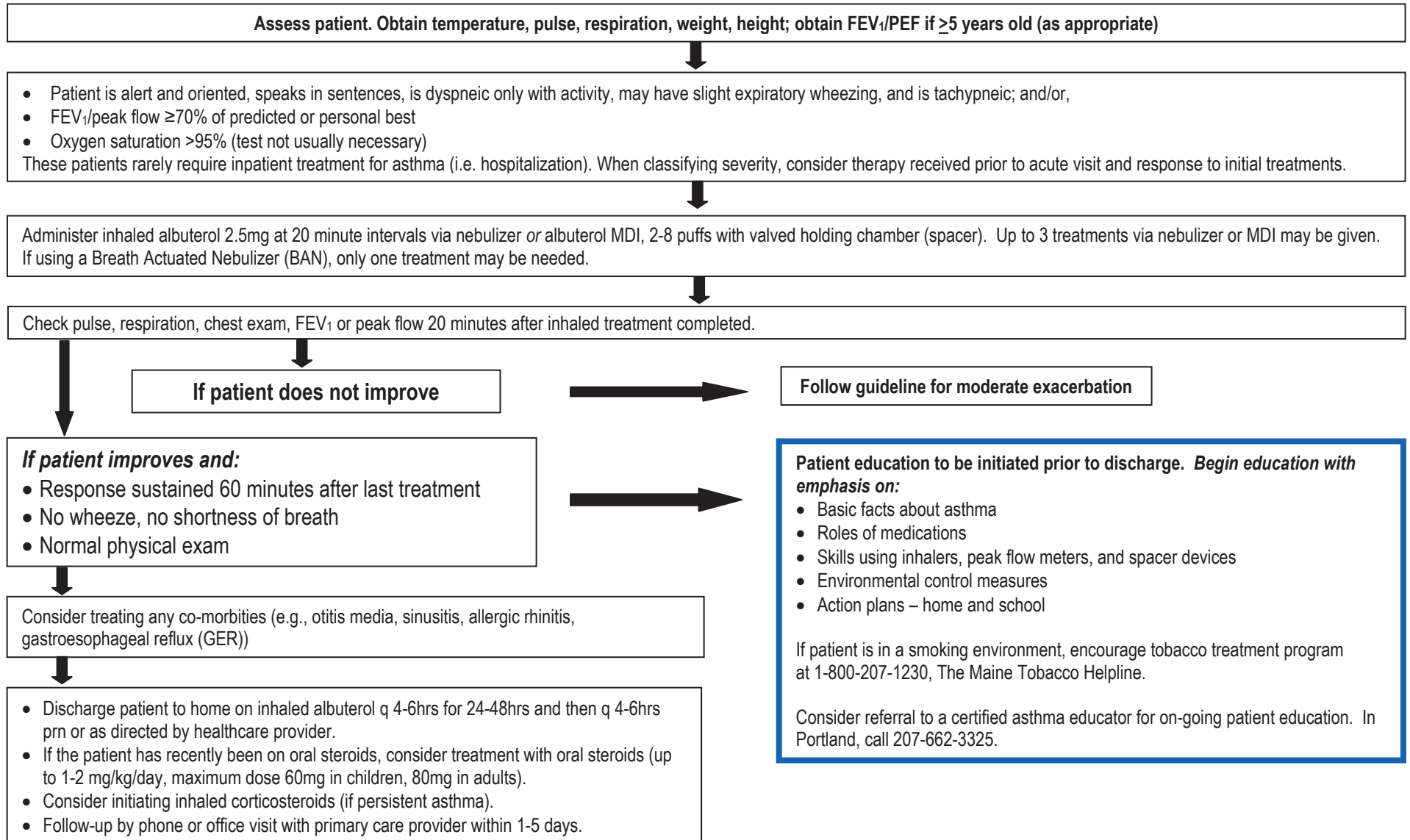
Key: DPI = dry powder inhaler; HFA = hydrofluoroalkane; MDI = metered-dose inhaler; NA = not available (either not approved, no data available, or safety and efficacy not established for this age group)

*Dosing recommendations are estimated based on FDA package insert. No direct comparisons were available at time of publication.

Usual Dosages for Quick-Relief Medications

Medications	Dosage Form	Adult Dose (≥12 years)	Child Dose (0-11 years)	Comments
Inhaled Short-Acting Beta₂-Agonists (SABA)^{1,2}				
<i>Albuterol (ProAir/Ventolin/Proventil) HFA</i>	90mcg/puff, 200 puffs	2 puffs q 4-6hrs prn or 10-15min before exercise	2 puffs q 4-6hrs prn	¹ Regular use exceeding 2 days/week for symptom control (not prevention of EIB) indicates the need for additional long-term control therapy. ² For an exacerbation at home, up to 2 treatments 20 minutes apart of MDI (2-6 puffs) or nebulizer may be used, and if good response, continued q 4hrs as needed for 24-48hrs. If incomplete response, contact doctor.
<i>Pirbuterol (Maxair) CFC</i>	200mcg/puff, 400 puffs		Safety and efficacy not established for children <12yrs	
<i>Levalbuterol (Xopenex) HFA</i>	45mcg/puff, 200 puffs	2 puffs q 4-6hrs prn	<u>5-11yrs</u> : 2 puffs q 4-6hrs prn	
<i>Albuterol</i>	Nebulizer Solution 0.63mg/3mL 1.25mg/3mL 2.5mg/3mL 5mg/mL (0.5%)	2.5-5mg q 4-8hrs prn	<u>0-4 yrs</u> : 0.63-2.5mg q 4-6hrs prn <u>5-11 yrs</u> : 1.25-5mg q 4-8hrs prn	
<i>Levalbuterol (Xopenex)</i>	0.31mg/3mL 0.63mg/3mL 1.25mg/0.5mL 1.25mg/3mL	0.63mg-1.25mg q 8hrs prn	<u>0-4 yrs</u> : 0.31-0.63mg q 4-6hrs prn <u>5-11yrs</u> : 0.31-0.63mg q 4-6hrs prn	
Anticholinergics:³				
<i>Ipratropium (Atrovent)</i>	Nebulizer Solution 0.25mg/mL (0.025%)	0.25mg q 6hrs	NA	³ Evidence is lacking for anticholinergics producing added benefit in long-term therapy.
<i>Ipratropium with albuterol (Duoneb)</i>	Nebulizer Solution 0.5mg/3mL ipratropium bromide and 2.5mg/3mL albuterol	3mL q 4-6hrs	NA	
Systemic Corticosteroids:				
<i>Prednisolone⁴</i>	10 & 15mg oral dissolving tabs (Orapred ODT) 5mg/5cc (Pediapred, Prelone) 15mg/5cc (Prelone, Orapred)	<u>Short course</u> : 40-60mg/day as single or 2 divided doses for 3-10 days	<u>Short course</u> : 1-2mg/kg/day max 60 mg/day for 3-10 days	⁴ The burst should be continued until patient achieves 80% PEF personal best or symptoms resolve; usually 3-10 days, may be longer. May consider tapering for patients requiring >6 days of therapy.
<i>Prednisone⁴</i>	1, 2.5, 5, 10, 20, 50mg tabs			
<i>Methylprednisolone acetate⁵</i>	Repository Injection 40mg/mL 80mg/mL	240mg IM once	<u>0-4yrs</u> : 7.5 mg/kg IM once <u>5-11yrs</u> : 240 mg IM once	⁵ May be used in place of a short burst of oral corticosteroids in patients who are vomiting or if adherence is a problem.

Emergency Treatment for Acute Exacerbations - Mild



Emergency Treatment for Acute Exacerbations - Moderate

Assess patient. Obtain temperature, pulse, respiration, weight, height; obtain FEV₁/PEF if ≥5 years old (as appropriate)

- Patient is agitated, not playful, and speaks in phrases. An infant may have a softer, shorter cry and difficulty feeding. Patient is using accessory muscles, may have loud wheezing, and is tachypneic; and/or,
- FEV₁/peak flow 40-69% of predicted or personal best
- Oxygen saturation 90-95% (test not usually necessary)

Administer albuterol 2.5 mg at 20 minute intervals via nebulizer *or* albuterol MDI, 2 - 8 puffs with valved holding chamber (spacer); may consider adding ipratropium. Up to 3 treatments via nebulizer or MDI may be given over the 1st hour and then spread to every 1-3 hours if improvement is noted.
If using a breath actuated nebulizer (BAN), fewer treatments may be needed.

Corticosteroids (oral prednisone or equivalent) 1-2 mg/kg up to a max of 60 - 80 mg. Consider IV steroids if patient cannot tolerate oral medication.

Check patient's pulse, respirations every hour.

Good Response

- FEV₁ or PEF ≥70%
- Sustained response 60 minutes after treatment
- No dyspnea or oxygen requirement
- Normal exam

Treat co-morbidities (e.g., pneumonia, otitis media, sinusitis, allergic rhinitis, gastroesophageal reflux (GER))

Discharge to home:

- Inhaled albuterol q 4-6hrs for 24-48 hrs and then q 4-6hrs prn or as directed by healthcare provider
- Continue controller medications and if not on inhaled corticosteroids (ICS) consider prescribing
- Oral corticosteroids (OCS): up to 1-2mg/kg/day in 1 or 2 divided doses for 3-10 days (maximum=60mg for children, 80mg for adults); consider tapering for patients requiring >6 days of OCS
- Follow-up by phone or office visit with primary provider within 24-48hrs

Incomplete Response

- FEV₁ or PEF 40-69% and/or,
- Mild to moderate symptoms

- Continue treatment with albuterol q 1-3hrs
- Continue systemic corticosteroids (0.5-1mg/kg q 12hrs for the initial 48hrs if hospitalized, then re-evaluate; usual maximum dose=60mg/day in children, 80mg/day in adults)
- Treat co-morbidities
- Consider hospitalization and follow available inpatient guidelines

Poor Response

- FEV₁ or PEF <40%
- Severe symptoms
- Drowsy, confused

Follow guidelines for severe exacerbation and admit to ICU

Patient education to be initiated prior to discharge; **begin education with emphasis on:**

- Basic facts about asthma
- Roles of medications
- Skills using inhalers, peak flow meters, and spacer devices
- Environmental control measures
- Action plans – home and school

If patient is in smoking environment, encourage tobacco treatment program at 1-800-207-1230, The Maine Tobacco Helpline.

Consider referral to a certified asthma educator for on-going patient education. In Portland, call 207-662-3325.

Emergency Treatment for Acute Exacerbations – Severe

Assess patient. Obtain vital signs, weight, and height (as appropriate) in ED. Consider FEV₁/peak flow if >5 years old. FEV₁/peak flow may be difficult or impossible to measure due to significant dyspnea and cough. Therefore, FEV₁/peak flow may not be appropriate in very severe cases of obvious airway compromise or cyanosis.

- Patient is breathless at rest. Dyspnea interferes with conversation (e.g. speaks in words). An infant will stop feeding. Patient is using accessory muscles, has suprasternal retractions, may or may not have loud wheezing (throughout inhalation and exhalation), and is tachypneic
- FEV₁/peak flow <40% of predicted or personal best
- Oxygen saturation <90%

Administer oxygen to keep saturation \geq 90%. Administer moderate to high dose albuterol plus ipratropium nebulizer q 20min x 3, or albuterol continuously for 1 hour. BAN (breath actuated nebulizer) is recommended to increase delivery of nebulized medications in severe exacerbations.

Corticosteroids (oral prednisone or equivalent) 1-2mg/kg up to a max of 60-80 mg. Consider IV corticosteroids if patient cannot tolerate oral medication.

Repeat vital signs (pulse and respiratory rate) q 15 minutes. Continuous pulse oximetry.

Good Response

- FEV₁ or PEF \geq 70%
- Sustained response 60mins after treatment
- No dyspnea or oxygen requirement
- Improved physical exam

- Consider hospitalization
- Continue oral corticosteroids 0.5-1mg/kg q 12hrs for 3-10 days (max dose=60mg for children, 80mg for adults); consider tapering for patients requiring >6 days of OCS
- Wean nebulized albuterol to q 3-4hrs
- Patient education
- If not on inhaled corticosteroids (ICS), consider initiation of an ICS

Incomplete Response

- FEV₁ or PEF 40-69%
- Mild to moderate symptoms

- Continue supplemental oxygen
- Continue treatment with albuterol and ipratropium q 1-3hrs (while in the ED); or continuous albuterol
- Continue systemic corticosteroids (0.5-1mg/kg q 6-12hrs: usual max dose=60mg/day in children, 80mg/day in adults)
- Treat co-morbidities
- Hospitalize and follow available inpatient guidelines

Poor Response

- FEV₁ or PEF <40%
- PCO₂ \geq 42mm Hg
- Severe symptoms
- Drowsy, confused

Admit to ICU – With orders for:

- Supplemental oxygen
- Corticosteroids IV 1 mg/kg q 12 hours
- Consider arterial line for serial ABGs
- Albuterol nebs hourly or continuous at 0.15-0.5mg/kg/hr (maximum of 10-15mg/hr)
- Consider adjunctive therapies

ICU Admission Criteria

- Intubated or pending intubation
- pCO₂ greater than 55
- Requiring more than 50% FiO₂
- Requiring nebulized therapies more frequently than q 2hrs
- Altered mental status
- Acute pneumothorax
- Use of adjunctive therapies – heliox, terbutaline, magnesium

MaineHealth, a not-for-profit health system serving the people of southern, western and central Maine, is working with communities and organizations around the state to improve the care of children and adults with asthma through the AH! Asthma Health Program. A key goal of the program is to improve the clinical care of asthma by supporting the consistent use of nationally developed guidelines in the diagnosis and management of asthma.

To support this effort, the AH! Program created this flip chart summarizing current recommendations for asthma care. The AH! Asthma Health Program efforts have been fueled by a multidisciplinary group of clinicians representing nursing, respiratory therapy, public health, primary care physicians, pulmonary and allergy/immunology subspecialists. This chart was adapted from the National Heart, Lung, and Blood Institute (NHLBI) National Asthma Education and Prevention Program Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma, 2007. Some recommendations reflect the local expert opinion of the AH! Asthma Health Program clinicians. We would like to give special thanks to the following people for their efforts in the production of the 2008 version of this flip chart: Dr. Barbara Chilmonczyk (Allergist/Immunologist); Dr. Jennifer Jewell (Hospitalist); Rhonda Vosmus, RRT; Donna Levi, M.S.; and Joel Richard.

These guidelines were developed for healthcare professionals who provide asthma care to patients. They are intended as a guide for care, but are not intended to replace providers' clinical judgment or to establish a single protocol. Some clinical problems may not be adequately addressed by these guidelines. As always, clinicians are urged to document management strategies. For questions or more information, please contact the AH! Asthma Health Program Manager at tel. 207-541-7566. These guidelines are also available on the web at www.mainehealth.org/AH.

MaineHealth
AH! Asthma Health