

Reference Guide for Caring for Pediatric Patients with Asthma

Adapted from: The National Asthma Education and Prevention Program (NAEPP) coordinated by National Heart, Lung, and Blood Institute (NHLBI): The Expert Panel Report 3(EPR-3) Full Report 2007: Guidelines for the Diagnosis and Management of Asthma and Global Initiative for Asthma (GINA). 2018 GINA Report, Global Strategy for Asthma Management and Prevention. Retrieved from: https://www.nhlbi.nih.gov/sites/default/files/media/docs/asthgdln_1.pdf and <https://ginasthma.org/>



National Association of
Pediatric Nurse Practitioners™

Asthma and
Allergy SIG

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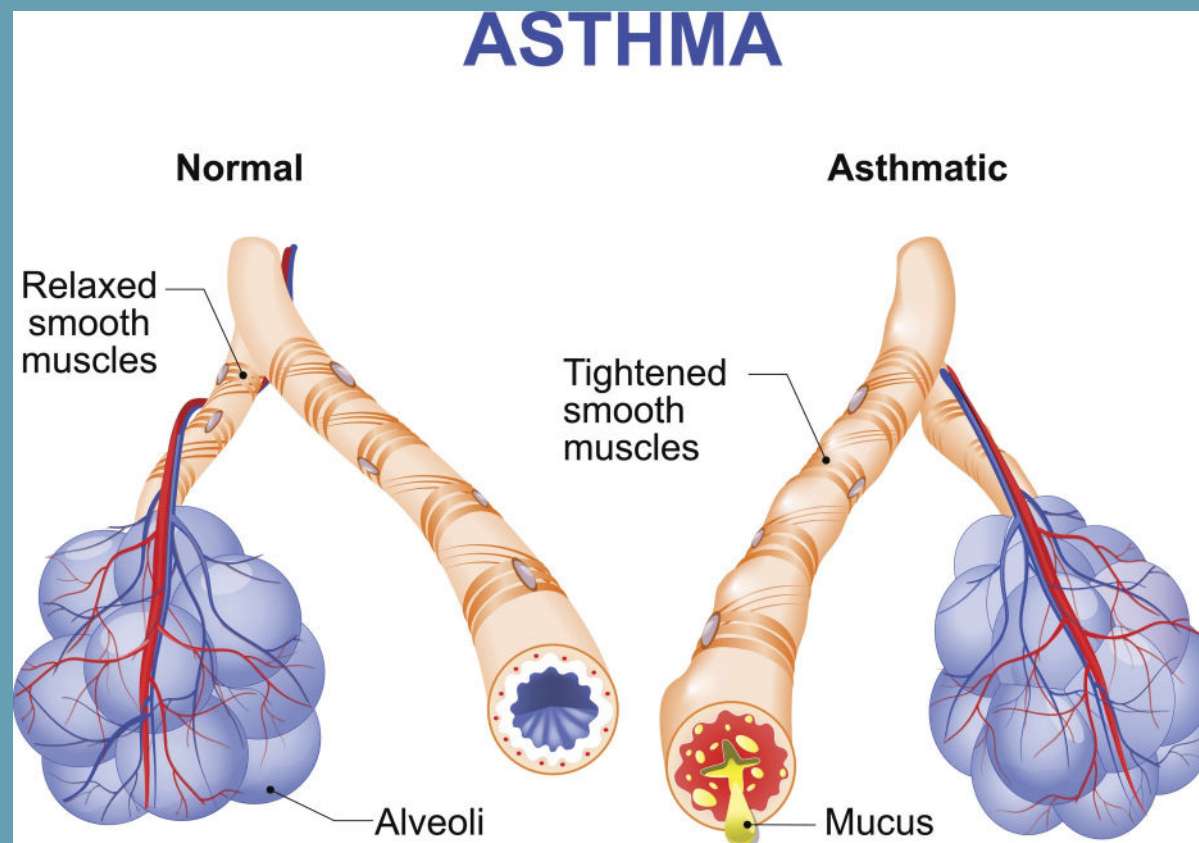


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Asthma is a chronic disease with variable and recurring symptoms, usually characterized by:

- chronic airway inflammation
- bronchoconstriction
- airway hyperresponsiveness

Methods to Establish the Diagnosis

- Detailed medical history
 - Determine if symptoms of recurrent airway obstruction are present, i.e. history of cough (particularly worse at night), recurrent wheezing, recurrent shortness of breath, recurrent chest tightness
 - Symptoms are worse at night or with exercise, with viral upper respiratory infections, exposure to allergens or irritants, change in weather, stress, other factors
- Physical examination
- Spirometry for children 5 and older to determine if obstruction and partially reversible. Reversibility is considered an $\geq 12\%$ increase from baseline of FEV1 after inhalation of a short acting beta2-agonist (SABA).
- Additional studies to exclude alternative diagnosis (refer to www.nhlbi.nih.gov/sites/default/files/media/docs/asthgdln_1.pdf for list of differential diagnosis)



Goals of Asthma Treatment

- Continuing to achieve symptom free days and nights
- Maintain normal activity including participating in sports
- Minimize the use of short-acting beta2-agonists (SABA)
- Reduce the number of days missed from school or work due to asthma
- Prevent the number of asthma exacerbations and minimize the need for ED visits or hospitalizations
- Maintain normal or near normal lung function
- Control asthma with minimal or no side effects from medication
- Patient and family satisfaction with therapy

When to Refer to an Asthma Specialist

- Patient with life threatening asthma exacerbations
- Patient is unresponsive to therapy or unable to meet goals of asthma therapy after 3-6 months of treatment
- Patients need immunotherapy
- Additional testing is needed to establish a diagnosis or rule out an alternative diagnosis
- Patient requiring step 3 or 4 therapy depending on age
- Patient or families requiring additional education for complicated therapies
- Patient requires more than 2 courses of oral corticosteroids in 1 year or was hospitalized for an exacerbation

Classification at the Initial Visit

INITIAL VISIT: CLASSIFYING ASTHMA SEVERITY AND INITIATING THERAPY

(in patients who are not currently taking long-term control medications)

Level of severity (Columns 2-5) is determined by events listed in Column 1 for both impairment (frequency and intensity of symptoms and functional limitations) and risk (of exacerbations). Assess impairment by patient's or caregiver's recall of events during the previous 2-4 weeks; assess risk over the last year. Recommendations for initiating therapy based on level of severity are presented in the last row.

Components of Severity		Intermittent			Persistent									
		Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Mild			Moderate			Severe			
		Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	Ages 0-4 years	Ages 5-11 years	Ages ≥12 years	
Impairment	Symptoms	≤2 days/week			>2 days/week but not daily			Daily			Throughout the day			
	Nighttime awakenings	0	≤2x/month		1-2x/month	3-4x/month		3-4x/month	>1x/week but not nightly		>1x/week	Often 7x/week		
	SABA* use for symptom control (not to prevent EIB*)	≤2 days/week			>2 days/week but not daily	>2 days/week but not daily and not more than once on any day		Daily			Several times per day			
	Interference with normal activity	None			Minor limitation			Some limitation			Extremely limited			
	Lung function	Not applicable	Normal FEV ₁ between exacerbations	Normal FEV ₁ between exacerbations	Not applicable	>80%	>80%	Not applicable	60-80%	60-80%	Not applicable	<60%	<60%	
	→ FEV ₁ * (% predicted)		>80%	>80%		>80%	>80%		75-80%	Reduced 5%†		<75%	Reduced >5%†	
→ FEV ₁ /FVC*	>85%		Normal†	>80%		Normal†	75-80%		Reduced 5%†	<75%		Reduced >5%†		
Risk	Asthma exacerbations requiring oral systemic corticosteroids‡	0-1/year			≤2 exacerb. in 6 months, or wheezing ≥4x per year lasting >1 day AND risk factors for persistent asthma	Generally, more frequent and intense events indicate greater severity.								
				≤2/year	Generally, more frequent and intense events indicate greater severity.									
	Consider severity and interval since last asthma 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 Therapy		Step 1			Step 2			Step 3	Step 3 medium-dose ICS* option	Step 3	Step 3	Step 3 medium-dose ICS* option or Step 4	Step 4 or 5	
(See "Stepwise Approach for Managing Asthma Long Term," page 7)														
The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.		In 2-6 weeks, depending on severity, assess level of asthma control achieved and adjust therapy as needed. For children 0-4 years old, if no clear benefit is observed in 4-6 weeks, consider adjusting therapy or alternate diagnoses.												

* Abbreviations: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity; ICS, inhaled corticosteroid; SABA, short-acting beta₂-agonist.

† Normal FEV₁/FVC by age: 8-19 years, 85%; 20-39 years, 80%; 40-59 years, 75%; 60-80 years, 70%.

‡ Data are insufficient to link frequencies of exacerbations with different levels of asthma severity. Generally, more frequent and intense exacerbations (e.g., requiring urgent care, hospital or intensive care admission, and/or oral corticosteroids) indicate greater underlying disease severity. For treatment purposes, patients with ≥2 exacerbations may be considered to have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.

Source: Asthma Care Quick Reference, Diagnosing and Managing Asthma. USDHHS, Rev. 2012

Stepwise Approach for Managing Asthma

STEPWISE APPROACH FOR MANAGING ASTHMA LONG TERM

The stepwise approach tailors the selection of medication to the level of asthma severity (see page 5) or asthma control (see page 6). The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.

ASSESS
CONTROL:

STEP UP IF NEEDED (first, check medication adherence, inhaler technique, environmental control, and comorbidities)

STEP DOWN IF POSSIBLE (and asthma is well controlled for at least 3 months)

	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
At each step: Patient education, environmental control, and management of comorbidities						
0–4 years of age	Intermittent Asthma	Persistent Asthma: Daily Medication Consult with asthma specialist if step 3 care or higher is required. Consider consultation at step 2.				
	Preferred Treatment [†]	SABA* as needed	low-dose ICS*	medium-dose ICS*	medium-dose ICS* + either LABA* or montelukast	high-dose ICS* + either LABA* or montelukast + oral corticosteroids
	Alternative Treatment ^{†,‡}		cromolyn or montelukast			
	Quick-Relief Medication	- SABA* as needed for symptoms; intensity of treatment depends on severity of symptoms. - With viral respiratory symptoms: SABA every 4–6 hours up to 24 hours (longer with physician consult). Consider short course of oral systemic corticosteroids if asthma exacerbation is severe or patient has history of severe exacerbations. - Caution: Frequent use of SABA may indicate the need to step up treatment.				
5–11 years of age	Intermittent Asthma	Persistent Asthma: Daily Medication Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.				
	Preferred Treatment [†]	SABA* as needed	low-dose ICS*	low-dose ICS* + either LABA* [§] or theophylline [§]	medium-dose ICS* + LABA*	high-dose ICS* + LABA* + oral corticosteroids
	Alternative Treatment ^{†,‡}		cromolyn, LTRA*, or theophylline [§]	medium-dose ICS* + either LTRA* or theophylline [§]	high-dose ICS* + either LTRA* or theophylline [§]	high-dose ICS* + either LTRA* or theophylline [§] + oral corticosteroids
	Quick-Relief Medication	- SABA* as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments every 20 minutes as needed. Short course of oral systemic corticosteroids may be needed. - Caution: Increasing use of SABA or use >2 days/week for symptom relief (not to prevent EIB*) generally indicates inadequate control and the need to step up treatment.				
≥12 years of age	Intermittent Asthma	Persistent Asthma: Daily Medication Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3.				
	Preferred Treatment [†]	SABA* as needed	low-dose ICS*	low-dose ICS* + LABA* [§] OR medium-dose ICS*	medium-dose ICS* + LABA*	high-dose ICS* + LABA* + oral corticosteroid ^{¶¶}
	Alternative Treatment ^{†,‡}		cromolyn, LTRA*, or theophylline [§]	low-dose ICS* + either LTRA* [§] or theophylline [§] or zileuton ^{‡‡}	medium-dose ICS* + either LTRA* [§] or theophylline [§] or zileuton ^{‡‡}	high-dose ICS* + LABA* + oral corticosteroid ^{¶¶} AND consider omalizumab for patients who have allergies ^{††}
	Quick-Relief Medication	- SABA* as needed for symptoms. The intensity of treatment depends on severity of symptoms: up to 3 treatments every 20 minutes as needed. Short course of oral systemic corticosteroids may be needed. - Caution: Use of SABA >2 days/week for symptom relief (not to prevent EIB*) generally indicates inadequate control and the need to step up treatment.				

* Abbreviations: EIB, exercise-induced bronchospasm; ICS, inhaled corticosteroid; LABA, inhaled long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; SABA, inhaled short-acting beta₂-agonist.

[†] Treatment options are listed in alphabetical order, if more than one.

[‡] If alternative treatment is used and response is inadequate, discontinue and use preferred treatment before stepping up.

[§] Theophylline is a less desirable alternative because of the need to monitor serum concentration levels.

^{¶¶} Based on evidence for dust mites, animal dander, and pollen; 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 to treat anaphylaxis that may occur.

^{¶¶} Zileuton is less desirable because of limited studies as adjunctive therapy and the need to monitor liver function.

^{¶¶} Before oral 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.

Source: Asthma Care Quick Reference, Diagnosing and Managing Asthma. USDHHS, Rev. 2012

Assessing Asthma Control in Follow-up Visits

FOLLOW-UP VISITS: ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY

Level of control (Columns 2–4) is based on the most severe component of impairment (symptoms and functional limitations) or risk (exacerbations). Assess impairment by patient's or caregiver's recall of events listed in Column 1 during the previous 2–4 weeks and by spirometry and/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. Assess risk by recall of exacerbations during the previous year and since the last visit. Recommendations for adjusting therapy based on level of control are presented in the last row.

Components of Control		Well Controlled			Not Well Controlled			Very Poorly Controlled		
		Ages 0–4 years	Ages 5–11 years	Ages ≥12 years	Ages 0–4 years	Ages 5–11 years	Ages ≥12 years	Ages 0–4 years	Ages 5–11 years	Ages ≥12 years
Impairment	Symptoms	≤2 days/week	≤2 days/week but not more than once on each day	≤2 days/week	>2 days/week	>2 days/week or multiple times on ≤2 days/week	>2 days/week	Throughout the day		
	Nighttime awakenings	≤1x/month		≤2x/month	>1x/month	≥2x/month	1–3x/week	>1x/week	≥2x/week	≥4x/week
	Interference with normal activity	None			Some limitation			Extremely limited		
	SABA* use for symptom control (not to prevent EIB*)	≤2 days/week			>2 days/week			Several times per day		
	Lung function									
	➔ FEV ₁ * (% predicted) or peak flow (% personal best)	Not applicable	>80%	>80%	Not applicable	60–80%	60–80%	Not applicable	<60%	<60%
	➔ FEV ₁ /FVC*		>80%	Not applicable		75–80%	Not applicable		<75%	Not applicable
Validated questionnaires†										
➔ ATAQ*	Not applicable	Not applicable	0	Not applicable	Not applicable	1–2	Not applicable	Not applicable	3–4	
➔ ACQ*			≤0.75‡			≥1.5			Not applicable	
➔ ACT*			≥20			16–19			≤15	
Risk	Asthma exacerbations requiring oral systemic corticosteroids§	0–1/year			2–3/year	≥2/year		>3/year	≥2/year	
		Consider severity and interval since last asthma exacerbation.								
	Reduction in lung growth/Progressive loss of lung function	Not applicable	Evaluation requires long-term follow-up care.		Not applicable	Evaluation requires long-term follow-up care.		Not applicable	Evaluation requires long-term follow-up 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 “Stepwise Approach for Managing Asthma Long Term,” page 7) The stepwise approach is meant to help, not replace, the clinical decisionmaking needed to meet individual patient needs.		Maintain current step. Regular follow-up every 1–6 months. Consider step down if well controlled for at least 3 months.			Step up 1 step	Step up at least 1 step	Step up 1 step	Consider short course of oral systemic corticosteroids. Step up 1–2 steps. Reevaluate in 2 weeks to achieve control.		
					Reevaluate in 2–6 weeks to achieve control. For children 0–4 years, if no clear benefit observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.					
					Before step up in treatment: Review adherence to medication, inhaler technique, and environmental control. If alternative treatment was used, discontinue and use preferred treatment for that step. For side effects, consider alternative treatment options.					

* Abbreviations: ACQ, Asthma Control Questionnaire; ACT, Asthma Control Test™; ATAQ, Asthma Therapy Assessment Questionnaire; EIB, exercise-induced bronchospasm; FVC, forced vital capacity; FEV₁, forced expiratory volume in 1 second; SABA, short-acting beta₂-agonist.

† Minimal important difference: 1.0 for the ATAQ; 0.5 for the ACQ; not determined for the ACT.

‡ ACQ values of 0.76–1.4 are indeterminate regarding well-controlled asthma.

§ Data are insufficient to link frequencies of exacerbations with different levels of asthma control. Generally, more frequent and intense exacerbations (e.g., requiring urgent care, hospital or intensive care admission, and/or oral corticosteroids) indicate poorer asthma control.

Medications: Dosing for Long-term Control

ESTIMATED COMPARATIVE DAILY DOSAGES FOR INHALED CORTICOSTEROIDS

inhaled corticosteroids		0-4 years			5-11 years			12 years and older		
Dose in mcg unless otherwise indicated. Including common brand name and strengths available in US.	FDA approved age in years	low	medium	high	low	Medium	high	low	medium	high
Beclomethasone BAI Qvar Redihaler: 40 or 80 mcg		NA	NA	NA	80-160	>160-320	>320	100-200	>200-400	>400
	4+	4 years: 40-80 mcg BID			NAEPP 2007					
Budesonide (DPI) Pulmicort Flexhaler 90 or 180 mcg/ inhalation		NA	NA	NA	100-200	>200-400	>400	200-400	>400-800	>800
	6+				GINA 2018: 6-11 years					
Budesonide (nebules)		0.25- 0.5 mg	> 0.5- 1 mg	> 1 mg	0.5 mg	1 mg	2 mg	NA	NA	NA
		NAEPP 2007			NAEPP 2007					
Ciclesonide MDI Alvesco 80 or 160 mcg		NA	NA	NA	80	>80-160	>160	80-160	>160-320	>320
	12+				GINA 2018: 6-11 years					
Fluticasone propionate MDI Flovent 44, 110, 220 mcg		176	>176-352	>352	88-176	>176-352	>352	100-250	>250-500	>500
	4+	NAEPP 2007			NAEPP 2007					
Fluticasone propionate (DPI) Flovent Diskus 50, 100, 250 mcg		NA	NA	NA	100-200	>200-400	>400	100-250	>250-500	>500
	4+	4 years: 50 mcg bid			NAEPP 2007					
Armon Air 55, 113, 232 mcg	12+									
Fluticasone furoate (DPI) Arnuity 50, 100, 200 mcg		NA	NA	NA	*50	NA	NA	100	NA	200
	5+									
Mometasone furoate MDI Asmanex 100, 200 mcg		NA	NA	NA	NA	NA	NA		*400	*800
	12+									
Mometasone furoate (DPI) Asmanex Twisthaler 110, 220 mg		NA	NA	NA	110	≥220- <440	≥ 440	110-220	>220-440	>440
	4+	4 years: 110 mcg daily			GINA 2018: 6-11 years					

Key:

BAI: Breath Actuated Inhaler
DPI: Dry Powder Inhaler
MDI: Meter Dose Inhaler

Resources:

The National Asthma Education and Prevention Program (NAEPP) coordinated by the National Heart, Lung, and Blood Institute (NHLBI): Expert Panel Report 3 (EPR-3) Full Report 2007: Guidelines for the Diagnosis and Prevention of Asthma. Global Initiative for Asthma (GINA). 2018 GINA Report, Global Strategy for Asthma Management and Prevention. Retrieved from: <https://ginasthma.org>. Liu, A., Zeiger, R., Sorkness, C., Mahr, T., Ostrom, N., Burgess, S., Rosa, K., . . . Manjunath, R. (2007). Development and cross-sectional validation of the Childhood Asthma Control Test. Journal of Clinical Immunology, 119 (4). 817-825. Manufacturer Prescribing Information: Arnuity, Astmanex Twisthaler, Asmanex HFA, Flovent Diskus, Qvar Redihaler.

Medications: Dosing for Long-term Control

Combination Inhaled Corticosteroid (ICS) + Long acting beta 2 agonist (LABA) Controllers						
Generic name	Brand name	FDA age indications	Mode	strength	Usual dosing 12+ years	Under 12 dosing
Fluticasone propionate + salmeterol DPI	Advair Diskus	4+	DPI	100/50 or 250/50 or 500/50	1 puff twice a day	4-11 years: 100/50 1 puff BID
Fluticasone propionate + salmeterol MDI	Advair HFA	12+	MDI	45/21 or 115/21 or 230/21	2 puffs twice a day	
Fluticasone propionate + salmeterol DPI	Air Duo Respiclick and Teva generic	12+	DPI	55/14 or 113/14 or 232/14	1 puff twice a day	
Fluticasone furoate + vilanterol DPI	Breo Ellipta	18+	DPI	100/25 or 200/25	1 puff once a day	
Mometasone furoate + formoterol fumarate dihydrate HFA	Dulera HFA	12+	MDI	100/5 or 200/5	2 puffs twice a day	
Budesonide + formoterol fumarate dihydrate MDI	Symbicort HFA	6+	MDI	80/4.5 or 160/4.5	2 puffs twice a day	6-11 years: 80/4.5 2 puffs BID

LAMA: long acting muscarinis anatagonist (anticholinergic)- Controller					
Tiotropium bromide	Spiriva Respimat	6+	Soft mist	1.25 mcg	2 puffs once a day

Leukotriene Modifier (Controller)						
Montelukast	Singulair & generic	6 mo+	chewable, granules, tablet	4mg: 6mo-5yrs 5mg: 6-14 yrs 10mg: 15+ yrs	1 tablet or packet at bedtime	Prevention of EIB age 6+ years: give 2 hours before exercise

Medications for Relief and Exacerbation

Rescue Medications					
Generic name	Brand Name	Action	Mode	Strength	Usual dose
Albuterol HFA	ProAir, Ventolin, Proventil	SABA	MDI	90 mcg/puff	2 puffs q 4-6 hrs prn, or 2 puffs 15-30" before exercise
Albuterol DPI	ProAir Respiclick	SABA	DPI	90 mcg/puff	2 puffs q 4-6 hrs prn, or 2 puffs 15-30" before exercise
Albuterol	Albuterol neb	SABA	neb-single unit dose vial	1.25 mg or 2.5 mg	up to every 4-6 hours prn
Levalbuterol tartrate	Xopenex HFA	SABA	MDI	45 mcg/puff	2 puffs q 4-6 hrs prn, or 2 puffs 15-30" before exercise
Levalbuterol	Xopenex neb & generic	SABA	neb-single unit dose vial	0.31 mg, 0.63 mg, or 1.25 mg	up to every 6-8 hours prn
ipratropium bromide	Atrovent HFA	SAMA	MDI	21 mcg	2 puffs 4 times a day and prn
ipratropium bromide	Atrovent neb	SAMA	neb-single unit dose vial	0.5 mg	every 6-8 hours
ipratropium bromide + albuterol	Combivent Respimat	SAMA + SABA	Soft mist	20 mcg/100mcg	1 puff 4 times a day
ipratropium bromide + albuterol	DuoNeb	SAMA + SABA	neb-single unit dose vial	0.5/2.5 mg	up to every 4-6 hours prn or 4 times a day

Key:

- SABA: short acting beta 2 agonist - Reliever
- SAMA: short acting muscarinic antagonist (anticholinergic)- Reliever or controller
- BAI: Breath Actuated Inhaler
- DPI: Dry Powder Inhaler
- MDI: Meter Dose Inhaler
- HFA: hydrofluorokane

Systemic Steroids for treatment of exacerbations			
	0-4 years	5-11 years	12+ years
Methylprednisolone, Prednisolone or Prednisone	Short- course "burst": 1-2 mg/kg/day, maximum 60 mg daily for 3-10 days	Short- course "burst": 1-2 mg/kg/day, maximum 60 mg daily for 3-10 days	Short- course "burst": to achieve control, 40-60 mg daily as single or 2 divided doses for 3-10 days
Dexamethasone	0.6 mg/kg/daily for 2 doses has been reported to be as effective in children 1-14 years as a 5 day course of prednisone/prednisolone for acute asthma exacerbation.		

Source: Paniaqua, N., Lopez, R., Munoz, N., Tames, M., Mojica, E., Arana-Arri, E., Mintegi, S., & Benito, J. (2017). Randomized Trial of Dexamethasone Versus Prednisone for Children with Acute Asthma Exacerbations. The Journal of Pediatrics, 191, p. 19-196.e1. Retrieved from DOI: <https://doi.org/10.1016/j.jpeds.2017.08.030>

Recommended Treatment of Acute Exacerbation

- Administer inhaled albuterol 2.5 mg via nebulizer or albuterol HFA 2-8 puffs with a spacer or aerosol spray.
- May give one treatment as a combination nebulizer (DuoNeb) of Albuterol 2.5mg and Ipratropium (Atrovent) 0.5mg/ml
- Consider oral steroids prednisone 1-2 mg/kg/day not to exceed 60 mg/day for 3-5 days or dexamethasone 0.6 mg/kg/day x 1 -2 days. Consider IV or IM if unable to take oral medication.
- Up to three treatments via nebulizer or MDI may be given in the office.
- Refer to ED for more intensive care.

Other Considerations for Asthma Management

- Asthma Control Tests: Validated questionnaires to assess asthma control at every visit (C-ACT: children 4-11 and ACT: children 12 and older).
- Written Asthma Action Plan: All patients should have a plan for home, school, daycare and babysitters.
- Spirometry (5 years and older): Should be performed upon diagnosis and every 1 to 2 years.
- Vaccinations: Yearly influenza vaccine starting at age 6 months and older.
- Follow up Visits: Initial follow-up in 2-6 weeks, depending on severity. Regular visits q 1-6 months to assess asthma control with history or a validated questionnaire i.e. Asthma Control Test, review and revise AAP and medication, provide education.
- Treatment for co-morbid conditions: obesity, allergic rhinitis, GERD, anxiety and depression, food allergy, sinusitis, nasal polyps
- Consider skin or IgE-specific testing.

Treatment for Exercise-induced Bronchoconstriction (EIB)

Prevention of Exercise-induced Bronchoconstriction:

- Encourage physical activity. The majority of children with EIB should be able to participate in any activity that they choose.
- For children with cold-induced EIB, encourage a warm-up period. Wearing a mask or scarf over the mouth may also be helpful.
- Teach patients to take the appropriate medications before vigorous activity:
 - 2-4 puffs short-acting beta2-agonist 5-60 minutes before exercise
 - Cromolyn or Nedocromil before exercise may also be protective.
- Consider other etiology in children with EIB who show no improvement from pretreating with SABAs. Vocal cord dysfunction is often provoked by exercise and can be mistaken as EIB.
- Long-acting beta-agonists (LABAs) are not recommended for EIB prevention as this may disguise poorly controlled asthma.

Consider long term control medication as EIB is often a sign of inadequate asthma control.

- May respond well to regular anti-inflammatory therapy
- 50% of patients respond to Leukotriene modifiers

Investigating Poorly Controlled Asthma Consider

Inhaler technique Compare patient's actual technique to recommended optimal technique and correct errors.



Adherence Assess adherence to prescribed treatment and identify barriers to adherence (cost, convenience, patient level of health literacy).



Risk factors & Co-morbidities Evaluate for co-morbidities such as:

- allergic rhinitis
- allergic bronchopulmonary aspergillosis
- gastroesophageal reflux symptoms
- obesity, stress & depression
- obstructive sleep apnea
- sinusitis



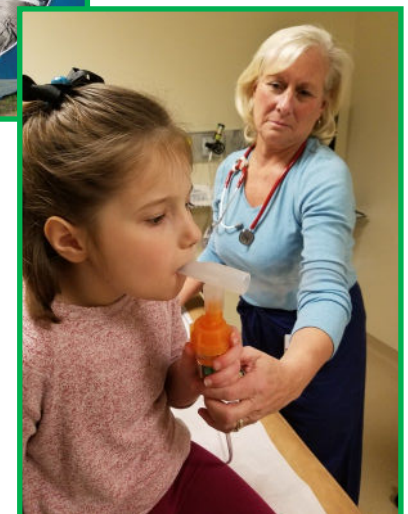
Check for risk factors including:

- smoking/exposure to second or third-hand cigarette smoke, vaping, marijuana, wood burning stove or fireplace
- pets
- allergen exposures
- certain medicines (NSAIDS or beta-blockers)



Patient/Family Education

- Determine and control asthma triggers
 - allergens
 - airway irritants: tobacco smoke, vaping, marijuana smoke
 - exercise
 - pollutants
 - viral illness
- Ongoing education
 - share basic facts of asthma and how to manage
 - review medication and technique
 - have patients >6 years of age and family members demonstrate MDI/spacer technique
 - provide information about triggers and avoidance
 - HCP resource: www.nhlbi.nih.gov/sites/default/files/media/docs/asthgdln_1.pdf
- Review **Asthma Action Plan** at every visit
- Use following pages to educate patients about inhaler usage—
copy and distribute as published



Using Inhalers

METERED DOSE INHALER—MDI (examples include Proair HFA, Flovent HFA)

- Shake the inhaler well.
- The inhaler should be held with the mouthpiece down.
- Remove the inhaler cap.
- Attach a spacer with either a mask or mouthpiece depending on age of patient.
- Spacer with mouthpiece (typically 5-6 years and older).
 - Remove the cap of the spacer
 - Breathe out fully through your mouth.
 - Place the mouthpiece in your mouth and seal your lips.
 - Push down the top of the canister and breathe in deep and hold for 10 seconds.
 - If you hear a whistle sound, you are breathing in too fast.
 - Wait one minute in between inhalations, if your provider ordered 2 puffs.
- Spacer with a mask
 - Have the child sit up straight or stand. Place the mask over the child's mouth and nose firmly so no air can escape.
 - Push down the top of the canister and watch your child BREATHE IN AND OUT NORMALLY for 6 breaths. There should be a flap in the spacer that will move each time a breath is taken. Do not remove the mask until the sixth breath is completed.
 - Remove the mask from your child's face.
 - Wait one minute in between inhalations, if your provider ordered 2 puffs.

QVAR RediHaler

- OPEN:
 - Open the white cap (do not open the white cap until you are ready to take your inhalation).
 - Breathe out fully (Never breathe out into the inhaler mouthpiece).
- INHALE:
 - Place the mouthpiece into your mouth and close your lips around it so you form a good seal.
 - Inhale deeply to release the medication.
 - Remove inhaler and hold your breath for 5-10 seconds. Breathe out slowly away from the inhaler.
- CLOSE THE WHITE CAP
- Repeat the steps if you need to take a second puff.



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Using Inhalers

DISKUS (examples include Advair, Flovent)

- Do not shake the Diskus.
- Hold the diskus in your left hand and place the thumb of your right hand in the thumb grip.
- Push the thumb grip away from you as far as it will go until the mouthpiece shows and snaps into place.
- Hold the diskus in a level, flat position with the mouthpiece facing you.
- Slide the lever until you hear a click. The dose counter will go down by 1. Do not tilt the diskus once dose is loaded.
- Exhale completely, away from the mouthpiece so you do not blow the dose into the device.
- Put the mouthpiece to your lips creating a tight seal. Breathe in quickly and deeply through the Diskus. Do not breathe through your nose.
- Hold your breath for 10 seconds or as long as comfortable. Breathe out slowly. You may not taste or feel the very fine powder. Do not take another dose even if you did not taste or feel the medicine.
- Place your thumb in the thumb grip and slide it back towards you as far as it will go. Make sure the Diskus clicks shut and you cannot see the mouthpiece.
- Rinse your mouth after taking in the medicine.

ELLIPTA (examples include Arnuity, Breo)

- Do not shake Ellipta.
- Slide the cover down until a click is heard.
- Breathe out gently away from inhaler.
- Put the mouthpiece in mouth and close lips to form a good seal. Do not block air vent with fingers. Breathe in steadily and deeply. Hold your breath for 5 seconds or as long as comfortable.
- Remove inhaler from mouth while holding breath.
- Breathe out gently, away from inhaler.
- Slide the cover upwards as far as it will go, to cover the mouthpiece.
- Rinse your mouth after taking in the medicine.

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Using Inhalers

ASMANEX TWISTHALER

- Hold the inhaler straight up with the colored portion on the bottom.
- Hold the colored portion, twist the cap in a counterclockwise direction to remove it. This loads your dose automatically when you remove the cap.
- Turn your head away from the inhaler and exhale fully.
- Put the mouthpiece in your mouth with your lips forming a tight seal.
- Breathe in steadily and deeply as you can.
- Remove the inhaler from your mouth while holding your breath for 5-10 seconds.
- Do not breathe out into the inhaler.
- Replace the cap all the way.
- If you take two puffs, wait 30 seconds and repeat steps.
- Rinse your mouth after taking Asmanex.

RESPIMAT (examples include Spiriva, Combivent)

- Do not shake the RespiMat. Prepare the inhaler per manufacturer instructions. Keep the cap closed.
- **Turn**: the clear base in the direction of the arrows on the label until it clicks (half a turn).
- **Open**: the cap until it snaps fully open.
- **Press**: Breathe out slowly and fully. Close your lips around the mouthpiece without covering the air vents. Point the inhaler to the back of your throat. While taking a slow, deep breath through your mouth,
- **Press** the dose-release button and continue to breathe in. Hold your breath for 10 seconds or for as long as comfortable.
- Repeat **Turn, Open, Press (TOP)** for a total of 2 puffs.
- Close the cap until you use your inhaler again.

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