

Evaluation and management of asthma

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Disclosures

- ❑ I do not have any relevant financial or commercial interests to disclose.
- ❑ I do not intend to discuss an unapproved or investigative use of a commercial product/device in my presentation.



Learning objectives

- ❑ Evaluation and management of exercise-induced bronchospasm
- ❑ Evaluation and management of vocal cord dysfunction
- ❑ Evaluation and management of asthma
 - ❑ Classifying intermittent versus persistent asthma based on severity and control in children, adolescents and adults
 - ❑ SMART (single maintenance and reliever therapy)



Clinical Case #1

- ❑ 16 year old athletic female with diagnosis of asthma
- ❑ Started ICS in 6th grade
- ❑ Presents to clinic for an initial visit and reports symptoms of shortness of breath and chest tightness with physical activity
- ❑ Reports pretreating with albuterol prior to physical activity and reports minimal improvement of symptoms



Clinical Case #2

- ❑ 5 yo female with diagnosis of mild persistent asthma
- ❑ Started on ICS a few months ago with marginal improvement in symptoms
- ❑ Parents report use of nebulized albuterol and albuterol HFA multiple times per week for productive cough and wheeze



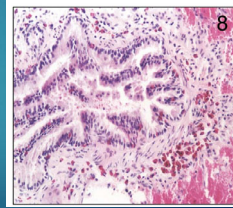
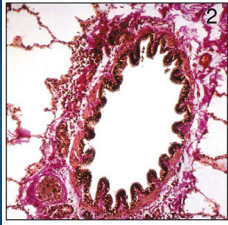
Clinical Case #3

- ❑ 12 yo male with diagnosis of severe persistent asthma
- ❑ Dx with asthma at 18 months by Pulmonology
- ❑ Typically requires 3-4 courses of systemic steroids yearly and reports prior hospitalization
- ❑ On high-dose ICS/LABA; has been on ICS since 18 months old



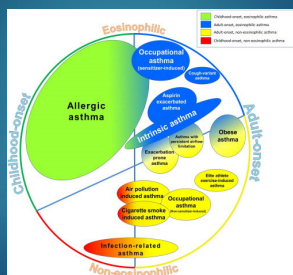
Asthma is characterized by airway inflammation and smooth muscle hyper-reactivity

Sputum, Spasm, & Swelling



Slide courtesy: Dr. Michelle Hernandez

Types of Asthma

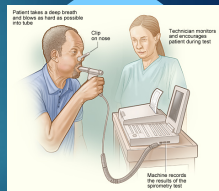


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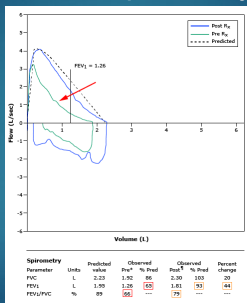
Asthma Diagnosis: Objective Testing

- ❑ Pulmonary Function Test
 - ❑ Obstructive pattern noted in patients with asthma
 - ❑ Albuterol challenge pre- and post-PFT to determine reversibility
- ❑ Bronchoprovocation
 - ❑ Methacholine challenge
 - ❑ Exercise challenge
 - ❑ Eucapnic voluntary hyperpnea (for athletes): breathing cold dry air x 6 min
- ❑ CXR



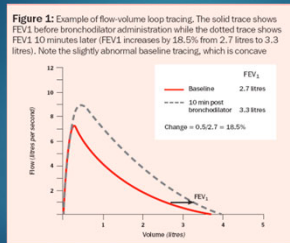
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Obstructive defect on spirometry in a child



<https://www.uptodate.com/contents/se>

Positive bronchodilator challenge in asthma



**Increase FEV1 or FVC (ATS) 12% with increase 200 ml

**Increase FEF 25-75% of 20-25%

Slide courtesy: Dr. Michelle Hernandez

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Exercise-induced bronchoconstriction (EIB)

- Acute onset of bronchoconstriction occurring during or immediately after exercise
- Approximately 5-20% of the general population
- Up to 90% of patients with symptomatic asthma have some degree of EIB
- The magnitude of EIB is most strongly correlated with the underlying degree of airway hyperresponsiveness and the presence of eosinophilic airway inflammation
- Many patients with mild intermittent asthma do not experience clinically significant bronchoconstriction even with strenuous exercise

Slide courtesy: Dr. Michelle Hernandez

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Who and why?

- ❑ High endurance sports: swimming, cycling, triathlon and rowing
- ❑ Low endurance sports: gymnastics and sailing
- ❑ Minute ventilation (TV x RR) increases with exercise
 - ❑ Large volume of relatively cool, dry air inhaled during vigorous activity
 - ❑ Inspired gas is more fully humidified and closer to body temperature
- ❑ Probably airway dehydration as a result of increased ventilation → increased osmolality of airway lining fluid → inflammation
- ❑ Numerous bronchoconstrictive & inflammatory mediators are secreted
 - ❑ Leukotrienes, histamine, interleukin-8, activation of Th2 lymphocytes

Slide courtesy: Dr. Michelle Hernandez



Clinical characteristics

- ❑ Initial bronchodilation during the first 6-8 minutes of exercise followed by bronchoconstriction
- ❑ Begins 3 minutes after exercise, peaks within 10-15 minutes and resolves by 60 minutes
- ❑ Typical symptoms: shortness of breath, chest tightness and cough
- ❑ Allergic Asthma patients:
 - ❑ more likely when exercise includes exposure to the relevant allergen



Image from: <https://my.clevelandclinic.org/health/diseases/22620-bronchoaspm>



Differential Diagnosis

- ❑ Central airway obstruction
 - ❑ Ex: Double aortic arch and subglottic cysts
- ❑ Vocal cord dysfunction
- ❑ Exercise-induced laryngomalacia
- ❑ Exercise-induced anaphylaxis
- ❑ Exercise-associated reflux
- ❑ CV disease (arrhythmias)

Slide courtesy: Dr. Michelle Hernandez



Diagnosis

- ❑ Combination of compatible clinical symptoms (eg, exercise-related symptoms of dyspnea, cough or wheeze)
- ❑ AND demonstration of reversible airflow limitation in response to exercise or a surrogate challenge
- ❑ Don't need exercise testing in patients with well-documented asthma and typical asthma symptoms following exercise
 - ❑ exception: if have limited improvement with albuterol



Slide courtesy: Dr. Michelle Hernandez

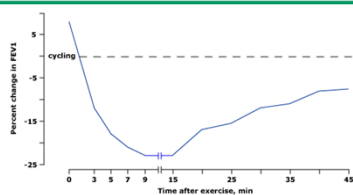
Exercise Challenge

- ❑ An exercise challenge test is the most direct and preferred way to establish a diagnosis of EIB
- ❑ Usually involves 6 -10 minutes of treadmill exercise
 - ❑ Goal: Raise the heart rate to 80-90% of the predicted maximum
 - ❑ Maximum Predicted Heart Rate: 220-age
- ❑ What is a positive test
 - ❑ Drop in $FEV_1 \geq 10\%$



Slide courtesy: Dr. Michelle Hernandez

Exercise-induced bronchoconstriction



The time course of exercise-induced bronchoconstriction in an asthmatic patient in whom the FEV_1 fell by more than 20 percent after cycling.
 FEV_1 : forced expiratory volume in one second.

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EIB Management

- ❑ DO NOT avoid exercise
- ❑ Nonpharmacologic measures
- ❑ Reduce the magnitude of minute ventilation (TV X RR)
 - ❑ Improving a patient's CV fitness reduces the minute ventilation required for a given level of exercise
- ❑ Increase the temperature and humidity of the inspired air
 - ❑ breathe through a loosely fitting scarf or mask when exercising in cold, dry conditions
- ❑ Allergic asthma
- ❑ Avoiding air pollution

Slide courtesy: Dr. Michelle Hernandez



Pharmacologic measures

- ❑ **Prevention**
 - ❑ 2 puffs of albuterol 15-20 minutes prior to exercise
 - ❑ Improved control of underlying asthma
 - ❑ ICS ± LABA
 - ❑ Leukotriene Receptor Antagonists
- ❑ **Acute Treatment**
 - ❑ Albuterol 2-4 puffs

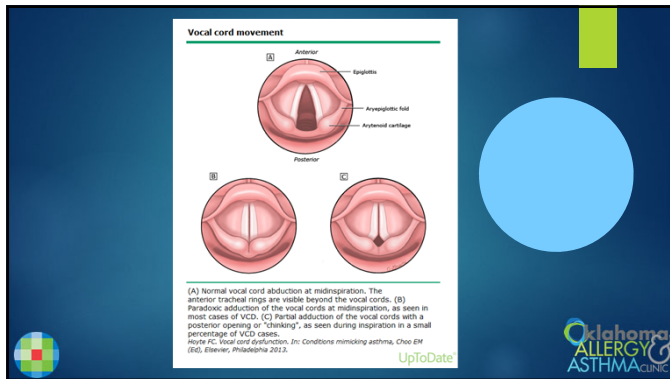
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Vocal cord dysfunction

- ❑ Inspiratory stridor accompanied by respiratory distress
- ❑ Symptoms: throat and upper chest tightness, throat clearing, dizziness, anxiousness, a choking sensation, sensation of not being able to breath, noisy breathing or stridor when breathing in, dysphonia and cough
- ❑ Onset of symptoms may be spontaneous or associated with triggers such as exercise, irritant exposure or anxiety
- ❑ Albuterol has minimal to no beneficial effect





What exacerbates VCD

- ❑ Asthma
- ❑ Exercise
- ❑ Irritants
 - ❑ Smoking
 - ❑ Air pollution
 - ❑ Perfumes and odors
- ❑ Upper respiratory infection
- ❑ Gastroesophageal reflux
- ❑ Psychosocial disorders and stress

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VCD diagnosis

- ❑ Pulmonary function test
 - ❑ Flattening of the inspiratory loop
- ❑ Exercise testing
- ❑ Laryngoscopy can be performed immediately after exertion, when symptomatic


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Image courtesy: <https://www.aafp.org/pubs/afp/issues/2010/0115/p156.html>

VCD management


- ❑ Acute episode:
 - ❑ Reassurance and supportive care until the episode spontaneously resolves
 - ❑ Asking patients to pant can sometimes abort an episode
 - ❑ Use of continuous positive airway pressure (CPAP) exercise
- ❑ Prevention:
 - ❑ Behavioral speech/voice therapy –help the patient regain laryngeal control
 - ❑ Vocal hygiene

Slide courtesy: Dr. Michelle Hernandez




VCD breathing exercises

- ❑ **Paused breathing**
 - ❑ Sit in a position that allows your neck & shoulders to relax but keep your back straight.
 - ❑ Breathe in gently through the nose.
 - ❑ Stick your tongue out of your mouth, past the teeth & lower lip, in preparation to exhale. This forward stretch of the tongue helps to open the airway at the vocal cords. This may be difficult to do with a severe spasm but will be easier the more you repeat this exercise.
 - ❑ With the tongue out, exhale only through the mouth in slow, paused or spaced breaths. The timing should be like saying Ha, Ha, Ha, Ha, very slowly. Don't use your voice, just breathe out
 - ❑ Repeat 10 times and practice 3 times a day so you will know how to do it well when VCD occurs.



VCD breathing exercises

- ❑ **Belly breathing**
 - ❑ Sit in a position that allows your neck and shoulder to relax but keep your back straight.
 - ❑ Place your hand on your belly. Breathe in gently through the nose with your belly pushing your hand outward from your body.
 - ❑ As you start to exhale, place the tip of your tongue where your upper teeth meet the roof of your mouth. This will allow you to make a hissing or "S" sound as you exhale. This creates a back pressure to help keep the airway open.
 - ❑ Slowly exhale allowing the hand & belly to move inward to a resting position and make the hissing or "S" sound as you push the air between your tongue & teeth.



Clinical Case #1

- ❑ 16 year old athletic female with diagnosis of asthma
- ❑ Symptoms: shortness of breath (difficulty getting air in)
- ❑ Allergy testing: positive to ragweed, dust mite
- ❑ Spirometry: no evidence of obstruction but with flattening of the inspiratory loop
- ❑ Therapy: started breathing exercises/speech therapy with improvement in symptoms



Clinical Case #2

- ❑ 5 yo female with diagnosis of mild persistent asthma
- ❑ Started on ICS a few months ago with marginal improvement in symptoms
- ❑ Parents report use of nebulized albuterol and albuterol HFA multiple times per week for productive cough
- ❑ Prior to onset of cough was diagnosed with rhinovirus and previously did not have respiratory symptoms
- ❑ Deny parental history of asthma, personal history of allergic rhinitis, eczema or food allergy
- ❑ She was treated with a 21 day course of Augmentin for presumed chronic sinusitis and symptoms resolved



Clinical Case #3

- ❑ 12 yo male with diagnosis of severe persistent asthma
- ❑ Dx with asthma at 18 months by Pulmonology
- ❑ Typically requires 3-4 courses of systemic steroids yearly
- ❑ Family has 2 inside dogs
- ❑ On high-dose ICS/LABA; has been on ICS since 18 months old
- ❑ Spirometry showed moderate-to-severe obstruction with improvement after bronchodilator



What's next?

- Check adherence and evaluate technique
- Call pharmacy to confirm patient has filled prescriptions
- Do they have a spacer?
- If adherence and technique are good, then step-up asthma therapy
- Consider Spiriva 1.25 mcg 2 puffs daily
- Consider montelukast 5 mg daily
 - Discuss black box warning
- Follow-up in 4-6 weeks to assess control
- If well-controlled, proceed with allergy testing
- If not well-controlled at follow-up visit, then obtain CBC with differential (evaluate eosinophilia), total IgE level and comprehensive environmental panel to determine eligibility for biologic
 - Bridge to SCIT
- Once asthma is well controlled, allergen immunotherapy will be started



Asthma assessment

- Good asthma control criteria
- Symptoms of asthma requiring quick-reliever medication ≤ 2 days per week
- Night-time awakenings no more than two nights per month
- Lung function (PEF or FEV1) within the normal range (or within 20 percent of the patient's personal best value)
- No more than one exacerbation in the past year requiring urgent care and/or oral glucocorticoids
- Lung function



Asthma control

Components of Control		Classification of Asthma Control (Children 0-4 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	<2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	<1/month	>1/month	>1x/week
	Interference with normal activity	None	Some limitation	Extremely limited
Risk	Quick-relief beta ₂ -agonist use for symptom control (not prevention of EBB)	<2 days/week	>2 days/week	Several times per day
	Exacerbations requiring oral corticosteroids	0-1/year	2-3/year	>3/year
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and persistent. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		

Components of Control		Classification of Asthma Control (Children 5-11 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	<2 days/week but not more than once in each day	>2 days/week or multiple times on >2 days/week	Throughout the day
	Nighttime awakenings	<1/month	>1/month	>2x/week
	Interference with normal activity	None	Some limitation	Extremely limited
Risk	Quick-relief beta ₂ -agonist use for symptom control (not prevention of EBB)	<2 days/week	>2 days/week	Several times per day
	Exacerbations requiring oral corticosteroids	<60% predicted/prevalent rate	>60% predicted/prevalent rate	>60% predicted/prevalent rate
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and persistent. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.		



Asthma control

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	≤2/month	≥3-4/month	≥4/month
	Interference with normal activity	None	Some limitation	Extremely limited
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EBB)	≤2 days/week	≥2 days/week	Several times per day
	PEV, or peak flow	≥80% predicted/ personal best	60-80% predicted/ personal best	<60% predicted/ personal best
Risk	Validated questionnaires	A1/G2 A2/G3	A3/G4 A4/G5	A5/G6 A6/G7
	Exacerbations requiring oral systemic corticosteroids	0-1/year	≥2/year	≥3/year (see note)
Recommended Action for Treatment (see Figure 4-5 for treatment steps)		Consider severity and internal risks for exacerbation		

*ACQ values of 0.75-1.4 are indeterminate regarding well-controlled asthma.

Key: EBB, exercise-induced bronchospasm; G2, intensive care unit.

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Image from: <https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/A1937/>

Asthma control NOT achieved

- Address the impairment domain
 - Patient adherence and technique
 - Coexisting conditions (sinusitis), new or increased exposure to allergens or irritants, psychosocial problems
 - Alternative diagnosis: vocal cord dysfunction
- Address the risk domain
 - adherence, environmental exposures and exacerbations

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<https://www.ncbi.nlm.nih.gov/books/NBK7229/>

Asthma severity

Components of Severity		Classification of Asthma Severity (0-4 years of age)			
		Intermittent	Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	≥2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	0	1-2/month	3-4/month	≥1/week
	Short-acting beta ₂ -agonist use for symptom control (not prevention of EBB)	≤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
	Exacerbations requiring oral systemic corticosteroids	0-1/year	≥2 exacerbations in 6 months requiring oral systemic corticosteroids, or ≥4 exacerbations (any severity) per year	≥1 day AND risk factors for persistent asthma	≥1 day AND risk factors for persistent asthma
Recommended Step for Initiating Therapy (see Figure 4-1a for treatment steps)		Step 1	Step 2	Step 3	Step 4

Key: EBB, exercise-induced bronchospasm

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Image from: <https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/A1937/>

Asthma severity

Assessing severity and initiating therapy in children who are not currently taking long-term control medication

Components of Severity		Classification of Asthma Severity (5-11 years of age)			
		Intermittent	Mild	Moderate	Severe
Symptoms	Symptoms	<2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	<2/months	2-4/months	>4/months but not nightly	Often >4/months
Impairment	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	<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	Normal FEV ₁ , between exacerbations	• FEV ₁ > 80% predicted	• FEV ₁ > 80% predicted	• FEV ₁ > 80-90% predicted	• FEV ₁ < 80% predicted
	• FEV ₁ > 80% predicted	• FEV ₁ > 80% predicted	• FEV ₁ > 80-90% predicted	• FEV ₁ < 80% predicted	• FEV ₁ < 80% predicted
Risk	Exacerbations requiring oral corticosteroids	0-1/year (see note)	1-2/year (see note)	3-4/year (see note)	5 or more/year (see note)
	Frequency and severity may indicate the severity category	Annual risk of exacerbations may be related to FEV ₁			
Recommended Step for Initiating Therapy (See Figure 4-1b for treatment steps.)		Step 1	Step 2	Step 3	Step 4 or 5

Key: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second; PFC, forced vital capacity; ICU, intensive care unit.

<https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/41937/>

Asthma severity

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	Mild	Moderate	Severe
Symptoms	Symptoms	<2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	<2/months	2-4/months	>4/months but not nightly	Often >4/months
Impairment	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	<2 days/week	>2 days/week but not daily, and not on an as-needed basis	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 > 80% predicted	• FEV ₁ > 80-90% predicted	• FEV ₁ < 80% predicted
	• FEV ₁ > 80% predicted	• FEV ₁ > 80% predicted	• FEV ₁ > 80-90% predicted	• FEV ₁ < 80% predicted	• FEV ₁ < 80% predicted
Risk	Exacerbations requiring oral corticosteroids	0-1/year (see note)	1-2/year (see note)	3-4/year (see note)	5 or more/year (see note)
	Frequency and severity may indicate the severity category	Annual risk of exacerbations may be related to FEV ₁			
Recommended Step for Initiating Treatment (See Figure 4-5 for treatment steps.)		Step 1	Step 2	Step 3	Step 4 or 5

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

<https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/41937/>

Long-term control therapy in children 0-4 years

- ≥ 4 episodes of wheezing in the past year that lasted > 1 day and affected sleep
- AND who have either one of the following:
 - parental history of asthma, physician's 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
- To reduce impairment in those who consistently require symptomatic treatment > 2 days per week for a period of > 4 weeks
- To reduce risk in those with 2 exacerbations requiring systemic corticosteroids within 6 months
- During periods, or seasons, of previously documented risk for a child

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>

Which asthma therapy should be started first?

- ❑ ICS preferred therapy
- ❑ FDA approved therapies
 - ❑ ICS budesonide nebulizer solution (children 1-8 yo)
 - ❑ ICS fluticasone DPI (children > 4 yo)
 - ❑ Salmeterol and combination product (salmeterol + fluticasone) DPI (children > 4 yo)
 - ❑ Montelukast 4 mg chewable tablet (children 2-6 yo) and 4 mg granules (children ≥ 1 yo)
- ❑ Reassess in 3 months and if improved consider step down therapy
- ❑ ****Administration of an ICS early in the course of the disease will not alter the underlying progression of the disease**



<https://www.ncbi.nlm.nih.gov/books/NBK7229/>

When to refer to an Allergist?

- ❑ Difficulties achieving or maintaining control of asthma
- ❑ A child 0-4 years old requires step 3 care or higher (step 4 care or higher for children 5-11 years old) to achieve or maintain control
- ❑ Patient has an exacerbation requiring hospitalization
- ❑ Immunotherapy is considered; additional tests are indicated to determine role of allergy
- ❑ Referral may be considered if child 0-4 years old requires step 2 care or a child 5-11 years old requires step 3 care



<https://www.ncbi.nlm.nih.gov/books/NBK7229/>

Estimated comparative daily dosages for ICS

Drug	Low Daily Dose		Medium Daily Dose		High Daily Dose	
	Child 0-4	Child 5-11	Child 0-4	Child 5-11	Child 0-4	Child 5-11
Beclometasone HFA	40 or 80 mcg/buff	NA	80-160 mcg	NA	>160-320 mcg	NA
Budesonide DPI	90, 180, or 230 mcg/inhalation	NA	180-400 mcg	NA	>400-800 mcg	NA
Budesonide Nebulizer	0.25-0.5 mg	0.5 mg	>0.5-1.0 mg	1.0 mg	>1.0 mg	2.0 mg
Fluticasone DPI	230 mcg/buff	NA	800-150 mcg	NA	>1500-1200 mcg	NA
Fluticasone HFA	40 mcg/buff	NA	160 mcg	NA	320 mcg	NA
Fluticasone HFA MDI	44, 110, or 220 mcg/buff	176 mcg	88-176 mcg	>176-352 mcg	>352 mcg	>352 mcg
Fluticasone DPI	90, 180, or 230 mcg/inhalation	NA	100-200 mcg	>200-400 mcg	NA	>400 mcg
Montelukast DPI	200 mcg/inhalation	NA	NA	NA	NA	NA
Triamcinolone acetonide	75 mcg/buff	NA	300-400 mcg	NA	>400-600 mcg	NA

Key: HFA, hydrofluoroalkane; NA, not approved and no data available for this age group.



<https://www.aacpi.org/>

Intermittent asthma (children 0-11 yo)

- ❑ If mild symptoms, recommend use of SABA (every 4-6 hours for 24 hours) as needed
- ❑ If therapy needs to be repeated more than once every 6 weeks, consider step-up
- ❑ If a viral respiratory infection causes a moderate-to-severe exacerbation, a short course of oral systemic corticosteroids should be considered
- ❑ If a viral respiratory infection causes a severe exacerbation, consider starting oral steroids at the start of illness
- ❑ **close monitoring required— if ≥ 2 exacerbations within 6 months with symptoms in between, the child would likely benefit from daily controller therapy

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



Persistent asthma (children 0-4 yo) Step 1-2

- ❑ Children with ≥ 4 wheezing episodes in 1 year and risk factors for persistent asthma, benefit from daily long-term therapy
- ❑ Consider if there is a second exacerbation requiring OCS in 6 months or children who consistently require symptomatic treatment > 2 days a week for > 4 weeks
- ❑ Consider OCS for patients with exacerbation when long-term control therapy is started or in patients who have moderate-to-severe asthma
- ❑ Close monitoring necessary; follow-up in 4-6 weeks and if no improvement change therapy or consider alternative diagnosis
- ❑ If improvement for at least 3 months, then step down therapy

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



Persistent asthma (children 0-4 yo) Step 3-6

- ❑ Step 3
 - ❑ medium-dose ICS
- ❑ Step 4
 - ❑ medium-dose ICS + either LABA or montelukast
- ❑ Step 5
 - ❑ High-dose ICS AND either LABA or montelukast
- ❑ Step 6
 - ❑ High-dose ICS AND either LABA or montelukast AND oral systemic corticosteroids

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



Persistent asthma (children 5-11 yo) Step 1

- ❑ Daily long-term control medication
- ❑ SABA as needed to relieve symptoms
 - ❑ If needed > 2 days/week indicates need to step-up therapy
- ❑ Consider OCS for patients with exacerbation when long-term control therapy is started or in patients who have moderate-to-severe asthma
- ❑ Consider daily therapy only during specific periods of previously documented risk
- ❑ Consider treating patients with ≥ 2 exacerbations requiring OCS in the past year

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



Persistent asthma (children 5-11 yo) Step 2

- ❑ Daily low-dose ICS
- ❑ Alternative therapies include leukotriene receptor antagonist
 - ❑ Preferred montelukast (discuss black box warning)
 - ❑ Less likely to respond as favorably if they have lower lung function and/or higher markers of allergic airway information

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



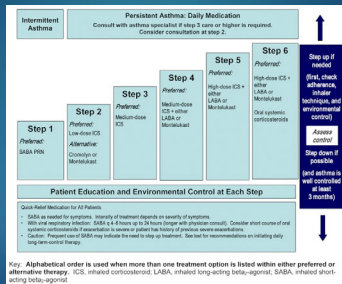
Persistent asthma (children 5-11 yo) Step 3-6

- ❑ Step 3
 - ❑ low-dose ICS plus some form of adjunctive therapy (LABA, LTRA) or medium-dose ICS
 - ❑ Masoli et al. 2004- dose-response to fluticasone propionate plateaus between 100-200 mcg/day
- ❑ Step 4
 - ❑ medium-dose ICS + either LABA or montelukast
- ❑ Step 5
 - ❑ High-dose ICS + LABA (not preferred: + montelukast)
- ❑ Step 6
 - ❑ High-dose ICS + LABA + oral systemic corticosteroids (not preferred: + montelukast)
 - ❑ Long-term OCS

<https://www.ncbi.nlm.nih.gov/books/NBK7229/>



Asthma therapy based on severity



<https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/A1937/>



Intermittent asthma (≥12 yo) Step 1

- ❑ SABA as needed
- ❑ EIB— SABA shortly before physical activity
- ❑ If mild symptoms, use SABA as needed
 - ❑ If SABA (every 4-6 hours for 24 hours) must be repeated more than once every 6 weeks, a step up in long-term care is recommended.
- ❑ If a viral respiratory infection results in a moderate-to-severe exacerbation, consider OCS
- ❑ If a viral respiratory infection resulted in severe exacerbation, consider OCS at first sign of infection

<https://www.ncbi.nlm.nih.gov/books/NBK7222/>



Persistent asthma (≥ 12 yo) Step 2

- ❑ Daily low-dose ICS
- ❑ Alternative therapy: LTRA

<https://www.ncbi.nlm.nih.gov/books/NBK7222/>



Persistent asthma (≥ 12 yo) Step 3-6

- ❑ Step 3
 - ❑ Add LABA to a low-dose ICS OR increase to medium-dose ICS
 - ❑ Alternative therapy: add LTRA
 - ❑ Review inhaler technique and adherence prior to increasing therapy
 - ❑ Environmental factor and consider specialist referral
- ❑ Step 4
 - ❑ medium-dose ICS AND add LABA
 - ❑ Alternative therapy: add LTRA
- ❑ Step 5
 - ❑ High-dose ICS AND LABA
 - ❑ Omalizumab
- ❑ Step 6
 - ❑ Step 5 + OCS

<https://www.ncbi.nlm.nih.gov/books/NBK7222/>



Symbicort in intermittent asthma management

- ❑ Symbicort 80-4.5 mcg or Symbicort 160-4.5 mcg 1-2 puffs with spacer every 4 hours as needed
- ❑ May administer up to 2 inhalations every 20 minutes for 3 doses
- ❑ Maximum dose: 6 inhalations/exacerbation



SMART in pediatric (12-17 years) asthma management

- ❑ Maintenance therapy: 1-2 puffs twice daily or 2 puffs twice daily
- ❑ Reliever therapy: 1 additional inhalation as needed (maximum 8 inhalations/day)
- ❑ Recommend patients ≥ 12 years old for steps 3 and 4



SMART in adult asthma management

- SMART (single maintenance and reliever therapy)
 - The onset of action of formoterol is as rapid as albuterol with a longer duration of action
 - Symbicort 80-4.5 mcg 2 inhalations twice daily (maximum dose: 12 inhalations/day (including reliever therapy))
 - Same dosing as Symbicort 160-4.5 mcg
 - Maximum 12 puffs per day (controller + reliever)



<https://www.jaci-inpractice.org/action/showPdf?pii=S2213-2198%2821%2901128-4>



Asthma Management Plan

GREEN ZONE

Child is **DOING WELL**. No cough and no wheezing. Child is able to do usual activities.

Continue daily asthma medications as previously prescribed

Exercise

2 puffs of albuterol 15-20 minutes prior to physical activity

YELLOW ZONE

Asthma is **GETTING WORSE**. Starting to cough, wheeze, or feel short of breath. Waking at night because of asthma. Can do some activities.

1st Step - Take Quick Relief medicine below. If possible, remove the child from the thing that made the asthma worse.
Albuterol 2-4 puffs every 4-6 hours as needed with spacer

OR

Symbicort 1-2 puffs every 4-6 hours as needed with spacer

RED ZONE

Asthma is **VERY BAD**. Coughing all the time. Short of breath. Trouble talking, walking or playing.

1st Step - Take Quick Relief medicine below:

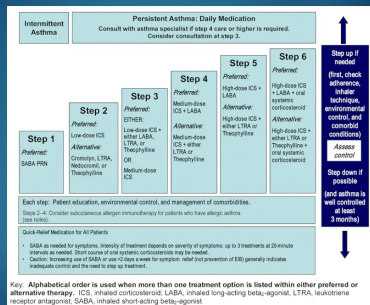
Albuterol 4-6 puffs with spacer

You may repeat this every 20 minutes for a **total of 3 doses.**

2nd Step - Call 911 or go to the Emergency Department if the medications are not working.



Asthma therapy based on severity



<https://www.ncbi.nlm.nih.gov/books/NBK7229/figure/A1937/>



When should a provider see a patient for follow-up and step-down asthma therapy?

- Follow-up visits: 1- to 6- month intervals, depending on the level of control
- Consider a 3-month interval if possible to step-down therapy
 - Reduced by 25-50% every 3 months to the lowest dose possible

<https://www.ncbi.nlm.nih.gov/books/NBK7222/>



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THANK YOU



QUESTIONS?

Image courtesy: <https://www.health.harvard.edu/blog/antibiotics-dont-speed-recovery-asthma-attacks-2017010410941>