Pediatric Asthma Evaluation & Management

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Asthma is a:

- A. Greek word meaning "panting"
- B. Latin word meaning "wheezing"
- C. Egyptian word meaning "difficulty breathing"
- D. Hebrew word meaning "chest congestion"

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Definition of Asthma

A *chronic* inflammatory disease of the airways with the following clinical features:

- Episodic and/or chronic symptoms of airway obstruction
- Bronchial hyperresponsiveness to triggers
- Evidence of at least partial reversibility of the airway obstruction
- Alternative diagnoses are excluded

Child-Onset Asthma

- Asthma is one of the most common chronic diseases in children.
- No one knows for sure what causes asthma.
- Both genetic and environmental factors play a role in the development of the disease.
- Asthma in children is often associated with allergies and eczema.

Diagnosis

1. History
2. Pulmonary function tests (PFTs)
3. Challenge studies

Diagnosing Asthma: Medical History

- Breathing problems during particular seasons, exposure to triggers, or after exercise
- Night-time cough
- Colds that last more than 10 days
- ED/hospitalization for breathing symptoms
- Relief of respiratory symptoms when medications are used
- History of eczema
- Family history

Wheezing—Asthma?

Wheezing with upper respiratory infections is very common in small children, but:

- Many of these children will not develop asthma.
- Asthma medications may benefit patients who wheeze whether or not they have asthma.

All that wheezes is not asthma.

Cough—Asthma?

Consider asthma in children with:

- Recurrent episodes of cough with or without wheezing
- Nocturnal awakening because of cough
- Cough that is associated with exercise/play
- Cough without wheeze is often not asthma

Cough may be the only symptom present in patients with asthma.

Goldsobel AB, Chipps BE. Cough in the pediatric population. *J Pediatr*. 2010;156(3):352–358

Asthma Predictive Index

- Identify high risk children (2 and 3 years of age):
- ≥4 wheezing episodes in the past year (at least one must be MD diagnosed)

PLUS

- One major criterion
  - Parent with asthma
  - Atopic dermatitis
  - Aero-allergen sensitivity

OR

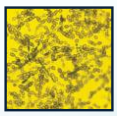
- Two minor criteria
  - Food sensitivity
  - Peripheral eosinophilia (≥4%)
  - Wheezing not related to infection

Modified from: Castro-Rodriguez JA, Holberg CJ, Wright AL, et al. A clinical index to define risk of asthma in young children with recurrent wheezing. *Am J Respir Crit Care Med*. 2000;162(4 Pt 1):1403–1406

Common Asthma Triggers

- Pollens
- Molds
- Animal Dander
- House Dust Mites
- Tobacco Smoke
- Cockroaches
- Changes in Weather/Season
- Exercise
- Respiratory Infections, such as colds
- Strong Emotions
- Cold Air




Objective Evaluation of Asthma

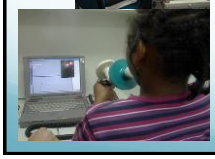
- Physical examination
- Pulmonary function
- Allergen Skin Tests or in Vitro tests

Diagnosis: Physical Examination

- Allergic "crease," "shiners"
- Pale boggy nasal turbinates
- Wheezing during normal breathing; chest hyperinflation
- Atopic dermatitis/eczema

***Signs of airflow obstruction are often absent between attacks*.-NAEPP**

Diagnosis: Pulmonary Function Testing



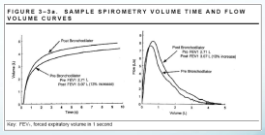
Spirometry Measures

- Forced Vital Capacity (FVC) - the maximal volume of air forcibly exhaled from the point of maximal inhalation
- Forced Expiratory Volume (FEV_1)- the volume of air exhaled during the first second of the FVC
- Peak Expiratory Flow (PEF) - maximum flow rate you can generate during a forced exhalation

Diagnosis: Pulmonary Function Testing

Spirometry Testing

- Airflow obstruction is indicated by reduced FEV_1 and FEV_1/FVC values relative to reference or predicted values.
- Significant reversibility is indicated by an increase of ≥12% and 200 mL in FEV_1 after inhaling a short-acting bronchodilator (American Thoracic Society 1991).



Asthma Management

Allergen Avoidance

Asthma Medications

- Quick-relievers vs. controllers
- Proper use of inhaled medications

Peak Expiratory Flow

- When, how and why to use

Action Plan

- What to do when

What Are the Goals of Asthma Therapy?

- The ability to participate in normal activities and sports
- To sleep through the night without having asthma symptoms
- Normal pulmonary function tests
- No more than one "flare" of asthma that requires a doctor visit or additional medication *per year*
- No side effects to medication

Medications to Treat Asthma

Asthma Medications come in a variety of forms

Two major categories of medications are:

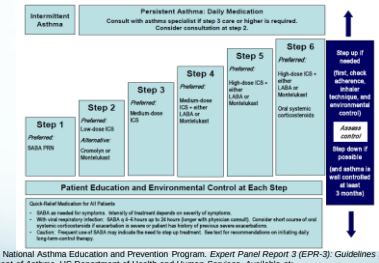
- **Quick-relief inhaler**
- **Long-term controller**

Classifying Asthma Severity and Initiating Treatment in Children 0 to 4 Years of Age

Components of Severity		Classification of Asthma Severity (0–4 years of age)			
			Persistent		
		Intermittent	Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	0	1–2x/month	3–4x/month	>1x/week
	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
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2 exacerbations in 6 months requiring oral systemic corticosteroids, or ≥4 wheezing episodes/1 year lasting >1 day AND risk factors for persistent asthma		
		⟵ Consider severity and interval since last exacerbation. Frequency and severity may fluctuate over time. ⟶			
		Exacerbations of any severity may occur in patients in any severity category.			
Recommended Step for Initiating Therapy (See figure 4–1a for treatment steps.)		Step 1	Step 2	Step 3 and consider short course of oral systemic corticosteroids	
		In 2–6 weeks, depending on severity, evaluate level of asthma control that is achieved. If no clear benefit is observed in 4–6 weeks, consider adjusting therapy or alternative diagnoses.			

Adapted from: National Asthma Education and Prevention Program. *Expert Panel Report 3 (EPR-3): Guidelines for the Diagnosis and Management of Asthma*. US Department of Health and Human Services. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf. Accessed July 5, 2012

Stepwise Approach for Managing Asthma in Children 0 to 4 Years of Age



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Assessing Asthma Control and Adjusting Therapy in Children 0 to 4 Years of Age

Components of Control		Classification of Asthma Control (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	≤1x/month	>1x/month	>1x/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
Risk	Exacerbations requiring oral systemic 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 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 4–1a for treatment steps.)		• Maintain current treatment. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.	• Step up (1 step) and • Reevaluate in 2–6 weeks. • If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids. • Step up (1–2 steps), and • Reevaluate in 2 weeks. • If no clear benefit in 4–6 weeks, consider alternative diagnoses or adjusting therapy. • For side effects, consider alternative treatment options.

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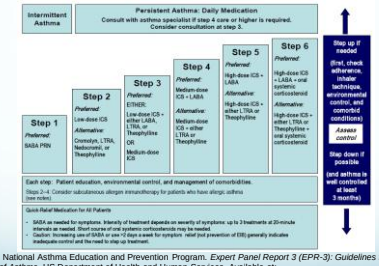
Classifying Asthma Severity and Initiating Treatment in Children 5 to 11 Years of Age

Components of Severity		Classification of Asthma Severity (5–11 years of age)			
			Persistent		
		Intermittent	Mild	Moderate	Severe
Impairment	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	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 >85%	• FEV_1 = >80% predicted • FEV_1/FVC =>80%	• FEV_1 = 60–80% predicted • FEV_1/FVC = 75–80%	• FEV_1 <60% predicted • FEV_1/FVC <75%
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 Therapy (See figure 4–1b for treatment steps.)		Step 1	Step 2	Step 3, medium-dose ICS option	Step 3, medium-dose ICS option, or step 4 and consider short course of oral systemic corticosteroids
		In 2–6 weeks, evaluate level of asthma control that is achieved, and adjust therapy accordingly.			

Stepwise Approach for Managing Asthma in Children 5 to 11 Years of Age



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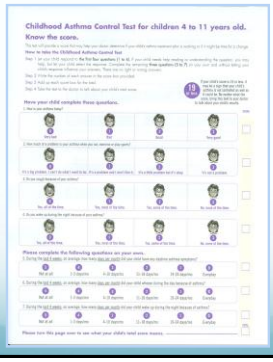
Assessing Asthma Control and Adjusting Therapy in Children 5 to 11 Years of Age

Components of Control		Classification of Asthma Control (5–11 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	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
	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
	Lung function • FEV_1 or peak flow • FEV_1/FVC	>80% predicted/ personal best >80%	60–80% predicted/ personal best 75–80%	<60% predicted/ personal best <75%
Risk	Exacerbations requiring oral systemic corticosteroids	0–1/year	≥2/year (see note)	
		Consider severity and interval since last exacerbation		
	Reduction in lung growth	Evaluation requires long-term followup.		
	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 4–1b for treatment steps.)		• Maintain current step. • Regular followup every 1–6 months. • Consider step down if well controlled for at least 3 months.	• Step up at least 1 step and • Reevaluate in 2–6 weeks. • For side effects: consider alternative treatment options.	• Consider short course of oral systemic corticosteroids, • Step up 1–2 steps, and • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.

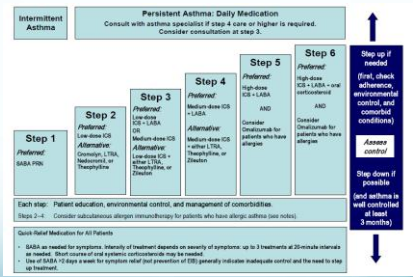
Childhood Asthma Control Test™



Classifying Asthma Severity and Initiating Treatment in Youth ≥12 Years of Age and Adults

Components of Severity		Classification of Asthma Severity ≥12 years of age			
			Persistent		
		Intermittent	Mild	Moderate	Severe
Impairment	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
Normal FEV_1/FVC: 8–19 yr 85%; 20–39 yr 80%; 40–59 yr 75%; 60–80 yr 70%	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 (See figure 4–5 for treatment steps.)		Step 1	Step 2	Step 3	Step 4 or 5
				and consider short course of oral systemic corticosteroids	
		In 2–6 weeks, evaluate level of asthma control that is achieved and adjust therapy accordingly.			

Stepwise Approach for Managing Asthma in Children 12 Years of Age and Adults



Assessing Asthma Control in Children ≥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 0 ACQ ≤0.75* ACT ≥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 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 figure 4–5 for treatment steps)		• Maintain current step. • Regular followups every 1–6 months to maintain control. • Consider step-down if well controlled for at least 3 months.	• Step up 1 step and • Reevaluate in 2–6 weeks. • For side effects, consider alternative treatment options.	• Consider short course of oral systemic corticosteroids, • Step up 1–2 steps, and • Reevaluate in 2 weeks. • For side effects, consider alternative treatment options.

Asthma Control Test™ (ACT)

						SCORE
1. In the past **4 weeks**, how much of the time did your **asthma** keep you from getting as much done at work, school or at home?	All of the time 1	Most of the time 2	Some of the time 3	A little of the time 4	None of the time 5	
2. During the past **4 weeks**, how often have you had shortness of breath?	More than once a day 1	Once a day 2	3 to 6 times a week 3	Once or twice a week 4	Not at all 5	
3. During the past **4 weeks**, how often did your **asthma** symptoms (wheezing, coughing, shortness of breath, chest tightness or pain) wake you up at night or earlier than usual in the morning?	4 or more nights a week 1	2 or 3 nights a week 2	Once a week 3	Once or twice 4	Not at all 5	
4. During the past **4 weeks**, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?	3 or more times per day 1	1 or 2 times per day 2	2 or 3 times per week 3	Once a week or less 4	Not at all 5	
5. How would you rate your **asthma** control during the **past 4 weeks**?	Not controlled at all 1	Poorly controlled 2	Somewhat controlled 3	Well controlled 4	Completely controlled 5	
						TOTAL

If your score is 19 or less, your asthma may not be under control.

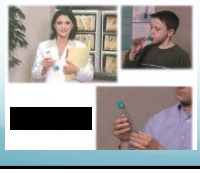
Peak Flow Monitoring

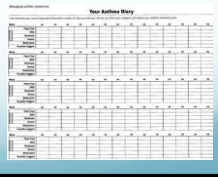
- A peak flow meter is a device that measures how well air moves out of the lungs.
- A peak flow meter is used to manage exacerbations.
- A peak flow meter is used for daily long-term monitoring.
- A peak flow meter guides therapeutic decisions in the home, school, clinician's office, or ED.

Charting Peak Flow

"Personal Best"

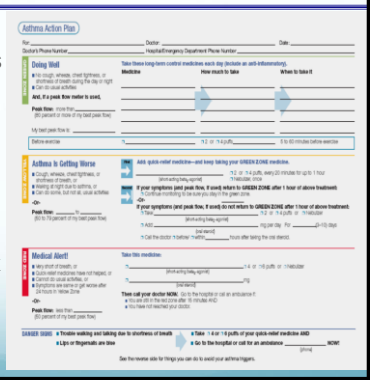
The physician usually determines the child's "Personal Best" peak flow by having the child monitor their peak flow a couple of times per day during a 2-week period of time when the child is not showing any symptoms of asthma.





Asthma Action Plan

- The peak flows are put into zones that are set up like a traffic light.
- Each zone determines what medications to use and what to do when the peak flow number changes.



Asthma Management Program

Your Asthma Management Program should have policies and procedures for administration of medications, specific actions for staff members to perform, and an Asthma Action Plan for asthma episodes.

In Conclusion

- Pediatric Asthma can be controlled
- Diagnosis by Physical Examination and Objective Measures (Spirometry)
- Treatment is 3 phase
  - Allergen and Irritant Avoidance
  - Proper Pharmacologic Therapy
  - Allergen Immunotherapy (under specialist care)