Allergy/Immunology Cases

TWO, TWO YEAR OLDS

- 1) A 2 year old female is brought to clinic with skin rash all over since 4 months of age. There are no individual lesions, but diffuse thickening with excoriated areas and some honey-crusting.
- 2) A 2 year old male presents with a history of wheezing.

TWO TEENAGERS

1) 14 year old female with high risk asthma, moderate persistent, presents to the emergency room with loud wheezing:

What does high risk mean? What does moderate persistent mean?

2) 15 year old male presents with urticaria after a summer football practice:

Use these questions to get started on the cases. We will discuss them at the lecture.

What other questions might you ask about history?

What diagnoses/differential might you consider?

Does family history matter here?

What might you expect on physical exam?

What testing might be done?

What allergies could play a role?

What might you prescribe?

What advice should you give the parents?



Introduction

More than 22 million Americans have asthma, and it is one of the most common chronic diseases of childhood, affecting an estimated 6 million children. The burden of asthma affects the patients, their families, and society in terms of lost work and school, lessened quality of life, and avoidable emergency department (ED) visits, hospitalizations, and deaths. Improved scientific understanding of asthma has led to significant improvements in asthma care, and the National Asthma Education and Prevention Program (NAEPP) has been dedicated to translating these research findings into clinical practice through publication and dissemination of clinical practice guidelines. The first NAEPP guidelines were published in 1991, and updates were made in 1997, 2002, and now with the current report. Important gains have been made in reducing morbidity and mortality rates due to asthma; however, challenges remain. The NAEPP hopes that the "Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma—Full Report 2007" (EPR—3: Full Report 2007) will support the efforts of those who already incorporate best practices and

will help enlist even greater numbers of primary care clinicians, asthma specialists, health care systems and providers, and communities to join together in making quality asthma care available to all people who have asthma. The goal, simply stated, is to help people with asthma control their asthma so that they can be active all day and sleep well at night.

This EPR—3: Summary Report 2007 presents the key recommendations from the EPR—3: Full Report 2007 (See www.nhlbi.nih.gov/guidelines/asthma/asthgdln. htm). Detailed recommendations, the levels of scientific evidence upon which they are based, citations from the published scientific literature, discussion of the Expert Panel's rationale for the recommendations, and description of methods used to develop the report are included in that resource document. Because EPR—3: Full Report 2007 is an update of previous NAEPP guidelines, highlights of major changes in the update are presented below, and figure 1 presents a summary of recommended key clinical activities.

FIGURE 3-1. SUGGESTED ITEMS FOR MEDICAL HISTORY*

A detailed medical history of the new patient who is known or thought to have asthma should address the following items:

1. Symptoms

Cough Wheezing

Shortness of breath

Chest tightness

Sputum production

2. Pattern of symptoms

Perennial, seasonal, or both

Continual, episodic, or both

Onset, duration, frequency (number of days or nights, per week or month)

Diurnal variations, especially nocturnal and on awakening in early morning

3. Precipitating and/or aggravating factors

Viral respiratory infections

Environmental allergens, indoor (e.g., mold, house-dust mite, cockroach, animal dander or secretory products) and outdoor (e.g., pollen)

Characteristics of home including age, location, cooling and heating system, wood-burning stove, humidifier, carpeting over concrete, presence of molds or mildew, characteristics of rooms where patient spends time (e.g., bedroom and living room with attention to bedding, floor covering, stuffed furniture)

Smoking (patient and others in home or daycare)

Exercise

Occupational chemicals or allergens

Environmental change (e.g., moving to new home; going on vacation; and/or alterations in workplace, work processes, or materials used)

Irritants (e.g., tobacco smoke, strong odors, air pollutants, occupational chemicals, dusts and particulates, vapors, gases, and aerosols)

Emotions (e.g., fear, anger, frustration, hard crying or laughing)

Stress (e.g., fear, anger, frustration)

Drugs (e.g., aspirin; and other nonsteroidal anti-inflammatory drugs, beta-blockers including eye drops, others)

Food, food additives, and preservatives (e.g., sulfites)

Changes in weather, exposure to cold air

Endocrine factors (e.g., menses, pregnancy, thyroid disease)
Comorbid conditions (e.g. sinusitis, rhinitis, GERD)

4. Development of disease and treatment

Age of onset and diagnosis

History of early-life injury to airways (e.g., bronchopulmonary dysplasia, pneumonia, parental smoking)

Progression of disease (better or worse)

Present management and response, including plans for managing exacerbations

Frequency of using SABA

Need for oral corticosteroids and frequency of use

5. Family history

History of asthma, allergy, sinusitis, rhinitis, eczema, or nasal polyps in close relatives

6. Social history

Daycare, workplace, and school characteristics that may interfere with adherence

Social factors that interfere with adherence, such as substance abuse

Social support/social networks

Level of education completed

Employment

7. History of exacerbations

Usual prodromal signs and symptoms Rapidity of onset

Duration

Frequency

Severity (need for urgent care, hospitalization, ICU admission)

Life-threatening exacerbations (e.g., intubation, intensive care unit admission)

Number and severity of exacerbations in the past year.

Usual patterns and management (what works?)

Impact of asthma on patient and family

Episodes of unscheduled care (ED, urgent care, hospitalization)

Number of days missed from school/work

Limitation of activity, especially sports and strenuous work

History of nocturnal awakening

Effect on growth, development, behavior, school or work performance, and lifestyle

Impact on family routines, activities, or dynamics Economic impact

Assessment of patient's and family's perceptions of disease

Patient's, parents', and spouse's or partner's knowledge of asthma and belief in the chronicity of asthma and in the efficacy of treatment

Patient's perception and beliefs regarding use and long-term effects of medications

Ability of patient and parents, spouse, or partner to cope with disease

Level of family support and patient's and parents', spouse's, or partner's capacity to recognize severity of an exacerbation

Economic resources

Sociocultural beliefs

*This list does not represent a standardized assessment or diagnostic instrument. The validity and reliability of this list have not been assessed.

PREDICTIVE INDEX for ASTHMA/PERSISTENT WHEEZE

For children under 3 years of age with >3 episodes of wheezing over the previous year:

1 MAJOR

2 MINOR CRITERIA

Atopic dermatitis

Peripheral eosinophilia

Parental asthma

Wheezing apart from URI

Allergic rhintiis

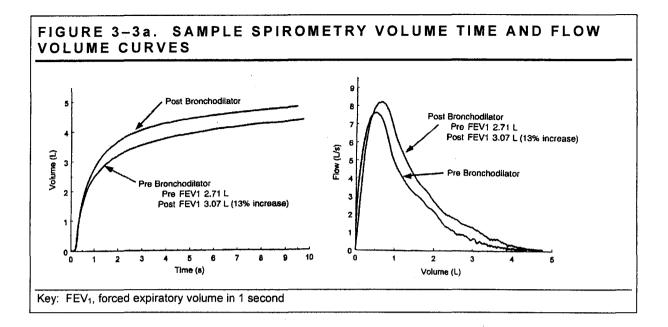


FIGURE 3-3b. REPORT OF SPIROMETRY FINDINGS PRE- AND POSTBRONCHODILATOR

Prebronchodilator									
Study: bronch Age: 59	ID: Height: 175 cm	Test date: 8/7/06 Sex: M	Time: 9:38 a.m. System: 7 20 17						
Trial	FVC	FEV ₁	FEV ₁ / FVC (%)						
1	4.34	2.68	61.8%						
2	4.44	2.62	58.9% 59.6%						
Best Values	4.56	2.71	59.4%						
Predicted	4.23	3.40	80.5%						
Values*	7.20	5.40	00.570						
Percent Predicted	107.8%	79.7%	73.8%						

Interpretations:

FEV₁ and FEV₁/FVC are below normal range. The reduced rate at which air is exhaled indicates obstruction to airflow. *Predicted values from Knudson et al. (1983)

Postbronchodilator

Study: bronch Age: 59	ID: Height: 175 cm	Test date: 8/7/06 Sex: M	Time: 9:58 a.m. System: 7 20 17
Trial	FVC	FEV ₁	FEV ₁ / FVC (%)
1	4.73	2.94	62.2%
2	4.76	3.07	64.5%
3	4.78	3.04	63.5%
Best Values	4.78	3.07	64.3%
Reference Values	4.56	2.71	
Difference (L)	0.22	0.36	
Difference (%)	4.8%	13.4%	

Interpretations:

Significant increases in FEV_1 , with bronchodilator ($\geq 12\%$ increase after bronchodilator indicates a significant change).

Key: FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity

FIGURE 3-4a. CLASSIFYING ASTHMA SEVERITY IN CHILDREN 0-4 YEARS OF AGE

 Classifying severity in children who are not currently taking long-term control medication.

Compo	nents of		fication of hildren 0-4		
Sev	erity			Persistent	
		Intermittent	Mild	Moderate	Severe
	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
(mpairment	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 pe day
	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited
Risk	Exacerbations requiring oral	0–1/year	or ≥4 wheezi	s in 6 months requir ng episodes/1 year factors for persiste	lasting >1 day
	systemic corticosteroids		ler severity and inter quency and severity		
		Exacerbations of	any severity may occ	cur in patients in an	y severity category

- Level of severity is determined by both impairment and risk. Assess impairment domain by caregiver's recall of previous 2–4 weeks. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral corticosteroids in the past 6 months, or ≥4 wheezing episodes in the past year, and who have risk factors for persistent asthma may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.
- Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.*

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Key: EIB, exercise-induced bronchospasm

*Notes

- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved. For clinical management, the focus is on monitoring the level of control (See figure 3–5a.), not the level of severity, once treatment is established.
- See figure 3-5a for definition of asthma control.

FIGURE 3-4b. CLASSIFYING ASTHMA SEVERITY IN CHILDREN 5-11 YEARS OF AGE

Classifying severity in children who are not currently taking long-term control medication.

Comp	onents of	Mark Signs and Coloration Colored Special Services (Services Services Servi	** USE **** *** ************************	Asthma Sev years of ag						
Se	verity	Intermittent	Persistent							
		Michiniconc	Mild	Moderate	Severe					
	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 dally	Daily	Several times per day					
Impairment	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited					
		Normal FEV ₁ between exacerbations								
	Lung function	• FEV ₁ >80% predicted	• FEV ₁ = >80% predicted	• FEV ₁ = 60–80% predicted	• FEV ₁ <60% predicted					
		• FEV ₁ /FVC >85%	• FEV ₁ /FVC >80%	• FEV ₁ /FVC = 75–80%	• FEV ₁ /FVC <75%					
	Exacerbations	0–1/year (see note)	:2 in 1 year (see	note)						
Risk	Exacerbations requiring oral systemic			last exacerbation. Fro patients in any sever						
	corticosteroids	Relative annu	al risk of exacerba	itions may be related	to FEV ₁					

- 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. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.
- Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.*

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

#### *Notes:

- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved.
   For clinical management, the focus is on monitoring the level of control (See figure 3-5b.), not the level of severity, once treatment is established.
- See figure 3-5b for definition of asthma control.

# FIGURE 3-4c. CLASSIFYING ASTHMA SEVERITY IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

 Classifying severity for patients who are not currently taking long-term control medications.

	nents of			f Asthma S s of age ar						
Sev	erity			Persistent						
		Intermittent	Mild	Moderate	Severe					
	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					
Impairment	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week but not >1x/day	Dally	Several times per day					
8-19 yr 85% 10-39 yr 80% 10-59 yr 75%	Interference with normal activity	None	Minor limitation	Some limitation	Extremely limited					
0 –80 yr 70%		Normal FEV ₁ between     exacerbations								
	Lung function	• FEV, >80% predicted	• FEV, ≥80% predicted	FEV ₁ >60% but <80% predicted	• FEV ₁ <60% predicted					
		• FEV ₁ /FVC normal	FEV ₁ /FVC normal	• FEV ₁ /FVC reduced 5%	• FEV ₃ /FVC reduced >5%					
	Exacerbations	0-1/year (see note)	>2/year (see note	)						
Risk	requiring oral systemic	Consider severity may	verity and interval si v fluctuate over time	nce last exacerbation. for patients in any se	Frequency andeverity category.					
	corticosteroids	Relative annual risk of exacerbations may be related to FEV ₁								

- Level of severity is determined by assessment of both impairment and risk. Assess impairment domain by patient's/caregiver's recall of previous 2–4 weeks and spirometry. Assign severity to the most severe category in which any feature occurs.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma severity. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate greater underlying disease severity. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have persistent asthma, even in the absence of impairment levels consistent with persistent asthma.
- Classifying severity in patients after asthma becomes well controlled, by lowest level of treatment required to maintain control.*

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

#### *Notes:

- For population-based evaluations, clinical research, or characterization of a patient's overall asthma severity after control is achieved.
   For clinical management, the focus is on monitoring the level of control (See figure 3–5c.), not the level of severity, once treatment is established.
- See figure 3-5c for definition of asthma control.

# FIGURE 3-5a. ASSESSING ASTHMA CONTROL IN CHILDREN 0-4 YEARS OF AGE

			Classification of Asthma Control (Children 0-4 years of age)							
Compone	nts of Control	Well Controlled	Not Well Controlled	Very Poorly Controlled						
	Symptoms	≤2 days/week	>2 days/week	Throughout the day						
	Nighttime awakenings	≤1x/month	>1x/month	>1x/week						
[mpairment	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						
	Exacerbations requiring oral systemic corticosteroids	0–1/year	2–3/year	>3/year						
Risk	Treatment-related adverse effects	troublesome and w	orrisome. The level	nsity from none to very of intensity does not it should be considered						

Key: EIB, exercise-induced bronchospasm; ICU, intensive care unit

#### Notes:

■ The level of control is based on the most severe impairment or risk category. Assess impairment domain by caregiver's recall of previous 2–4 weeks. 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.

in the overall assessment of risk.

At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with persistent asthma.

# FIGURE 3-5b. ASSESSING ASTHMA CONTROL IN CHILDREN 5-11 YEARS OF AGE

Compane	Components of Control		Classification of Asthma Control (Children 5-11 years of age)							
Compone		Well Controlled	Not Well Controlled	Very Poorly Controlled						
	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						
Impairment	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per da						
	Lung function									
	• FEV ₁ or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best						
	■ FEV ₁ /FVC	>80%	75–80%	<75%						
	Exacerbations requiring oral systemic	0–1/year	≥2/yea	r (see note)						
	corticosteroids	Consider sev	erity and interval since	e last exacerbation						
2.	Reduction in lung growth	Evaluation requires I								
Risk	Treatment-related adverse effects		y from none to very ntensity does not correlat onsidered in the overall							

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

### Notes:

- 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 the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

# FIGURE 3-5c. ASSESSING ASTHMA CONTROL IN YOUTHS ≥12 YEARS OF AGE AND ADULTS

6	nents of Control		ication of Asthma 12 years of age						
	nents of control	Well-Controlled	Not Well-Controlled	Very Poorly Controlled					
	Symptoms	≤2 days/week	>2 days/week	Throughout the day					
	Nighttime awakening	≤2x/month	1-3x/week	≥4x/week					
	Interference with normal activity	None	Some limitation	Extremely limited					
Impairment	Short-acting beta ₂ -agonist use for symptom control (not prevention of EIB)	≤2 days/week	>2 days/week	Several times per da					
	FEV ₁ or peak flow	>80% predicted/ personal best	60–80% predicted/ personal best	<60% predicted/ personal best					
	Validated Questionnaires								
	ATAQ ACQ ACT	0 ≤0.75* ≥20	1-2 ≥1.5 16-19	3–4 N/A ≤15					
	F Latin	0–1/year	≥2/year (	see note)					
	Exacerbations	Consider sev	erity and interval since la	st exacerbation					
Risk	Progressive loss of lung function	Evaluation requires long-term followup care							
	Treatment-related adverse effects	Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.							

^{*}ACQ values of 0.76-1.4 are indeterminate regarding well-controlled asthma.

Key: EIB, exercise-induced bronchospasm; FEV₁, forced expiratory volume in 1 second. See figure 3–8 for full name and source of ATAQ, ACQ, ACT.

### Notes:

- The level of control is based on the most severe impairment or risk category. Assess impairment domain by patient's recall of previous 2–4 weeks and by spirometry/or peak flow measures. Symptom assessment for longer periods should reflect a global assessment, such as inquiring whether the patient's asthma is better or worse since the last visit.
- At present, there are inadequate data to correspond frequencies of exacerbations with different levels of asthma control. In general, more frequent and intense exacerbations (e.g., requiring urgent, unscheduled care, hospitalization, or ICU admission) indicate poorer disease control. For treatment purposes, patients who had ≥2 exacerbations requiring oral systemic corticosteroids in the past year may be considered the same as patients who have not-well-controlled asthma, even in the absence of impairment levels consistent with not-well-controlled asthma.

# FIGURE 3-6. SAMPLE QUESTIONS FOR ASSESSING AND MONITORING ASTHMA CONTROL

### **Monitoring Asthma Control**

### Ask the patient:

- Has your asthma awakened you at night or early morning?
- Have you needed more quick-relief bronchodilator medication (inhaled short-acting beta₂-agonist) than usual?
- Have you needed any urgent medical care for your asthma, such as unscheduled visits to your doctor, an urgent care clinic, or the emergency department?
- Are you participating in your usual and desired activities?
- If you are measuring your peak flow, has it been below your personal best?

#### Actions to consider:

- Assess whether the medications are being taken as prescribed.
- Assess whether the medications are being inhaled with correct technique.
- Assess lung function with spirometry and compare to previous measurement.
- Adjust medications, as needed; either step up if control is inadequate or step down if control is maximized, to achieve the best control with the lowest dose of medication.

Source: Adapted and reprinted from "Global Initiative for Asthma: Pocket Guide for Asthma Management and Prevention." NIH Publication No. 96-3659B. Bethesda, MD: Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute. 1995