Asthma Guidelines for Children: A Clinician's Perspective

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Disclosures and Conflicts of Interest

I have no association, financial or otherwise, with any pharmaceutical, laboratory, or medical equipment manufacturer or distributor.

I am a Senior Medical Director for Superior HealthPlan, the sponsor of this educational activity.

Agenda

- Making the Diagnosis
- Asthma Guidelines

Making the Diagnosis

Diagnosing Asthma in Young Children

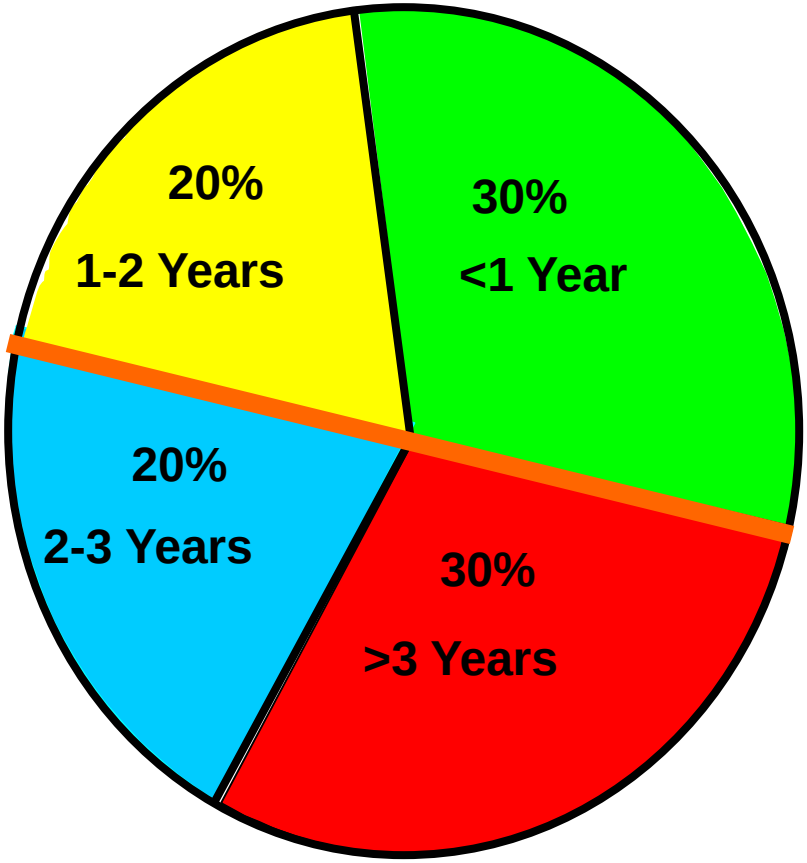
Three benefits to making an early and accurate asthma diagnosis:

1. To identify the most effective treatment to alleviate symptoms and prevent mortality
2. To educate the parent or primary caregiver to manage symptoms and avoid triggers
3. To estimate prognosis

Making the Asthma Diagnosis: History of Asthma Triggers

- Precipitating or aggravating factors that are important in children with asthma:
  - Viral upper respiratory infection*
  - Allergen exposure*
  - Exercise and hyperventilation (as part of exercise or for other reasons, such as crying or laughing)
  - Airborne irritants, especially cigarette smoke or other fumes
  - Changes in the weather, including cold air or humidity
  - Gastroesophageal reflux*

Onset of Symptoms in Children with Asthma[1,2]



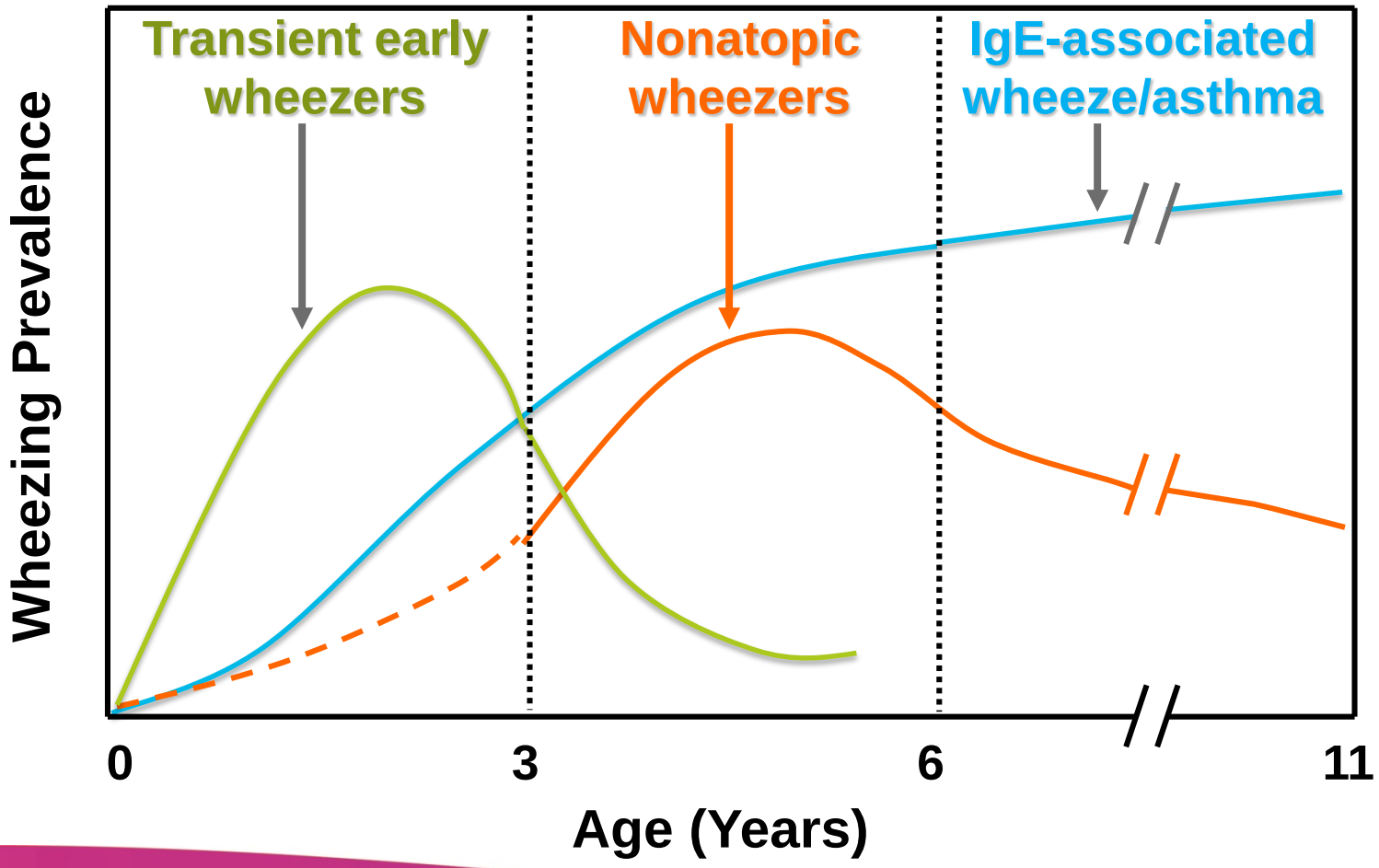
1. McNicol KN, Williams HE. *BMJ.* 1973;4:7-11.
2. Wainwright C, Isles AF, Francis PW. *MJA* 1997;167:218-222.

Asthma and Wheezing in the First 6 Years of Life

- There are 2 different wheezing syndromes that coexist in different patients, during the first 3 years of life:
  - Transient wheezing: Smaller airway caliber, no bronchial hyperresponsiveness, and resolution by age 6
    - Of patients who wheezed before age 3, 60% fell into this category
  - Persistent wheezing: These patients are characterized by the presence of atopy, bronchial hyperresponsiveness, and significant deterioration in lung function by age 6
    - Of patients who wheezed before age 3, 40% fell into this category
- It is this *relatively substantial* proportion who have early-onset asthma and are at risk of progressive asthma throughout childhood and adulthood

Martinez FD, Wright AL, Taussig LM, et al. *N Engl J Med.* 1995;332:133-138.

Natural History of Childhood Asthma



Martinez FD. *J Allergy Clin Immunol.* 1999;104:S169-S174.

Wheezing and Asthma

- The **most common cause of wheezing** in young children is a **viral respiratory infection**
- However, the **strongest predictor** *for* wheezing that continues into *asthma* is **atopy**
  - 70%-90% of children with asthma have allergies (documented by allergy testing, such as positive skin tests to inhaled allergens)

American Academy of Allergy Asthma &Immunology. *Pediatric Asthma: Promoting Best Practice, Guide for Managing Asthma in Children.* Available at: http://www.aaaai.org/members/resources/initiatives/pediatricasthma.stm. Accessed October 15, 2007.

Asthma Predictive Index

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

- Plus one of the following:
  - One major criterion
    - Parent with asthma
    - Atopic dermatitis
    - Aero-allergen sensitivity
  - 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

Asthma Guidelines

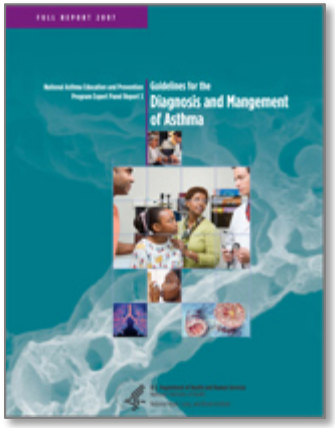
EPR-3

- Guidelines for the Diagnosis and Management of Asthma (EPR-3), found here: https://www.nhlbi.nih.gov/health-topics/guidelines-for-diagnosis-management-of-asthma

Evolution of EPR 1-2-3

1991

1997/2002
153pp



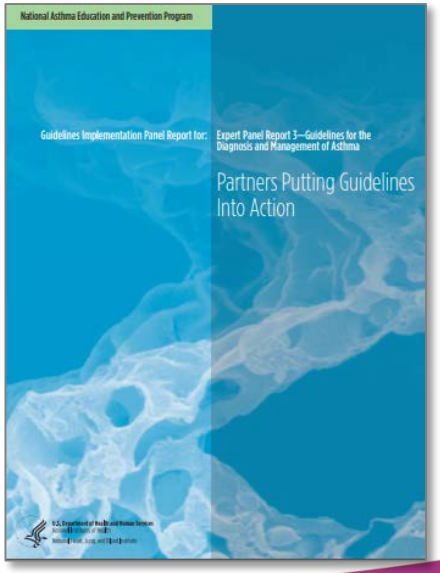
2007
440pp

Global Initiative for Asthma (GINA)

- Revision 2014
- Update 2015
- Update 2016
- Update 2017

Guidelines Implementation Panel (GIP)

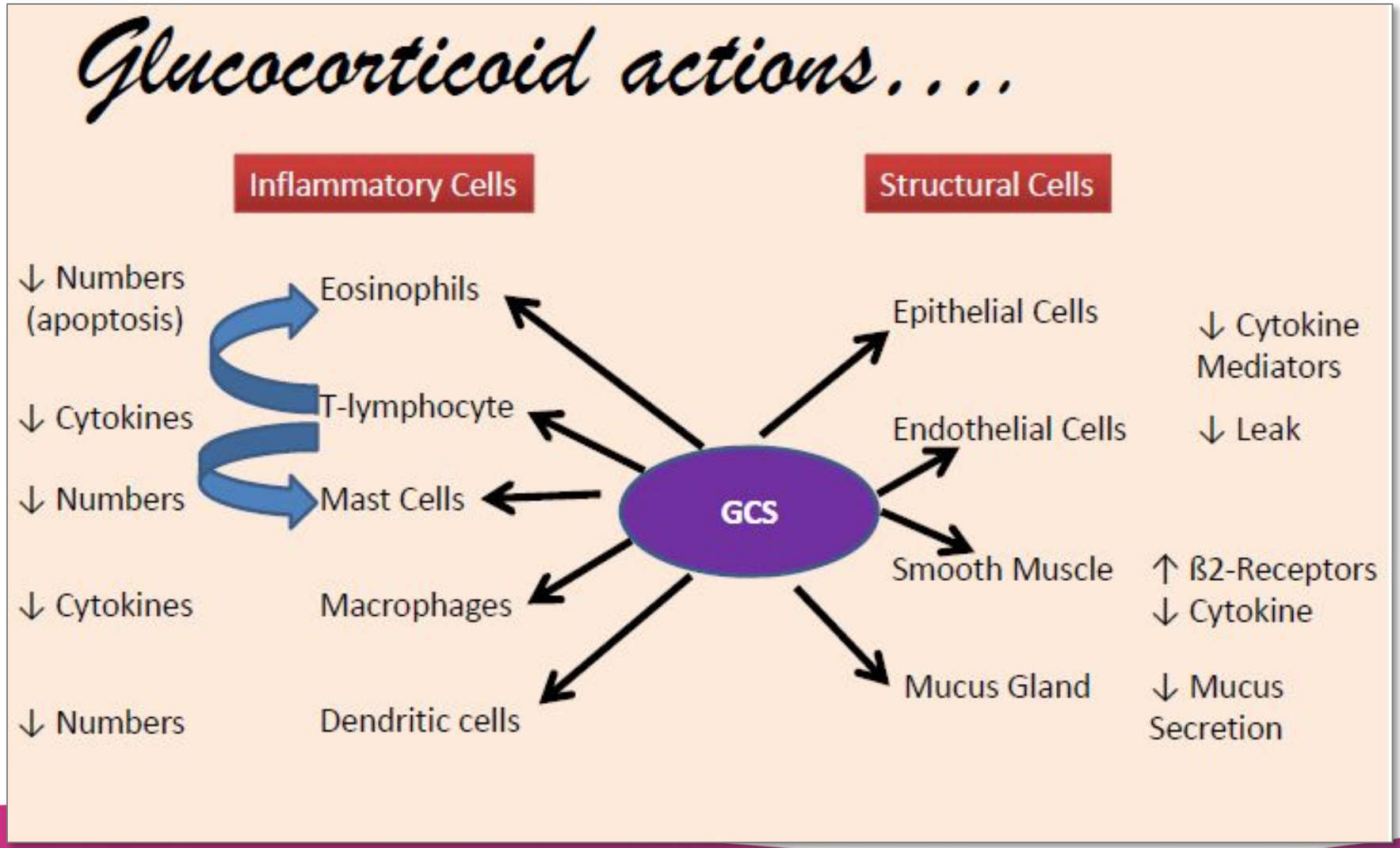
- Guidelines Implementation Panel Report for Expert Panel Report 3, found at: http://www.nhlbi.nih.gov/guidelines/asthma/gip_rpt.pdf
  - Recommendations and strategies to implement EPR-3
  - Six key messages



Guidelines Implementation Panel (GIP)

- GIP's 6 Key Messages
  1. Inhaled Corticosteroids (Medications)
  2. Asthma Action Plan (Education)
  3. Asthma Severity
  4. Asthma Control
  5. Re-assessment/Follow-up
  6. Allergen and Irritant Exposure Control

Inhaled Corticosteroids



Inhaled Corticosteroids: Dosing Guide

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FIGURE 4: ESTIMATED COMPARATIVE DAILY DOSAGES FOR COMMON INHALED CORTICOSTEROIDS

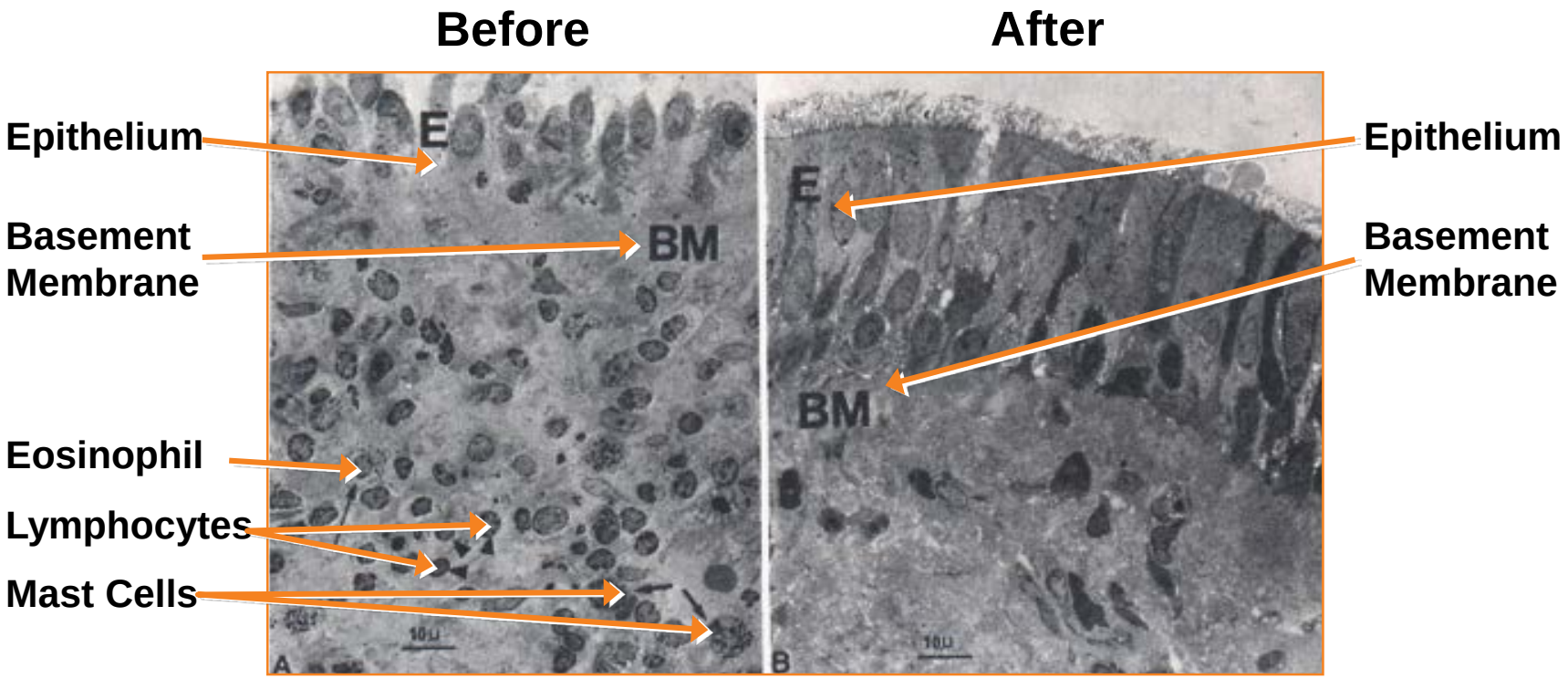
Drug	Low daily dose			Medium daily dose			High daily dose		
	Child 0-4 years of age	Child 5-11 years of age	≥12 years of age and adults	Child 0-4 years of age	Child 5-11 years of age	≥12 years of age and adults	Child 0-4 years of age	Child 5-11 years of age	≥12 years of age and adults
Beclomethasone HFA 40 or 80 mcg/puff	NA	80-160 mcg	80-240 mcg	NA	>160-320 mcg	>240-480 mcg	NA	>320 mcg	>480 mcg
Budesonide inhaled Inhalation suspension for nebulization	0.25-0.5 mg	0.5 mg	NA	>0.5-1.0 mg	1.0 mg	NA	>1.0 mg	2.0 mg	NA
Fluticasone HFA/MDI 44, 110, or 220 mcg/puff	176 mcg	88-176 mcg	88-264 mcg	>176-352 mcg	>176-352 mcg	>264-440 mcg	>352 mcg	>352 mcg	>440 mcg

Source: NIH, National Heart, Lung and Blood Institute. Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (EPR-3 2007). http://www.nhlbi.nih.gov/guidelines/asthma/index.htm.

Inhaled Corticosteroids: Dosing Guide

Drug	Low Daily Dose (μg)		Medium Daily Dose (μg)		High Daily Dose (μg)	
	> 5 years	< 5 years	> 5 years	< 5 years	> 5 years	< 5 years
Beclomethasone	200-500	100-200	>500-1000	>200-400	>1000	>400
Budesonide	200-600	100-200	600-1000	>200-400	>1000	>400
Budesonide-Neb Inhalation Suspension	N/A	250-500	N/A	500-1000	N/A	>1000
Ciclesonide	80-160	80-160	>160-320	>160-320	>320-1280	>320
Flunisolide	500-1000	500-750	>1000-2000	>750-1250	>2000	>1250
Fluticasone	100-250	100-200	>250-500	>200-500	>500	>500
Mometasone furoate	200-400	100-200	>400-800	>200-400	>800-1200	>400
Triamcinolone acetonide	400-1000	400-800	1000-2000	>800-1200	>2000	>1200

Effects of ICS on Inflammation



Before and After 3 Months of Treatment With an ICS

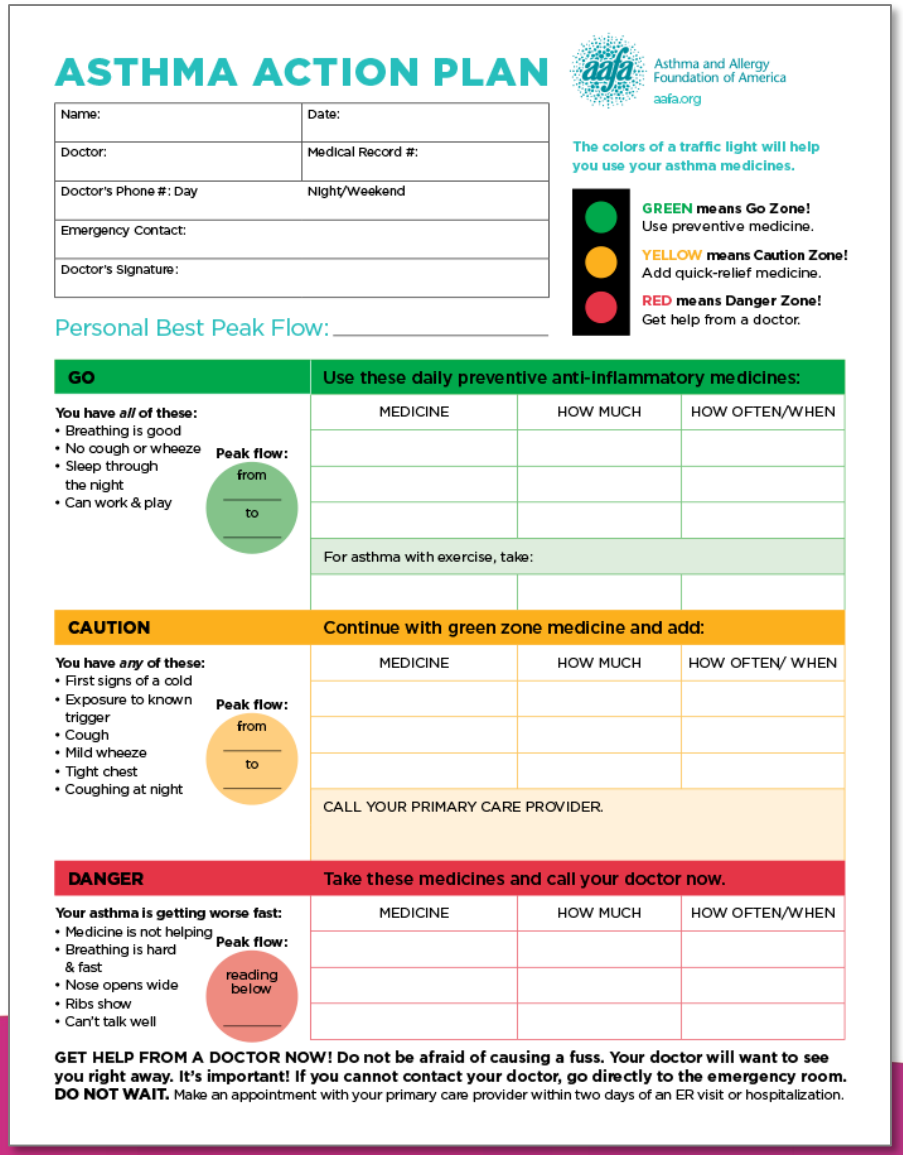
Laitinen LA, Laitinen A, Haahtela T. *J Allergy Clin Immunol*. 1992;90:32-42.

Inhaled Corticosteroids: Drug v. Device

Inhaled Corticosteroids: Obstacles

- ‘The specialist has to prescribe them’
- ‘Did you say steroids?’
- ‘I’ve done my research…’
- Expense
- Hassle

Asthma Action Plan



ASTHMA ACTION PLAN

Asthma and Allergy Foundation of America
aafa.org

Name:	Date:
Doctor:	Medical Record #:
Doctor's Phone #: Day	Night/Weekend
Emergency Contact:	
Doctor's Signature:	

Personal Best Peak Flow: _____

The colors of a traffic light will help you use your asthma medicines.

GREEN means Go Zone!
Use preventive medicine.

YELLOW means Caution Zone!
Add quick-relief medicine.

RED means Danger Zone!
Get help from a doctor.

GO

You have *all* of these:
- Breathing is good
- No cough or wheeze
- Sleep through the night
- Can work & play

Peak flow: from _____ to _____

Use these daily preventive anti-inflammatory medicines:

MEDICINE	HOW MUCH	HOW OFTEN/WHEN
For asthma with exercise, take:		

CAUTION

You have *any* of these:
- First signs of a cold
- Exposure to known trigger
- Cough
- Mild wheeze
- Tight chest
- Coughing at night

Peak flow: from _____ to _____

Continue with green zone medicine and add:

MEDICINE	HOW MUCH	HOW OFTEN/ WHEN
CALL YOUR PRIMARY CARE PROVIDER.		

DANGER

Your asthma is getting worse fast:
- Medicine is not helping
- Breathing is hard & fast
- Nose opens wide
- Ribs show
- Can't talk well

Peak flow: reading below _____

Take these medicines and call your doctor now.

MEDICINE	HOW MUCH	HOW OFTEN/WHEN

GET HELP FROM A DOCTOR NOW! Do not be afraid of causing a fuss. Your doctor will want to see you right away. It's important! If you cannot contact your doctor, go directly to the emergency room. DO NOT WAIT. Make an appointment with your primary care provider within two days of an ER visit or hospitalization.

Asthma Severity

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.			

Level of severity is determined by both impairment and risk. Assess impairment by caregivers recall of previous 2-4 weeks.

Asthma Severity

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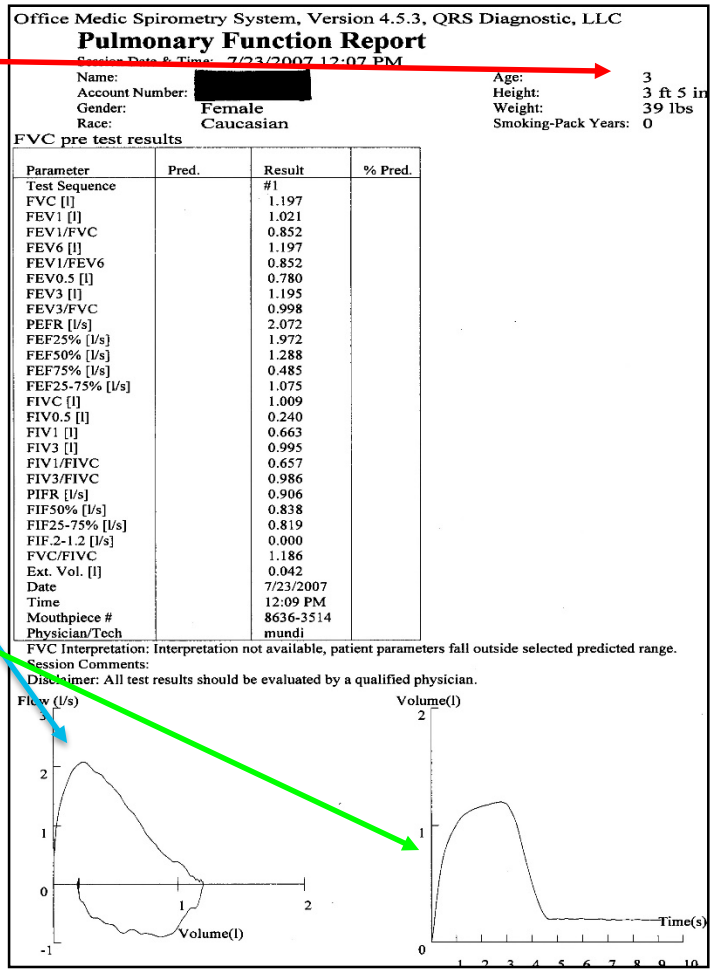
Components of Severity		Classification of Asthma Severity (5–11 years of age)			
			Persistent		
		Intermittent	Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week but not daily	Daily	Throughout the day
	Nighttime awakenings	≤2x/month	3–4x/month	>1x/week but not nightly	Often 7x/week
	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.			

Spirometry in the Diagnosis of Asthma in Children

- Spirometry is a simple, powerful, and widely available tool for investigating lung function
- There are published guidelines for making measurements and their interpretation
- There is a variety of published normative data, allowing for interpretation of results based on specific vital statistics
- With proper training and adequate time, sometimes even fairly young children can produce useful results

Spirometry: Sometimes Even on the Very Young

- Only 3 Years Old
- Excellent and quite interpretable flow-volume curve
- Sustained expiratory maneuver
- Forced vital capacity (FVC) of 1.2 L
- FEV_1[a]/FVC is >0.85
- Peak expiratory flow (PEF) is >2 L/sec



Office Medic Spirometry System, Version 4.5.3, QRS Diagnostic, LLC

Pulmonary Function Report

Session Date & Time: 7/23/2007 12:07 PM

Name: [redacted]
Account Number:
Gender: Female
Race: Caucasian

Age: 3
Height: 3 ft 5 in
Weight: 39 lbs
Smoking-Pack Years: 0

FVC pre test results

Parameter	Pred.	Result	% Pred.
Test Sequence		#1	
FVC [l]		1.197	
FEV1 [l]		1.021	
FEV1/FVC		0.852	
FEV6 [l]		1.197	
FEV1/FEV6		0.852	
FEV0.5 [l]		0.780	
FEV3 [l]		1.195	
FEV3/FVC		0.998	
PEFR [l/s]		2.072	
FEF25% [l/s]		1.972	
FEF50% [l/s]		1.288	
FEF75% [l/s]		0.485	
FEF25-75% [l/s]		1.075	
FIVC [l]		1.009	
FIV0.5 [l]		0.240	
FIV1 [l]		0.663	
FIV3 [l]		0.995	
FIV1/FIVC		0.657	
FIV3/FIVC		0.986	
PIFR [l/s]		0.906	
FIF50% [l/s]		0.838	
FIF25-75% [l/s]		0.819	
FIF.2-1.2 [l/s]		0.000	
FVC/FIVC		1.186	
Ext. Vol. [l]		0.042	
Date		7/23/2007	
Time		12:09 PM	
Mouthpiece #		8636-3514	
Physician/Tech		mundi	

FVC Interpretation: Interpretation not available, patient parameters fall outside selected predicted range.
Session Comments:
Disclaimer: All test results should be evaluated by a qualified physician.

Flow (l/s) 3 2 1 0 -1 1 2 Volume(l)

Volume(l) 2 1 0 Time(s) 1 2 3 4 5 6 7 8 9 10

[a]Forced expiratory volume in 1 second

Asthma Control

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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.

Asthma Control

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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.

Asthma Control

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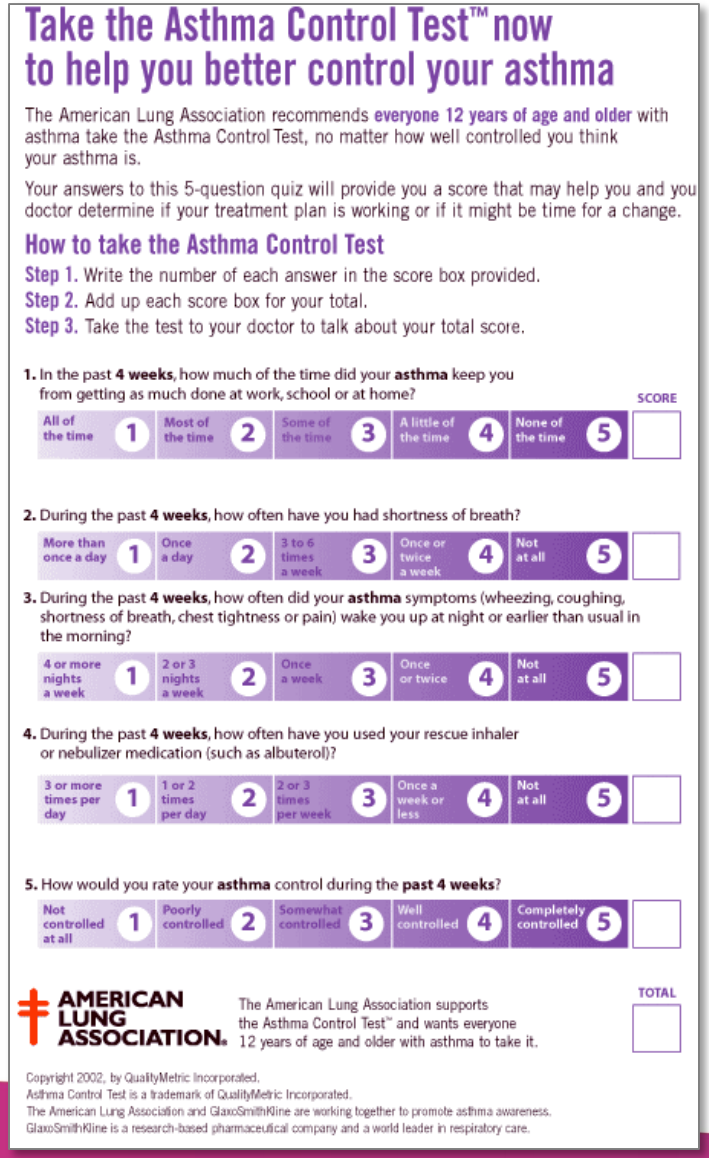
Components of Control		Classification of Asthma Control (≥12 years of age)		
		Well Controlled	Not Well Controlled	Very Poorly Controlled
Impairment	Symptoms	≤2 days/week	>2 days/week	Throughout the day
	Nighttime awakenings	≤2x/month	1–3x/week	≥4x/week
	Interference with normal activity	None	Some limitation	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 ACQ ACT	 0 ≤0.75* ≥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 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.		
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.

Re-assessment/Follow-up



Take the Asthma Control Test™ now to help you better control your asthma

The American Lung Association recommends **everyone 12 years of age and older** with asthma take the Asthma Control Test, no matter how well controlled you think your asthma is.

Your answers to this 5-question quiz will provide you a score that may help you and you doctor determine if your treatment plan is working or if it might be time for a change.

How to take the Asthma Control Test

Step 1. Write the number of each answer in the score box provided.
Step 2. Add up each score box for your total.
Step 3. Take the test to your doctor to talk about your total 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?

SCORE

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	

AMERICAN LUNG ASSOCIATION.

The American Lung Association supports the Asthma Control Test™ and wants everyone 12 years of age and older with asthma to take it.

TOTAL

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Re-assessment/Follow-up

Asthma Control Test 4-11 Years Old

Have your child complete these questions.

1. How is your asthma today?

Score

 0 Very bad	 1 Bad	 2 Good	 3 Very good

2. How much of a problem is your asthma when you run, exercise, or play sports?

 0 It's a big problem, I can't do what I want to do	 1 It's a problem and I don't like it	 2 It's a little problem but it's OK	 3 It's not a problem

3. Do you cough because of your asthma?

 0 Yes, all the time	 1 Yes, most of the time	 2 Yes, some of the time	 3 No, none of the time

4. Do you wake up during the night because of asthma?

 0 Yes, all the time	 1 Yes, most of the time	 2 Yes, some of the time	 3 No, none of the time

Please complete the following questions on your own.

5. During the last 4 weeks, how many days did your child have any daytime asthma symptoms?

5 Not at all	4 1–3 days	3 4–10 days	2 11–18 days	1 19–24 days	0 Everyday

6. During the last 4 weeks, how many days did your child wheeze during the day because of asthma?

5 Not at all	4 1–3 days	3 4–10 days	2 11–18 days	1 19–24 days	0 Everyday

7. During the last 4 weeks, how many days did your child wake up during the night because of asthma?

5 Not at all	4 1–3 days	3 4–10 days	2 11–18 days	1 19–24 days	0 Everyday

Total

Childhood ACT - Spain/Spanish - Final version - 09 Jun 05 - Mapi Research Institute.
f:\institut\cultadap\project\gsk2852\etude2852\final_versions\childhoodactspaq.doc-09/06/2006

Allergen and Exposure Control

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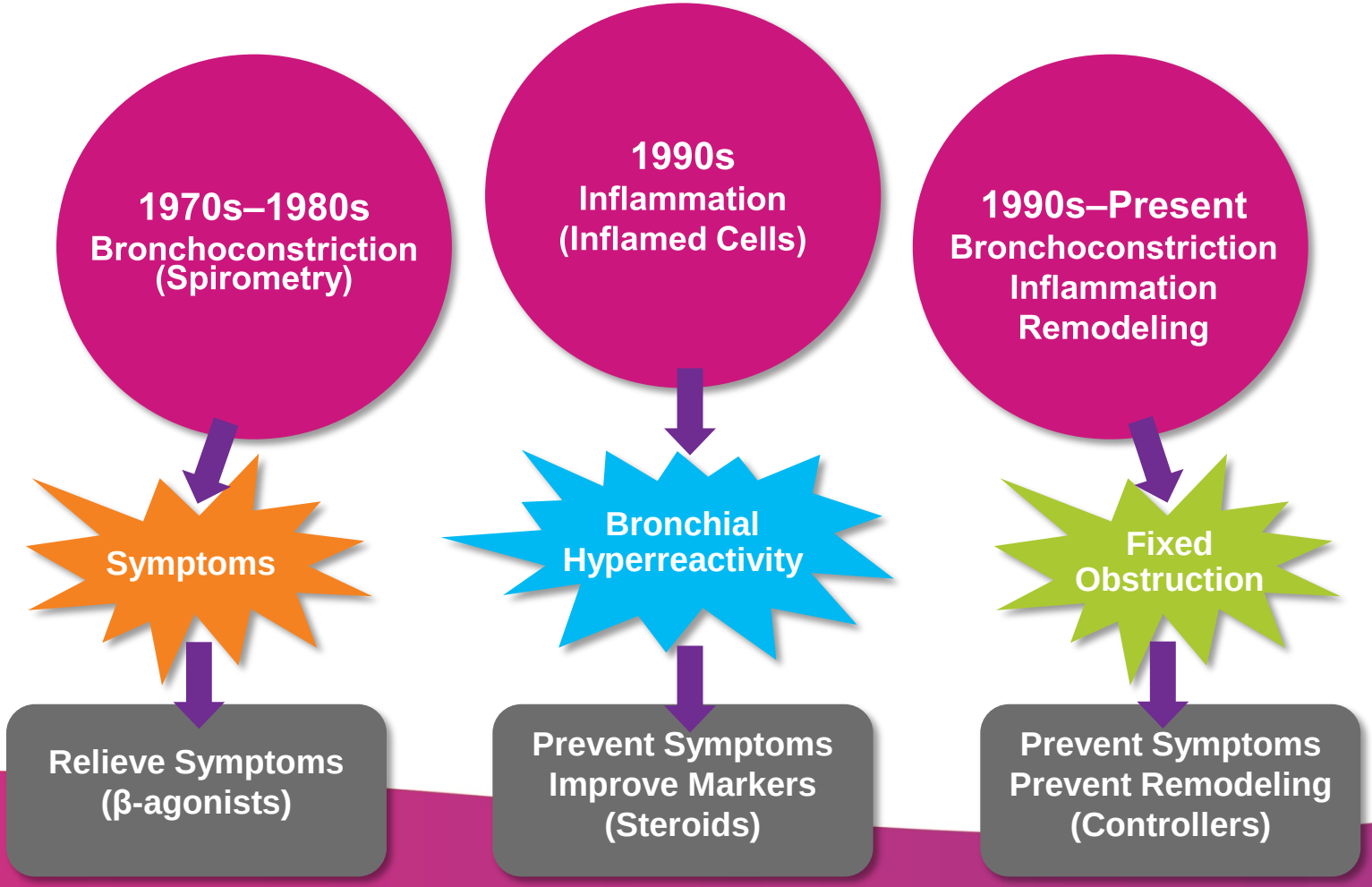
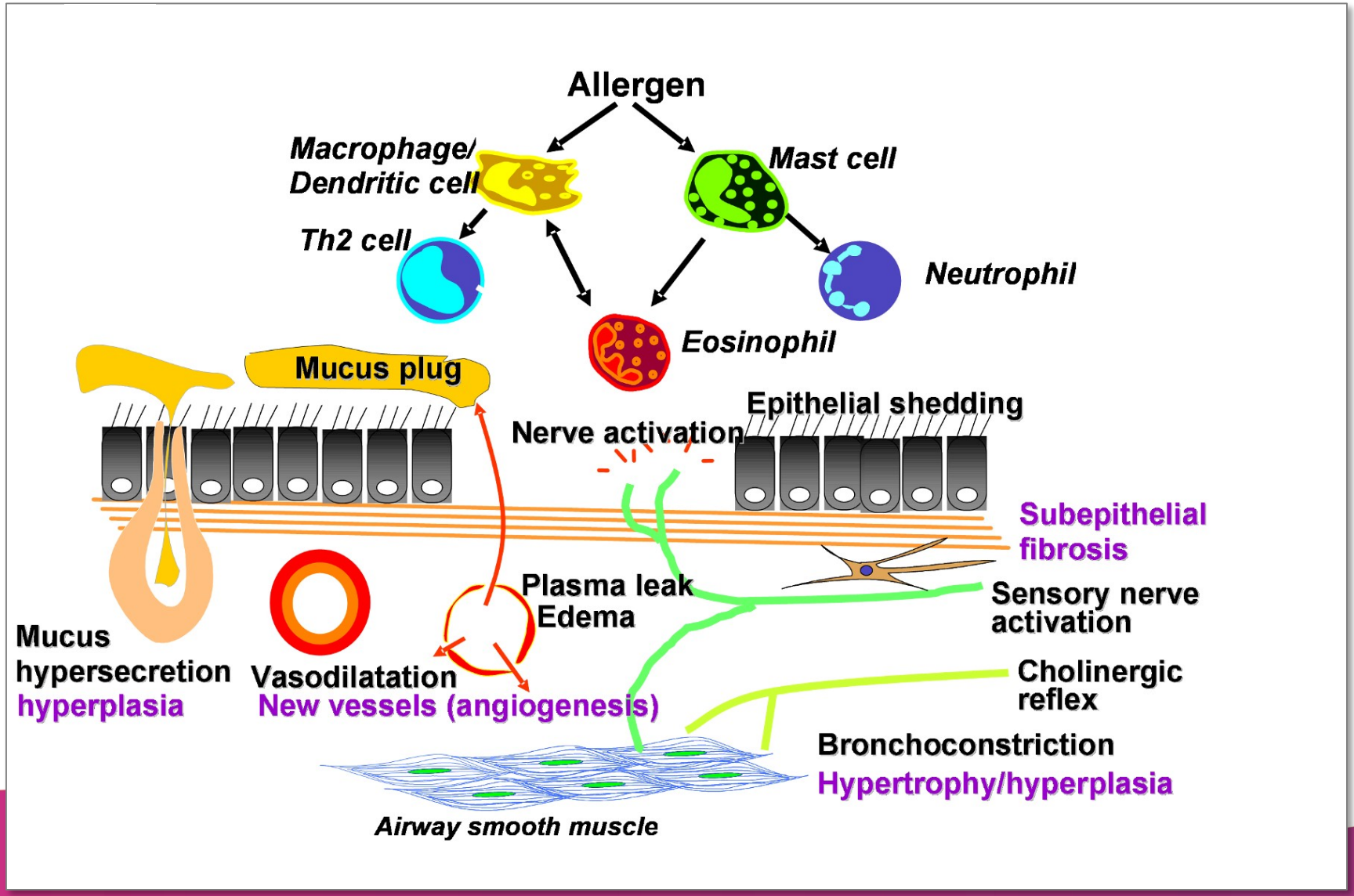
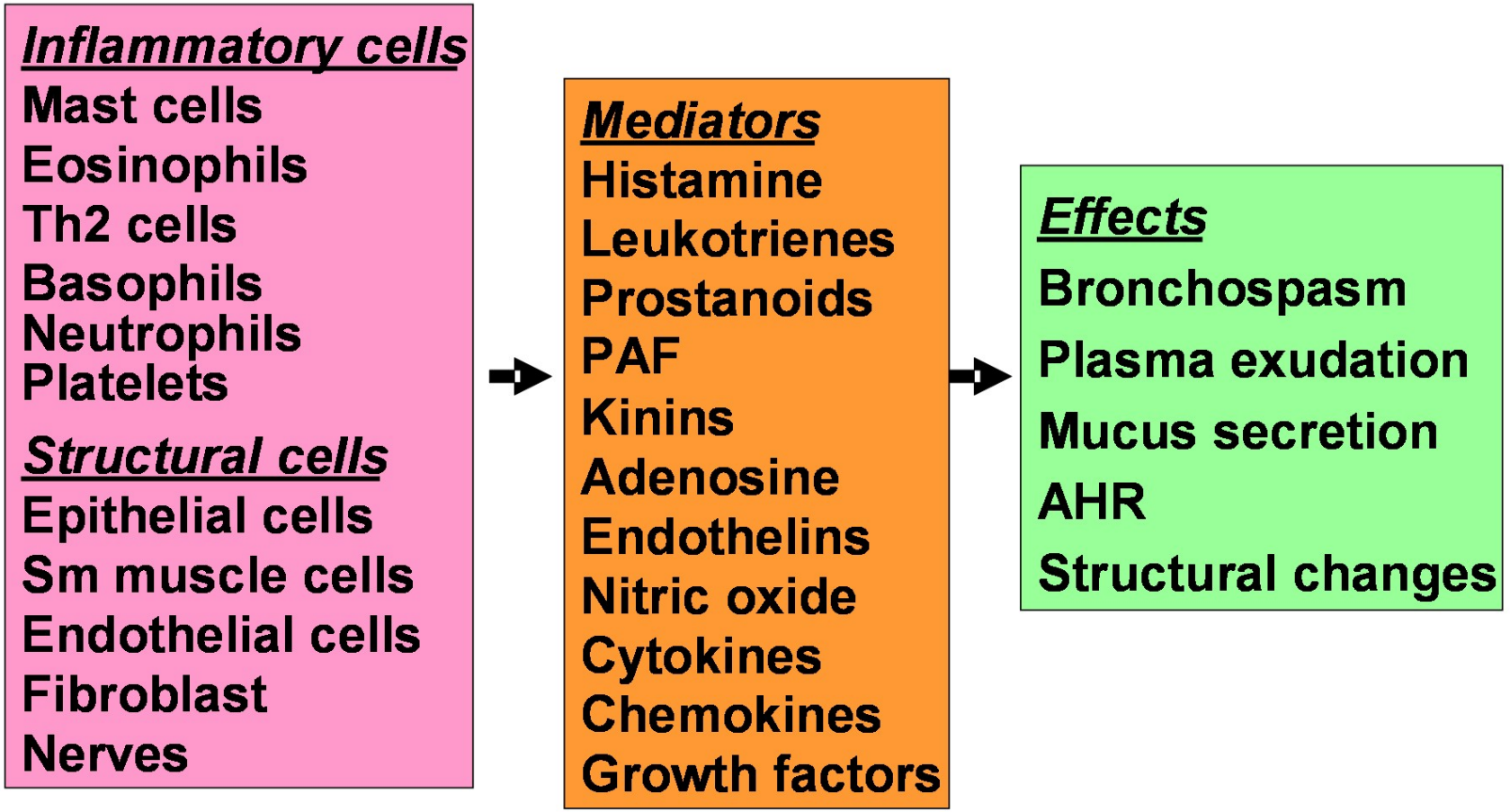
Evolution of Asthma: 1970s-Present



Asthma Inflammation: Cells and Mediators



Asthma Inflammation: Cells and Mediators



EPR3:
The 4 Components of Asthma Care

- Monitoring and assessment of asthma control and severity with results obtained from:
  - Objective tests
  - Physical examination
  - Patient history
  - Patient report
- Patient education (and their families)
  - “For a partnership in asthma care.”
- Control of environmental factors and co-morbid conditions affecting asthma
- Medications
  - Pharmacological therapy

EPR3:
Goals of Therapy

- Reducing impairment
  - Prevent chronic and troublesome symptoms (eg, coughing or breathlessness in the daytime, in the night, or after exertion)
  - Require infrequent use (≤2 days/week) of inhaled short-acting β_2-agonist (SABA) for quick relief of symptoms
  - Maintain (near) normal lung function
  - Maintain normal activity levels (including exercise and other physical activity and attendance at school or work)
  - Meet patients' and families' expectations of and satisfaction with asthma care

- Reducing risk
  - Prevent recurrent exacerbations and minimize need for ED visits and hospitalizations
  - Prevent progressive loss of lung function
  - Provide optimal pharmacotherapy with minimal or no adverse effects

Nation Heart, Lung, and Blood Institute. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm. Accessed October 8, 2007.

In Conclusion: EPR-3 and Pediatric Asthma

- Severity, control, and responsiveness to treatment are key elements of asthma assessment and monitoring
- The goal of asthma therapy is to achieve control by:
  - reducing current impairments
  - future risks of adverse events
- Periodic assessments of asthma control are recommended to determine:
  - whether the goals of therapy are being met
  - if adjustments to treatment are necessary
- A *stepwise approach* to therapy should be used to achieve and maintain control
- ICSs are *the* preferred controller therapy in patients of any age with persistent asthma

Future Directions… EPR4?

1. Asthma phenotype
2. Genotype-phenotype correlation
3. Imprinting
4. Inflammatory markers
5. Pharmacogenomics
6. Biologics
7. Microbiome

Resources

- National Asthma Education and Prevention Program
  - http://www.nhlbi.nih.gov/about/naepp/
- American Academy of Allergy, Asthma, and Immunology
  - http://www.aaaai.org
- American College of Chest Physicians
  - http://www.chestnet.org
- American Thoracic Society
  - http://www.thoracic.org
- American College of Allergy, Asthma, and Immunology
  - http://www.acaai.org
- The Centers for Disease Control and Prevention
  - http://www.cdc.gov/asthma

Questions and Answers