

Asthma 2015: Establishing and Maintaining Control

Webinar for
Michigan Center for Clinical Systems Improvement
(Mi-CCSI)

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Asthma Prevalence

- Approx. 26 million Americans have asthma (2012)
- Most common chronic disorder in children
 - about 9 million children and adolescents
- Children with asthma are 3 times more likely to miss school than children without the disease
 - 10.5 million days/year
- Asthma is the 3rd leading cause of hospitalization in children < 15 years of age
 - Each year asthma in children accounts for >500,000 ED visits
- Annual economic cost is \$56 billion
 - Direct costs; indirect costs (lost productivity); Rx single largest expenditure of >\$6 billion

Asthma Prevalence

- Currently, prevalence rate is 8.4% in the U.S. (CDC)
 - An average of one out of 10 school-aged children has asthma
- Higher prevalence among the poor and minority populations
- Prevalence is increasing
 - Number of people with asthma in U.S. grew by 15% in the last decade
 - Greatest rise in asthma rates among black children (almost a 50% increase) from 2001 through 2009
 - It is estimated that the number of people (worldwide) with asthma will grow by more than 100 million by 2025
- 3,388 deaths annually in U.S. due to asthma (2009)
 - 9 people die from asthma each day in the U.S.
 - In Michigan, approx. 130 – 150 deaths/year (10-15 are children)

Asthma in Michigan

- 213,600 children and 654,100 adults currently have asthma in Michigan.
- >50% of Michigan adults with asthma had an asthma attack in the last year.
- 20% of Michigan adults with asthma are experiencing asthma symptoms every day.
- Asthma hospitalization rates are highest in very young children, age 0 to 4 years.
- Hospitalization rates for blacks are 4 times the rate for whites.

State/National Response

- **Asthma Initiative of Michigan (AIM)** includes 10 local asthma coalitions who have formed the Michigan Consortium of Asthma Coalitions: visit www.GetAsthmaHelp.org
- **U.S. Environmental Protection Agency (EPA)** hosts annual National Asthma Forum and has created a website of asthma programs nationwide: visit www.asthmacommunitynetwork.org
- **National Asthma Educator Certification Board (NAECB)** includes ~150 certified asthma educators in Michigan (~4,000 in the nation): visit www.naecb.org to find an AE-C in your area

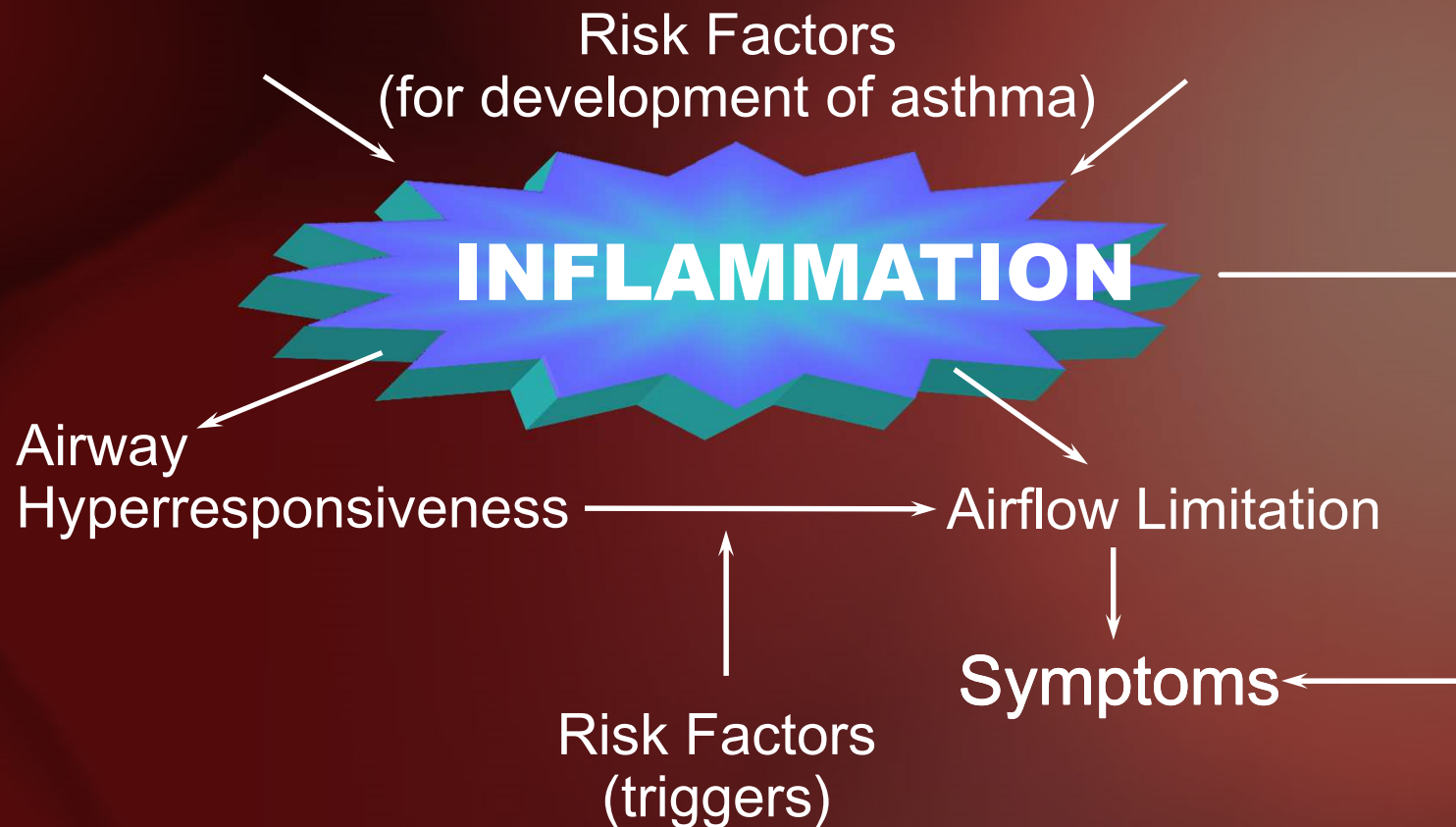
Definition of Asthma

- Chronic inflammatory disease of the airways characterized by:
 - Recurrent episodes of wheezing
 - Shortness of breath
 - Chest tightness/pain
 - Coughing
- Airflow limitation is at least partially reversible
- Airways are hyperresponsive (supersensitive) and react to a variety of stimuli or triggers

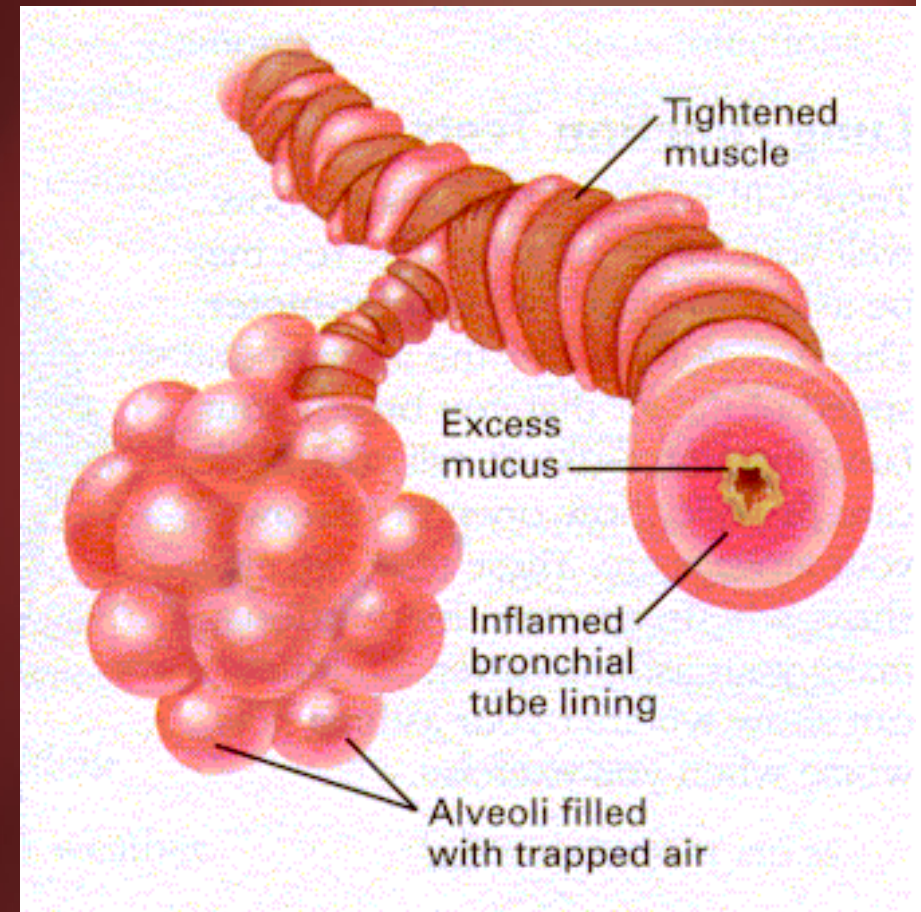
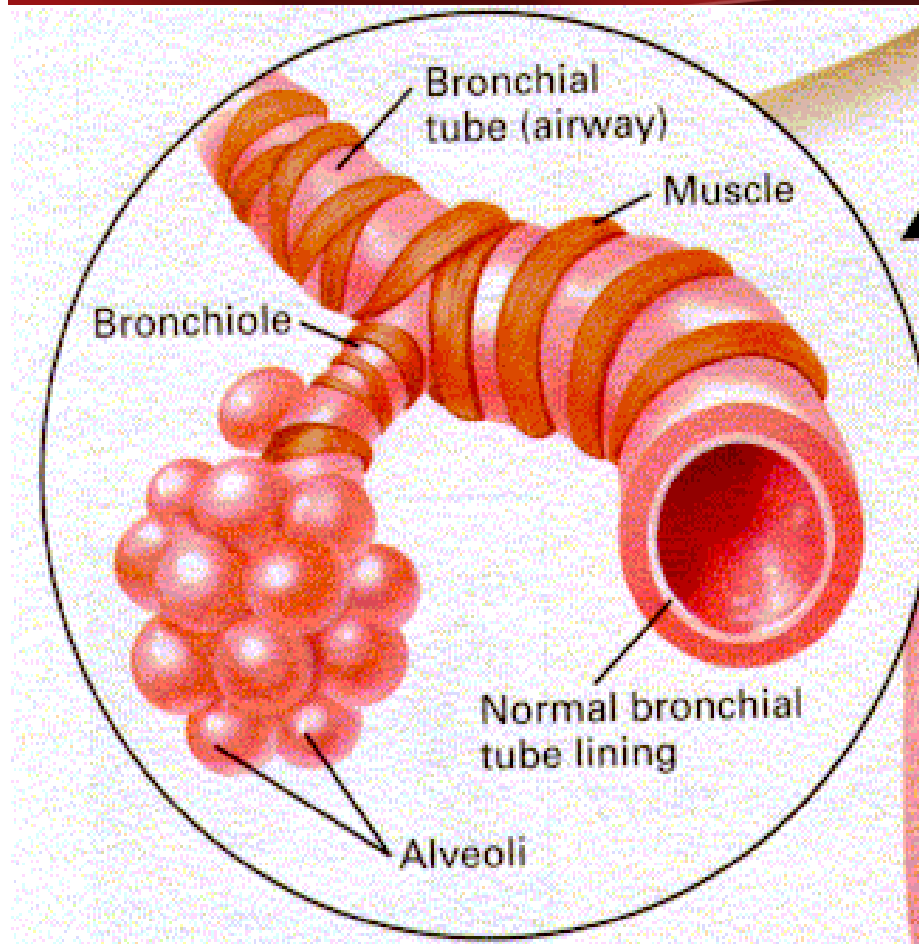
Asthma Pathophysiology

- In response to a trigger:
 - Airway inflammation
 - Bronchial smooth muscles constriction (bronchospasm)
 - Increased mucus production
 - The airways become narrow and breathing becomes difficult

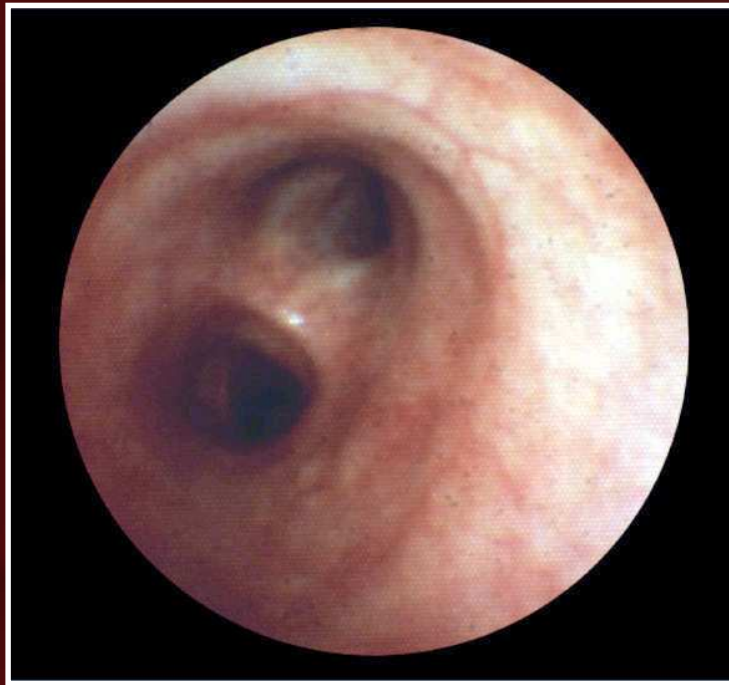
Mechanisms Underlying the Definition of Asthma



Normal vs. Asthma Airways



Asthma Airways

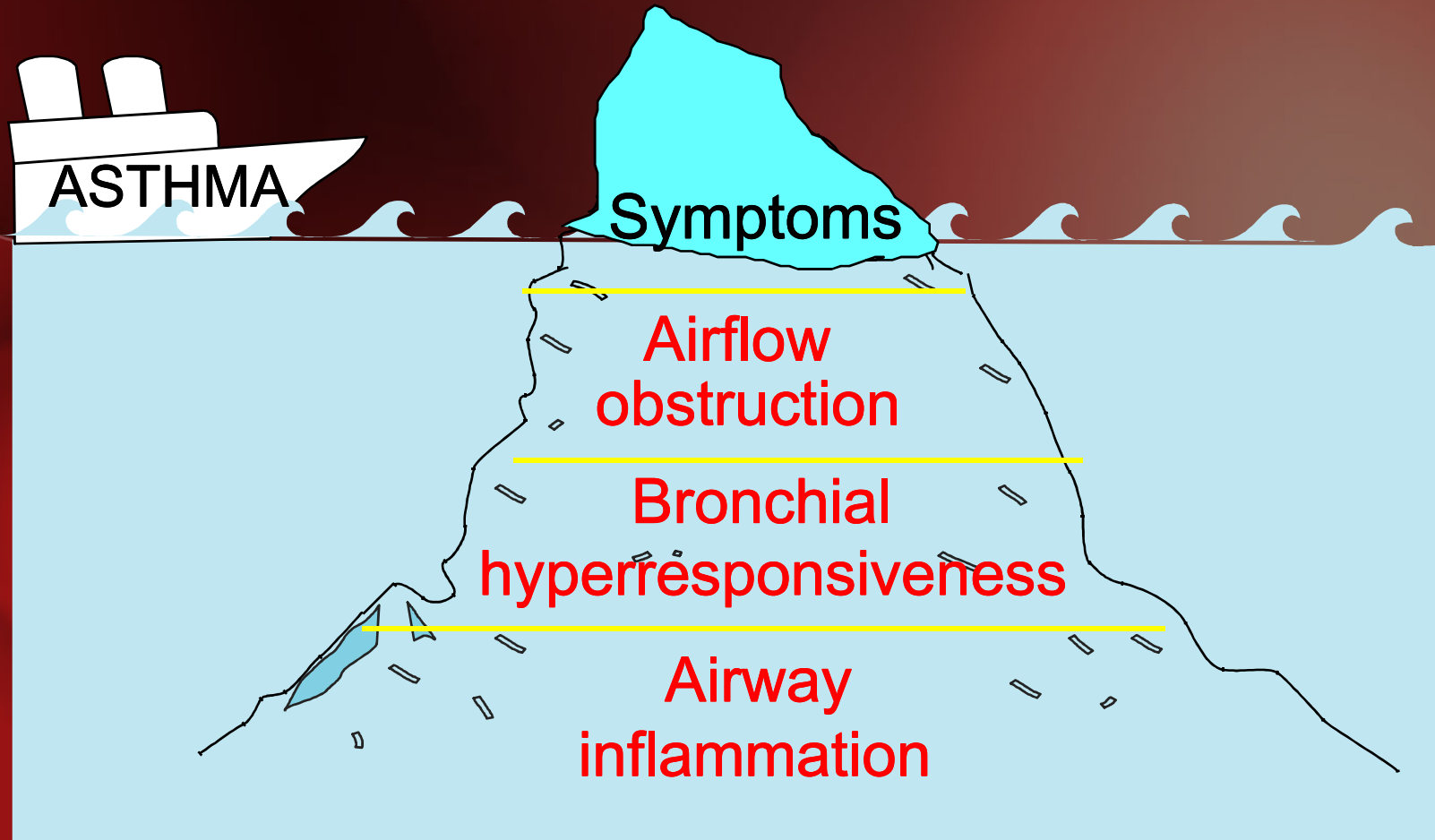


Before



**10 Minutes After
Allergen
Challenge**

The “Tip” of the Iceberg



National Asthma Education and Prevention Program. *Highlights of the Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma*. Bethesda, MD., May 1997. NIH Publication No. 97-4051A.

Factors Predicting Persistent Asthma

- Family history of asthma (maternal > paternal)
- Atopy (IgE/positive skin tests, eczema, rhinitis)
- Allergen exposure (dust mites / animals)
- Viral (RSV) infection
- Gender (males > females)
- Smoking (passive or active)
- The strongest *predictor* for wheezing that develops into asthma is ATOPY

Challenges in Treating Asthma

Assessing Symptoms

- Cough
- Wheeze
- Dyspnea
- Nocturnal symptoms
- Activity affected?

- ✓ Recurrent episodes of cough ($\pm$ wheeze) are frequently due to asthma
- ✓ Coughing may be the *only* symptom present

Asthma Diagnosis

- Medical history
- Physical exam
- Measurements of lung function
 - Diurnal variation in peak flow
- Evaluation of allergic status
- Exclude alternative diagnoses
 - Bronchiolitis, cystic fibrosis, GERD, foreign body aspiration

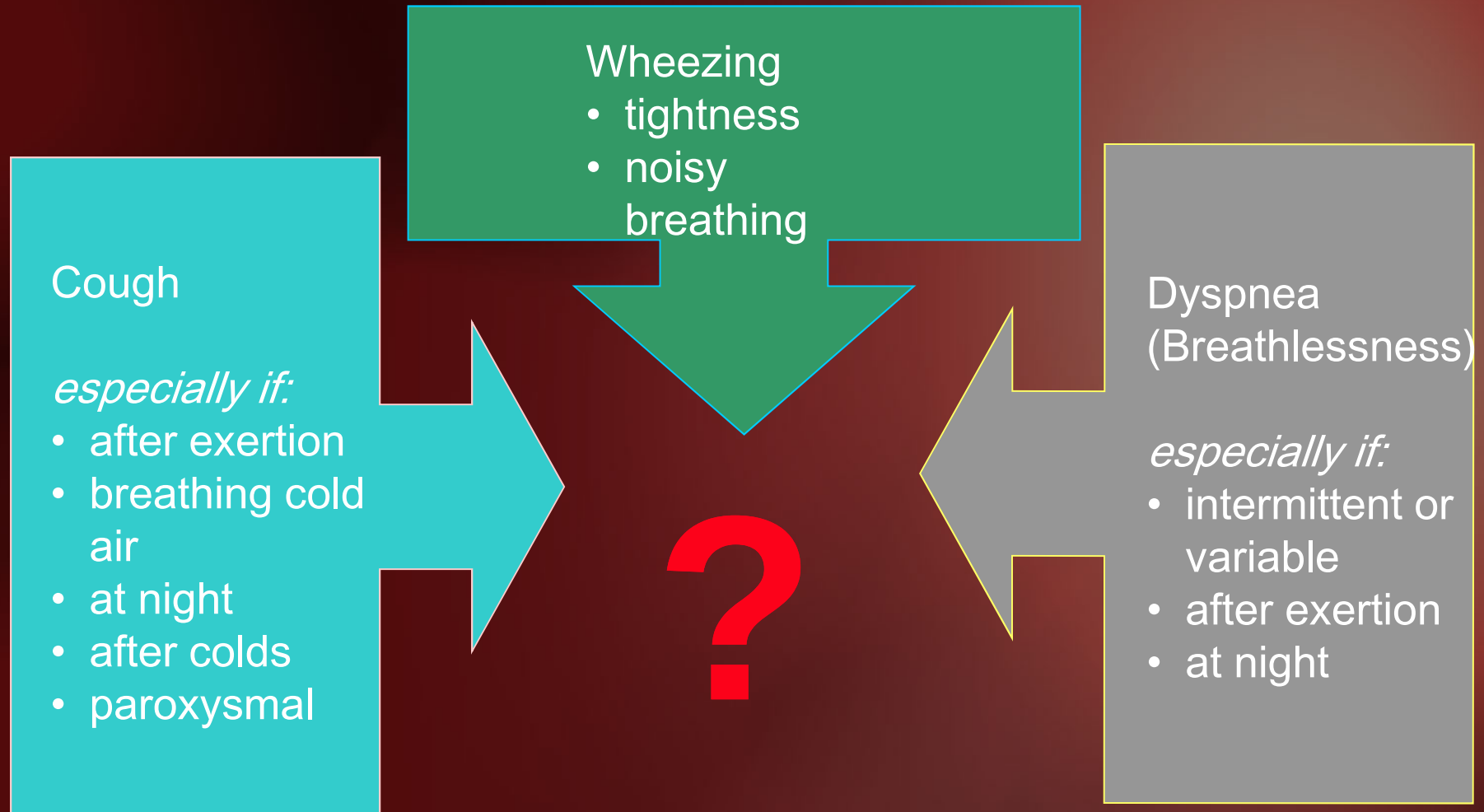
Asthma Diagnosis

Medical History

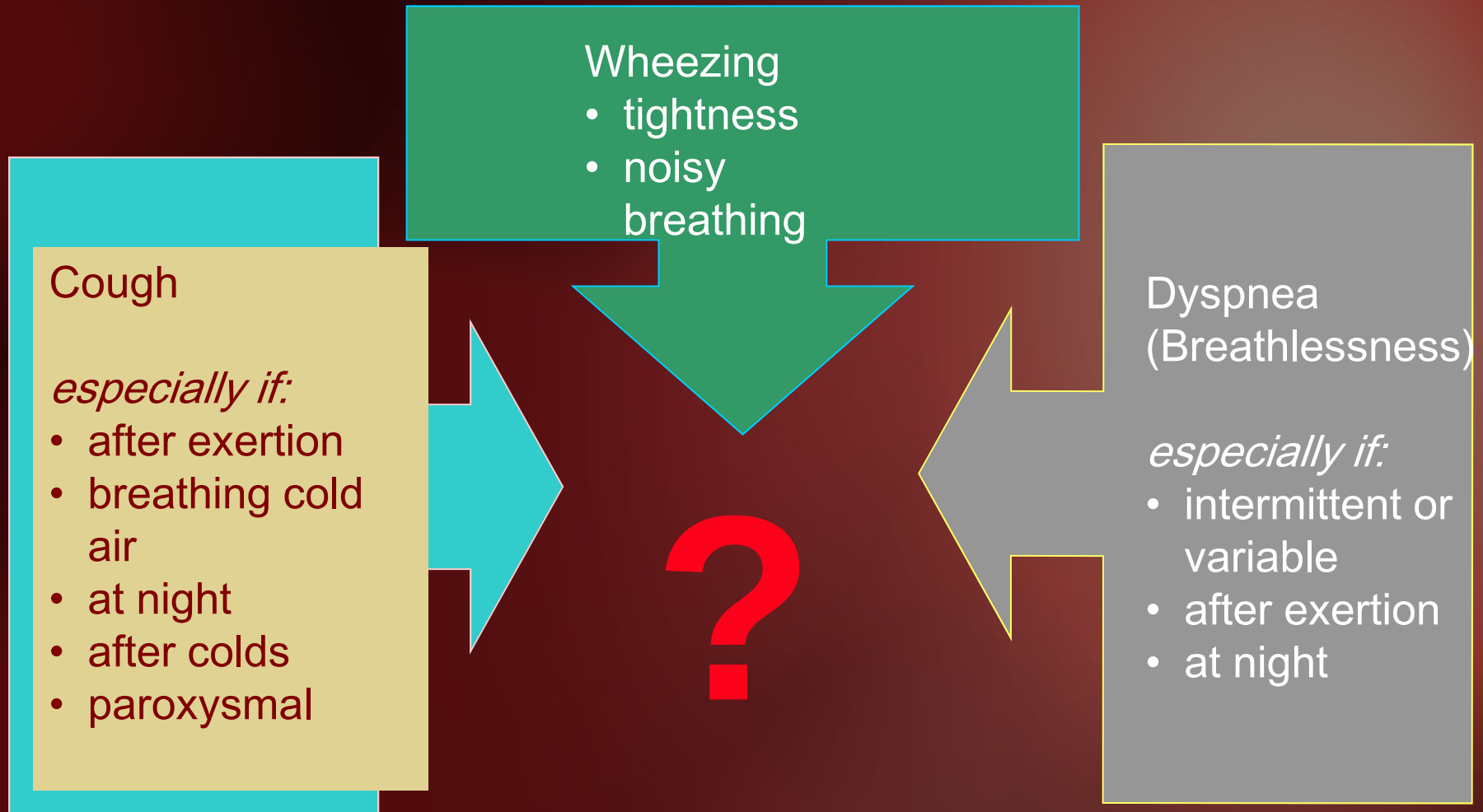
- Repeated cough, wheeze, chest tightness
- Repeated diagnoses of reactive airway disease, allergic bronchitis or wheezy bronchitis
- Symptoms worsened by viral infection, smoke, allergens, exercise, weather
- Symptoms occur/worsen at night
- Reversible airflow limitation

Wheezing may or may not be present

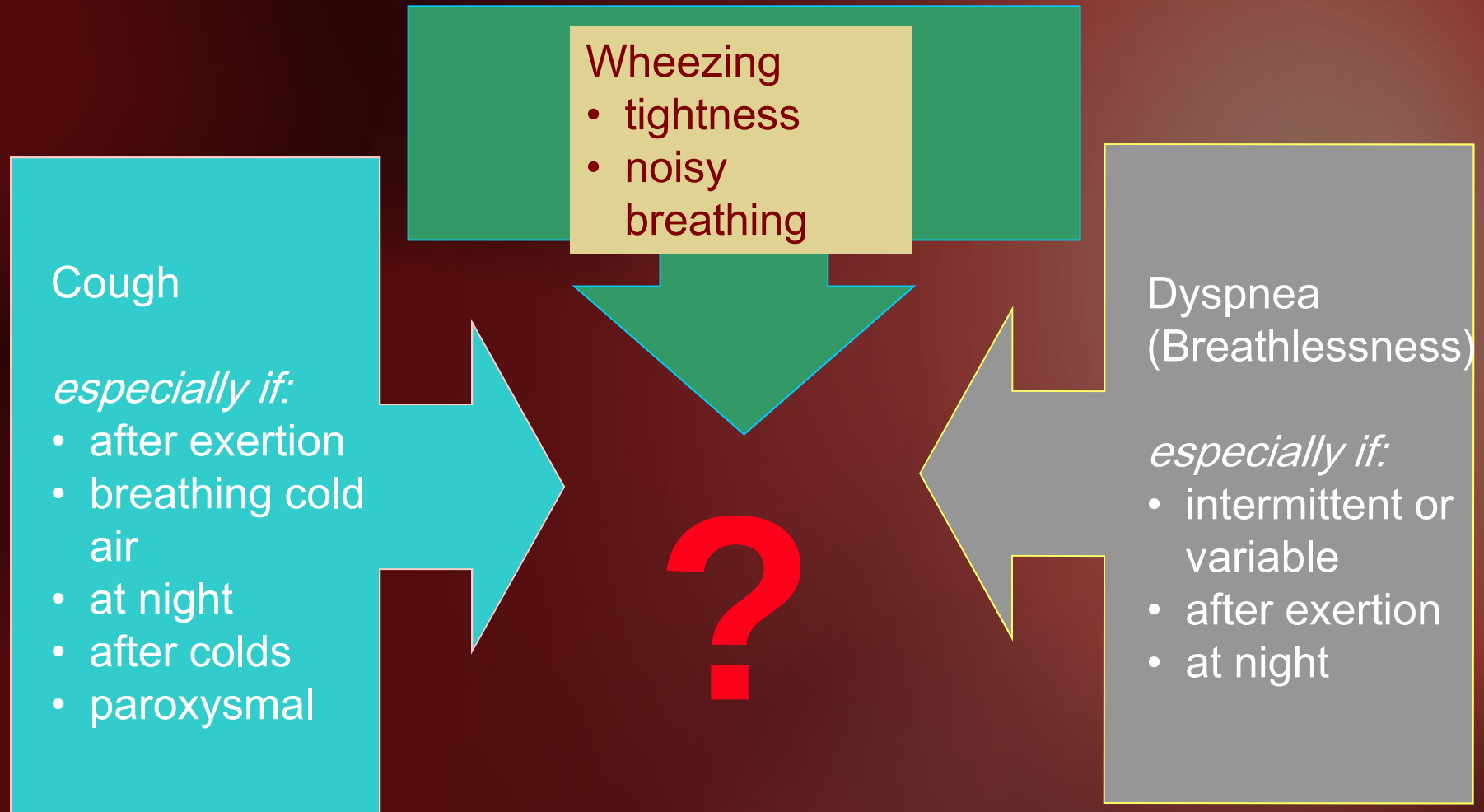
Asthma Diagnosis



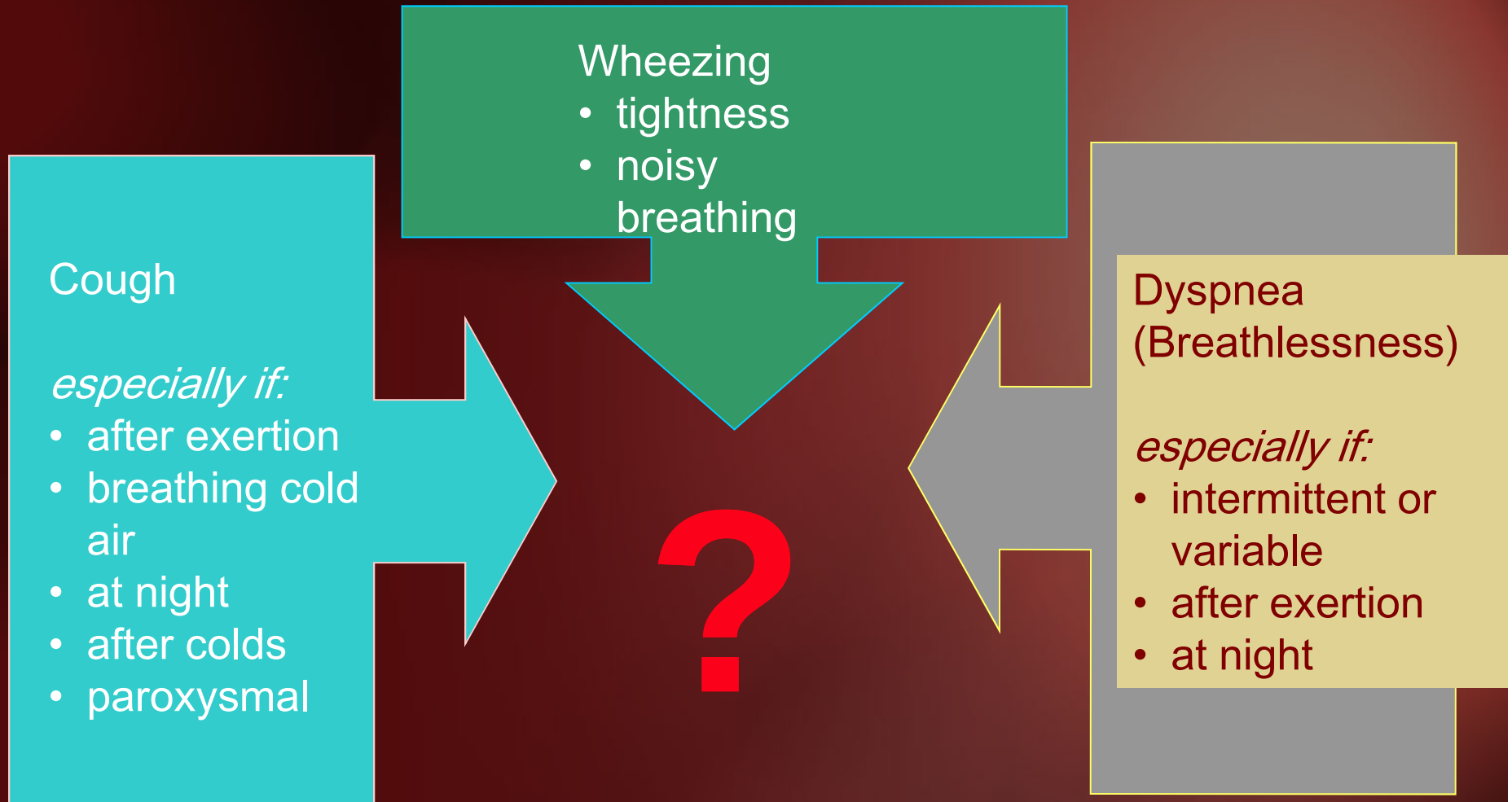
Asthma Diagnosis



Asthma Diagnosis



Asthma Diagnosis



Asthma Diagnosis



Asthma Diagnosis

Physical Exam

- Coughing, wheezing
- Prolonged forced expiration
- Use of accessory muscles
- Retractions
- Hyperexpansion of the chest
- Signs of other allergic diseases:
 - Atopic dermatitis
 - Allergic rhinitis

Physical examination of the chest may be normal

Spirometry

Measurements of Lung Function

- FEV_1
 - volume forcefully exhaled in 1 sec.
 - assesses large airways
- FVC
 - forced vital capacity
 - total amount forcefully exhaled
- FEV1 / FVC Ratio
 - helps differentiate obstruction vs. restriction
- FEF 25-75%
 - assesses small airways

Asthma Diagnosis

Measurements of Lung Function

Spirometry / Pulmonary Function Testing

Obstruction

- FEV_1 < 80%
- FEV_1 / FVC ratio < 80%

Reversibility

- FEV_1 change of > 12 % or 200mL
- FEF_{25-75} change of > 25%

Spirometry: Flow-Volume Loop Obstruction

Flow-Volume Loop

Flow in liters/second

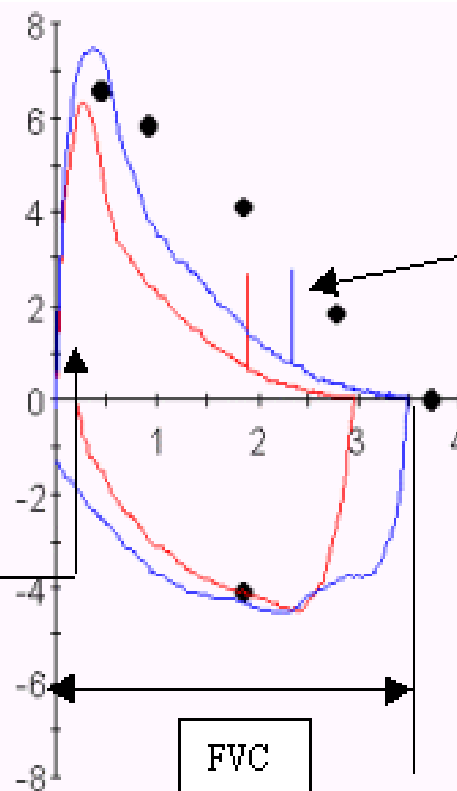
Maximal exhalation is noted with a sharp upward flow.

Expiratory side

FEV1 hash mark

Volume in liters

Inspiratory side



● Pred — Pre
— Post

FVC

Spirometry Results

- Classic finding is baseline spirometry reveals obstruction
- Post-bronchodilator spirometry may reveal reversibility
- Can still pursue post-bronchodilator spirometry even if baseline spirometry is normal
- Usually recommend 4 puffs of albuterol with spacer for post-bronchodilator trial
- Even if these values are all normal that does not completely exclude asthma

Flow-Volume Loops Side by Side Comparison

Exhalation Loops

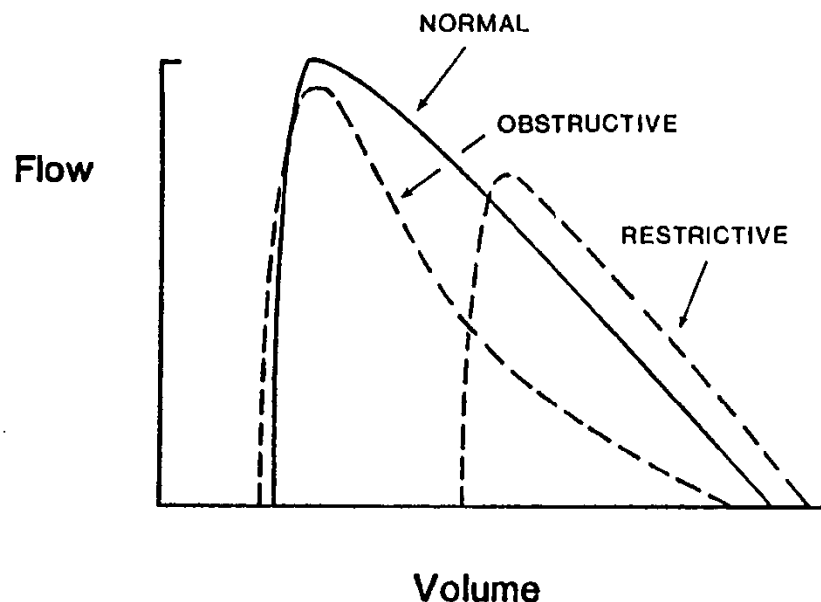


FIGURE 10-13. Changes in maximal expiratory flow-volume curve configuration occurring with mild to moderate restrictive or obstructive respiratory dysfunction. (Modified from Baum GL and Wolinsky E: Textbook of Pulmonary Diseases. 5th ed. Boston, Little, Brown & Co, 1994, with permission.)

Spirometric Results

Obstructive

- similar width to normal
- “scooped” appearance
- concave appearance

Restrictive

- narrowed width
- similar shape

Spirometry

- Patient Positioning
 - Critical to achieving acceptable spirometry
 - Stand or sit upright – no bending at the waist
 - Trunk upright
 - Chin slightly elevated
 - Neck in extension
 - Nose clips (+/-) Be consistent

Spirometry: Bronchodilator Studies



- A normal baseline lung function test *does NOT rule out asthma*, nor does it negate the need for a post-bronchodilator study
- It is quite possible that your patient's flow-volume loops could still improve after 2-4 puffs of a bronchodilator!



Spirometry: Bronchodilator Studies

Test	Restriction	Obstruction	Reversibility
FEV₁	< 80%	< 80%	≥12%
FVC	decreased	decreased / normal	≥12%
FEV₁/FVC	normal	decreased	-----
FEF25-75%	decreased	decreased	≥25%

Diagnosis

- Response to Medications
 - If still suspect asthma can pursue medication trial
 - Can consider a 2 to 4 week trial of inhaled steroid
 - Could also consider 2 week trial of oral steroids
 - Assess for spirometry changes at follow up
 - Significant improvement in symptoms and spirometry is consistent with asthma

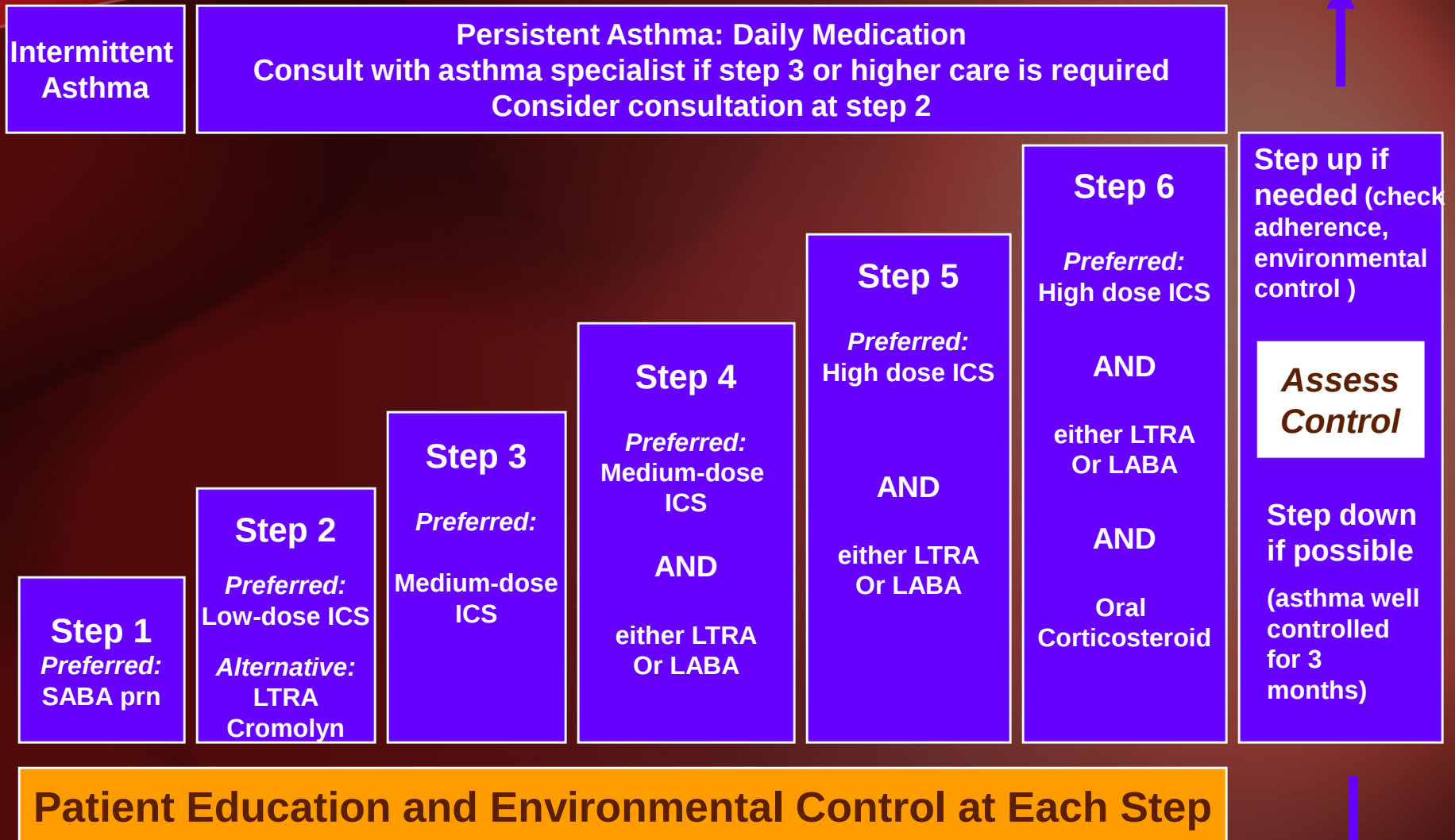
CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN CHILDREN 0-4 YEARS OF AGE

EPR-3, p72, 307

Components of Severity		Classification of Asthma Severity			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment	Symptoms	≤2 days/week	>2 days/week not daily	Daily	Continuous
	Nighttime Awakenings	0	1-2x/month	3-4x/month	>1x/week
	SABA use for sx control	≤2 days/week	>2 days/week not daily	Daily	Several times daily
	Interference with normal activity	none	Minor limitation	Some limitation	Extremely limited
Risk	Exacerbations (consider frequency and severity)	0-1/year	≥2 exacerbations in 6 months requiring oral steroids, or ≥4 wheezing episodes/ year lasting >1 day AND risk factors for persistent asthma		
		Frequency and severity of may fluctuate over time Exacerbations of any severity may occur in patients in any category			
Recommended Step for Initiating Treatment		Step 1	Step 2	Step 3	
		In 2 -6 weeks, evaluate asthma control accordingly	Consider short course of oral steroids that is achieved and adjust therapy		

STEPWISE APPROACH FOR MANAGING ASTHMA IN CHILDREN 0 - 4 YEARS OF AGE

EPR-3, p291-296



ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN CHILDREN 0 - 4 YEARS OF AGE

EPR-3, p75, 309

Components of Control		Classification of Asthma Control		
IMPAIRMENT	Symptoms	Well Controlled ≤ 2 days/week	Not Well Controlled > 2 days/week	Very Poorly Controlled Throughout the day
	Nighttime awakenings	≤ 1 /month	≥ 2 x/month	≥ 2 x/week
	Interference with normal activity	none	Some limitation	Extremely limited
	SABA use	≤ 2 days/week	> 2 days/week	Several times/day
RISK	Exacerbations	0- 1 per year	2 - 3 per year	> 3 per year
	Progressive loss of lung function	Evaluation requires long-term follow up care		
	Rx-related adverse effects	Consider in overall assessment of risk		
Recommended Action For Treatment		- Maintain current step - REGULAR FOLLOW UP EVERY 3 - 6 MONTHS - Consider step down if well controlled at least 3 months	- Step up 1 step - Reevaluate in 2 - 6 weeks - If no clear benefit in 4-6 weeks , consider alternative dx or adjust therapy	- Consider oral steroids - Step up (1-2 steps) and reevaluate in 2 weeks - If no clear benefit in 4-6 weeks , consider alternative dx or adjust therapy

CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN CHILDREN 5 - 11 YEARS OF AGE

EPR-3, p73, 308

Components of Severity		Classification of Asthma Severity				
		Intermittent	Persistent			
			Mild	Moderate	Severe	
Impairment	Symptoms	≤2 days/week	>2 days/week not daily	Daily	Continuous	
	Nighttime Awakenings	≤2x/month	3-4x/month	>1x/week not nightly	Often nightly	
	SABA use for sx control	≤2 days/week	>2 days/week not daily	Daily	Several times daily	
	Interference with normal activity	none	Minor limitation	Some limitation	Extremely limited	
	Lung Function	•Normal FEV ₁ between exacerbations • FEV ₁ > 80% • FEV ₁ /FVC> 85%	• FEV ₁ >80% •FEV ₁ /FVC> 80%	• FEV ₁ =60% - 80% •FEV ₁ /FVC=75% -80%	•FEV ₁ <60% •FEV ₁ /FVC < 75%	
Risk	Exacerbations (consider frequency and severity)	0-2/year > 2 /year 				
		Frequency and severity may vary over time for patients in any category				
Recommended Step for Initiating Treatment		Step 1		Step 2	Step3 medium-dose ICS option	Step 3 or 4
				Consider short course of oral steroids		
		In 2 -6 weeks, evaluate asthma control that is achieved and adjust therapy				

STEPWISE APPROACH FOR MANAGING ASTHMA IN CHILDREN 5-11 YEARS OF AGE

EPR-3, p296-304

Intermittent
Asthma

Persistent Asthma: Daily Medication
Consult with asthma specialist if step 4 or higher care is required
Consider consultation at step 3

Step 1
Preferred:
SABA prn

Step 2
Preferred:
Low-dose ICS
Alternative:
LTRA
Cromolyn
Theophylline

Step 3
Preferred:
Medium-dose ICS

OR
Low-dose ICS
+ either LABA,
LTRA, or
Theophylline

Step 4
Preferred:
Medium-dose ICS+LABA

Alternative:
Medium-dose ICS + either LTRA, or Theophylline

Step 5
Preferred:
High dose ICS + LABA

Alternative:
High-dose ICS + either LTRA or Theophylline

Step 6
Preferred:
High-dose ICS + LABA + oral Corticosteroid

Alternative:
High-dose ICS + either LTRA or Theophylline + oral corticosteroid

Step up if needed (check adherence, environmental control and comorbidities)

Assess Control

Step down if possible (asthma well controlled for 3 months)

Patient Education and Environmental Control at Each Step

ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN

CHILDREN 5 - 11 YEARS OF AGE

EPR-3, p76, 310

Components of Control		Classification of Asthma Control		
IMPAIRMENT	Symptoms	Well Controlled ≤ 2 days/week	Not Well Controlled > 2 days/week	Very Poorly Controlled Throughout the day
	Nighttime awakenings	≤ 1 /month	≥ 2 x/month	≥ 2 x/week
	Interference with normal activity	none	Some limitation	Extremely limited
	SABA use	≤ 2 days/week	> 2 days/week	Several times/day
	FEV ₁ or peak flow	$> 80\%$ predicted/ personal best	60-80% predicted/ personal best	$< 60\%$ predicted/ personal best
	FEV ₁ /FVC	$> 80\%$ predicted	75-80% predicted	$< 75\%$ predicted
RISK	Exacerbations	0- 1 per year	2 - 3 per year	> 3 per year
	Progressive loss of lung function	Evaluation requires long-term follow up care		
	Rx-related adverse effects	Consider in overall assessment of risk		
Recommended Action For Treatment		- Maintain current step - Consider step down if well controlled at least 3 months	- Step up 1 step - Reevaluate in 2 - 6 weeks	- Consider oral steroids - Step up 1-2 weeks and reevaluate in 2 weeks

CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN

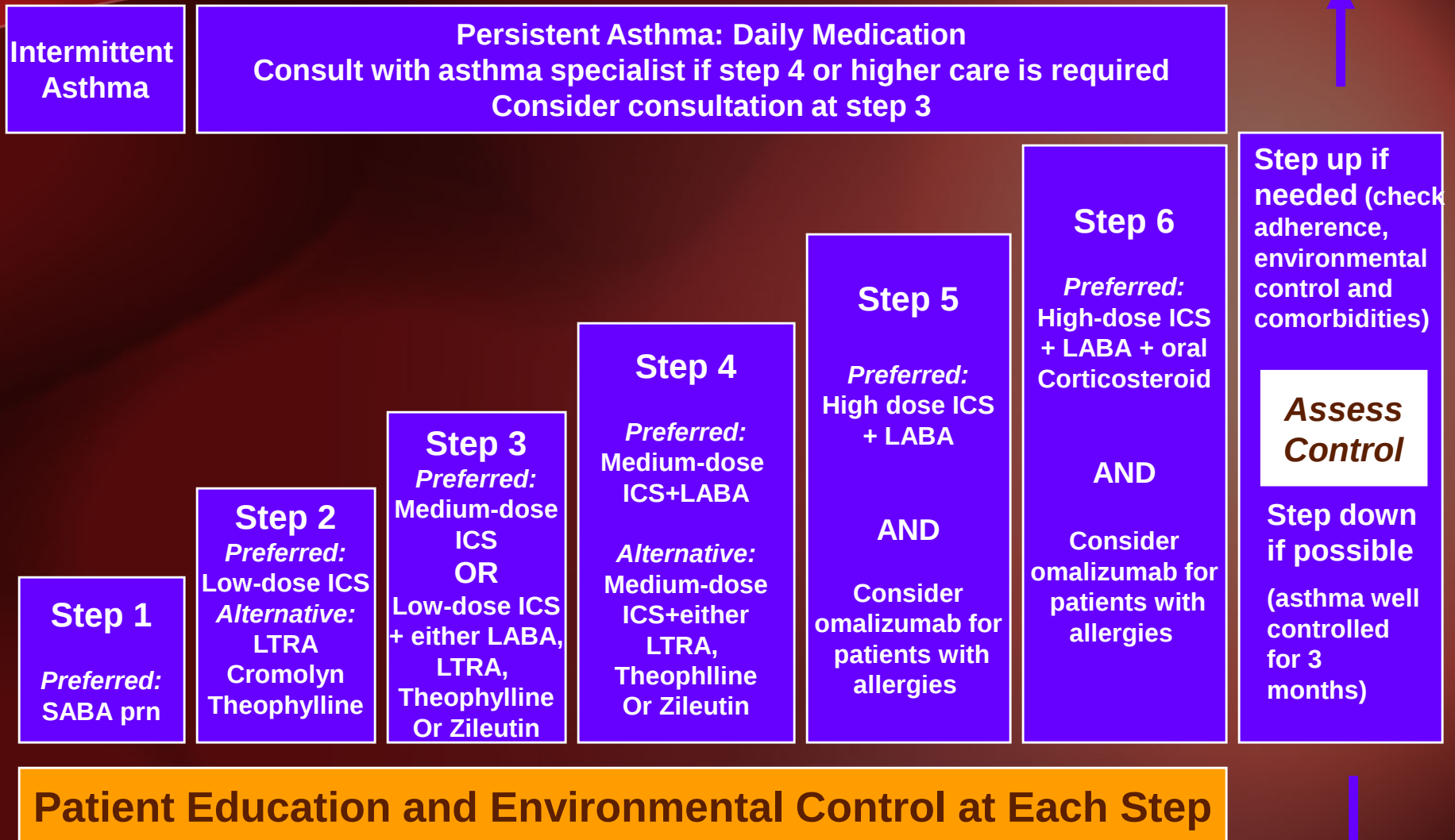
YOUTHS $\geq$ 12 YEARS AND ADULTS

EPR-3, p74, 344

Components of Severity		Classification of Asthma Severity			
		Intermittent	Persistent		
			Mild	Moderate	Severe
Impairment Normal FEV ₁ /FVC 8-19 yr 85% 20-39 yr 80% 40-59 yr 75% 60-80 yr 70%	Symptoms	≤2 days/week	>2 days/week not daily	Daily	Continuous
	Nighttime Awakenings	≤2x/month	3-4x/month	>1x/week not nightly	Often nightly
	SABA use for sx control	≤2 days/week	>2 days/week not daily	Daily	Several times daily
	Interference with normal activity	none	Minor limitation	Some limitation	Extremely limited
	Lung Function	• Normal FEV₁ between exacerbations • FEV₁ > 80% • FEV₁/FVC normal	• FEV₁ >80% • FEV₁/FVC normal	• FEV₁ >60% but< 80% • FEV₁/FVC reduced 5%	• FEV₁ <60% • FEV₁/FVC reduced >5%
Risk	Exacerbations (consider frequency and severity)	0-2/year > 2 /year 			
		Frequency and severity may vary over time for patients in any category Relative annual risk of exacerbations may be related to FEV ₁			
Recommended Step for Initiating Treatment		Step 1	Step 2	Step 3	Step 4 or 5
		Consider short course of oral steroids In 2 - 6 weeks, evaluate asthma control that is achieved and adjust therapy accordingly			

STEPWISE APPROACH FOR MANAGING ASTHMA IN YOUTHS > 12 YEARS AND ADULTS

EPR-3, p333-343



ASSESSING ASTHMA CONTROL AND ADJUSTING THERAPY IN

YOUTHS ≥ 12 YEARS OF AGE AND ADULTS

EPR-3, p77, 345

Components of Control		Classification of Asthma Control		
IMPAIRMENT	Symptoms	Well Controlled ≤ 2 days/week	Not Well Controlled > 2 days/week	Very Poorly Controlled Throughout the day
	Nighttime awakenings	≤ 2 /month	1-3/week	≥ 4 /week
	Interference with normal activity	none	Some limitation	Extremely limited
	SABA use	≤ 2 days/week	> 2 days/week	Several times/day
	FEV ₁ or peak flow	$> 80\%$ predicted/ personal best	60-80% predicted/ personal best	$< 60\%$ predicted/ personal best
	Validated questionnaires ATAQ/ACT	0/ ≥ 20	1-2/16-19	3-4/ ≤ 15
RISK	Exacerbations	0- 1 per year	2 - 3 per year	> 3 per year
	Progressive loss of lung function	Evaluation requires long-term follow up care		
	Rx-related adverse effects	Consider in overall assessment of risk		
Recommended Action For Treatment		• Maintain current step • Consider step down if well controlled at least 3 months	• Step up 1 step • Reevaluate in 2 - 6 weeks	• Consider oral steroids • Step up 1-2 weeks and reevaluate in 2 weeks

Childhood Asthma Control Test™ (ACT): Questions Completed by Child

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 okay.



3

It's not a problem

3. Do you cough because of your asthma?



0

Yes, all of 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 your asthma?



0

Yes, all of the time.



1

Yes, most of the time.



2

Yes, some of the time.



3

No, none of the time

Childhood Asthma Control Test™ (ACT): Questions Completed by Parent/Caregiver

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

5

Not at all

4

1-3 days/mo

3

4-10 days/mo

2

11-18 days/mo

1

19-24 days/mo

0

Everyday

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

5

Not at all

4

1-3 days/mo

3

4-10 days/mo

2

11-18 days/mo

1

19-24 days/mo

0

Everyday

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

5

Not at all

4

1-3 days/mo

3

4-10 days/mo

2

11-18 days/mo

1

19-24 days/mo

0

Everyday

TOTAL

Asthma Control Test™ (ACT) for Patients 12 Years and Older

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
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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
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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
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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
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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
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Patient Total
Score

Treatment Strategies

Gain Control!

- Aggressive, intensive initial therapy to suppress airway inflammation and gain prompt control

Maintain Control

- Frequent follow-up clinically and physiologically
- Therapeutic modifications depending on severity and clinical course
- “Step down” long-term control medications to maintain control with minimal side effects

Recommended Action for Treatment Based on Assessment of Control

Well Controlled	Not Well Controlled	Very Poorly Controlled
Maintain current step	Step up 1 step and reevaluate in 2-6 weeks	Consider short course of oral corticosteroids
Consider step down if well controlled for at least 3 months	For side effects, consider alternative treatment options	Step up 1-2 steps and reevaluate in 2 weeks
		For side effects, consider alternative treatment options

Before stepping up check adherence and environmental control

Monitoring Asthma Control

Ask the patient

- Has your asthma awakened you at night or early morning?
- Have you needed more rescue inhaler than usual?
- Have you needed urgent care for asthma? (office, ED, etc)
- Are you participating in your usual or desired activities?
- What are your triggers? (and how can we manage them?)

Actions to consider

- Assess whether medications are being taken as prescribed
- Assess whether inhalation technique is correct
- Assess spirometry and compare to previous measurements
- Adjust medications, as needed to achieve best control with the lowest dose needed to maintain control
- Environmental mitigation strategy

Questions?

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