Childhood Asthma Management

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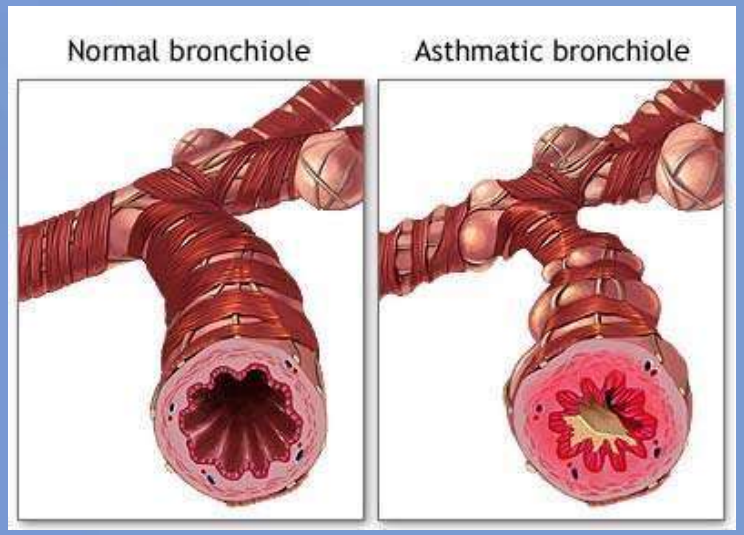
Definition of asthma

Asthma is a heterogeneous disease, characterized by chronic airway inflammation resulting in episodic airflow obstruction.

It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.

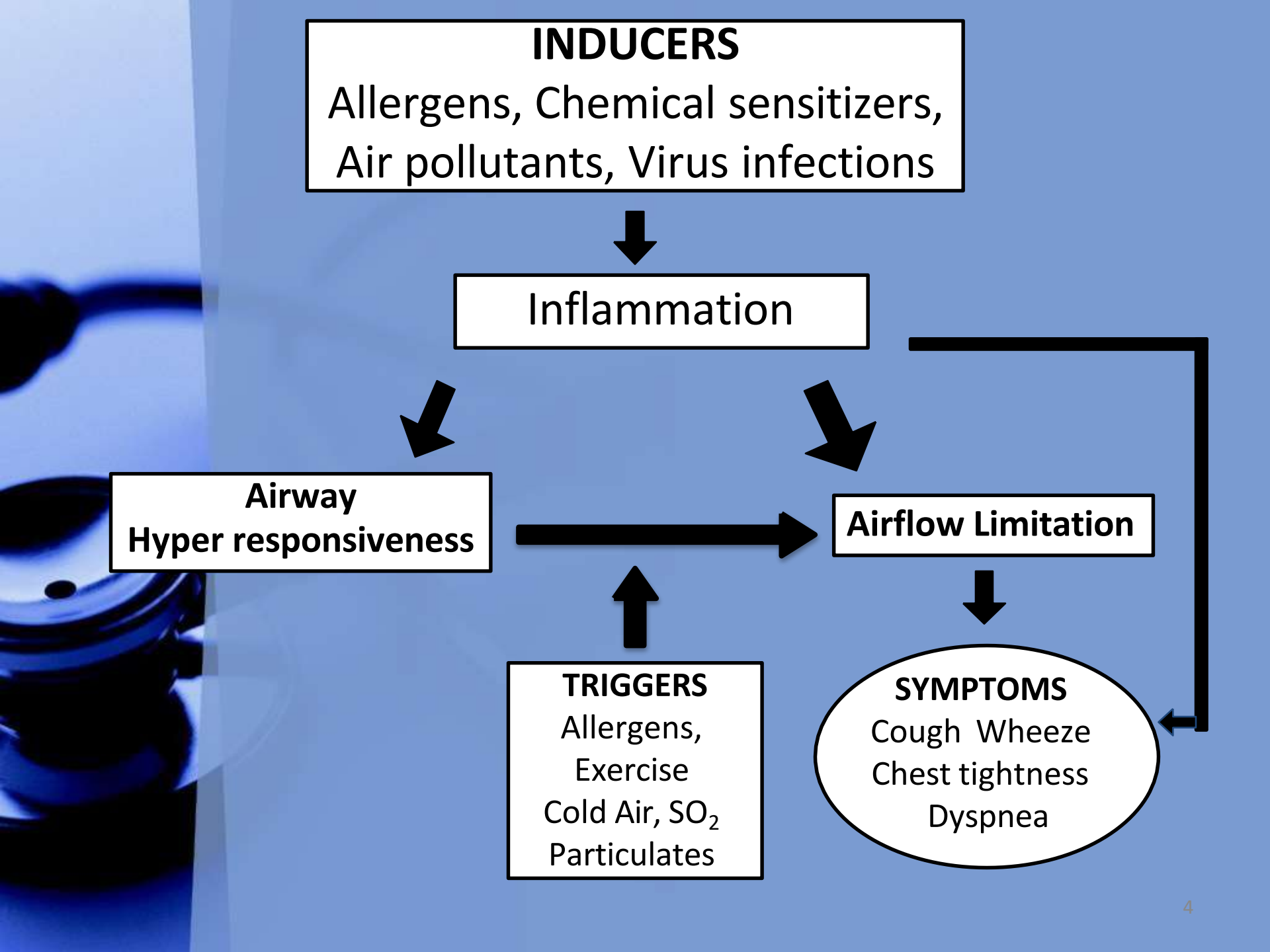


Childhood Asthma

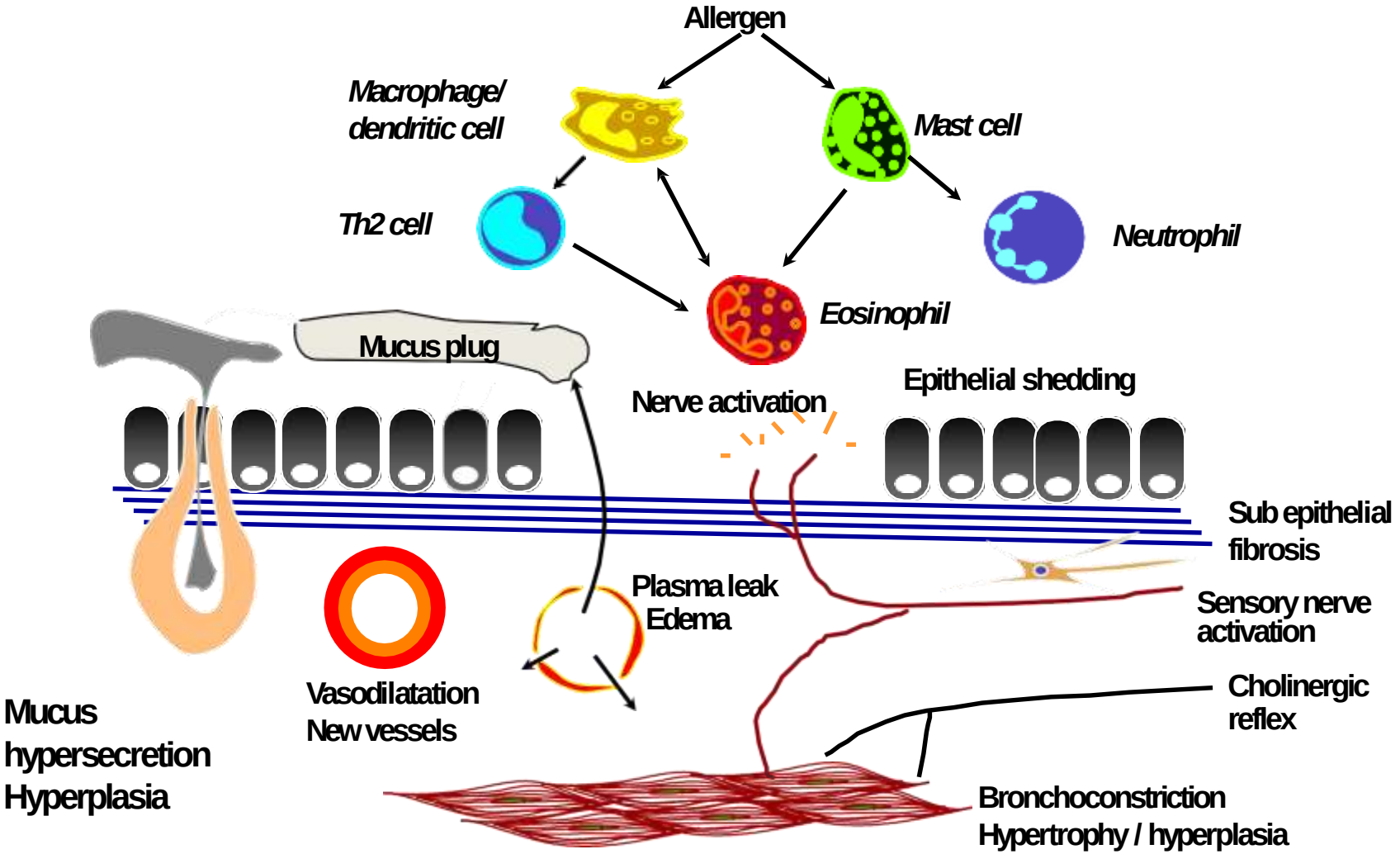
Bronchospasm

Inflammation

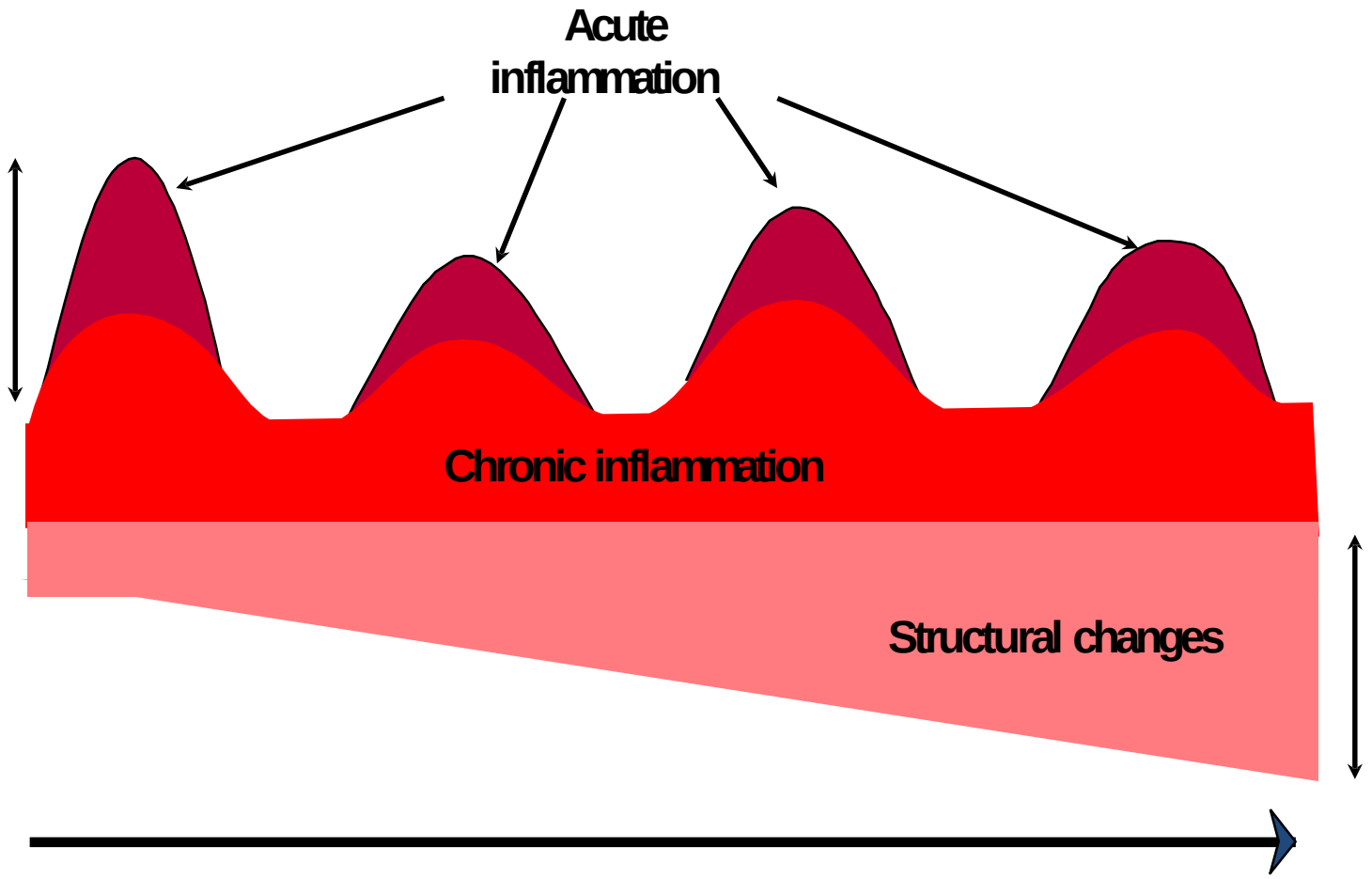
- is characterized by
  - Airway obstruction
    - which is reversible
  - Airway inflammation


INDUCERS
Allergens, Chemical sensitizers,
Air pollutants, Virus infections
Inflammation
Airway
Hyper responsiveness
Airflow Limitation
TRIGGERS
Allergens,
Exercise
Cold Air, SO_2
Particulates
SYMPTOMS
Cough Wheeze
Chest tightness
Dyspnea

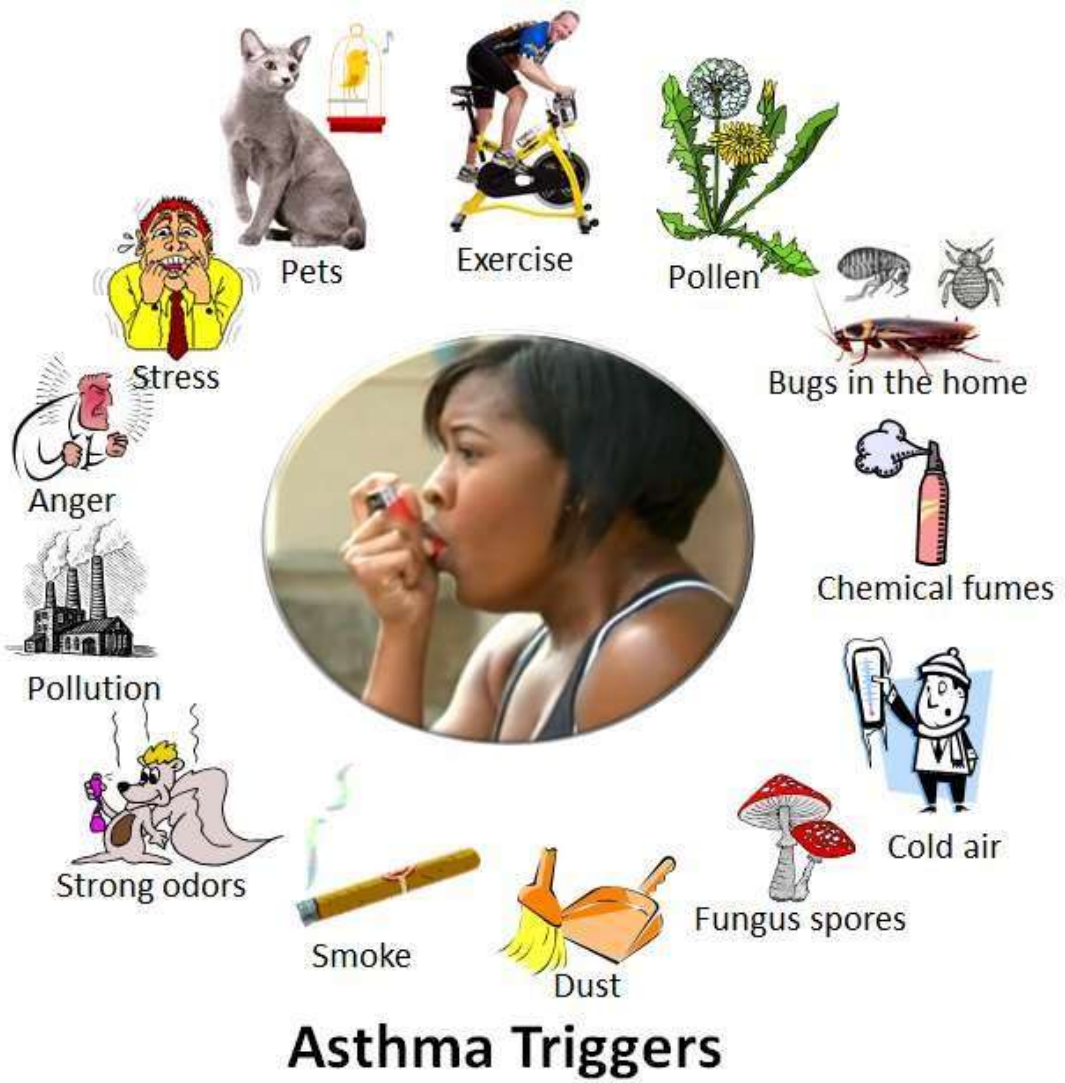
MODERN VIEW OF ASTHMA



INFLAMMATION IN ASTHMA

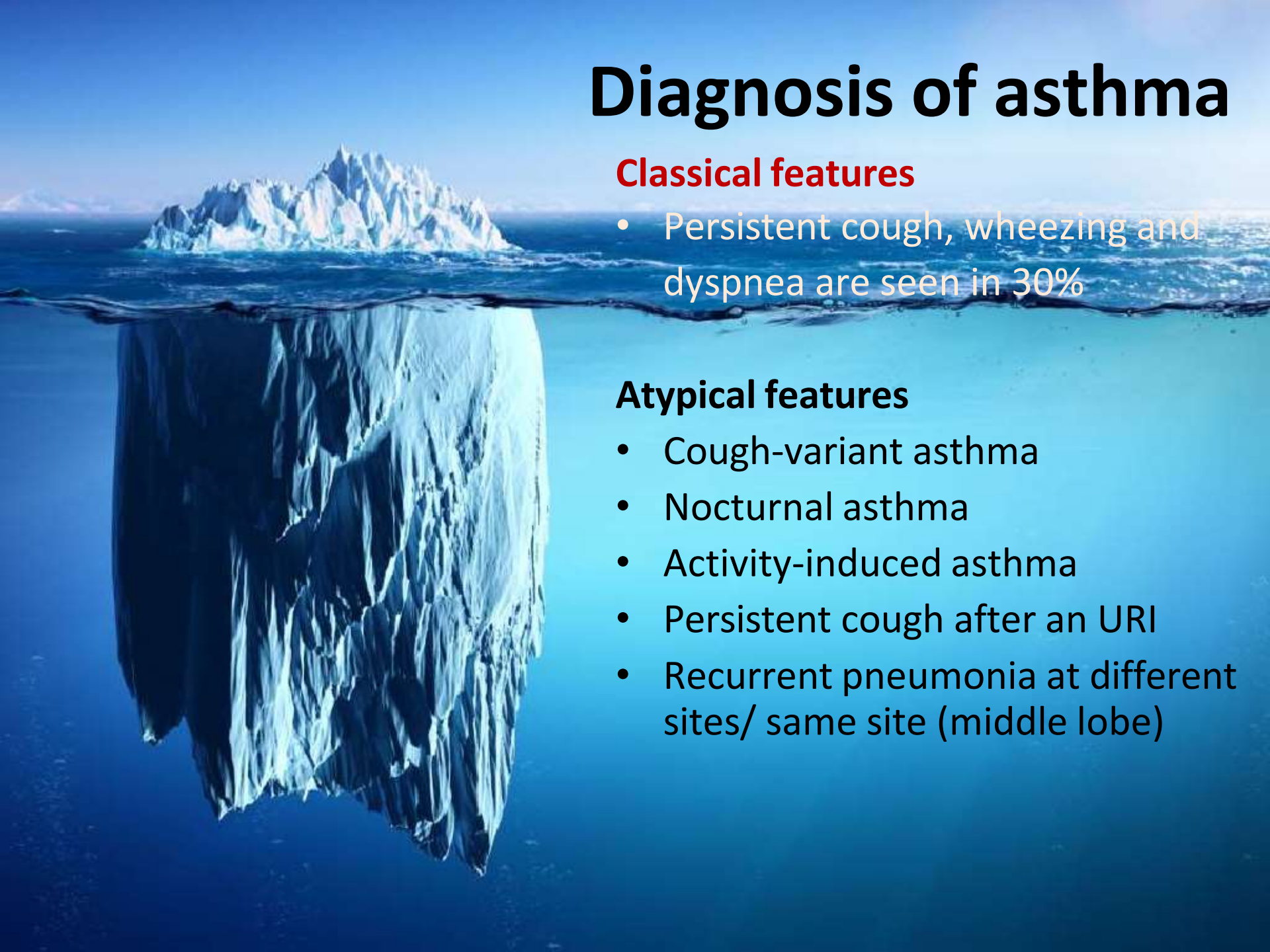


TRIGGERS



Drugs:

- NSAIDs
- Aspirin
- ß-blockers



Diagnosis of asthma

Classical features

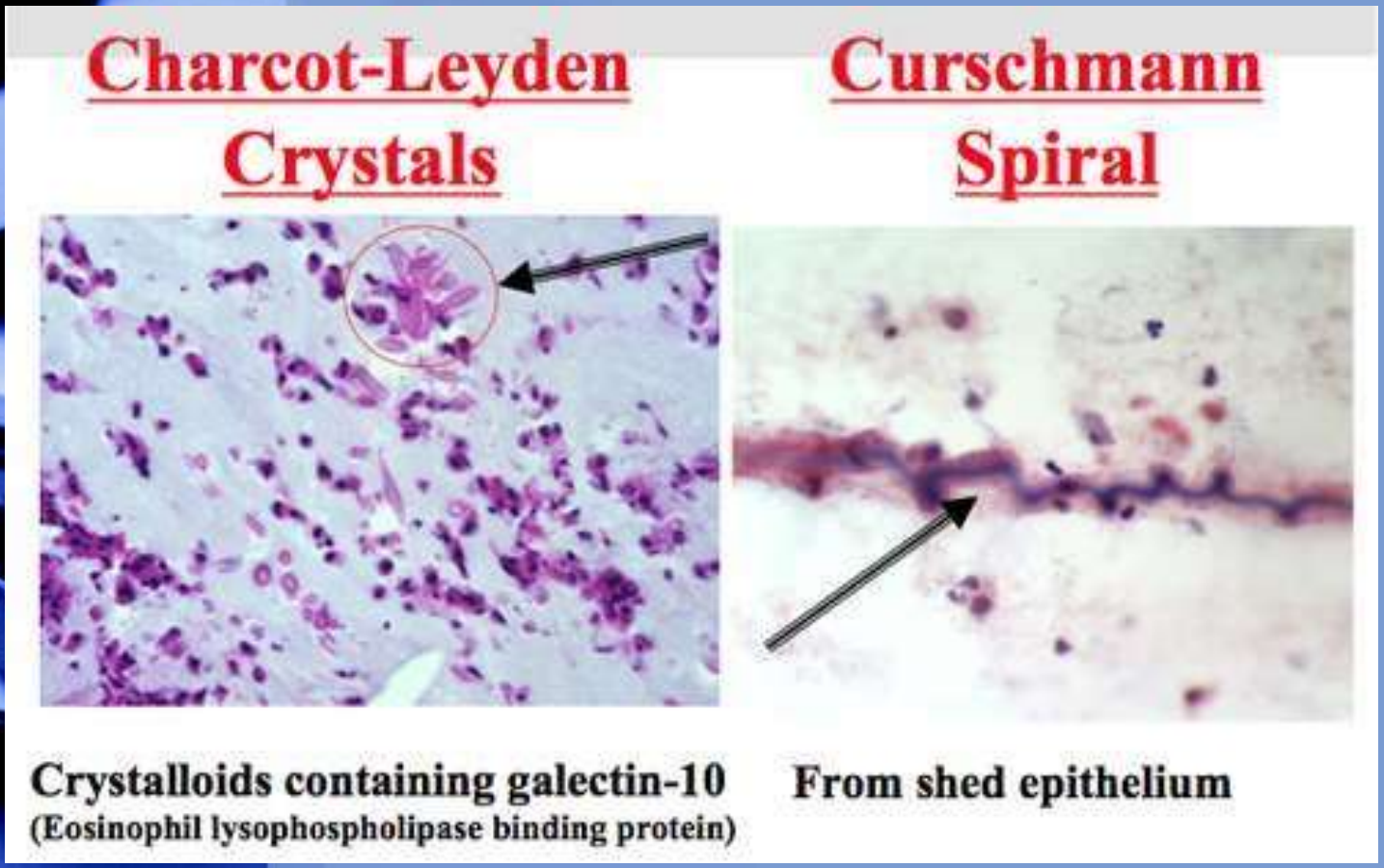
- Persistent cough, wheezing and dyspnea are seen in 30%

Atypical features

- Cough-variant asthma
- Nocturnal asthma
- Activity-induced asthma
- Persistent cough after an URI
- Recurrent pneumonia at different sites/ same site (middle lobe)

INVESTIGATIONS

- Routine blood counts may not help
- Peripheral smear may show eosinophilia
- X–ray chest to rule out tuberculosis

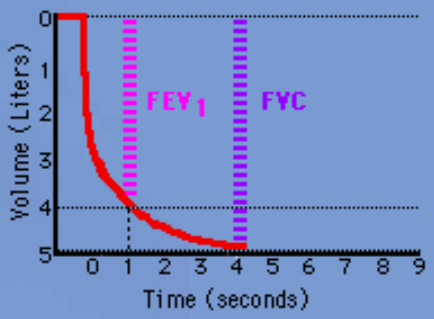


- Sputum examination for eosinophils and Curschmanns spiral bodies – rarely needed
- **Pulmonary function tests – Gold Standard**
- Spirometry
- Peak Expiratory flow rate

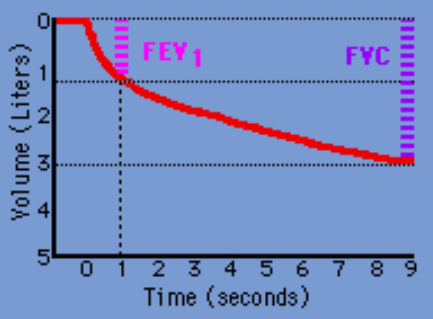
SPIROMETRY

Useful in children above 6 years

- An objective measure of airflow limitation.
  - Low FEV1 (relative to percentage of predicted)
  - FEV1/FVC ratio < 0.80
- Bronchodilator response (to inhaled β-agonist):
  - Improvement in FEV1 ≥12% and ≥200 mL*
- Exercise challenge:
  - Worsening in FEV1 ≥15%*
- Daily peak flow or FEV1 monitoring:
  - day to day and/or am-to-pm variation ≥20%*



Normal Forced Expiration Curve

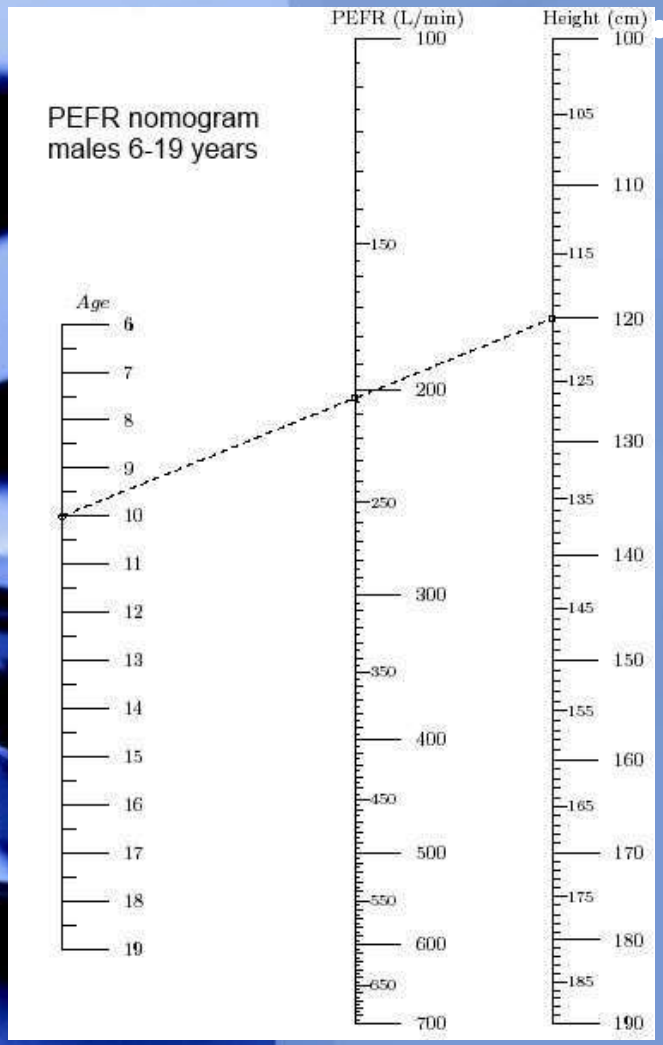


Obstructive Forced Expiration Curve

** MAIN criteria consistent with asthma.*

Lung Function Tests

- **PEFR Monitoring** :
- Simple and inexpensive home-use tools to measure airflow and can be helpful in a number of circumstances.



Differential Diagnosis

Early infancy Birth – 6 months	Infancy – Early childhood 6 months – 3 years	Late Childhood > 3 years
Aspiration syndromes (Gastroesophageal Reflux etc.)	Bronchiolitis	Asthma
Bronchiolitis	Transient wheezing of childhood (TWC)	Transient wheezing of childhood (TWC)
Foreign body inhalation (Rarely)	Foreign body inhalation, CHD, TB	Congenital heart disease

CLASSIFICATION OF ASTHMA SEVERITY

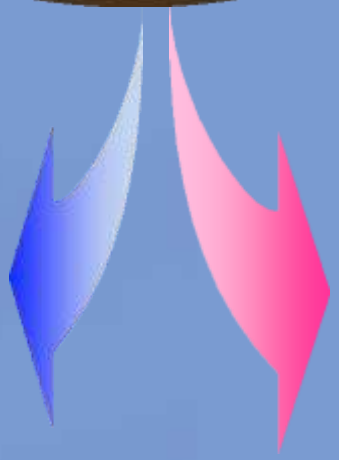
(0 - 4 yrs old Children)

Components of Severity	Intermittent	Persistent		
		Mild	Moderate	Severe
Symptoms	< 2 days / week	> 2 days / week But not daily	Daily	Throughout the day
Night Awakenings	0	1-2 / month	3- 4 / month	> 1 / week
SABA use	< 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

Asthma Management

- Asthma management is aimed at reducing airways inflammation by minimizing proinflammatory environmental exposures, using daily controller anti-inflammatory medications, and controlling comorbid conditions that can worsen asthma.

Asthma Medications



Relievers

- **Selective short - acting**

  β_2-agonists

  - Salbutamol

  - Terbutaline

- **Non selective**

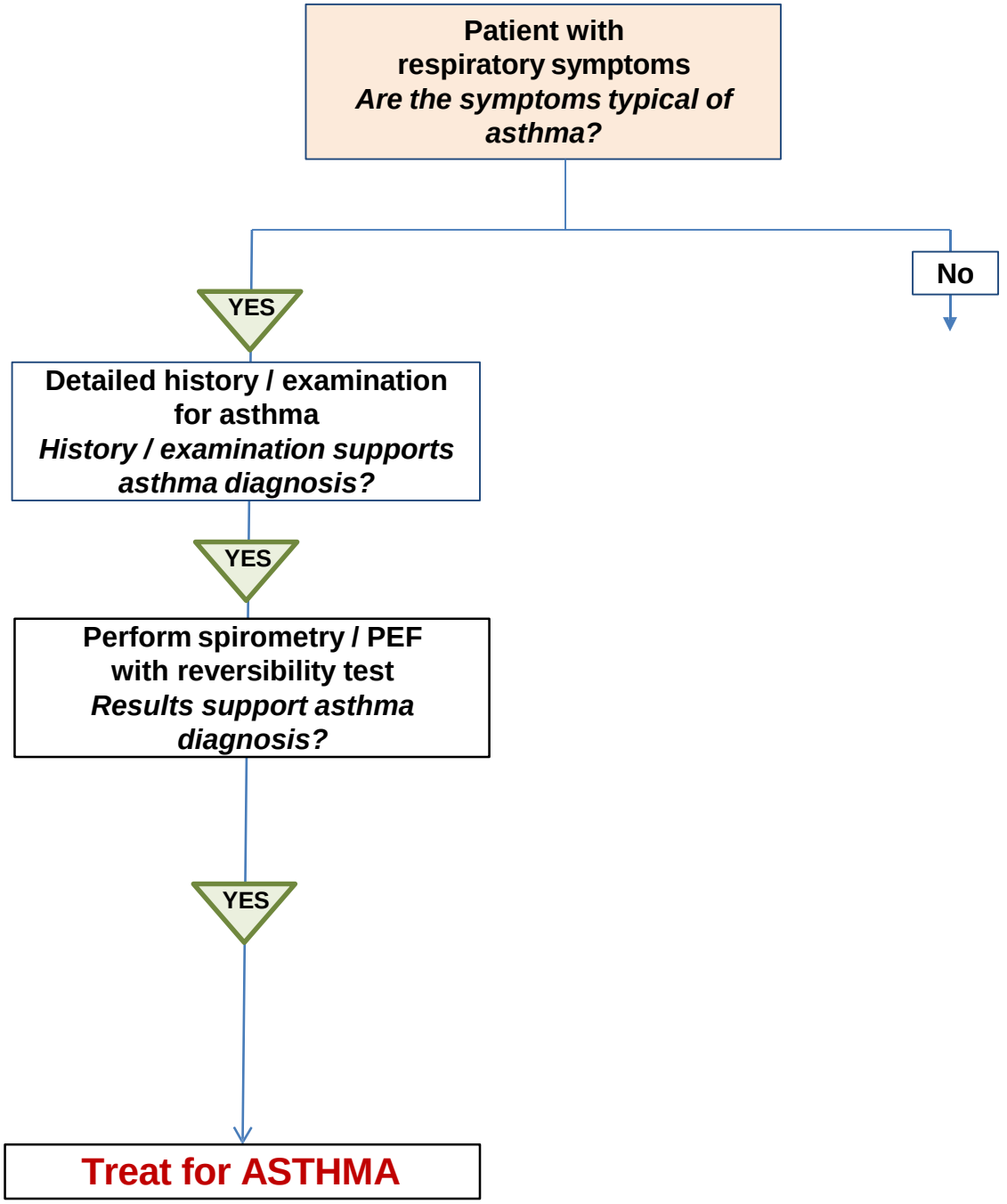
  β-agonist

  - Adrenaline

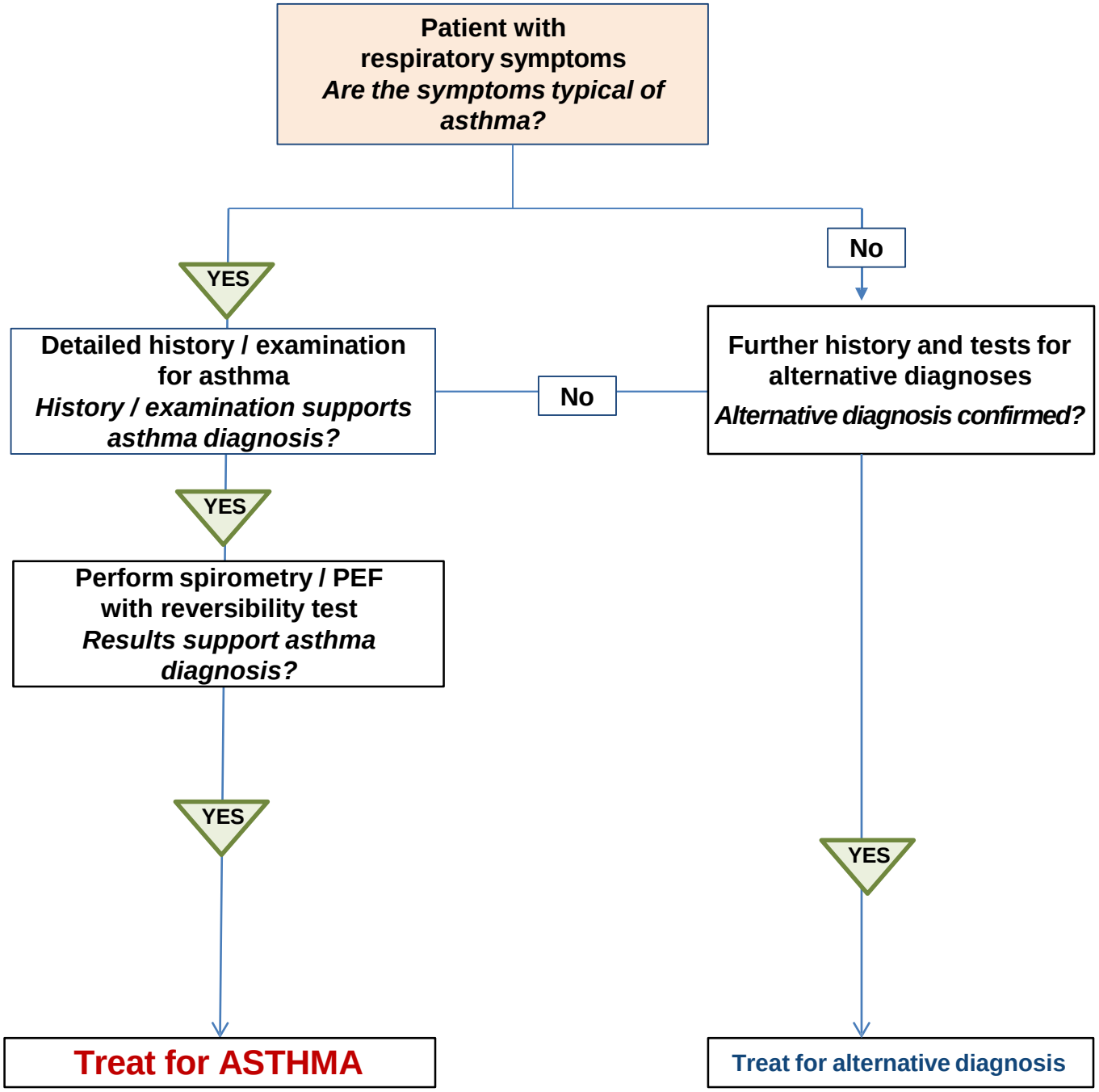
Controllers

- **Inhaled steroids**
  - Beclomethasone dipropionate
  - Budesonide
  - Fluticasone propionate
  - Ciclosenide
- **Mast cell stabilizers**
  - Sodium cromoglicate
  - Nedocromil Sodium

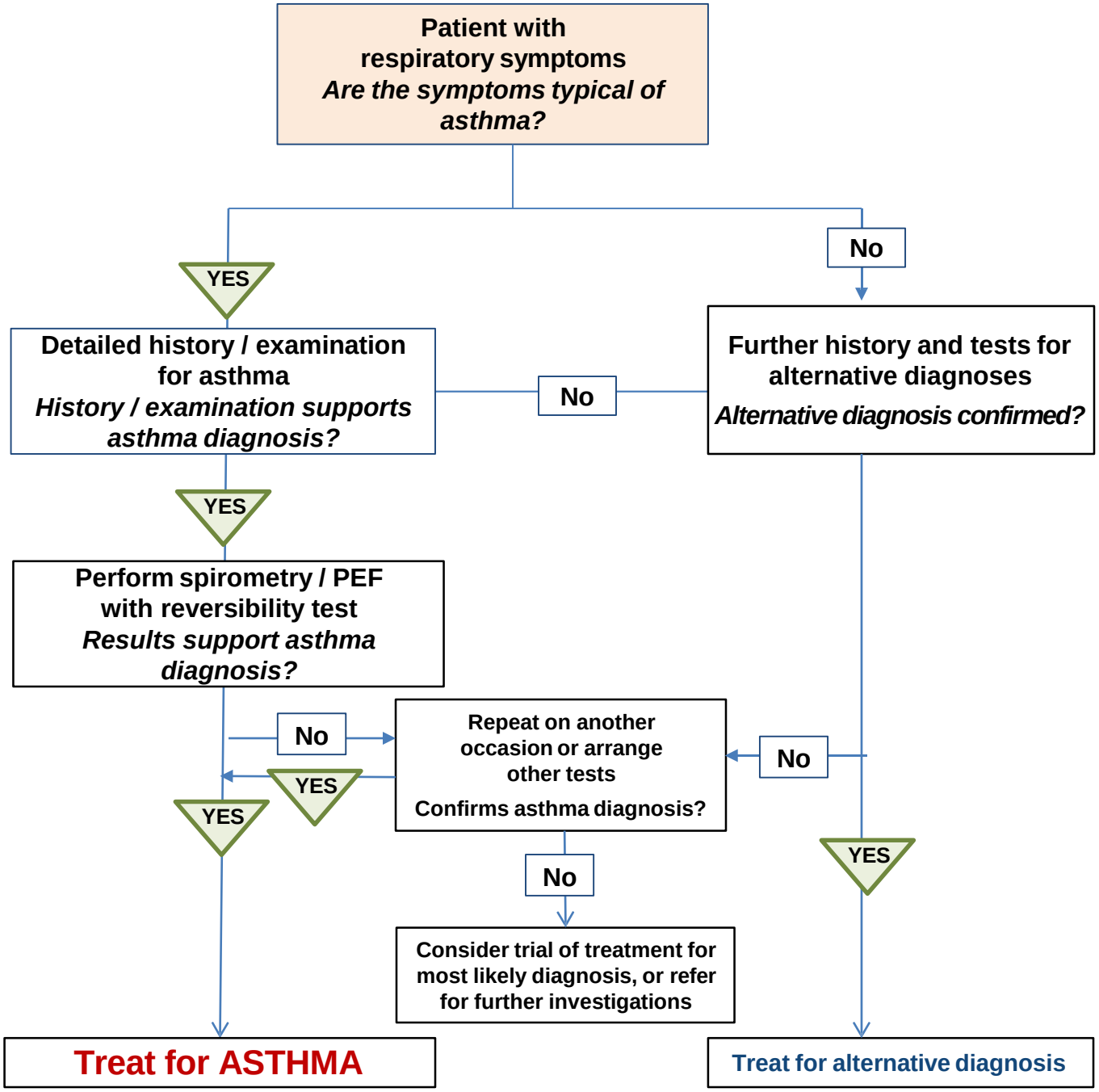
Diagnostic flow-chart for asthma in clinical practice



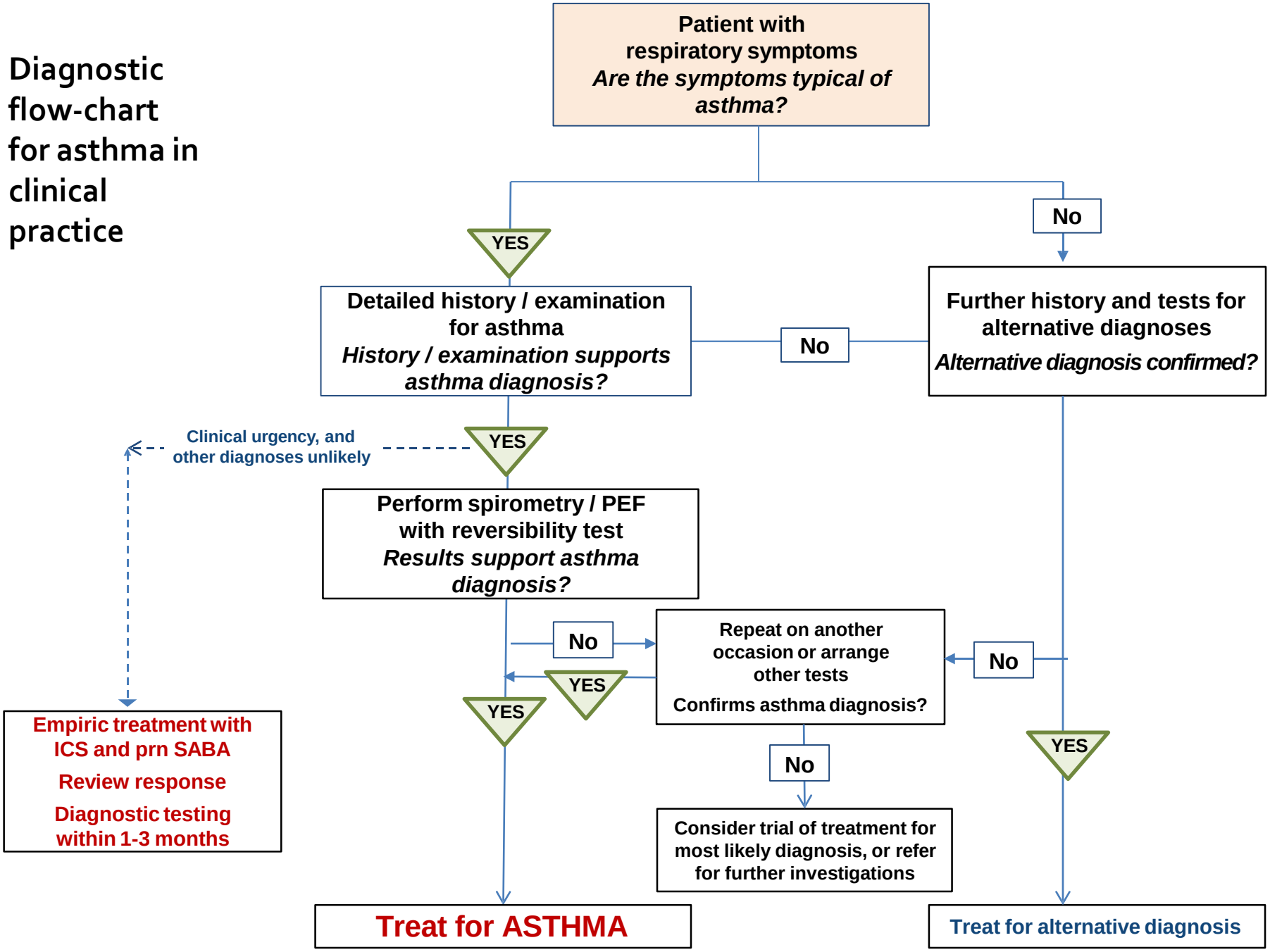
Diagnostic flow-chart for asthma in clinical practice



Diagnostic flow-chart for asthma in clinical practice



Diagnostic flow-chart for asthma in clinical practice

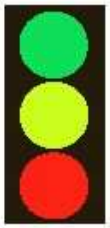


Asthma Action Plan

Name:		Date:
Birth Date:	Provider Phone #:	Provider Fax #
Patient Goal:		Parent/Guardian Phone #

Important!: Things that make your asthma worse: (Triggers) ☐ dust ☐ pets ☐ mold ☐ smoke ☐ pollen ☐ other_____

Severity: ☐ Severe Persistent ☐ Moderate Persistent ☐ Mild Persistent ☐ Mild Intermittent



GO -- You're Doing Well! — Use these medicines everyday:

PERSONAL BEST PEAK FLOW: _____

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

OR

Peak flow from _____ to _____

MEDICINE	HOW MUCH	HOW OFTEN / WHEN

CAUTION -- Slow Down! — Continue with green zone medicine and add:

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

OR

Peak flow from _____ to _____

MEDICINE	HOW MUCH	HOW OFTEN / WHEN

CALL YOUR HEALTH CARE PROVIDER: _____

DANGER -- Get Help! — Take these medicines and call your provider now.

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

OR

Peak flow less than _____

MEDICINE	HOW MUCH	HOW OFTEN / WHEN

Get help from a provider now! Do not be afraid of causing a fuss. Your provider will want to see you right away. It's important! If you cannot contact your provider, go directly to the emergency room and bring this form with you. DO NOT WAIT.
Make an appointment with your primary care provider within two days of an ED visit or hospitalization.

Provider Signature: _____ Date: _____

PARENT/GUARDIAN TO COMPLETE THIS SECTION:

I, _____ give permission to the school nurse and/or the school-based health
(parent/guardian name-please print)
clinic to exchange information and otherwise assist in the asthma management of my child including direct communication with my child's primary care provider _____ Date:_____
(parent/guardian signature)

REFER TO THE BACK OF THE LAST PAGE FOR THE MEDICATION AUTHORIZATION FORM

The written asthma action plan should include:

- the patient's usual asthma medications
- when and how to increase medications, and start OCS
- how to access medical care if symptoms fail to respond

GINA assessment of symptom control

A. Symptom control

In the past 4 weeks, has the patient had:

- Daytime asthma symptoms more than twice a week? Yes❑ No❑
- Any night waking due to asthma? Yes❑ No❑
- Reliever needed for symptoms* more than twice a week? Yes❑ No❑
- Any activity limitation due to asthma? Yes❑ No❑

Level of asthma symptom control		
Well-controlled	**Partly controlled**	**Uncontrolled**
None of these	1-2 of these	3-4 of these

*Excludes reliever taken before exercise, because many people take this routinely

GINA assessment of symptom control

A. Symptom control

In the past 4 weeks, has the patient had:	Well-controlled	Partly controlled	Uncontrolled
• Daytime asthma symptoms more than twice a week? Yes❑ No❑			
• Any night waking due to asthma? Yes❑ No❑	None of these	1-2 of these	3-4 of these
• Reliever needed for symptoms* more than twice a week? Yes❑ No❑			
• Any activity limitation due to asthma? Yes❑ No❑			

Level of asthma symptom control

B. Risk factors for poor asthma outcomes

ASSESS PATIENT'S RISKS FOR:

- Exacerbations
- Fixed airflow limitation
- Medication side-effects

Assessment of risk factors for poor asthma outcomes

Potentially modifiable risk factors for exacerbations

- ICS not prescribed; poor ICS adherence; incorrect inhaler technique
- high SABA use
- low FEV_1, especially if < 60% predicted
- higher bronchodilator reversibility
- major psychological or socioeconomic problems
- exposures: smoking; allergen exposure if sensitised
- comorbidities: obesity; chronic rhinosinusitis; confirmed food allergy
- sputum or blood eosinophilia;
- pregnancy

Risk factors for medication side-effects include:

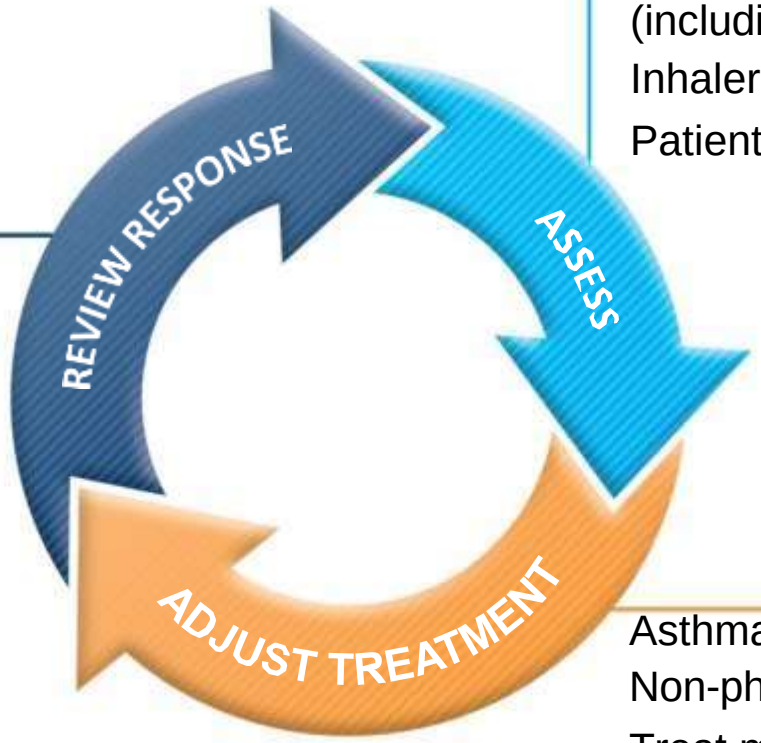
Systemic: frequent OCS; long-term, high dose and/or potent ICS; also taking P450 inhibitors

Local: high-dose or potent ICS; poor inhaler technique

Risk factors for developing fixed airflow limitation : preterm birth, low birth weight and greater infant weight gain; lack of ICS treatment; exposure to tobacco smoke, noxious chemicals or occupational exposures; low FEV_1; chronic mucus hypersecretion; and sputum or blood eosinophilia

Having any of these risk factors increases the patient's risk of exacerbations *even if they have few asthma symptoms*

The control-based asthma management cycle



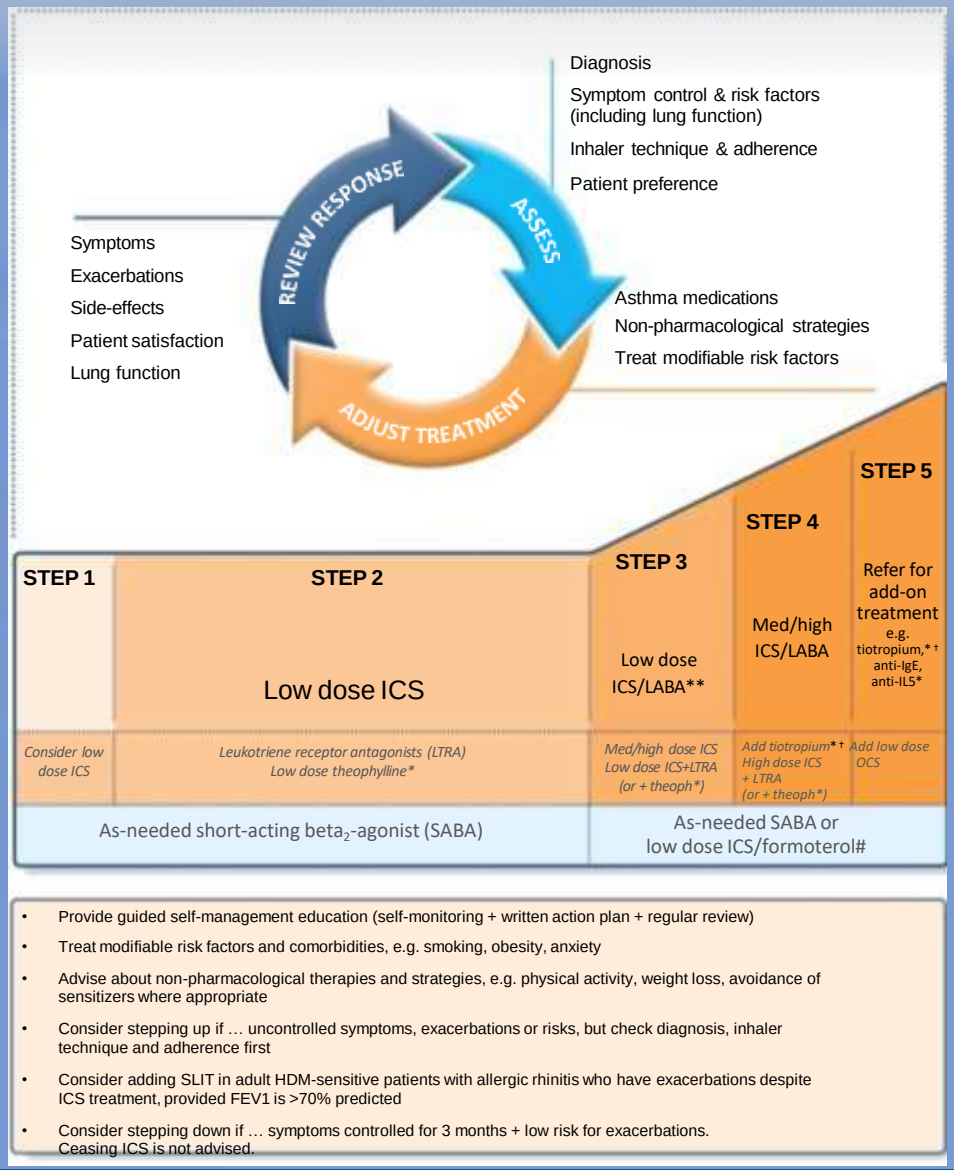
Diagnosis
Symptom control & risk factors (including lung function)
Inhaler technique & adherence
Patient preference

Symptoms
Exacerbations
Side-effects
Patient satisfaction
Lung function

Asthma medications
Non-pharmacological strategies
Treat modifiable risk factors

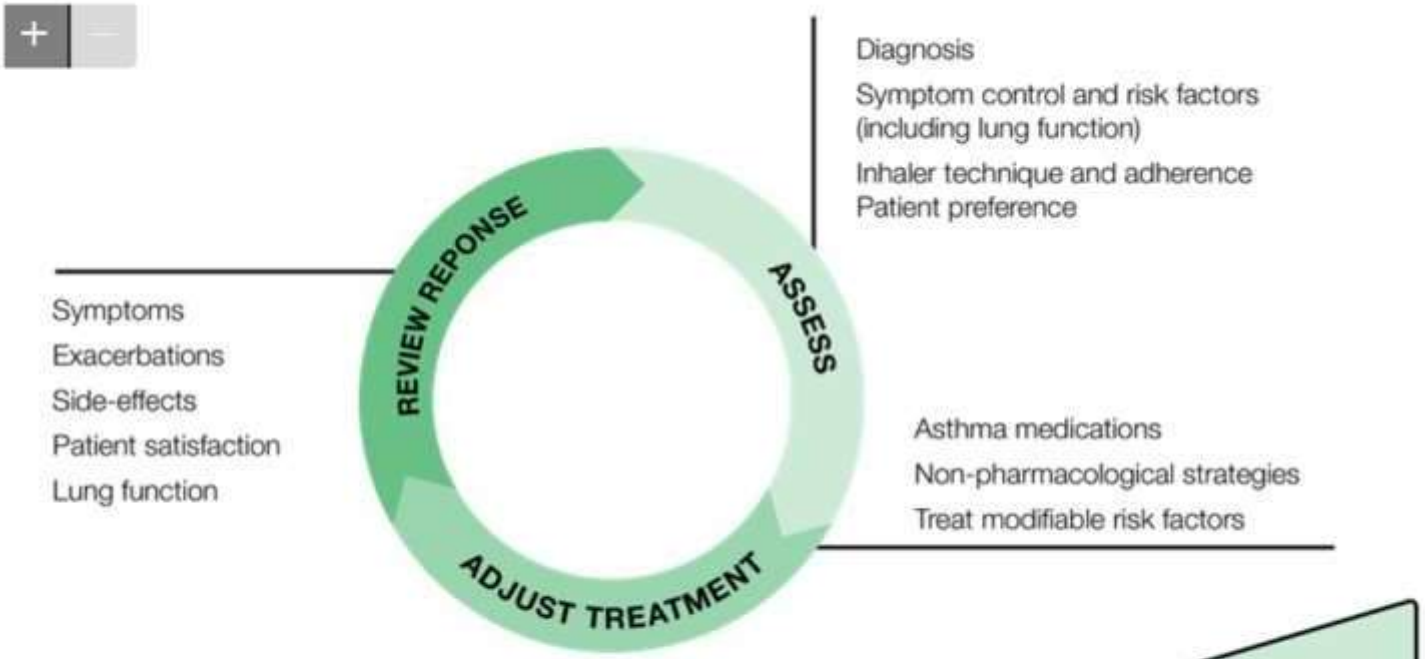
GINA 2015, Box 3-2

Stepwise approach to control asthma symptoms and reduce risk



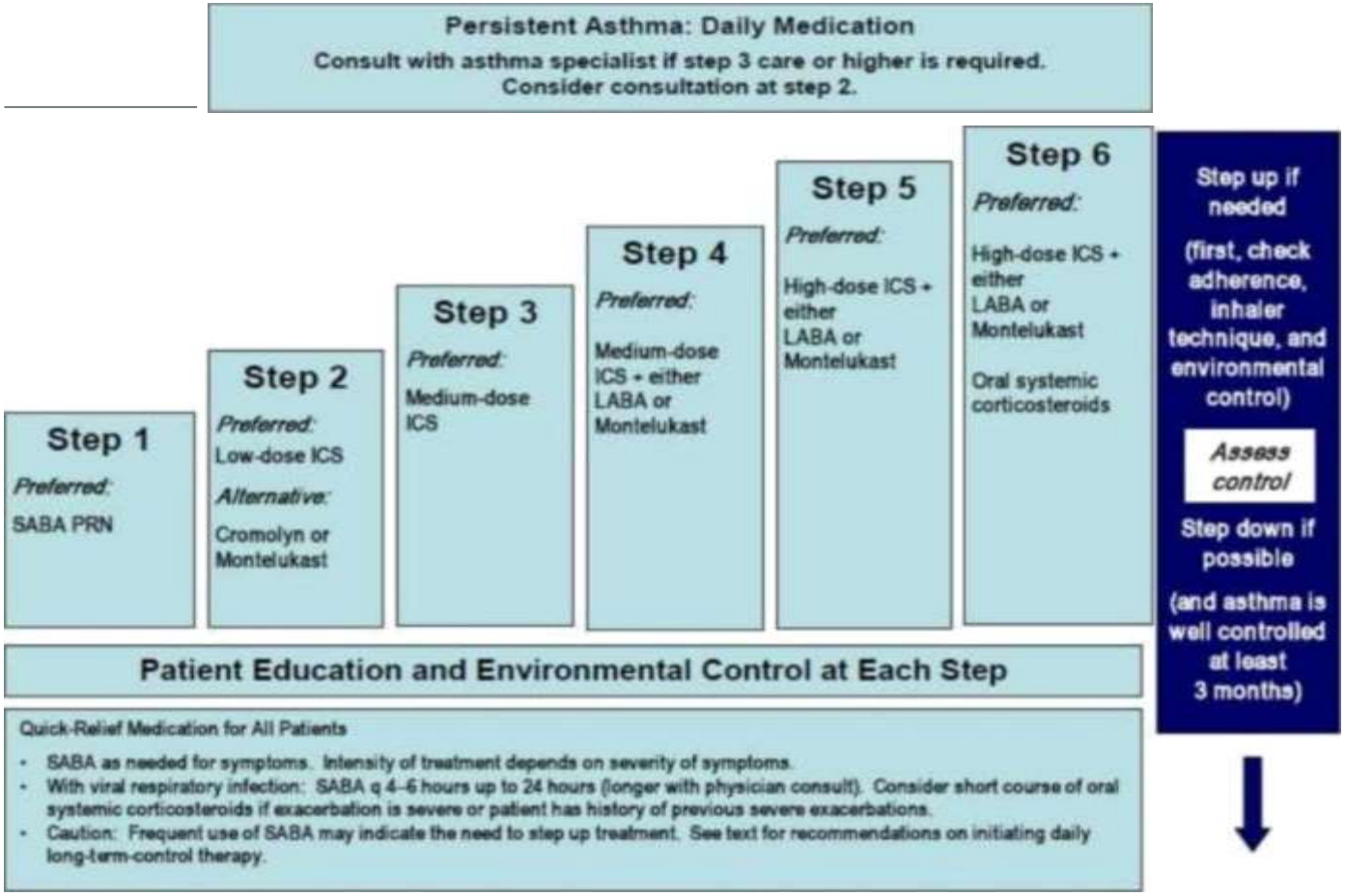
SLIT added as an option

Stepwise approach to asthma treatment



	Step 1	Step 2	Step 3	Step 4	Step 5
Preferred controller choice		Low dose ICS	Low dose ICS/ LABA†	Medium/high ICS/LABA	Refer for add-on treatment e.g. tiotropium,*‡ Anti-IgE, Anti-IL5*
Other controller options	Consider low dose ICS	Leukotriene receptor antagonists (LTRA) Low dose theophylline*	Medium/high dose ICS Low dose ICS+LTRA (or + theophylline*)	Add tiotropium*‡ Medium/high dose ICS + LTRA (or + theophylline*)	Add low dose OCS
Reliever	As-needed short-acting beta$_2$-agonist		As-needed SABA or low dose ICS/formoterol§		

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



Adapted from: National Asthma Education and Prevention Program. Expert *Panel* import 8 *(EPR-3):* Guide/ines/or *the Diagnosis and Management* o/Asthma. US Department of Health and Human Services. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf. Accessed July 5, 2012

STEP 1:

- ***As-needed SABA with no controller*** *(this is indicated only if symptoms are rare, there is no night waking due to asthma, no exacerbations in the last year, and normal FEV1).*
- *Other options: regular low dose ICS for patients with exacerbation risks*

STEP 2:

- ***Regular low dose ICS plus as-needed SABA***
- *Other options:*
  - *LTRA are less effective than ICS;*
  - *ICS/LABA leads to faster improvement in symptoms and FEV1 than ICS alone but is more expensive and the exacerbation rate is similar.*
  - *For purely seasonal allergic asthma, start ICS immediately and cease 4 weeks after end of exposure.*

STEP 3:

- ***Low dose ICS/LABA either as maintenance treatment plus as-needed SABA, or as ICS/formoterol maintenance and reliever therapy***
- For patients with ≥1 exacerbation in the last year, low dose BDP/formoterol or BUD/formoterol maintenance and reliever strategy is more effective than maintenance ICS/LABA with as-needed SABA.
- *Other options:*
  - *Medium dose ICS*

STEP 4:

- ***Low dose ICS/formoterol maintenance and reliever therapy, or medium dose ICS/LABA as maintenance plus as-needed SABA***
- *Other options:*
  - *Add-on tiotropium by mist inhaler for patients ≥12 years with a history of exacerbations;*
  - *high dose ICS/LABA, but more side-effects and little extra benefit;*
  - *extra controller, e.g. LTRA or slow-release theophylline*

STEP 5:

- ***Refer for expert investigation and add-on treatment***
- Add-on treatments include
  - **tiotropium** by mist inhaler for patients with a history of exacerbations (age ≥12 years),
  - **omalizumab** (anti-IgE) for severe allergic asthma, and
  - **mepolizumab** (anti-IL5) for severe eosinophilic asthma (age ≥12 years).
  - Sputum-guided treatment, if available, improves outcomes.
- *Other options: Some patients may benefit from **low dose OCS** but long-term systemic side-effects occur.*

Stepping down treatment when asthma is well-controlled

- Consider stepping down treatment once good asthma control has been achieved and maintained for 3 months, to find the lowest treatment that controls both symptoms and exacerbations, and minimizes side-effects.

NON-PHARMACOLOGICAL STRATEGIES AND INTERVENTIONS

- Smoking cessation advice
- Allergen avoidance
- Avoid drugs probably triggering asthma
- Some common triggers for asthma symptoms (e.g. exercise, laughter) should not be avoided

Inhaled Medication Deliveries

Age of the Child	Inhalation Device Advised
0 to 5 years	pMDI with static-treated spacer and mask (or mouth piece as soon as child is capable of using)
> 5 years	Choice of : • pMDI with spacer and mouth piece • DPI (rinse or gargle after inhaling ICS, breath-actuated pMDI • Nebulizer – 2nd choice at any age

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