

- A 26 year old woman with history of recurrent cough and wheezing in winters presents with 3 days history of progressive wheezing and shortness of breath after an upper respiratory tract infection. Her respiratory rate is 28/minute, and her pulse is 110/minute. There is evidence of wheezing throughout both of her lungs.

- 
- What is the diagnosis?

- 
- How she should be managed?

# ASTHMA

**Prof. Mutti Ullah Khan**

Head of Department

Medical Unit-II

Holy Family Hospital

Rawalpindi Medical College

# OBJECTIVES

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- Introduction.
- Triggers.
- Pathogenesis.
- Clinical features.
- Diagnosis and tests.
- Management.

# INTRODUCTION



- Asthma is a common **chronic disorder** of the airways that is complex and characterized by:
  - Variable and recurring symptoms.
  - Airflow obstruction.
  - Bronchial hyper responsiveness &
  - An underlying inflammation.

# TRIGGERS

## inflammatory factors



respiratory infections

allergens

work

medication

temperature change



strong odors

## others



food additives

pollutants

## irritants



exercise

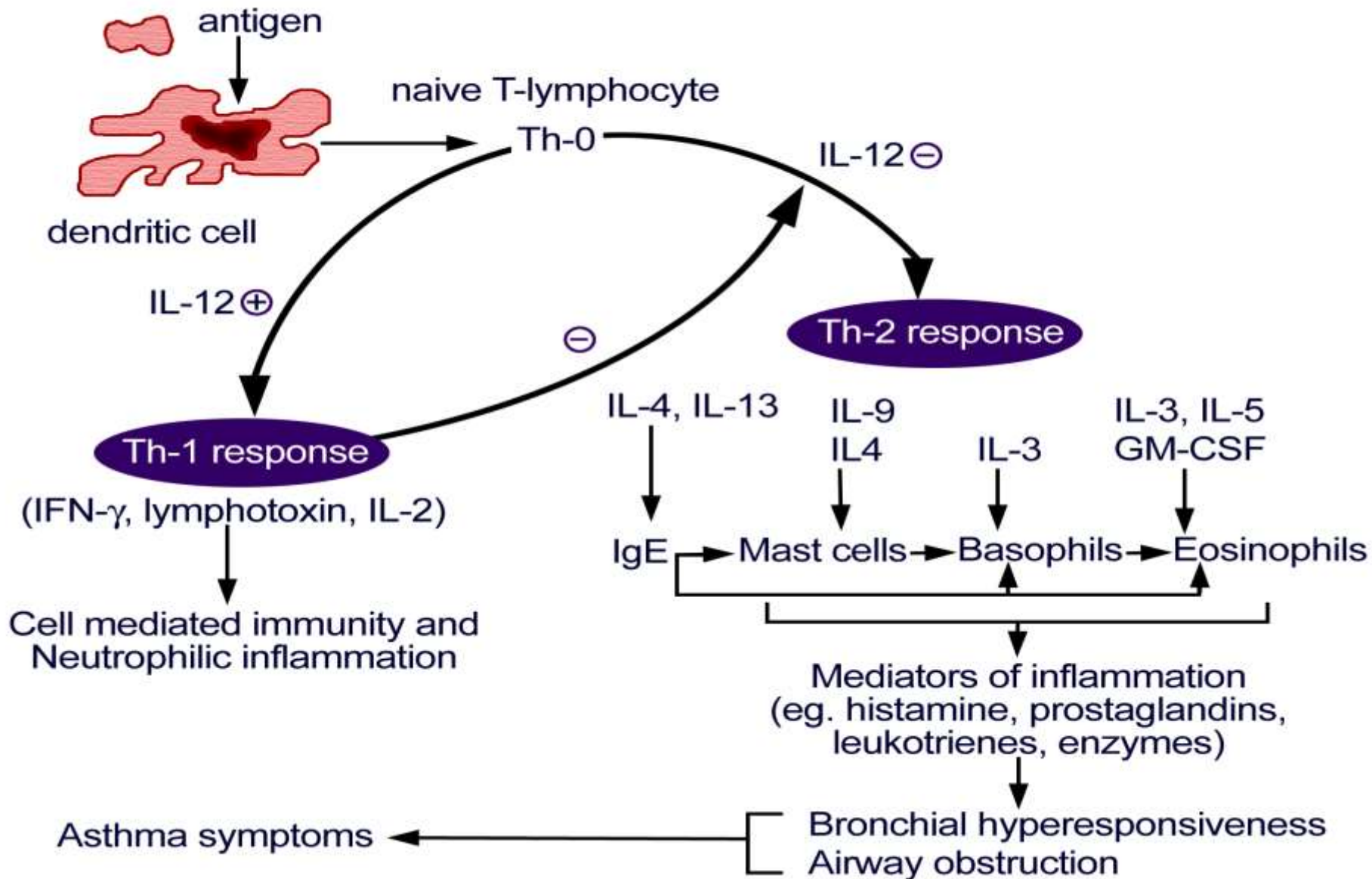
cold air

stress and emotions

stress and emotions

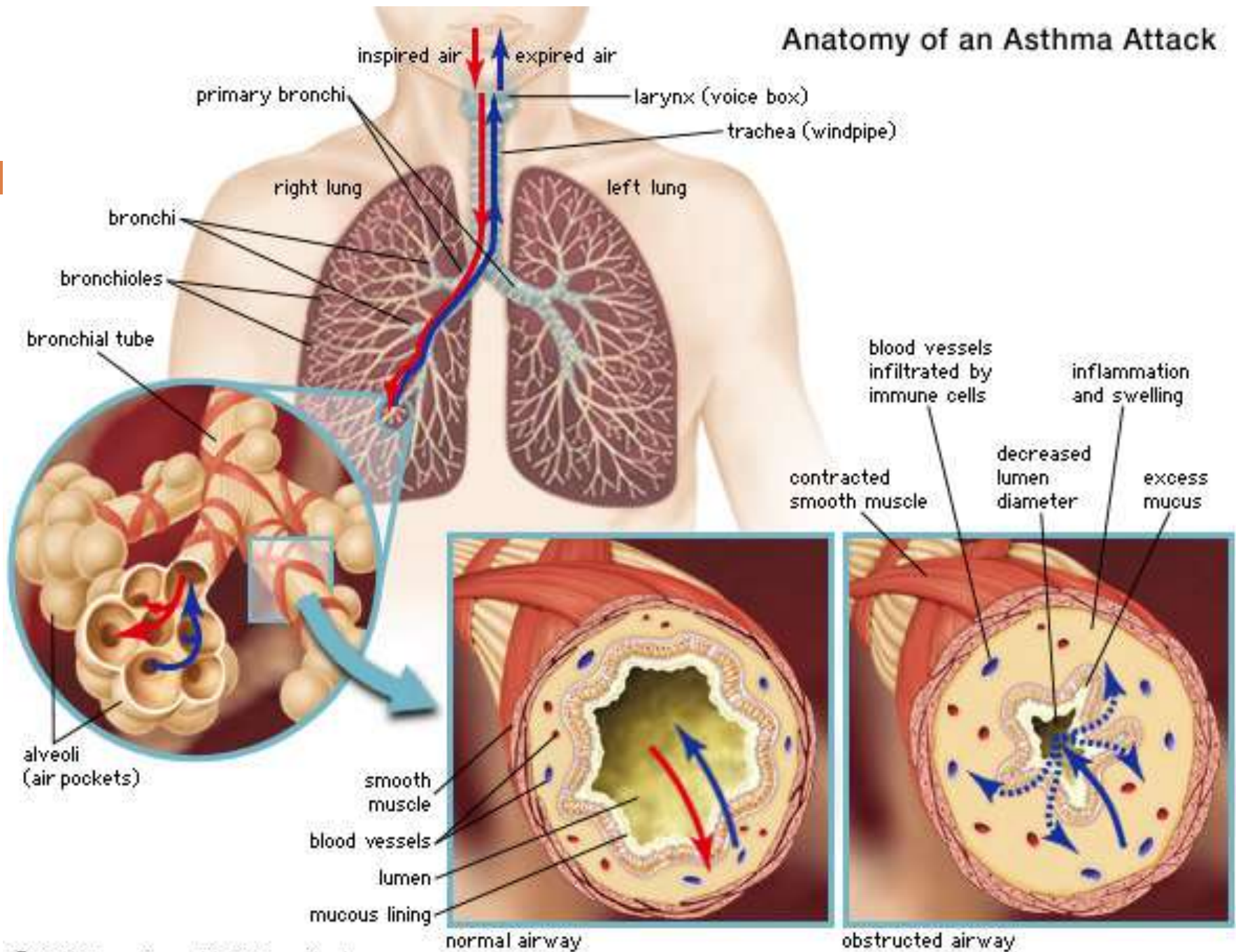
gastric reflux

# Pathogenesis of asthma





# Anatomy of an Asthma Attack



Environment factor

Genetic predisposition

Bronchial inflammation

Bronchial hyperreactivity + trigger factors

Oedema  
BronchoConstriction  
Mucus production

Airways  
narrowing

Cough, Wheeze, Breathlessness, Chest tightness

# TYPES OF ASTHMA

- 1) Allergic asthma (extrinsic: Tobacco smoke, Animal dander, Dust mites, Cockroaches, Molds, Pollens).
- 2) Non-allergic asthma (intrinsic).
- 3) Cough variant asthma.
- 4) Occupational asthma.
- 5) Exercise induced asthma.
- 6) Medication induced asthma.
- 7) Nocturnal asthma.

# SIGNS AND SYMPTOMS

## Common symptoms of asthma

1. Coughing, especially at night.
2. Wheezing.
3. Shortness of breath.
4. Chest tightness, pain, or pressure.



# Symptoms of asthma attack

## Mild asthma attack

1. Cough.
2. Wheezing.
3. Mild difficulty breathing during normal activities.
4. Difficulty sleeping.
5. Hiccups .
6. Peak expiratory flow rate (PEFR) is 70 to 90% of personal best .

## Moderate asthma attack

1. Severe cough.
2. Moderate wheezing.
3. Shortness of breath.
4. Chest tightness.
  - ✓ Usually worsens with exercise.
5. Inability to sleep.
6. Nasal congestion.
7. PEFr is 50 to 70% of personal best .



## Severe asthma attack

1. Severe wheezing.
2. Severe difficulty breathing.
3. Inability to speak in complete sentences.
  - ✓ Sentences are interrupted by breathing.
4. Inability to lie down.
5. Signs of severe difficulty breathing:
  - ✓ Rib retractions: ribs are visible during each breath .
  - ✓ Nasal flaring: nostrils open wide during each breath .
  - ✓ Use of accessory muscles: neck muscles are prominent during each breath .
6. Chest pain:
  - ✓ Sharp, chest pain when taking a breath, coughing.
7. PEFr is <50% of personal best .
8. Confusion.
9. Rapid pulse.
10. Fatigue.
11. Rapid breathing rate.



# Physical examination

## □ General inspection:

Tachypnoeic.

Signs of respiratory distress.

Effort of breathing.

Cyanosis (life-threatening).

## □ Inspection:

- fingers: tar staining.

- pulse rate: tachycardia and pulsus paradoxus, bradycardia (life-threatening).

- use of accessory muscles or recession.

- wheezing.



# Chest

## □ Inspection:

- shape: hyperinflated in severe asthma
- movement of chest/silent chest (life-threatening)
- chest deformity:
- recession:

## □ Palpation:

- chest expansion may be reduce (hyperinflated)/normal
- apex beat: may be displaced
- vocal fremitus: decrease

## ○ Percussion:

- may be hyperresonance / normal

## ○ Auscultation:

- breath sound: vesicular
- ronchi in expiratory phase, may be both in severe asthma
- prolonged expiratory phase
- vocal resonance decrease / normal

# DIAGNOSIS & TESTS

- Medical history.
- Asthma symptoms, how you feel, known asthma and allergy triggers, your activity level and diet, your home and work environment, and family history.
- Then, some tests will be conducted to diagnose asthma.

# Diagnosing asthma

Asthma can often be diagnosed on the basis of a patient's **symptoms** and **medical history** (Figure 1).

## Figure 1. Is It Asthma?

Presence of any of these signs and symptoms should increase the suspicion of asthma:

- Wheezing—high-pitched whistling sounds when breathing out—especially in children. (A normal chest examination does not exclude asthma.)
- History of any of the following:
  - Cough, worse particularly at night
  - Recurrent wheeze
  - Recurrent difficult breathing
  - Recurrent chest tightness
- Symptoms occur or worsen at night, awakening the patient.
- Symptoms occur or worsen in a seasonal pattern.
- The patient also has eczema, hay fever, or a family history of asthma or atopic diseases.
- Symptoms occur or worsen in the presence of:
  - Animals with fur
  - Aerosol chemicals
  - Changes in temperature
  - Domestic dust mites
  - Drugs (aspirin, beta blockers)
  - Exercise
  - Pollen
  - Respiratory (viral) infections
  - Smoke
  - Strong emotional expression
- Symptoms respond to anti-asthma therapy.
- Patient's colds "go to the chest" or take more than 10 days to clear up.

# Non-specific investigations

## □ Non-specific:

- full blood count and differential count: increase number of **eosinophils** number.
- arterial blood **gases**.
- **sputum** test: number of eosinophils.
- chest **X-ray**: hyperinflated lungs.



## Chest X-ray

Showed **lung hyperinflation**.

Not **diagnostic of asthma**

Useful to rule out other causes eg.

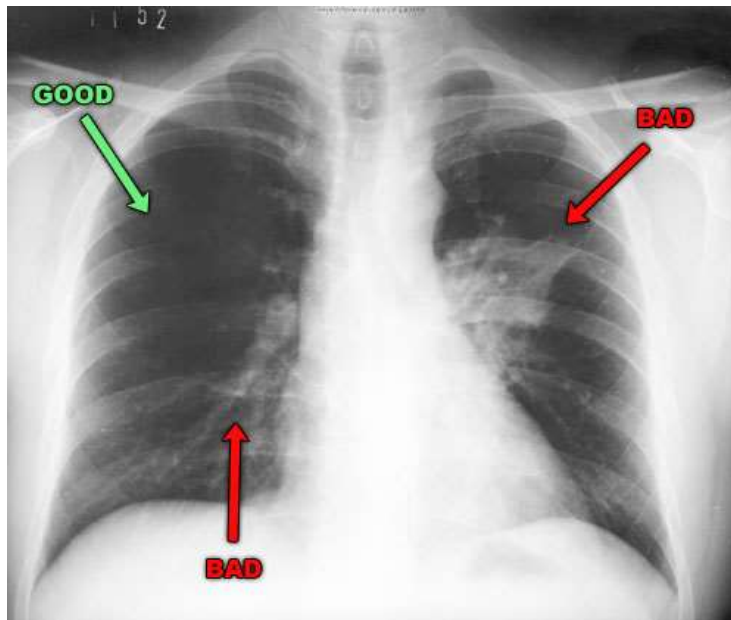
Pneumothorax

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Hyperinflation and increased  
bronchovascular markings

# Chest X-Ray

- If there are symptoms that may be caused by another condition such as pneumonia.
- It also may help to clarify the problem if there is problem with asthma treatment.



# Specific investigations

## □ Specific:

- respiratory function test:

1. peak expiratory flow.

2. spirometry .

- exercise tests .

- histamine/methacholine bronchial provocation test.

- trial of corticosteroids .

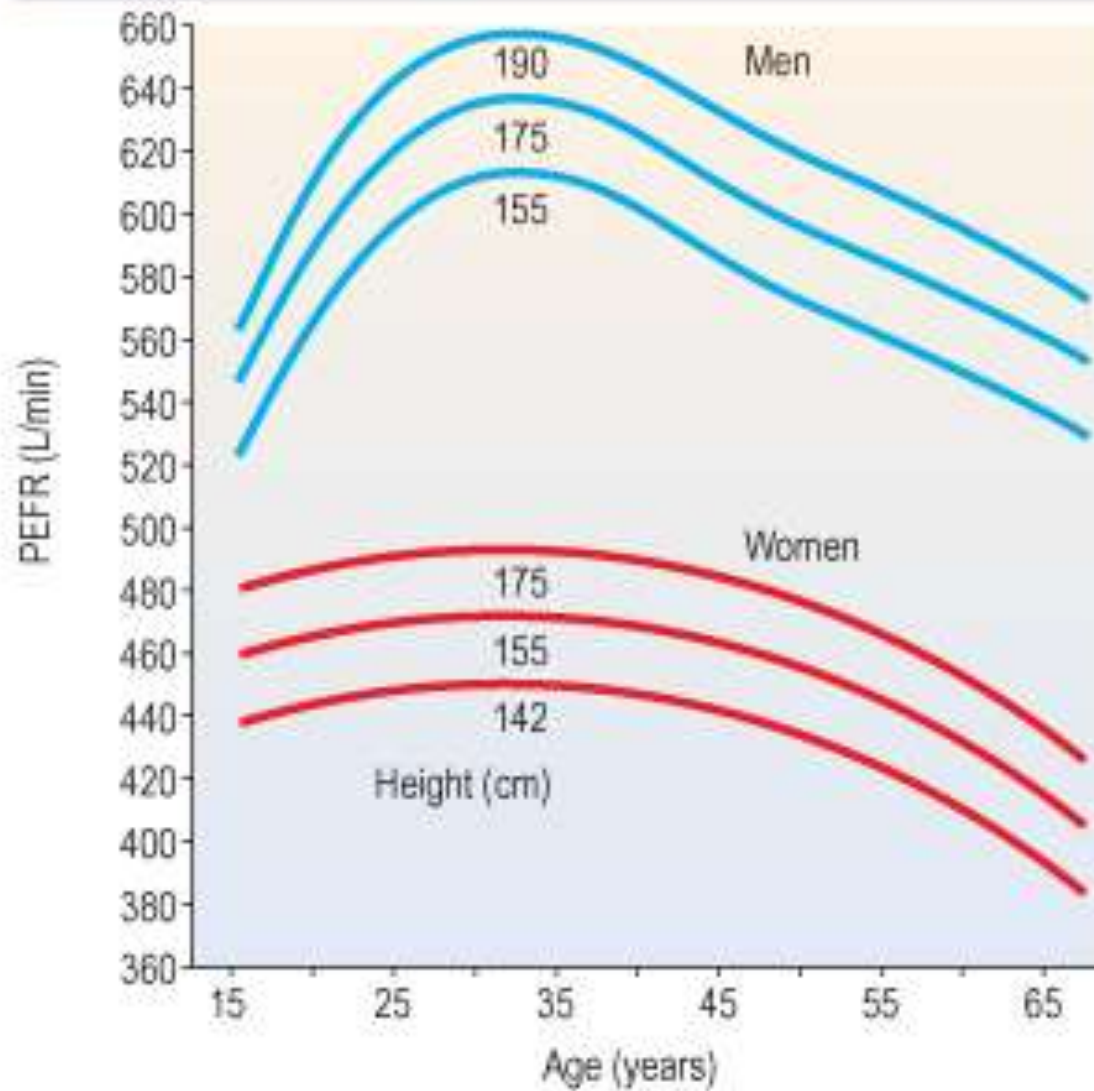
# Peak Expiratory Flow Rate (PEFR)



- The maximum rate of air breathed out as hard as possible through a measuring device called a peak flow meter, (after a full breath taken in).
- Reading is measured in litres/minute (l/min).
- Take 3 readings and choose the best .
- Reading  $< 80\%$  - presense of obstruction, but not diagnostic of asthma.
- During an attack of asthma PEF fairly accurately measures the degree of bronchospasm. A PEF of less than  $50\%$  of normal or best suggests a very severe attack and a PEF of less than  $30\%$  suggests a life-threatening attack.



(b) Graph of normal readings



# Spirometry Test

- + It is the **single best diagnostic test** for patients with airflow limitation.
- + A Spirometry Test
  - measures the volume of air blown out against time .
  - gives more specific information about lung function.
- + A value is calculated for the amount of air blown out in one second - “Forced Expiratory Volume” or FEV1).
- + This is divided by the total amount of air blown out until all air is expired - Forced Vital Capacity or FVC).
- + FEV1 /FVC expressed as a percentage value



**TLC : total lung capacity**

**VC : vital capacity**

**RV : reserve volume**

**IC : inspirational capacity**

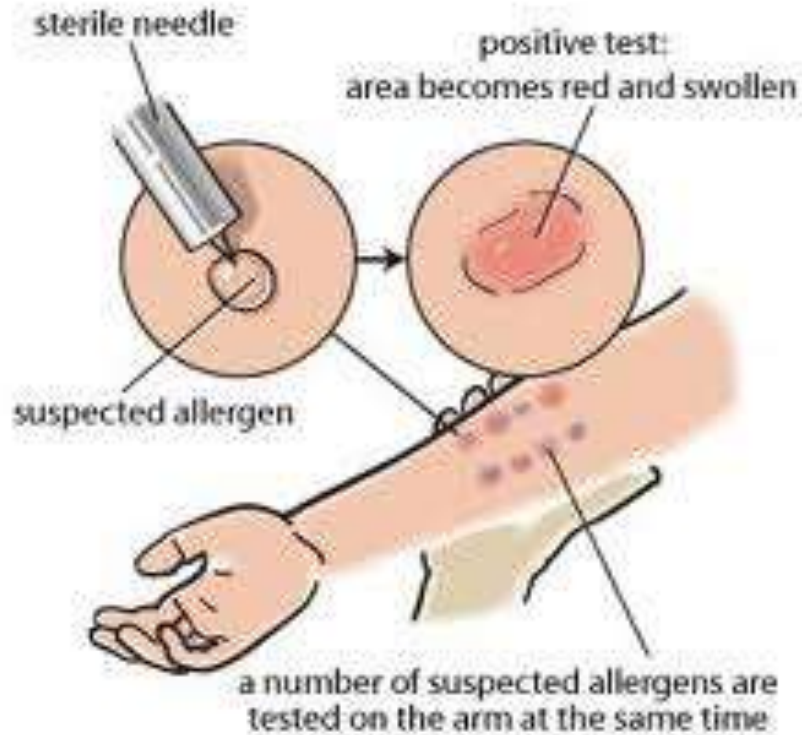
**FRC : functional residual capacity**

**IRV : inspirational reserve volume**

**TV : tidal volume**

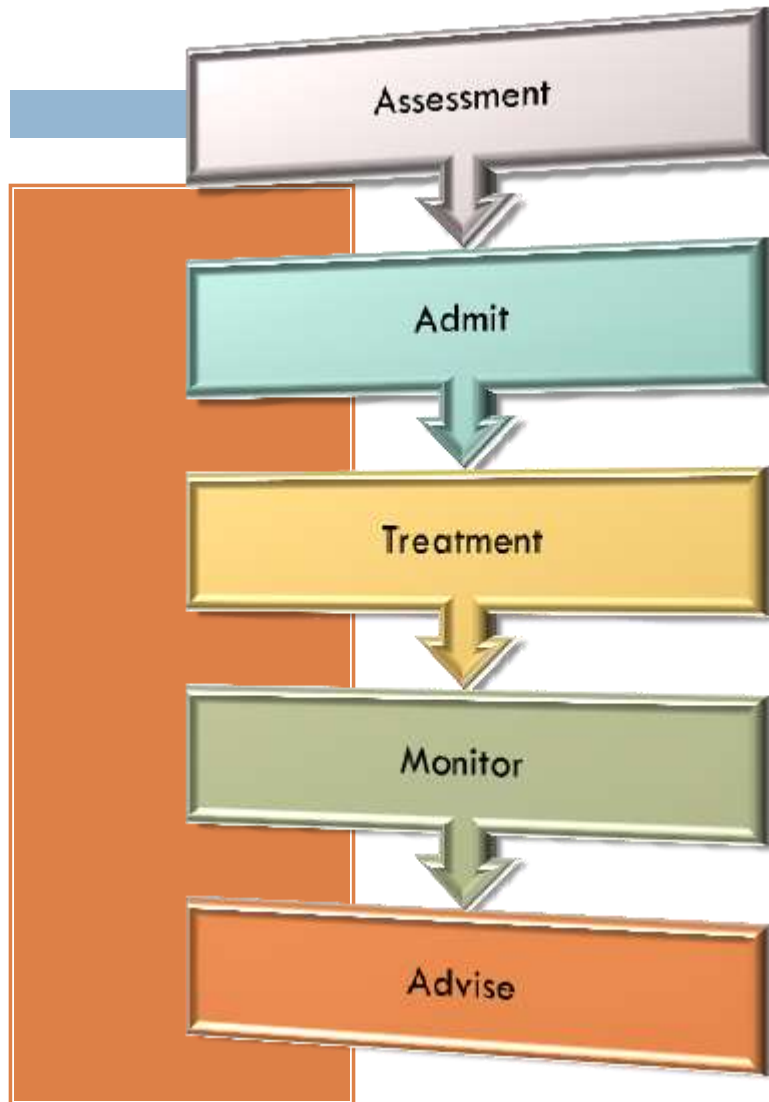
**ERV : expiratory reserve volume**

- Normal:75-80%
- Obstructive airway disease: reduced ratio
- Restrictive lung disease: ratio normal or increase (enhanced elastic recoil).



# Allergy-skin test

# Approach to management



# Management of Chronic Asthma

## □ Aims of management

- to **recognize** asthma.
- to **abolish** symptoms.
- to **restore** normal or best possible long term airway function.
- to **reduce** morbidity and prevent mortality.

# Approach of chronic asthma

- **Education** of patient and family.
- **Avoidance** of precipitating factors .
- Use of the lowest effective dose of convenient **medications** minimizing short and long term side effects.
- **Assessment** of severity and response to treatment.

# Medications

2 major groups of drugs:

## Bronchodilator drugs

- to relieve bronchospasm and improve symptoms.

## Anti inflammatory drugs

- to treat the airway inflammation and bronchial hyperresponsiveness, the underlying cause of asthma, i.e. to prevent attacks.



# Long-term asthma control medication

Drugs	Function	Side effects
Inhaled corticosteroids (flovent, pulmicort, aerobid)	Reduce swelling and mucus production in airways	Poor growth, decreased bone density, varicella Infection (chickenpox that spreads to organs),cataracts & glaucoma
Long-acting beta agonists (LABA) : serevant, fulmoterol	Open the airways and reduce inflammation (need to be used with other combination inhalers)	Increases severity of asthma exacerbations and risk of fatal asthma episodes.
Leukotrine modifiers-oral medication (singulair,accolate)	Relieve asthma symptoms	Psychological reactions - agitation, aggression, hallucinations, depression & suicidal thinking/ headache, skin rashes



Bronchodilators

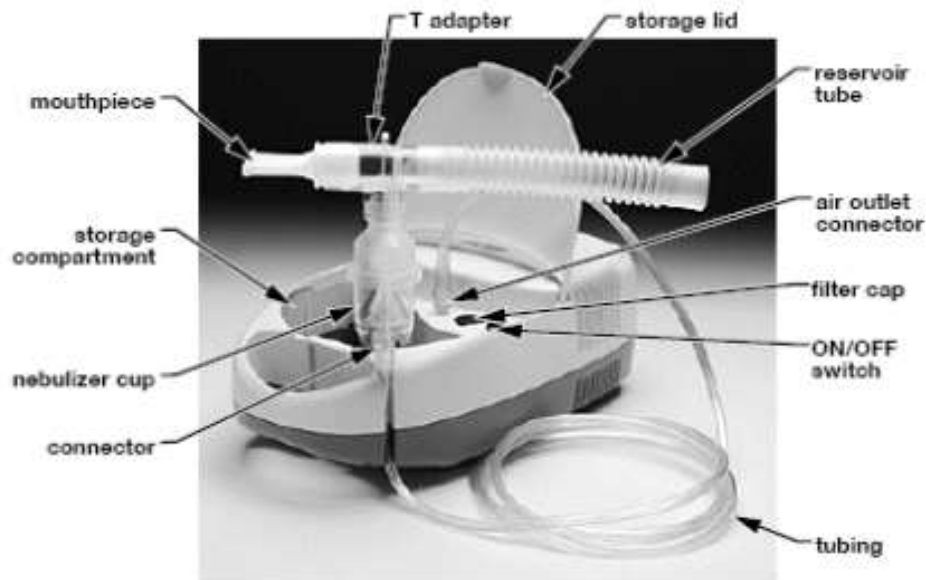


LABA

# Quick-relief (rescue) medication

Drugs	Function	Side effects
Short-acting beta agonists (SABA) – albuterol, levalbuterol	-Can be taken using inhalers/nebulizers - Relax airway muscles	Appetite changes, dizziness, nausea, nervousness, sinus pain, sore throat, tremor
Oral and intravenous corticosteroids (prednisone)	Relieve airway inflammation	Same as inhaled corticosteroids





**Neb-u-Lite LX2 Nebulizer Compressor**



## **Asthma nebulizer**

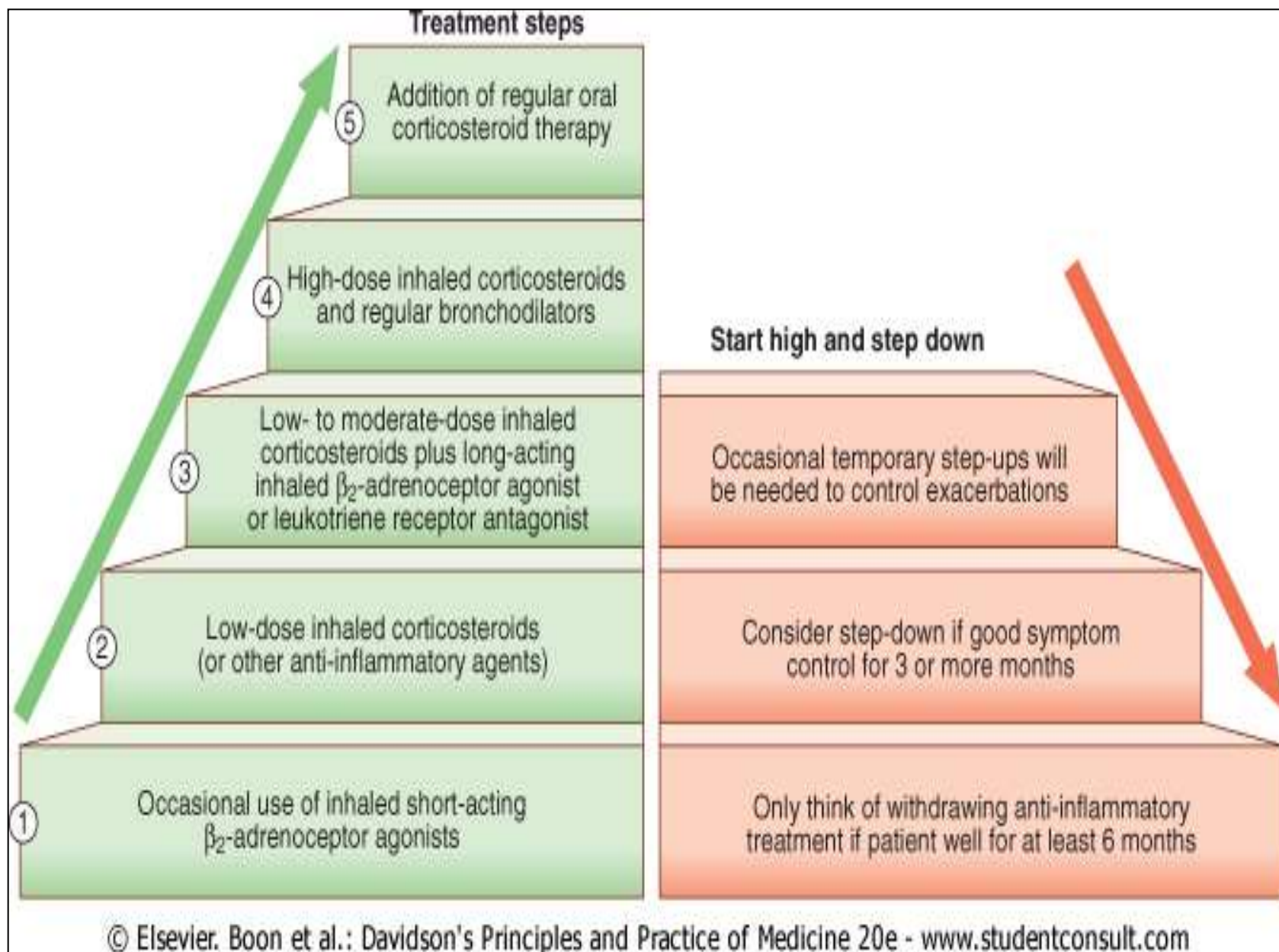
Changes asthma medications from a liquid to a mist, so that they can be more easily inhaled into the lungs.



# Allergy medications

Drugs	Function	Side effects
Allergy shots (immunotherapy).	Reduce symptoms in people allergic to pollens, animal dander, dust mites, mold, and cockroaches	Redness, warmth at the shot site, low blood pressure
Omalizumab (Xolair).	<ul style="list-style-type: none"><li>- Given as an injection every two to four weeks (for people who have allergies, severe asthma)</li><li>- Altering the immune system.</li></ul>	Sinusitis, headache, sore throat

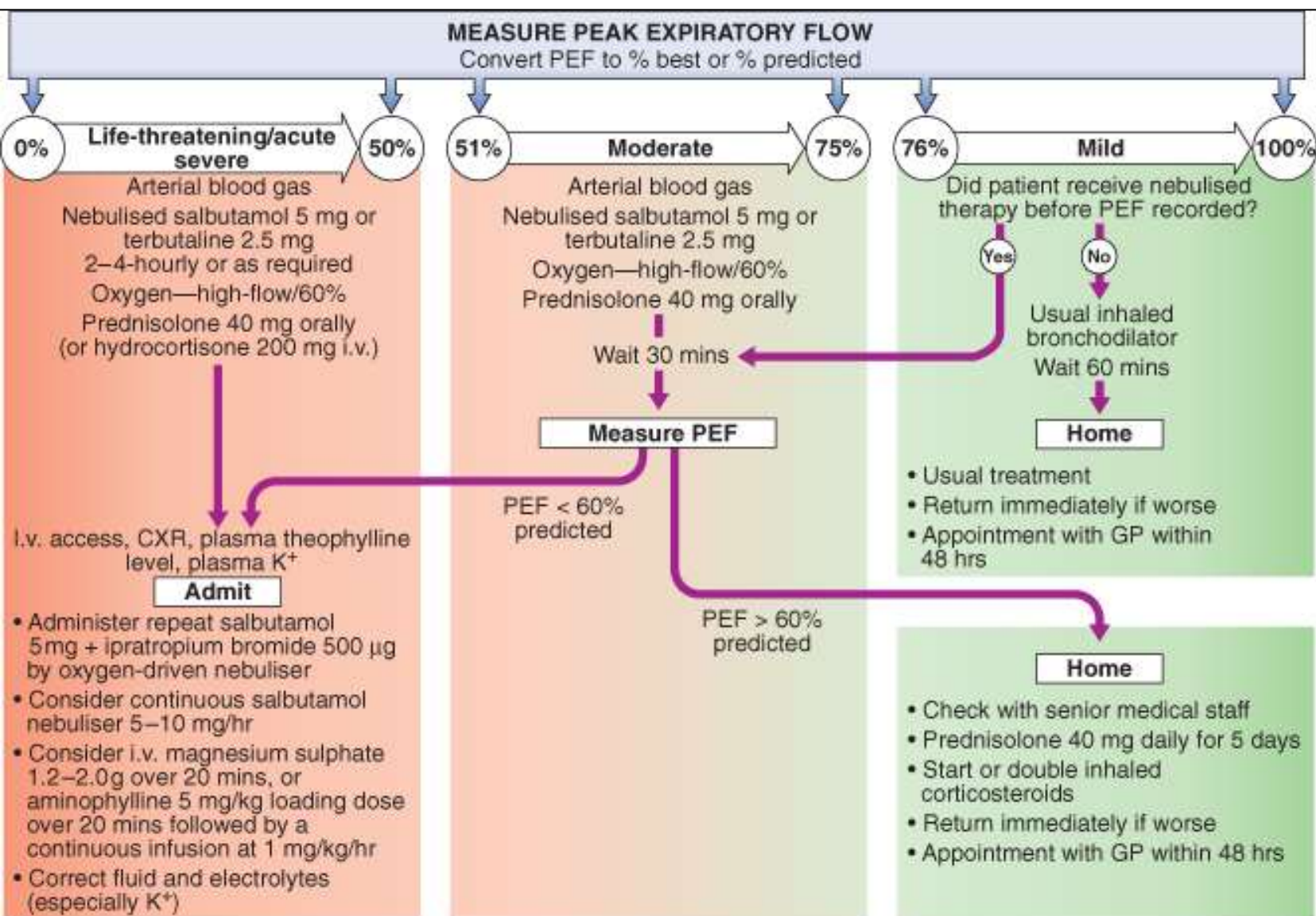




# Management Of Acute Asthma

## Aims Of Management

- i. To prevent **death**.
- ii. To relieve **respiratory distress** .
- iii. To restore the **patient's lung function** to the best possible level as soon as possible.
- iv. To prevent **early relapse** .





# 1. Assess severe attack

## Severe attack:

- a) Unable to complete sentences
- b)  $RR > 25/\text{min}$
- c)  $PR > 110 \text{ bpm}$
- d)  $PEF < 50\%$  of predicted or best

## Life-threatening attack:

- a)  $PEF < 33\%$  of predicted or best
- b) Silent chest, cyanosis, feeble respiratory effort
- c) Bradycardia/ hypotension
- d) Exhaustion, confusion, or coma
- e) ABG : normal/high  $P_a\text{CO}_2 > 5\text{kPa}$  (36mmHg)  
 $P_a\text{O}_2 < 8\text{kPa}$  (60mmHg)  
low pH, e.g.  $< 7.35$

## 2. Start treatment immediately

- Sit patient up & give high dose O<sub>2</sub> in 100% via non-rebreathing bag.
- Salbutamol 5mg (or terbutaline 10mg) + ipratropium bromide 0.5 mg nebulized with O<sub>2</sub>.
- Hydrocortisone 100mg IV/prednisolone 30 mg PO (both if very ill).
- CXR to exclude pneumothorax.

**If life threatening features (above) present:**

- **Inform ITU, and seniors**
- **Add MgSO<sub>4</sub> 1.2-2g IV over 20 min**
- **Give Salbutamol nebulizers every 15 min, or 10mg continuously per hour**

# Further management

## If **improving**

- 40-60% O<sub>2</sub>
- Prednisolone 30-60mg/24h PO
- Nebulized salbutamol every 4 h
- Monitor peak flow and O<sub>2</sub> saturations

## If **not improving** after 15-30min

- Continue 100% O<sub>2</sub> and steroids
- Hydrocortisone 100mg IV or prednisolone 30mg PO if not already given
- Give Salbutamol nebulizers every 15 min, or 10 mg continuously per hour
- Continue ipratropium 0.5 mg every 4-6h

### **If patient still not improving**

- Discuss with seniors and ITU.
- Repeat salbutamol nebulizers every 15 mins
- $\text{MgSO}_4$  1.2-2g IV over 20 min, unless already given.
- Consider aminophylline, if not already on a theophylline. Alternatively, give salbutamol IV.

### **Monitoring the effects of treatment**

- Repeat PEF 15-30min after initiating treatment
- Pulse oximeter monitoring: maintain  $\text{SaO}_2 > 92\%$ .
- Check blood gases within 2h if: initial  $\text{PaO}_2$  was normal/raised or initial  $\text{PaO}_2 < 8$  kPa (60mmHg) or patient deteriorating
- Record PEF pre- and post-  $\beta$ -agonist in hospital at least 4 times.

# Once patient improving...

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- Wean down and stop aminophylline over 12-24 h.
- Reduced nebulized salbutamol and switch to inhaled  $\beta$ -agonist.
- Initiate inhaled steroids and stop oral steroids if possible
- Continue to monitor PEF. Look for deterioration on reduced treatment and beware early morning dips in PEF
- Look for the cause of the acute exacerbation and admission

# Follow-Up and Monitoring

- Include review of symptoms and measurement of lung function
- PEF monitoring at every visit along with review of symptoms helps in evaluating the patient's response to therapy and adjusting tx. PEF consistently  $>80\%$  of the patient's personal best suggests good control.
  - Regular visits (at 1 to 6 month interval as appropriate) is essential even after control of asthma is established

# Asthma Management Plan

- When PEF  $>80\%$ : continue current dose of inhaled corticosteroids.
- When PEF 60-80%:double the dose of inhaled corticosteroids.
- When PEF 40- 60%:start rescue course prednisolone
- When PEF persists below 60% despite rescue course prednisolone with worsening symptoms,advised to come to EMERGENCY DEPT immediately .

# Questions

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- What is asthma?



- 
- What are types of asthma?

- 
- Which investigations can be used to diagnose asthma?

- 
- How will you manage an acute attack of asthma?

- 
- How will you manage chronic asthma?



**THANKYOU**