

**National Guidelines for Primary
Health Care Physicians**

**Guidelines for the Management of Asthma and Chronic
Obstructive Pulmonary Diseases**

**Volume 1
Management of Asthma**

Directorate of Public Health

Non-Communicable Disease Department

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Abbreviation Terminology

WHO	World health organization
FEV1	Forced Expiratory Volume In One Second
FVC	Forced Vital Capacity
PEF	Peak Expiratory Flow
COPD	Chronic Obstructive Pulmonary Disease
ACE	Angiotensin converting enzyme
LTRA	Leukotrine receptor antagonist
ICS	Inhaled Corticosteroids
OCS	Oral Corticosteroids
LABA	Long Acting β 2 - Agonist
SABA	Short Acting β 2 - Agonist
EIA	Exercise-Induced Asthma
GERD	Gastro Esophageal Reflux Disease
AIA	Aspirin-Induced Asthma
GINA	Global Initiative For Asthma
IgE	Immunoglobulin E
PEFM	Peak Expiratory Flow Meter
PEF	Peak Expiratory Flow
CRDs	Chronic respiratory diseases
AAP	Asthma action plan

Introduction

Asthma is a major noncommunicable disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. Symptoms may occur several times in a day or week in affected individuals, and for some people become worse during physical activity or at night. During an asthma attack, the lining of the bronchial tubes swells, causing the airways to narrow in addition to bronchospasm from contraction of bronchial smooth muscles and reducing the flow of air into and out of the lungs. Recurrent asthma symptoms frequently cause sleeplessness, daytime fatigue, reduced activity levels and school and work absenteeism. Asthma has a relatively low fatality rate compared to other chronic diseases.

Key facts

- According to the latest WHO estimates, released in December 2016, there were 383 000 deaths due to asthma in 2015.
- The strongest risk factors for developing asthma are inhaled substances and particles that may provoke allergic reactions or irritate the airways.
- Medication can control asthma. Avoiding asthma triggers can also reduce the severity of asthma.
- Appropriate management of asthma can enable people to enjoy a good quality of life.
- Generally, between 50% and 80% of cases of asthma are evident by 5 years of age. Although it is most problematic during childhood, symptoms may disappear in up to 50% of those with relatively mild severity by late adolescence; while 80% of those with more severe conditions symptoms will persist with the disease into adulthood. Fortunately, as immunologic capacity declines with age, the symptoms of asthma usually decline in the older population.

Epidemiology

- An estimated worldwide prevalence is approximately 10% among children and youths less than 18 years of age.
- The current reported prevalence in the Middle East region is somewhat lower, varying between 5.6% in Saudi Arabia and 8.5% in Kuwait.

Based on National stepwise noncommunicable disease risk factor survey 2015 diagnosed cases by history was 2.2 % (men 1.8%, women 2.7%)

In Iraq approximately 200,000 patients per year with asthma are either hospitalized or treated in an Emergency Room.

Definition of Asthma

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. 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.

Pathophysiology

The bronchial wall inflammation noted in asthma can be provoked by a number of environmental and intrinsic triggering factors. These result in airflow obstruction of varying degrees, with the accompanying physical findings of expiratory wheezing, cough, chest tightness and agitation. In those with chronic symptoms, this inflammation is always present to some degree, regardless of the level of severity of asthma. See(figure1)

The cardinal pathophysiological features of asthma are

- 1- Airway hyper responsiveness.
- 2- Airway inflammation.
- 3- airway narrowing.

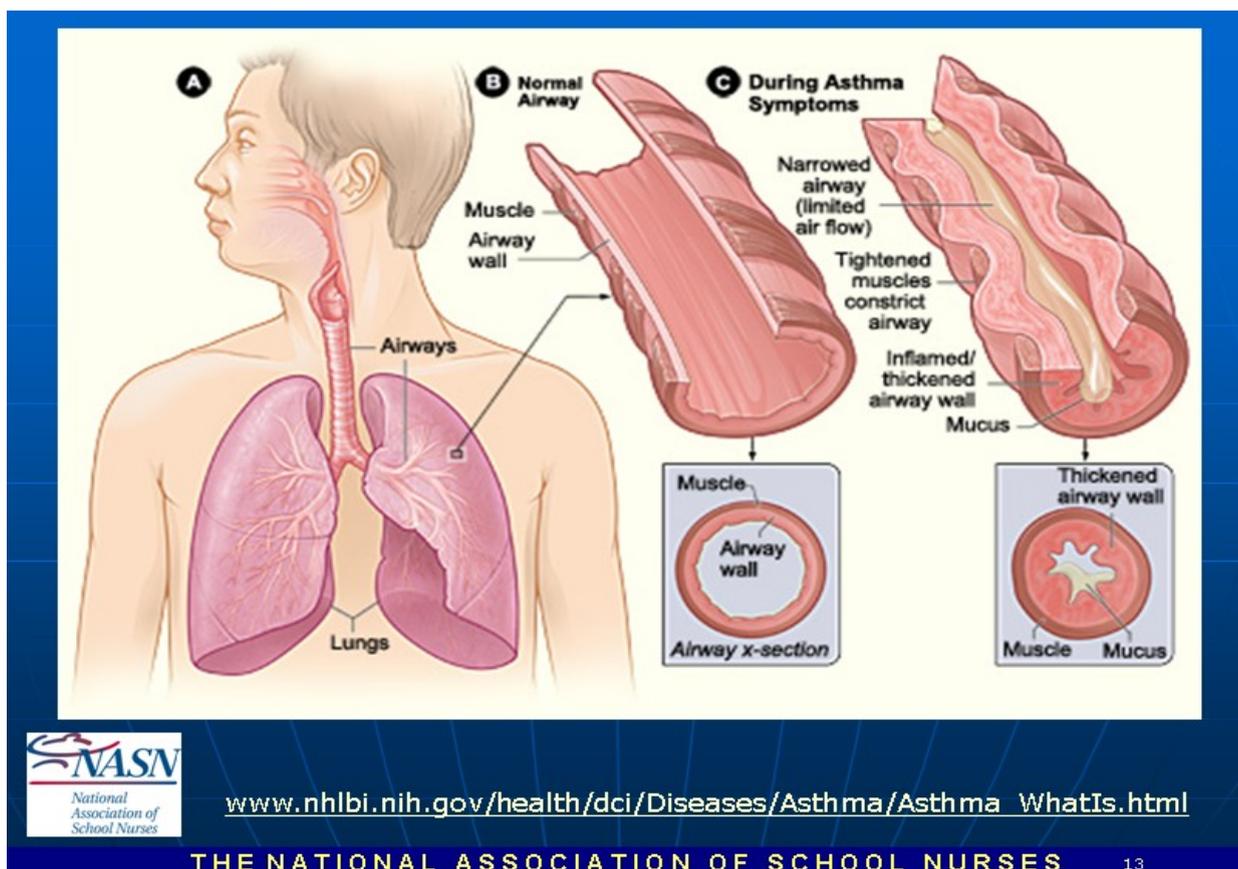


Figure 1:- Pathophysiology of Asthma

Diagnostic tests

I. Respiratory function test

1-Spirometer

Measurement of the Forced Expiratory Volume in the first second (FEV1) and the Forced Vital Capacity (FVC), both at rest and after the inhalation of a short-acting inhaled beta 2 agonist.

2- Peak Expiratory Flow Meter.

Measurement of peak flow as a baseline for future reference and for monitoring.

II. Other investigations

- Chest X-ray, : to identify other problems as:
- infiltrates indicating viral or bacterial pneumonia
- cardiomegaly or evidence of heart failure (which can cause “cardiac asthma”)
- hyperinflation of the chest and lungs, with flattening of the diaphragm
- inhaled foreign body with unilateral hyperexpansion (especially in children)
- Other problems as atelectasis, pneumothorax, pneumomediastinum.

In selected or severe cases, some additional investigations may be indicated:

- Sinus X-rays, if history or examination suggests chronic sinusitis.

Oxygen saturation, or blood gas measurement.

Physical Examination

A good general examination and recording of the vital signs including the respiratory rate, Auscultation of the chest can be normal or one can hear a prolonged expiratory phase or diffuse wheezing.

Targeted physical examination should be performed.

Height and weight (assessment of growth), nose, throat and paranasal sinuses.

Features of atopy may be associated with asthma.

Table 2 Possible factors that may be triggering asthma episodes :-

- - Viral respiratory infection (URI)
- House dust (mites)
- Plant pollens
- Exercise
- Exposure to smoke (cigarettes, cigars, indoor heaters)
- Environmental irritants such as air pollution, perfumes
- Latex particles (especially noted in medical personnel using latex gloves or tubing)
- Animals and animal dander
- Specific medications (such as aspirin or NSAID medications and β - Blockers)
- Emotional stress
- Occupational factors such as chemical fumes
- Food allergies (note that these are much less frequent as a cause of asthma than most inhalant allergies or irritants)
- feeding, In infants.

Diagnosis of Asthma

Table 1:-Diagnostic criteria for asthma in adults, adolescents, and children 6–11 years

DIAGNOSTIC FEATURE	CRITERIA FOR MAKING THE DIAGNOSIS OF ASTHMA
1- History of variable respiratory symptoms	
<p>Wheeze, shortness of breath, chest tightness and cough</p> <p>Descriptors may vary between cultures and by age, e.g. children may be described as having heavy breathing Symptoms often appear or worsen with viral infections</p>	<ul style="list-style-type: none"> • Generally more than one type of respiratory symptom (in adults, isolated cough is seldom due to asthma) • Symptoms occur variably over time and vary in intensity • Symptoms are often worse at night or on waking • Symptoms are often triggered by exercise, laughter, allergens, cold air
2- Confirmed variable respiratory airflow limitation	
Documented excessive variability in lung function.FEV ₁ OR PEF	The greater the variations, or the more occasions excess variation is seen, the more confident the diagnosis
AND documented airflow limitation	At least once during diagnostic process when FEV ₁ is low, confirm that FEV ₁ /FVC is reduced (normally > 0.70–0.85 in adults, > 0.90 in children)
Positive bronchodilator (BD) reversibility test (more likely to be positive if BD medication is withheld before test: SABA ≥ 4 hours, LABA ≥15 hours)	Adults: increase in FEV ₁ of >12% and >200 mL from baseline, 10–15 minutes after 100–200 mcg salbutamol or equivalent (greater confidence if increase is >15% and >400 mL). OR PEF > 12% Children: increase in FEV ₁ of >12% predicted OR PEF > 12%
Excessive variability in twice-daily PEF over 2 weeks	Adults: average daily diurnal PEF variability >10% Children: average daily diurnal PEF variability >13%
Significant increase in lung function after 4 weeks of anti-inflammatory treatment	Adults: increase in FEV ₁ by >12% and >200 mL (or PEF by >20%) from baseline after 4 weeks of treatment, outside respiratory infections
Excessive variation in lung function between visits (less reliable)	Adults: variation in FEV ₁ of >12% and >200 mL between visits, outside of respiratory infections Children: variation in FEV ₁ of >12% in FEV ₁ OR >15% in PEF between visits (may include respiratory infections)

Differential Diagnosis

Table 3 :- Differential Diagnosis

Age	Condition	Symptoms
6–11 years	Chronic upper airway cough syndrome	Sneezing, itching, blocked nose, throat-clearing
	Inhaled foreign body	Sudden onset of symptoms, unilateral wheeze
	Bronchiectasis	Recurrent infections, productive cough
	Primary ciliary dyskinesia	Recurrent infections, productive cough, sinusitis
	Congenital heart disease	Cardiac murmurs
	Bronchopulmonary dysplasia	Pre-term delivery, symptoms since birth
	Cystic fibrosis	Excessive cough and mucus production, gastrointestinal symptoms
12–39 years	Chronic upper airway cough syndrome	Sneezing, itching, blocked nose, throat-clearing
	Vocal cord dysfunction	Dyspnea, inspiratory wheezing (stridor)
	Hyperventilation, dysfunctional breathing	Dizziness, paresthesia, sighing
	Bronchiectasis	Productive cough, recurrent infections
	Cystic fibrosis	Excessive cough and mucus production
	Congenital heart disease	Cardiac murmurs
	Alpha ₁ -antitrypsin deficiency	Shortness of breath, family history of early emphysema
	Inhaled foreign body	Sudden onset of symptoms
40+ years	Vocal cord dysfunction	Dyspnea, inspiratory wheezing (stridor)
	Hyperventilation, dysfunctional breathing	Dizziness, paresthesia, sighing
	COPD	Cough, sputum, dyspnea on exertion, smoking or noxious exposure
	Bronchiectasis	Productive cough, recurrent infections
	Cardiac failure	Dyspnea with exertion, nocturnal symptoms
	Medication-related cough	Treatment with angiotensin converting enzyme (ACE) inhibitor
	Parenchymal lung disease	Dyspnea with exertion, non-productive cough, finger clubbing
	Pulmonary embolism	Sudden onset of dyspnea, chest pain
	Central airway obstruction	Dyspnea, unresponsive to bronchodilators

Classification of Severity of Asthma

The classification of the severity of the asthma forms the basis for the intensity of medical therapy. The level of severity should be classified according to the frequency of occurrence of symptomatic episodes of **ANY** of the following (Table 4):

- Coughing episodes
- Chest tightness
- Shortness of breath
- Episodes of wheezing

**Table 4: Classification of Asthma severity: Clinical features before treatment
(If any one meet one of the following)**

	Days with Symptoms (and /or)	Nights with Symptoms (and /or)	PEF or FEV1 *
Mild Intermittent	≤2 symptomatic episodes/week	≤2 nights/month	≥80%
Mild Persistent	3-6 symptomatic episodes/week	3-4 nights/month	≥80%
Moderate Persistent	Daily symptoms	≥5 nights/month	>60%- <80%
Severe Persistent	Continual symptoms	Frequent	≤60%

* Predicted values for forced expiratory volume in 1 second (FEV₁) or percent of personal best for peak expiratory flow (PEF) (relevant for children 6 years old or older who can use these devices).

The following points are considered in this classification:

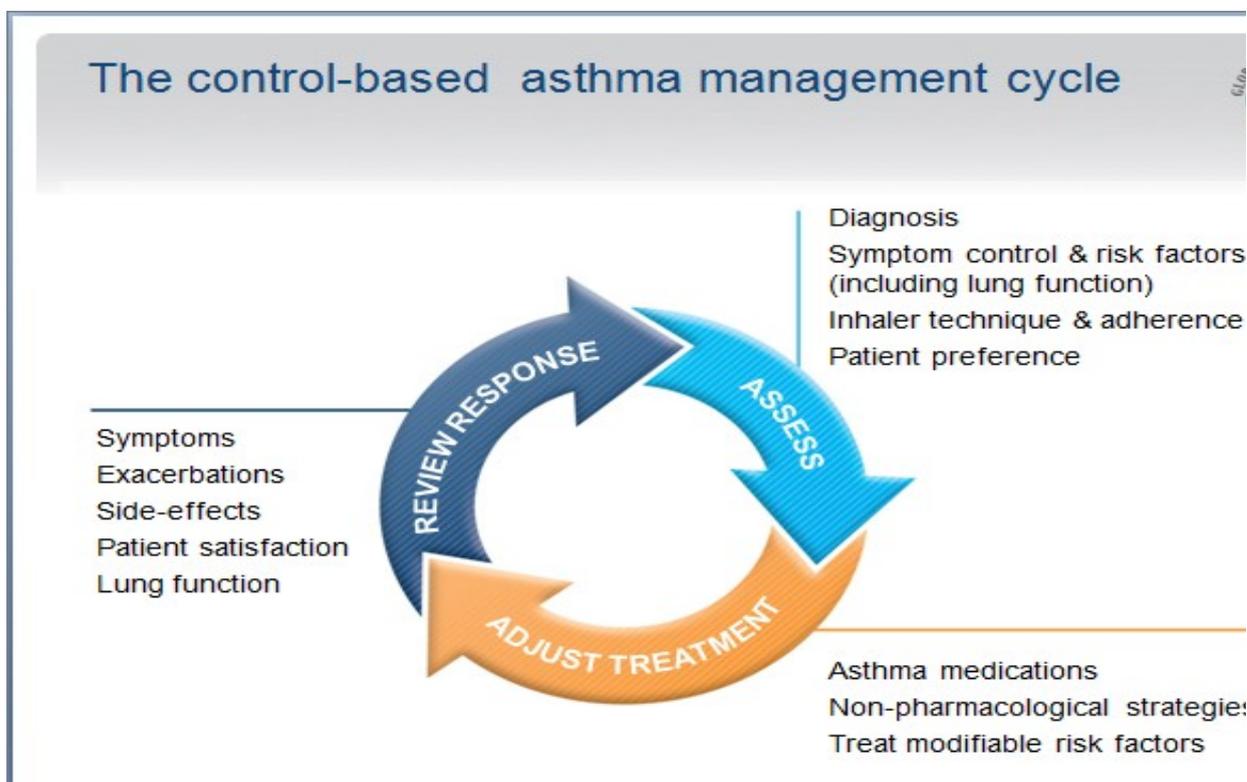
- The night-time symptoms (which may only be awakening with cough) are still significant even if they only occur once or twice per month. These may require careful questioning to uncover.
- Patients should be assigned to the classification level at which the most frequent symptom occurs
- An individual's classification may change over time
 - Patient at any level of severity of chronic asthma have mild, moderate or severe exacerbations of asthma. Some patients with intermittent asthma experience severe and life-threatening exacerbations separated by long periods of normal lung functions and no symptoms
- Patients with two or more asthma exacerbations per week (ie., progressively worsening symptoms) that last hours or days tend to have moderate-to-severe persistent asthma

Management of Asthma

Goals of Management

When the diagnosis of chronic asthma has been established, the goals of the management strategy need to be carefully defined and discussed with the patient. goals should include the following:

- 1- Prevent chronic asthma symptoms and asthma exacerbations during both the day and night including:-
 - No sleep disruptions
 - No missed school or work
 - No visits to the Emergency department
 - No hospitalization
- 2- Maintain normal or near-normal activity throughout the day, including exercise and other physical activities
- 3- Achieve normal or near-normal pulmonary function as measured by spirometer or peak flow meter.
- 4- Minimal use of the short acting β_2 agonist inhaler (salbutamol) for acute asthma symptoms



Medication treatment

The long term management of asthma requires attention to the following:

1. Investigate and minimize possible triggering factors, when possible
2. Use appropriate medication as per established guidelines. In most cases (except for mild intermittent asthma), the patient will require both a RELIEVER medication and a CONTROLLER/ PREVENTOR medication.

The RELIEVER medication is generally a short-acting β_2 agonist inhaler such as salbutamol, which is used to abort acute symptoms of chest tightness, sudden wheezing, cough, or shortness of breath.

The CONTROLLER / PREVENTOR medication is directed specifically at decreasing the inflammatory response to asthma triggers, which suppresses the cascade of symptoms and prevents chronic pulmonary damage over time. and also to maintain airway dilatation and prevents narrowing.

There are several varieties of medications that have been proven effective in the management of asthma, which can be briefly described as follows:

Table 5 :- Medications Available for Management of Asthma		
RELIEVERS Medications (acute management)		
Medication	Dosage Range	Notes
Selective β_2 agonist short acting Salbutamol inhaler	1-3 puffs as needed every 4hours	Immediate, but short-lived (<4 hours) relief
Anticholinergic drugs Ipratropium inhaler	2 puffs every 6 hrs.	Anticholinergic effect with slight additive benefit to β_2 agonist; reduces mucous production in bronchi
Theophylline injection	5mg/kg bolus 15-20 mg/kg/day	Are given IV infusion (250 ml 5%GW OR NS during 10-30 mins) At emergency department
CONTROLLER \ PREVENTER Medications (chronic daily management)		
Medication	Dosage Range	Note
Salmeterol inhaler long acting Selective β_2 agonist	1-2 puffs every 12 hours	Delayed action (1-2 hours) but long-lasting relief (12 hours) it should not be used alone so it can't be used in mild intermittent
Beclomethasone inhaler or other steroid inhalers	50 – 250 μ gm/puff dosage varies with age and size	Inhaled corticosteroid
Montelukast tablets or granules(Antileukotrine)	Montelukast children > 1 year age – 1 dose daily	Leukotriene inhibitor, blocks action of leukotrienes on cell receptor Oral medication
Theophylline , sustained release oral preparation	-1-5 years - 15-20 mg/kg/day -5-10 years - 12 mg/kg/day ->10 years – 5-6 mg/kg/day	Use sustained release (SR) dosage when possible Dosage varies by age and clearance – therapeutic window between effective dose and toxic dose very narrow. Can lead to agitation and seizures in the toxic range.
Prednisone, Prednisolone	0.5 – 2 mg/kg/day Given orally or IV	Used primarily for acute asthma episodes for short periods <14 days. Requires 2-4 hours for maximum effectiveness. No need to taper dose when the treatment period is less than14 days. Avoid prolonged use unless no other alternatives for severe asthma.
Cromolyn inhaler Nedocromil inhaler	1 puff every 6 hrs.	Inhibitor of mastocyte degranulation to inhibit inflammation cascade. used only in children &it is not so effective

Table 7 :- Medication Management Protocols by Classification of Asthma Severity

Level of care	Level of Severity of Asthma	Medication
	For all levels of severity	RELIEVER medication short acting inhaled β_2 agonist (salbutamol or albuterol inhaler) as needed
At primary health care level	Step 1: Mild intermittent asthma (<2 symptomatic episodes/week) and /or (≤ 2 nights /month) and /or(PEF or FEV1 $\geq 80\%$)	short acting inhaled β_2 agonist (salbutamol or albuterol) as needed (1-3 puffs every times) *very low dose inhaled steroid may be required(for patients who previously use inhaled steroid)
	Step 2: Mild persistent asthma (3-6 symptomatic episodes/week)(β -4 nights/month) and /or(PEF or FEV1 $\geq 80\%$)	-Low-dose inhaled corticosteroid - Consider to add :- - LTRA(if patient with history of atopy or nasal symptoms) plus as needed SABA or -Sustained–release theophylline (patient with night symptoms)
At referral level	Step 3: Moderate persistent asthma (Daily symptoms) and or (≥ 5 nights/month) and /or(PEF or FEV1 $>60\%$-$<80\%$)	- Low dose ICS/LABA (preferred for adults) -Or Alternative options ◊Med/high dose ICS preferable for children <10 years befor adding LABA ◊Low dose ICS+LTRA(history or atopy , nasal symptoms) - Add Sustained–release theophylline (patient with night symptoms) ◊ plus As-needed SABA or combined low dose ICS /formoterol
	Step 4: Severe persistent asthma (continual day symptoms) And /or (Frequent night symptoms) And /or PEF or FEV1 $\leq 60\%$	-Med/high ICS/LABA --Or Alternative options Add <i>tiotropium+ High dose ICS + LTRA</i> Add Sustained–release theophylline (patient with night symptoms) Plus As-needed SABA or combined low dose ICS/formoterol
	Step 5: Severe persistent asthma (continual day symptoms) And /or (Frequent night symptoms) And /or PEF or FEV1 $\leq 60\%$	- Refer for add-on treatment e.g. tiotropium, omalizumab, mepolizumab - Oral corticosteroid in dosage of 0.52 mg per Kg per day with the dose generally not exceeding 60 mg/day. -Add <i>low dose OCS</i> -Plus As-needed SABA or combined low dose ICS/formoterol

low, medium and high daily doses of inhaled corticosteroids Adults and adolescents (12 years and older) ,See annex 4

Once the level of asthma severity has been determined base on Table 4 medications should be given according to the protocols given in Table 7. In all cases, a Reliever medication inhaler is given for short-term relief of symptoms as needed, in addition to one or more daily Controller / Preventer medication which work to decrease the inflammatory component of the asthma reaction and maintain airway dilatation.

- The Controller / Preventer medication should be given on a daily basis for an extended period of time, with one of the goals being a gradual reduction in the use of the as- needed Reliever inhaler.
- The lowest effective dose of medication which will control the symptoms should be used.
- When the patient has been symptom free for over 3 months should consider “**Step Down Therapy**”, in which the use of the long-term Controller / Preventer medications is gradually reduced consistent with the next lowest level of severity. This should be done slowly, with the inhaled steroids reduced about 25% every 2-3 months until the lowest dose required to maintain control is reached and should not withheld inhaled corticosteroid completely.

Table 6:- Stepping Down Options	
Current Treatment	Stepping Down Plan
Medium- high dose inhaled steroids	50% reduction in dose
Inhaled steroids + LABA	50% reduction in dose of inhaled steroids while continuing LABA. Further reduction to reach low dose and then to discontinue LABA Or discontinue LABA while continuing high dose of inhaled steroids

If the patient appears to be worsening with increasing symptoms, should begin “Step Up Therapy”, with increasing dosage of existing Controller / Preventer medication or addition of an additional medication consistent with the next highest level of severity.

If control is not achieved , consider step up , But first review :-
a. Inhaler technique b. Compliance c. Trigger factors
Review treatment every 3 to 6 months.

If control is sustained for at least 3 months, a gradual stepwise reduction in treatment should be considered

Where available, physicians, clinical pharmacists and paramedical staff should participate in the instruction of the patient and parents, and should focus on educating the family about the medications prescribed, how often to take them, their potential side effects and how to avoid them, potential danger signs of overdose (especially if theophylline is being used), and the need to continue the medications without interruption.

Follow-up / monitoring

For each follow-up visit assessment of the following:-

- Weight and Height measurement – graphed on percentile growth chart (children).
- Number of visits to Emergency or for hospitalization.
- Number of school absences due to asthma or illness.
- Number of nights with cough.
- Chest examination.
- Current classification of asthma.

A patient's memories and self management practices may fade with time. Reinforcement, review, and reminders are needed.

Management plan

At each follow-up visit, the following topics should be reviewed with the patient and family members:-

- Current medications and appropriate dose
- Need for “Step-up” or “Step-down” medication changes depending on frequency of asthma symptoms
- Appropriate use of medications (Inhaler technique and compliance).
- Recognition of Danger Signs that indicate emergency visit to hospital
- Review of avoidance or control of known triggering factors for this patient
- Asthma control test.
- Patient asthma action plan.

Follow-up visits may be weekly during an unstable and severe level, but may diminish to every 3-6 months when the patient has been stable for several months.

The frequency of follow-up visits to the physician or clinic will vary from patient to patient, depending on the

- 1- level of severity of the asthma.
- 2- the ability of the patient or parents to comply with home management of the medication

- 3- the progress toward the goals of minimal disruption of normal life and minimal use of the RELIEVER inhaled medication.

Special considerations

1. Exercise-Induced Asthma (EIA):

- EIA is a problem among active children, adolescents, and young adults
- A history of wheezing, fatigue or poor performance on exercise may be the presentation. Physical examination at the time of symptoms may be helpful. Pulmonary function or exercise test may be needed often
- Patient should be advised to avoid exercise in cold weather, in places where pollen or air pollution levels are high and to do proper warm-ups before vigorous exercise.
- Taking short acting β_2 agonist 20-30 minutes before exercise is recommended
- Leukotriene modifiers can be considered in the management of EIA every 3-6 months when the patient has been stable for several months.

2. Respiratory infections

- Respiratory infections have an important relationship to asthma as they provoke wheezing and increased symptoms in many patients. Microorganisms associated with increased asthma symptoms are often respiratory viruses

Treatment of an infectious exacerbation follows the same principles as treatment of other asthma exacerbations. Because increased asthma symptoms can often persist for weeks after the infection is cleared, anti-inflammatory treatment should be continued

- Vaccination :- Is recommended for Influenza vaccine and Pneumococcal vaccine

3. Rhinitis/Sinusitis/Nasal polyps

- Many patients with asthma have a history of rhinitis and up to 30% of patients with persistent rhinitis have or develop asthma
- Treatment of Rhinitis may improve asthma symptoms. Intra-nasal corticosteroid as well as leukotriene modifiers, anticholinergics, allergen-specific immunotherapy, and anti-IgE therapy can be effective in both conditions
- Sinusitis is a complication of upper respiratory infections, allergic rhinitis, nasal polyps, and other forms of nasal obstruction. Both acute and chronic sinusitis can worsen asthma. Treatment should include topical nasal decongestants or topical nasal or even systemic corticosteroid and a 10 day course of antibiotics. Nasal polyps associated with asthma and rhinitis, and sometimes with aspirin hypersensitivity, are seen primarily in patients over

40 years old. Nasal polyps are quite responsive to topical corticosteroid. A limited number of patients with corticosteroid-refractory polyps may benefit from surgery.

4. Occupational asthma

- Once a diagnosis of occupational asthma is established, complete avoidance of the relevant exposure is advisable
- Occupational asthma may persist for several years after removal from exposure to the causative agent, especially when the patient has had symptoms for a long time before cessation of exposure
- Pharmacologic therapy for occupational asthma is identical to therapy for other forms of asthma, but it is not a substitute for adequate avoidance.

5. Gastroesophageal reflux

- The relationship of increased asthma symptoms, particularly at night, to gastroesophageal reflux remains uncertain
- Medical management should be given for the relief of reflux symptoms as it is often effective. Patients may be advised to eat smaller, more frequent meals; avoid food or drink between meals and especially at bedtime; avoid fatty meals, alcohol and Theophylline

6. Aspirin-induced asthma (AIA)

- Up to 28% of adults with asthma, but rarely children, suffer from asthma exacerbations in response to aspirin and other non steroidal anti-inflammatory drugs (NSAIDs).
- The majority of patients first experience symptoms, which may include vasomotor rhinitis and profuse rhinorrhea, during the third to fourth decade of life. Asthma and hypersensitivity to aspirin often develop subsequently.
- Patients with AIA should avoid aspirin, products containing it and other analgesics that inhibit cyclooxygenase-1 (COX-1). Where an NSAID is indicated, a COX-2 inhibitor may be considered with appropriate physician supervision and observation for at least one hour after administration.

Emergency Management of Acute Asthma Exacerbation

Most patients with chronic asthma will have an occasional acute episode of asthma with increased respiratory distress and difficulty breathing. This is often in response to an acute exposure to a known or newly identified triggering event. Although the goal of the daily management of asthma is to reduce such acute exacerbations, they must be appropriately managed in an emergency setting when they occur.

Danger Signs:

The emergency evaluation should focus on the Danger Signs of respiratory

distress, which are:

- Cyanosis – which indicates significant hypoxia, and alarm that the patient may undergo significant retention of carbon dioxide
- Exhaustion – which is due to fatigue of the chest and neck muscles, and often indicates impending respiratory failure
- Inability to talk – which indicates that the patient’s entire physical effort is concentrated on the work of breathing
- Silent chest – or no audible breath sounds, which indicates that very little air is being exchanged and significant respiratory failure.
- Respiratory rate > 30 breaths/minute in adults and children older than 6 years, >60 breaths/min young infants (0–2 months), >50 breaths/min for infant (2 -12 months) and, > 40 breaths/min for children (1–5 years) (See Annex 1)
- Pulse rate (See Annex 1)

For patients who present with relatively MILD respiratory distress (some wheezing and distress with none of the above danger signs), the following management can be applied:

- Administer Oxygen by nasal cannula at 2-6 l./minute.
 - Give additional β_2 agonist dose by inhalation (nebulizer or inhaler with spacer) – up to 3 inhalations spaced 15 minutes apart.
- The use of an inhaler with spacer is **PREFFERED**, however especially for small children, a powered nebulizer with mask can be used.
- Give short acting corticosteroid (either prednisolone or prednisone tab\ bolus of 1 mg/kg orally , or 5 mg/kg hydrocortisone vial IV. follow with 0.5-1 mg/kg/day by mouth for 5-14 days.
 - Follow-up with the patient within 24-48 hours, and again in 2 weeks for possible adjustment to the chronic **PREVENTER / CONTROLLER** medications.

Patients who present with MODERATE OR SEVERE respiratory distress (with one or more of the above critical signs) should be referred to the Emergency Department for management.

Table 7:- Indications for referral

Adult	Children
Referral for measures not available in primary care	
Diagnostic unclear	Diagnostic unclear
Suspected occupational asthma (symptoms that improve when patient is not at work ,adult – onset asthma and works in high risk occupations)	
Poor response to asthma treatment	Poor response to monitored initiation of asthma treatment
Sever/ life –threatening asthma attack	Sever/ life –threatening asthma attack
Red flag and indicators of alternative diagnosis	
Prominent systemic features(myalgia, fever, weight loss)	Failure to thrive
Unexpected clinical findings (eg crackles ,clubbing, cyanosis, cardiac disease monophonic wheeze or stridor)	Unexpected clinical findings (eg focal signs ,abnormal voice or cry, dysphagia, inspiratory stridor)
Persistent non-variable breathlessness	Symptom persent from birth or perinatal lung problem
Chronic suptum production	Excessive vomiting
Unexplained restrictive spiromtry	Sever upper respiratory tract infection
Abnormal Chest Xray	Persistent wet productive cough
Marked blood eosinophillia	Family history of unuasual chest disease
	Nasal polyp

Health Education Messages

Over the course of regular follow-up visits, physicians and the health care team should provide the following general information and counseling about asthma and its management:

- Asthma is a chronic lung disease characterized by inflammation of the airways. There may be periods when there are no symptoms, but the airways are swollen and sensitive to some degree all the time. Long-term anti-inflammatory (Controller / Preventer) medications are important to control the airway inflammation.
- Many things at home, school, work, or elsewhere can cause asthma attacks (e.g., secondary smoke, allergens, irritants).
- Asthma cannot be “cured”, but it may improve spontaneously in some patients, and can be controlled with some alteration of lifestyle and medication, and the patient can live a normal life with appropriate care.
- Asthma can be best controlled when the patient works together with the medical staff. The patient plays a big role in monitoring asthma, taking medications, and avoiding things that can cause asthma episodes.
- Asthma requires long-term care and monitoring. It can get better or worse over time and requires periodic changes in treatment.
- All patients should keep a β_2 agonist (salbutamol) inhaler and a spacer device accessible and available at all times, and instructed in the optimal use of the inhaler for acute symptoms.
- The benefits and potential risks of corticosteroids should be discussed, with emphasis on the low risk of long-term complications with the use of inhaled corticosteroids compared to the use of injected or oral steroids.
- Discussion may be necessary regarding beliefs about the influence of diet and its effect on asthma.
- A patient’s response to asthma triggers may change over time.
- Children with asthma should be encouraged to participate in school exercise activities as long as the asthma is controlled. They may need to use a pre-exercise salbutamol inhaler, or take a pre-exercise dose of monteleucast.

Although difficult for some families, they should be encouraged to use a peak flow meter when possible, preferably on a daily basis until the patient is well stabilized. The daily peak flow reading should be recorded in a daily calendar, or marked on a graph, together with any comments that might relate to the daily reading. Once a regular peak flow baseline has been established with the patient in a stable condition, the WARNING peak flow level ($\leq 80\%$ of the average personal best level) can be calculated and noted, as well as the DANGER peak flow ($\leq 50\%$ of the average personal best level). The patients should be instructed to respond to either of these levels with the following measures:

- A decrease in peak flow to $\leq 80\%$ of the personal best level – recommend an immediate increase in the Controller/ Preventer medication for the next 10-20 days
- A decrease in peak flow to $\leq 50\%$ of the personal best level indicates a severe exacerbation and need for immediate consultation with a physician in an emergency setting

Asthma Action Plan (See Annex 6)

Home Peak Flow Monitoring

The peak expiratory flow rate (abbreviated PEFr), is used to assess the severity of wheezing in those who have asthma. PEFr measures how quickly a person can exhale air from the lungs, and it is measured using a simple and inexpensive device called the Peak Flow Meter. It's important to learn the proper technique for use your peak flow meter, and your doctor or nurse will help you learn how to measure your PEFr. Younger children can have trouble with this, but most children over 5 years of age can learn how to use the peak flow meter correctly.

Asthma First Aid

If you have a sudden worsening of your asthma, an acute asthma attack with significant difficulty breathing, wheezing, and cough:

- Prepare an action plan with your doctor, so that you know what to do when an attack occurs.
- Use your inhaler at the first signs of an asthma attack.
- Use maximum doses of your inhaler allowed by your treatment plan.
- Seek medical attention immediately if symptoms do not improve.
- Seek medical attention immediately if your peak expiratory flow is in the red zone.
- Remain calm, but do not lie down.
- Stop cough and cold medicines if you are taking them.
- Drink plenty of clear liquids.

ANNEXES

Annex 1: Normal Values of Vital Signs

Normal Values for Respiratory Rate by Age

Normal Values for Pulse by Age

Annex 2:- Peak expiratory flow rate - pediatric normal values

Height (m)	Height (ft)	Predicted EU PEFR (L/min)		Height (m)	Height (ft)	Predicted EU PEFR (L/min)
0.85	2'9"	87		1.30	4'3"	212
0.90	2'11"	95		1.35	4'5"	233
0.95	3'1"	104		1.40	4'7"	254
1.00	3'3"	115		1.45	4'9"	276
1.05	3'5"	127		1.50	4'11"	299
1.10	3'7"	141		1.55	5'1"	323
1.15	3'9"	157		1.60	5'3"	346
1.20	3'11"	174		1.65	5'5"	370
1.25	4'1"	192		1.70	5'7"	393

Annex 3: Pulmonary function tests - Predicted values charts Diagnostic tests and procedures

The initial investigation should include the following:

- Pulmonary Function Tests

Spirometry:

Spirometer is used to confirm the diagnosis. It demonstrates specific airflow obstruction which is at least partially reversible with appropriate medication. Spirometry should be performed if possible during the time that the patient has some symptoms, and is based on measurement of the Forced Expiratory Volume in the first second (FEV₁) and the Forced Vital Capacity (FVC), both at rest and after the inhalation of a short-acting inhaled beta₂agonist such as salbutamol. Confirmation of asthma is obtained with the following results:

- The FEV₁ is less than 80% the predicted value based on the patient’s height and weight.
- The ratio of FEV₁/FVC is less than 70% of the lower limit of normal for the patient’s age and size.
- The FEV₁ increases more than 12% after the inhalation of a short-acting inhaled beta₂agonist such as salbutamol. (4 puffs of 100 microgram each puff)

Interpreting Spirometry			
Diagnosis	FEV ₁	FVC	FEV ₁ /FVC%
Obstructive	Decreased < 80% of Predicted	Normal or Decreased	Decreased ≤ 70%
Restrictive	Decreased or normal	Decreased < 80% of Predicted	Normal or increased > 70%
Reversible airway obstruction	Increase of > 12 % of the base line value after administration of bronchodilator		

FEV₁ = Forced Expiratory Volume in One Second, FVC = Forced Vital Capacity, FEV₁/ FVC% = FEV₁ as Percentage of FVC

Spirometry is generally recommended, rather than measurements by a peak flow meter, due to wide variability in peak flow rate and reference values. The absence of airway obstruction does not rule out asthma, especially if the patient is not symptomatic at the time of testing, since airflow obstruction in asthma is, by definition, intermittent.

• **Peak Expiratory Flow Rate:**

Measurement of peak flow as a baseline for diagnosis and monitoring of asthma

- 1- Peak flow measurement is effort dependant and requires patient understanding. In certain patients measuring PEF prior to and after a bronchodilator or an

exercise challenge may help in confirming the diagnosis. increase of 20 % after bronchodilator indicates confirmation of asthma diagnosis.

% of post bronchodilator improvement :-

$$\frac{(\text{post bronchodilator value} - \text{pre bronchodilator value})}{\text{pre bronchodilator value}} \times 100$$

2-Measurement of PEF variability by comparing the morning and evening PEF over a period of 2 weeks is also helpful. Variability FOR:-
 Adults: average daily diurnal PEF variability >10% , Children: average daily diurnal PEF variability >13% , variability over 20% make the diagnosis highly probable . It is calculated as follows:

Peak daily flow variability % =

$$\frac{(\text{highest value} - \text{lowest value})}{\text{Mean of 2 readings}} \times 100$$

$$\text{Diurnal variability over 1-2 weeks} = \frac{\text{Sum of readings of daily variability}}{\text{No of days}}$$

Use of the Peak Flow Meter

- The peak flow meter can often be used in children over the age of 5 years, although it may take some practice for them to be consistent with its use
- The doctor or nurse should demonstrate the proper use of the peak flow meter, and be sure that it is being used correctly. The technique consists of the following:
 - Place a clean mouthpiece on the peak flow meter, and set the indicator needle to “0”.
 - Taking one or two deep breaths to prepare for measurement.
 - Take a very deep breath, insert the mouthpiece of the peak flow meter in the mouth with the lips completely sealing around the mouthpiece, and forcefully blow out through the meter as quickly as possible, completely emptying the lungs of air.
- The results are very dependent on a maximum breathing effort by the patient, so the patient should be encouraged to blow out through the meter as forcefully, as rapidly, and as completely as possible.
- It is recommended that at least two or three tries are made at measuring the peak flow; The number used should be the highest of all the efforts.
- If the results are erratic or inconsistent, check for possible errors in technique:

- The effort of blowing out was not a maximum possible effort – try increasing the effort.
- The mouth was not completely sealed around the meter mouthpiece, allowing leakage of air.
- Some of the air was exhaled through the nose and not the mouth – try placing a clip on the nose to prevent this.

PEFR ZONES

The asthma patient should use and record the peak flow every day for at least one or two weeks during the time that there are no symptoms of chest tightness, cough, or wheezing, the asthma appears to be controlled (with or without medication), and the patient feels well. The highest peak flow reading that was obtained should be recorded as the patient's "personal best" peak flow reading. This is then used as a comparison against future peak flow measurements. It is helpful to not only record the "personal best" reading, but also to calculate and record two additional figures – 80% of the "personal best", and 50% of the "personal best" ($0.8 * \text{Best PEFR}$, and $0.5 * \text{Best PEFR}$). These two calculated figures are then used to compare with future peak flow readings, and classify them into one of three zones, as follows:

- Green zone:
 - Your current PEFR is 80-100% of personal best PEFR.
 - This zone carries a low risk of complications and danger, and indicates that you are in good control.
 - You should continue the treatment strategy in place.
- Yellow zone:
 - Your current PEFR is 50-80% of personal best PEFR.
 - This zone has a moderate risk of complications and danger of worsening.
 - You should have a treatment strategy in place by your doctor for what to do when you are in the yellow zone, which usually means increasing the dose of both the Reliever and the Controller medications.
- Red zone:
 - Your current PEFR is less than 50% of personal PEFR.
 - This indicates a severe risk of danger and complications, and the patient will need to see a doctor urgently.
 - You should have a treatment strategy in place for when you are in the red zone, which should include an emergency visit to a treatment facility, and may mean not only increasing the dose of existing medications but perhaps adding another medication as well.

Annex 4 : Low, medium and high daily doses of inhaled corticosteroids Adults and adolescents (12 years and older)

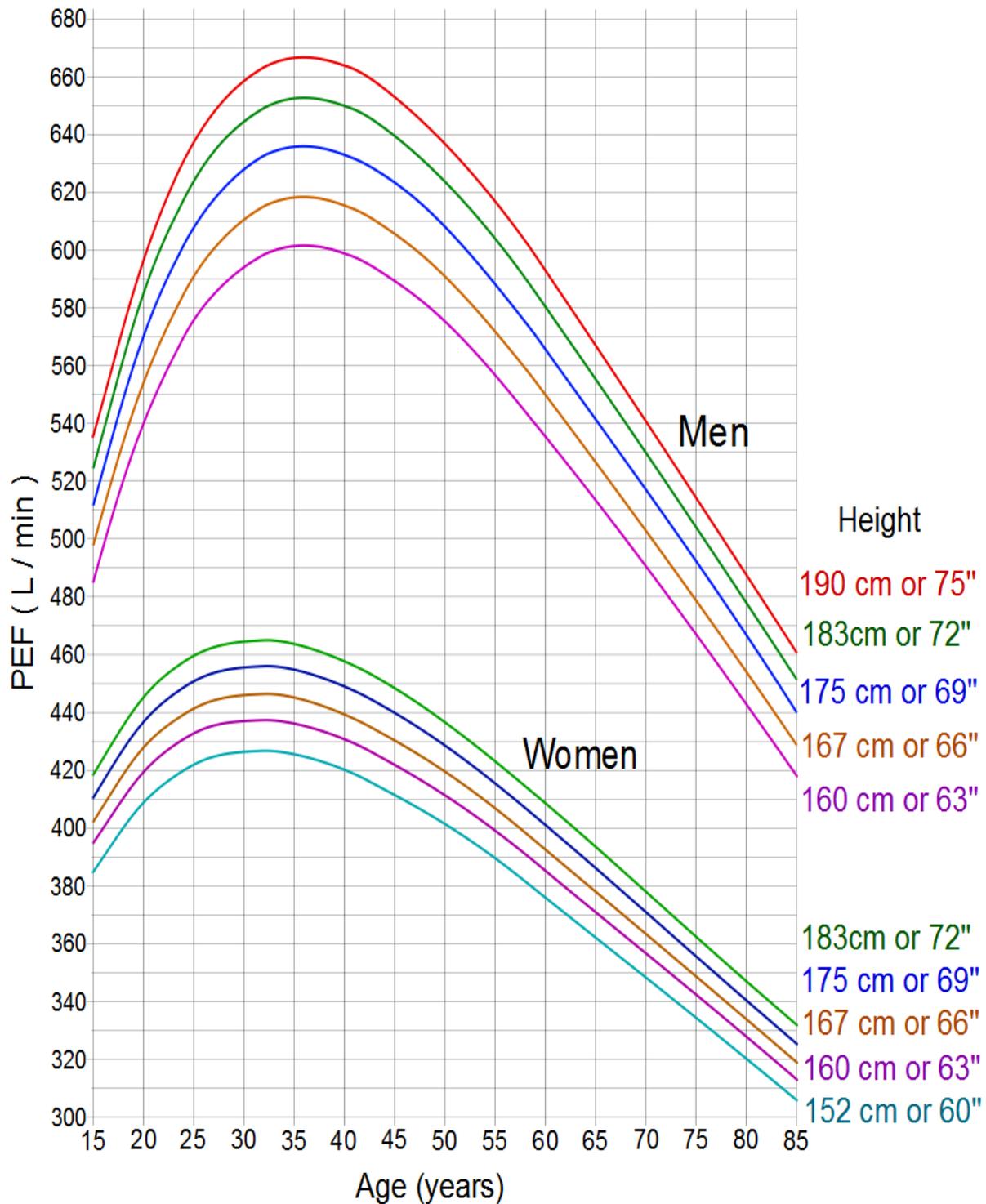
Drug	Daily dose (mcg)		
	Low	Medium	High
Beclometasone dipropionate (CFC)*	200–500	>500–1000	>1000
Beclometasone dipropionate (HFA)	100–200	>200–400	>400
Budesonide (DPI)	200–400	>400–800	>800
Ciclesonide (HFA)	80–160	>160–320	>320
Fluticasone furoate (DPI)	100	n.a.	200
Fluticasone propionate(DPI)	100–250	>250–500	>500
Fluticasone propionate (HFA)	100–250	>250–500	>500
Mometasone furoate	110–220	>220–440	>440
Triamcinolone acetonide	400–1000	>1000–2000	>2000
Children 6–11 years (for children 5 years and younger, see Box 6-6, p.112)			
Beclometasone dipropionate (CFC)*	100–200	>200–400	>400
Beclometasone dipropionate (HFA)	50-100	>100-200	>200
Budesonide (DPI)	100–200	>200–400	>400
Budesonide (nebulas)	250–500	>500–1000	>1000
Ciclesonide	80	>80-160	>160
Fluticasone furoate (DPI)	n.a.	n.a.	
n.a. Fluticasone propionate (DPI)	100–200	>200–400	
>400			
Fluticasone propionate (HFA)	100–200	>200–500	>500
Mometasone furoate	110	≥220–<440	≥440
Triamcinolone acetonide	400–800	>800–1200	>1200

CFC: chlorofluorocarbon propellant; DPI: dry powder inhaler; HFA: hydrofluoroalkane propellant; n.a. not applicable*Beclometasone dipropionate CFC is included for comparison with older literature

Annex 5:- Peak expiratory flow rate - normal values

Normal values for peak expiratory flow (PEF)

EN 13826 or EU scale



Annex 6:- Asthma Action Plan (AAP)

Every asthma patient need to have an action plan, and this should be reviewed

and updated by doctor every 3 months or according to physician's opinion.

The goal of an asthma action plan is to control the disease, so you can:

- Prevent symptoms.
- Reduce need for medicines.
- Maintain normal activity.
- Sleep through the night.
- Prevent emergencies

The asthma action plan allows the patient to understand asthma medications:

- Different medications have different functions.
- Use quick relief medicines to quickly relieve the symptoms when they occur.
- Use long term control medicines daily to reduce airway inflammation and prevent future symptoms.

The asthma action plan also includes:

- Asthma triggers in order to avoid as possible.
- The patient records his/her symptoms, this allow to know the poorly controlled patients.
- When to call the doctor, or seeks medical attention.
- When need to seek emergency care, should know the life threatening features of asthma.

AAPs are particularly helpful for patients with moderate or severe persistent asthma, a history of severe exacerbations, or poorly controlled asthma. While the content of each AAP may vary to some extent, typical plans outline which medications and what actions to take in the following 3 zones:

Three Zones of asthma action plan (AAP)	
“green zone,”	Which includes medications taken every day to achieve and maintain good control
“yellow zone”	Which includes which rescue medications to add when asthma gets worse and when to see their provider for follow-up.
“red zone”	Which details what medications to take and how to seek care in the event of an asthma emergency.

خطة العمل الخاصة بالربو للمريض

الاسم / /

العمر

التاريخ

	الحالة الصحية جيدة (أنا بخير)
	حالة المريض (ليست بخير)
	علامات الخطر (التأذر الطبي)

المنطقة الآمنة (الخضراء)	
التنفس جيد لا تعاني من السعال أو الصفير أو ضيق الصدر المنتظم في الليل لا يكون لديك صفير أو سعال أو ضيق الصدر المنتظم عندما تستيقظ أو خلال النهار استطيع القيام بكافة اعمالى اليومية بدون اعراض الربو لا احتاج الى الغياب عن الدراسة أو اخذ اجازة من العمل بسبب الربو احتاج دواء تخفيف الاعراض اقل من 3 مرات في الاسبوع	----- تناول العلاج الوقائي (علاج التحكم بالمرض) كل يوم وحسب ارشادات الطبيب (ملاحظة:- استعمال البخاخ الازرق) قبل ممارسة التمارين الرياضية تناول عن طريق الة النفخ (ان وجدت) قبل عشر دقائق من التمرين بخة من دواء
المنطقة الصفراء	
اعاني من واحد أو أكثر من هذه الاعراض لدي سعال أو ضيق نفس أو ضيق صدر أو ازيز خلال اليوم أو خلال ممارسة الرياضة أو النوم اشعر باصابتي بنزلة برد أو انفلونزا استعمل البخاخ الازرق فنتولين أكثر من 3 مرات بالاسبوع	-:استمر في العلاج الذي تستعمله في المنطقة الخضراء مع اضافة الاتي • اولاً:- خذ بخة من (البخاخ الازرق فنتولين) كررها بفاصل 20 دقيقة لغاية 4 جرعات إذا لم تتحسن راجع الطبيب فوراً • ثانياً :- إذا تحسنت - مضاعفة جرعة البخاخات الأخرى لمدة 7 أيام حتى تتحسن وترجع للمنطقة الآمنة • ثالثاً:- العودة الى العلاج السابق بعد التحسن إذا لم تتحسن أو ساءت الحالة راجع الطبيب فوراً
المنطقة الحمراء	
عند وجود اي من الاعراض الآتية البقاء في المنطقة الصفراء لمدة أكثر من 24 ساعة بدون اي تحسن الاعراض بدأت تسوء أكثر البخاخ الازرق لم يعد يفيدني لا استطيع القيام باي نشاط اجد صعوبة في الكلام أو المشي	اولاً:- اتصل بالاسعاف الفوري أو توجه لأقرب مستشفى ثانياً:- خلال فترة الانتظار استعمل البخاخ 2 بخة (البخاخ الازرق فنتولين)...كل عشرة دقائق التوجه فوراً لأقرب مستشفى

	اشعر بالتعب والنحول
	ازرقاق في اللسان او اطراف الاصابع

انواع البخاخات لمرضى الربو

النوع	الفائدة
الدواء المهدئ او المسعف اللون الازرق	لتخفيف الاعراض يؤخذ عند الحاجة
الدواء الوقائي او المانع للاعراض اللون الاحمر او البني	لمنع ظهور الاعراض يؤخذ كل يوم
دواء التحكم بالاعراض الاحمر , البني الفاتح , البنفسجي	للسيطرة على اعراض الربو يؤخذ كل يوم

مثيرات او محفزات النوبة

نصائح عامة

- 1- الابتعاد عن المهيجات لنوبات الربو وبضمنها دخان التبغ
- 2- لا تاخذ المضادات الحيوية او ادوية السعال او اي علاج بدون استشارة الطبيب
- 3- اثناء النوبة اشرب السوائل بكثرة ولا تستلقي على ظهرك
- 4- استعمل علاج الربو الخاص بك وتجنب تركها او نسيانها
- 5- راجع مع طبيبك الطريقة الصحيحة لاستخدام البخاخ مع او بدون فاصل
- 6- يفضل شراء جهاز ذروة التدفق الزفيري وتسجيل القراءات اليومية

Annex 7:- Asthma control test (ACT)

It is recommended for all asthmatic patients 12 years and older. The test is a 5 - question assessment tool, which provides physicians and patients a simple yet highly predictive tool they can use to help assess asthma control. The questions included in the test are based on measures of asthma control

The total ACT score is based on a range of 5 to 25. **A score of 19 or less may be a sign that asthma symptoms are not under control.**

Asthma Control Test (for 12 years or older)

إختبار السيطرة على الربو (من عُمُر ١٢ سنة فأكثر)

Do you want to know about your asthma control level, then simply take the test

The below five questions will let you know whether you are controlling your asthma or asthma controlling you..

1. Choose the most appropriate one that you think your asthma is.
2. Add your 5 scores to get the total.
3. Your total score will help you and your doctor to discuss your treatment plan.

Score

Q1 During the past 4 weeks, how often did your asthma prevent you from getting as much done at work, school or home?

- 1 All of the time 2 Most of the time 3 Some of the time 4 A little of the time 5 None of the time

Q2 During the past 4 weeks, how often have you had shortness of breath?

- 1 More than once a day 2 Once a day 3 3 to 6 times a week 4 Once or twice a week 5 Not at all

Q3 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?

- 1 4 or more times a week 2 3 to 6 times a week 3 Once a week 4 Once or twice a week 5 Not at all

Q4 During the past 4 weeks, how often have you used your rescue inhaler Bronchodilator?

- 1 3 or more times a day 2 1 or 2 times a day 3 2 or 3 times a week 4 Once a week or less 5 Not at all

Q5 How would you rate your asthma control ?

- 1 Not controlled 2 Poorly controlled 3 Somewhat controlled 4 Well controlled 5 Completely controlled

ns

Total

هل تريد أن تعرف مستوى حالة الربو لديك، إخذاً قم بإجراء الإختبار

الأسئلة الخمسة التالية تجعلك تعرف إن كنت مسيطر على مشكلة الربو أو إنه يعيق نظلم حياتك.

١. اختر درجتك عن كل سؤال و اكتب الرقم في الخانة المحددة على اليسار.

٢. اجمع درجاتك للحصول على المجموع.

٣. مجموع درجاتك سيساعدك أنت وطبيبك في وضع الخطة العلاجية الخاصة بك.

النقطة

س١ خلال ال ٤ أسابيع الماضية، في كم من الوقت منعك الربو من انجاز واجباتك في العمل، أو الحراسة، أو المنزل؟

- ١ كل الوقت ٢ معظم الوقت ٣ بعض الوقت ٤ قليل من الوقت ٥ لم يحصل أبداً

س٢ خلال ال ٤ أسابيع الماضية، كم مرة حصل لك ضيق نفس؟

- ١ أكثر من مرة في اليوم ٢ مرة واحدة في اليوم ٣ من ثلاث إلى ٦ مرات في الأسبوع ٤ مرة أو مرتين في الأسبوع ٥ لم يحصل أبداً

س٣ خلال ال ٤ أسابيع الماضية، كم مرة أيقظتك أعراض الربو (الصفير، السعال، ضيق تنفس، ضيق صدر أو ألم في الصدر) أثناء الليل أو في الصباح الباكر؟

- ١ ٤ مرات أو أكثر في الأسبوع ٢ ٢ إلى ٣ مرات في الأسبوع ٣ مرة واحدة في الأسبوع ٤ مرة أو مرتين في الأسبوع ٥ لم يحصل أبداً

س٤ خلال ال ٤ أسابيع الماضية، كم مرة استخدمت بخاخة اللزمات (موسعات الشعب الهوائية)؟

- ١ ٣ مرات أو أكثر في اليوم ٢ مرة واحدة أو مرتين في اليوم ٣ ٢ أو ٣ مرات في الأسبوع ٤ مرة واحدة في الأسبوع أو أقل ٥ لم يحصل أبداً

س٥ خلال ال ٤ أسابيع الماضية، ما هو تقييمك للسيطرة على الربو عندك؟

- ١ لا يوجد سيطرة أبداً ٢ سيطرة ضعيفة ٣ مسيطر إلى حد ما ٤ سيطرة جيدة ٥ سيطرة تامة

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