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DIAGNOSIS AND MANAGEMENT OF ASTHMA



PRIMARY HEALTH CARE SERVICE DELIVERY
GUIDELINES

IRAQ 2013

Table of Contents

Introduction.....	3
Definition of Asthma.....	3
Pathophysiology.....	3
Diagnosis of Asthma.....	3
Initial Evaluation.....	4
History	4
Physical Examination.....	5
Diagnostic tests and procedure.....	6
Differential Diagnosis.....	6
Classification of Severity of Asthma.....	7
Goal of Management of Asthma.....	7
Choice of Medications.....	8
Medication Management Protocols.....	9
Recommended Follow-up schedule.....	11
Emergency Management.....	11
Referral Guidelines.....	12
Health Education Messages and Counseling.....	12
Home Management of Asthma.....	13
Annexes.....	14
Annex 1 – Appropriate Use of Inhalers and Spacers.....	15
Annex 2 – Normal Respiratory and Pulse Rate by Age.....	16
Annex 3 – Performance Monitoring Checklist: Asthma.....	17
Annex 4 – Home Care for Asthma.....	20
References.....	25

Asthma

Introduction

Bronchial asthma is a significant public health problem which is found in all parts of the world. It most commonly begins in childhood, with an estimated worldwide prevalence of about 300 million cases, and found in approximately 10% of 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. In Iraq, approximately 200,000 patients per year with asthma are either hospitalized or treated in an Emergency Room.

In general, between 50% and 80% of cases of asthma are evident by 5 years of age. Although it is most problematic during childhood, up to 50% of those with relatively mild severity find that the symptoms disappear by late adolescence; while 80% of those with more severe symptoms will persist with the disease into adulthood. Fortunately, as immunologic capacity declines with age, the symptoms of asthma also usually decline in the older population.

Definition

Asthma is a chronic inflammatory disorder of the airways resulting in, variable airflow bronchial obstruction which is potentially reversible with appropriate therapy or spontaneously. It is typically characterized by episodic attacks of breathlessness, cough, and wheezing (“asthma triad”).

Pathophysiology

The bronchial wall inflammation noted in asthma can be provoked by a number of environmental and intrinsic triggering factors. These results 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.

Diagnosis of Asthma

Asthma is diagnosed primarily when the following three conditions are true:

1. Episodic symptoms of obstruction of airflow is present
2. Airflow obstruction is at least partially reversible
3. Alternative possible causes of this airflow obstruction are excluded by history and physical examination

The diagnosis of asthma (indicating episodic airflow obstruction and some evidence of reversibility of this obstruction) should be strongly considered in the presence of the following symptoms. The absence of symptoms at the time of examination does not exclude the diagnosis of asthma; these symptoms and signs can be quite variable throughout the day, and sometimes present only at night.

- The patient describes intermittent wheezing, chest tightness, shortness of breath, or cough especially at night
- Symptoms vary throughout the day or the week
- Symptoms worsen at night, while exercising, or in the presence of allergens or irritants
- History of allergic rhinitis or atopic dermatitis
- Wheezing develops with specific triggering factors. These triggers vary from individual to individual, but are relatively constant for each individual. There may be only one or two identified triggers for some individuals, and multiple triggers for another. The identification

of these asthma triggers is primarily through the observations of the patient and a careful history by the health care provider.

- The patient has relatives with asthma, respiratory or skin allergies, sinusitis, or chronic rhinitis.
- A targeted physical exam may reveal:
 - Hyperexpansion of the thorax
 - Expiratory wheezing, or prolonged or forced exhalation
 - Nasal secretions, sinusitis, rhinitis, or nasal polyps
 - Atopic dermatitis or eczema, or allergic skin problems

The diagnosis of asthma is established primarily through a positive history and physical examination as noted above. It can be confirmed by referral for pulmonary spirometry, which 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 65% 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.

Initial Evaluation

History

The diagnosis of asthma is established primarily by the history; and this clinical history should include the following points:

- Ask specifically about the following, and try to quantify the frequency of each per week, and the duration:
 - Episodes of wheezing
 - Sensation of tightness in the chest or chest pain (especially in children)
 - Shortness of breath when resting, or with mild exercise
 - Cough, dry or productive
 - Frequent colds or upper respiratory infections (URI), especially with URI that take >10 days to resolve
- Symptoms that worsen at night, especially cough
- Possible factors that may be triggering asthma episodes, such as:
 - 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)
 - 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)

- Symptoms of gastro-esophageal reflux (GERD)
- Presence of allergic rhinitis or atopic dermatitis (50-80% of patients with atopic dermatitis will develop asthma or allergic rhinitis)
- Family history, with special focus on close relatives with asthma, allergic rhinitis, atopic dermatitis, or chronic sinusitis
- Recent episode of acute respiratory infection
- History of medications, especially B-Blockers, Non-steroidal anti-inflammatory drugs (NSAID), Aspirin
- Other clinical problems

Physical Examination

A targeted physical examination is essential and should include at a minimum the following:

General examination should assess:

- Degree of dyspnea
 - Assessment of speech – is it interrupted by the effort to breathe?
 - Presence of cyanosis
 - Anxiety or restlessness
 - Use of accessory muscles of respiration
- Respiratory and pulse rate (See Annex 2 for normal values by age)
- Blood pressure (ELEVATED BP often accompanies the anxiety of respiratory distress; DECREASED BP can indicate severe cardiac decompensation with respiratory failure)
- Presence of pulsus paradoxicus – an INCREASE in the strength of the pulse with inspiration
- Differentiation between inspiratory stridor and expiratory wheezing (especially in children)

Ear, Nose and Throat:

- Possible otitis, acute or chronic, especially in children. Refer if any question of diagnosis.
- Nasal abnormalities, including:
 - Degree of mucous congestion and character of mucous – clear or purulent
 - Hypertrophy of nasal mucosa
 - Presence of nasal polyps
- Throat – possible upper airway obstruction with tonsillar hypertrophy or infection

Respiratory:

- Use of accessory muscles of respiration – specifically the neck and trapezius muscles
- Degree of chest movement
- Degree of air movement (possible prolonged expiratory phase, or silent chest)
- Presence and location of expiratory wheezing
- Presence and location of crackles or rales

Cardiac:

- Cardiac rate
- Presence of heart murmurs
- Presence of gallop sounds (S₃ or S₄)
- Assessment of possible cardiomegaly

Diagnostic tests and procedures

The initial investigation should include the following:

- Measurement of peak flow as a baseline for future reference

- Possible chest X-ray, with a focus on:
 - Possible infiltrates indicating viral or bacterial pneumonia
 - Possible cardiomegaly or evidence of heart failure (which can cause “cardiac asthma”)
 - Possible hyperinflation of the chest and lungs, with flattening of the diaphragm
 - Possible inhaled foreign body with unilateral hyperexpansion (especially in children)

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

- When possible, referral for spirometry at rest and after salbutamol inhalation, measuring both the FVC and FEV₁, as noted above in the “Diagnosis of Asthma”
- Sinus X-rays, if history or examination suggests chronic sinusitis
- Oxygen saturation, or blood gas measurement
- Chest X-ray to identify problems such as atelectasis, pneumothorax, pneumomediastinum, etc.

Differential Diagnosis

It is important to remember that “all that wheezes is not asthma!” There are several other conditions that can initially mimic asthma, and need to be excluded by a careful history and physical examination, supported by targeted diagnostic examinations. The differential diagnosis should consider the following:

- Bronchiolitis due to Respiratory Syncytial Virus (RSV) in children less than 2 years of age
 - Some studies show that up to 30% of children with significant wheezing with RSV infection develop asthma later in childhood
- Viral or bacterial bronchitis with significant pulmonary mucous
- Croup (which on careful examination shows inspiratory stridor rather than expiratory wheezing)
- Chronic obstructive airway disease (usually irreversible with bronchodilator)
- Pulmonary embolism
- Congenital heart disease (left heart failure with pulmonary edema can produce some audible wheezing known as “cardiac asthma”)
- Inhaled foreign body – usually in children
- Esophageal reflux with aspiration – usually associated with episodes of choking and with right middle lobe chest infiltrates
- Laryngotracheomalacia – usually present from the neonatal period, usually more inspiratory stridor
- Vocal cord dysfunction – which usually produces both inspiratory stridor and expiratory sounds that can resemble a wheeze
- Parasitic infestation with pulmonary migration – in areas endemic for helminthic infections such as Ascaris

Other causes of chronic cough and occasional respiratory distress:

- Early pulmonary tuberculosis – This can present in the early stages with cough, intermittent wheezing and crackles, and chest pain; however it can usually be distinguished by the steady progression and worsening of symptoms, appetite loss, weight loss, abnormal chest X-ray,
- Cystic Fibrosis – a congenital disease with very thickened pulmonary mucous and secondary infections – may be at times associated with wheezing and respiratory difficulty

Classification of Asthma Level of Severity

The classification of the severity of the asthma forms the basis for the intensity of medication therapy. The level of severity should be classified according to the frequency of occurrence of symptomatic episodes of ANY of the following (Table 1):

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

Table 1
Classification of Asthma severity: Clinical features before treatment

	Days with Symptoms	Nights with Symptoms	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).

Note that the following applies to 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

Goals of Management of Asthma

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. At a minimum, these goals should include the following:

- Prevent chronic asthma symptoms and asthma exacerbations during both the day and night, which should include:
 - No sleep disruptions

- No missed school or work
- No visits to the Emergency department
- No hospitalization
- Maintain normal or near-normal activity throughout the day, including exercise and other physical activities
- Achieve normal or near-normal lung function as measured by spirometer or peak flow
- Minimal use of the short acting β_2 agonist inhaler(salbutamol) for acute asthma symptoms
 - Less than one usage per day
 - Less than one β_2 agonist inhaler container used per month
- Tolerable or no side effects from medications used for control

Management of Asthma

Overview

The chronic management of asthma requires attention to two specific factors, which have been defined as 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 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 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.

Choice of Asthma Medication

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

Table 2
Medications Available for Management of Asthma

RELIEVER Medications (acute management)

Medication	Dosage Range	Notes
Salbutamol inhaler	1-3 puffs as needed every 4 hours	Immediate, but short-lived (<4 hours) relief
Salmeterol inhaler	1-2 puffs every 12 hrs.	Delayed action (1-2 hours) but long-lasting relief (12 hours)
Ipratropium inhaler	2 puffs every 6 hrs.	Anticholinergic effect with slight additive benefit to β_2 agonist; reduces mucous production in bronchi

Table 2 (continued)

CONTROLLER Medications (chronic daily management)

Medication	Dosage Range	Notes
Beclomethasone inhaler (other steroid inhalers available)	50 – 250 µgm/puff – dosage varies with age and size	Inhaled corticosteroid – probably the least expensive and most effective daily controller medication currently available.
Cromolyn inhaler Nedocromil inhaler	1 puff every 6 hrs.	Inhibitor of mastocyte degranulation to inhibit inflammation cascade.
Zafirlucast tablets, Montelukast tablets or granules	Zafirlucast-children >5 years age – dose twice daily Montelukast – children > 1 year age – 1 dose daily	Leukotriene inhibitor, blocks action of leukotrienes on cell receptor Oral medication
Theophylline tablets, liquid, sustained release	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. No need to taper dose over <14 days. Requires 2-4 hours for maximum effectiveness. Avoid prolonged use unless no other alternatives for severe asthma

Ineffective Medications

Recent carefully controlled studies have shown that the following commonly used medications are relatively **INEFFECTIVE** in the management of asthma:

- The oral forms of β_2 agonist medications (ie. salbutamol tablets or liquid). There may be some minimal bronchodilation with very high doses of the oral forms of salbutamol, but in general the side effects, especially tremor and tachycardia, are severe at these doses. The inhaled salbutamol or other inhaled B_2 agonist medications are reliably effective with proper inhalation technique.
- The oral forms of mast cell stabilizers (ie. Ketotifen).. The inhaled form of the mast cell stabilizers is much more effective.
- Antibiotics with asthmatic exacerbations. Studies have shown that most exacerbations of asthma caused by infectious agents are caused by viral infections, against which antibiotics have little benefit, rather than bacterial infections. Various antibiotic regimens have been shown to have little effect on improvement of an acute asthma attack, unless a co-existing pneumonia is demonstrated on chest X-ray.

Medication Management Protocols by Classification of Asthma Severity

Once the level of asthma severity has been determined by history and Table 1, medications should be given according to the protocols given in Table 3. Note that 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 medications which work to decrease the inflammatory component of the asthma reaction.

In general, the CONTROLLER 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 2 months – the doctor should consider “Step Down Therapy”, in which the use of the long-term CONTROLLER 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. If the patient appears to be worsening with increasing symptoms, the doctor should begin “Step Up Therapy”, with increasing dosage of existing CONTROLLER medication or addition of an additional medication consistent with the next highest level of severity.

**Table 3
Medication Management by Classification of Asthma Severity**

Level of Severity of Asthma	Medication Protocol
For all levels of severity RELIEVER medication	Use short acting inhaled β_2 agonist (salbutamol or albuterol inhaler) as needed with other long-term control medications (1-3 puffs every 4 hours)
Step 1: Mild intermittent asthma (<2 symptomatic episodes/week)	No daily medication needed Use short acting inhaled β_2 agonist (salbutamol or albuterol) as needed (1-3 puffs every 4 hours)
Step 2: Mild persistent asthma (3-6 symptomatic episodes/week)	One daily CONTROLLER medication, which could be ONE of the following: <ul style="list-style-type: none"> • Low-dose inhaled corticosteroid (50 μgm. 1-4 puffs/day) • Cromolyn (Intal) or nedocromil (Tilade) inhaler • Zafirlukast (Accolate) or Montelukast (Singulair) <p style="text-align: center;">OR</p> Sustained –release theophylline to serum concentration of 5-15 mg/dl. (not preferred therapy)
Step 3: Moderate persistent asthma (Daily symptoms)	One daily CONTROLLER medication : Medium-dose inhaled corticosteroid. (50 μ gm. 2-4 puffs twice daily) <p style="text-align: center;">OR</p> Two daily medications: Low-to-medium dose inhaled corticosteroid <p style="text-align: center;">AND</p> Long-acting bronchodilator especially for night time symptoms - sustained-release theophylline or long-acting β_2 agonist (Salmeterol inhaler).
Step 4: Severe persistent asthma	Three daily CONTROLLER medications: High-dose inhaled corticosteroid (250 μ gm. 1-2 puffs twice daily) <p style="text-align: center;">AND</p>

Level of Severity of Asthma	Medication Protocol
(continual symptoms)	Long-acting bronchodilator (Salmeterol or sustained-release theophylline). <p style="text-align: center;">AND</p> Oral corticosteroid in dosage of 0.25 – 1 mg per Kg per day with the dose generally not exceeding 60 mg/day

Follow-up Activities and Schedule

For each follow-up visit, the following parameters should be investigated:

- 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

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
 - Emergency use of RELIEVER medication (salbutamol inhaler)
 - Need to continue with daily CONTROLLER medication
- Recognition of Danger Signs that indicate emergency visit to hospital
- Review of avoidance or control of known triggering factors for this patient
- Proper use of inhalers with a spacing device

The frequency of follow-up visits to the physician or clinic will vary from patient to patient, depending on the level of severity of the asthma, the ability of the patient or parents to comply with home management of the medication, and the progress toward the goals of minimal disruption of normal life and minimal use of the RELIEVER inhaled medication. 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.

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.

The emergency evaluation should focus on the Danger Signs of respiratory distress, which are:

- Cyanosis – which indicates significant hypoxia, and very likely 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 > 6 years, > 60 breaths/min young infants (0–2 months), > 50 breaths/min for infants (2 -12 months) and, > 40 breaths/min for children (1–5 years)

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 – up to 3 inhalations spaced 15 minutes apart
 - The use of an inhaler with spacer is PREFERRED, however especially for small children, a powered nebulizer with mask can be used
 - Give prednisolone or prednisone bolus of 1 mg/kg, (which can be by mouth, or IV) and 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 CONTROLLER medications

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

Referral Guidelines

A patient with chronic asthma should be referred to an appropriate specialist and higher level of care under the following conditions:

- Confirmation of diagnosis of asthma, associated medical conditions, or further medical opinion
- Presence of complications such as pneumonia or others, or complications of asthma treatment
- If therapeutic goals, such as a significant reduction in the frequency of acute asthma episodes or symptoms, have not been reached within six months.
- Presence of severe asthma (Step 4)
- Immediately after all necessary emergency measures have been taken and any of the danger signs are present:
 - Cyanosis
 - Exhaustion
 - Inability to talk
 - Silent chest

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) medications are important to control the airway inflammation.

- Many things in the home, school, work, or elsewhere can cause asthma attacks (e.g., secondhand smoke, allergens, irritants). An asthma attack occurs when airways narrow, making it harder to breathe.
- 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. Asthma 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.
- All patients should be instructed in the proper use of the inhaler (see Annex I).
- 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.
- A patient’s memories and self management practices may fade with time. Reinforcement, review, and reminders are needed.
- Where available, clinical pharmacists should also 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. They should also reinforce the proper utilization of the inhalers with a spacer or open-mouth technique, and the danger signs for seeking emergency attention.

Home Management of Asthma

Although difficult for some families especially in low-resource areas, when possible they should be encouraged to purchase and use a peak flow meter, 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 (80% of the average personal best level) can be calculated and noted, as well as the DANGER peak flow (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 80% of the personal best level – recommend an immediate increase in the CONTROLLER medication for the next 10-20 days
- A decrease in peak flow to 50% of the personal best level indicates a severe exacerbation and need for immediate consultation with a physician in an emergency setting

In addition, the patient and parents should be taught the cardinal danger signs, which should make them seek help immediately:

Guidelines for the Diagnosis and Management of Asthma

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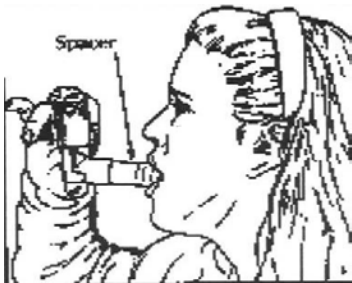
ANNEXES

Annex 1

Appropriate Use of Inhalers and Spacers

The use of all inhalers should be accompanied by specific instruction on the proper use of the inhaler, with training on how to coordinate the activation of the inhaler with an inhalation of the medication through the mouth. The use of a spacer device between the inhaler and the mouth, or the use of the inhaler approximately 4 cm. from the open mouth, should be strongly encouraged. Either of these two methods will increase the total dosage of medication delivered to the bronchus by 15-20% over simply placing the inhaler in the mouth. In addition, the use of a spacer reduces the need to coordinate the activation of the inhaler with actual inhalation – the medication is aerosolized in the spacer for a short period and will be inhaled naturally.

**Recommended
Use of a Spacer Device**



**Recommended
Use of Inhaler away from open
mouth**



**NOT Recommended
Placing inhaler directly into
mouth**



Annex 2

Normal Values for Respiratory Rate by Age

Age	Normal Respiratory Rate
< 2 months	< 60/min.
2 – 12 months	< 50/min.
1 – 5 years	< 40/min.
6 – 8 years	< 30/min.
> 8 years	< 30/min

Normal Values for Pulse by Age

Age	Normal Pulse Rate
2 – 12 months	< 160/min.
1 – 2 years	< 120/min.
2 – 8 years	< 110/min.
> 8 years	< 100/min.

Annex 3

Performance Monitoring Checklist: Asthma

Instructions: For each of the tasks listed below, place a check in the "Yes" or "No" box. As appropriate, indicate whether or not the task was achieved. If a particular task is not applicable, enter NA ("not applicable") in the "Comments" column. Use the "Comments" Column also to note details about why a particular task was not achieved or other information that may be useful in identifying or resolving inappropriate practices.

Task	Achieved?		Comments
	Yes	NO	
A. History: Patient is asked about:			
The number and severity of wheezing episodes since last visit			
School absences due to asthma or illness			
Number of nights with cough			
Prolonged or severe upper respiratory infections			
Visits to Casualty or Emergency facility for asthma exacerbation			
Interference with normal daily activities by asthma symptoms			
Current known triggering factors for asthma			
Home management of acute wheezing episodes			
Family history of asthma, atopic dermatitis, allergies			
Proper use of salbutamol inhaler with spacer			
Daily adherence to prescribed medication regimen			
Side effects or problems with any of asthma medications			
B. Physical Examination			
Measurement of height and weight on growth chart graph			
Measurement of blood pressure, resp. rate			
Indication of general condition (anxiety, cyanosis, talking, etc.)			
Complete ear, nose, throat exam			
Complete pulmonary exam			

C. Patient Education			
Review proper use of inhaler and spacer			
Emphasize need for daily controller medication regardless of symptoms			
Review mechanisms for control of triggering factors			
Review home records of asthma (esp. peak flow records)			
Understanding of patient and parents of nature of asthma			
Reinforce home management of acute episodes and changes in peak flow			
Review danger signs indicating immediate medical consultation			
Review current medication regimen and need for refills			
D. Diagnostic Tests/Procedures/ Orders and records the following tests/procedures during first visit:			
Pulmonary spirometry – baseline			
Pulmonary spirometry after salbutamol inhalation			
Baseline peak flow			
Chest X-ray			
Oxygen saturation			
Treatment Plan			
Appropriate drug prescription according to guidelines			
Referral			
Appropriate referral for consultation according to guidelines			

Annex 4

Asthma – Home care

Introduction:

The wheezing, coughing, chest tightness, shallow breathing, and other symptoms of adult asthma can all be unpleasant feelings for those who have this condition. What makes things worse, though, is when you experience these asthma symptoms and you're not even sure what they are.

But if you suspect that you or your child has asthma, your doctor has a series of examinations that he will go through to make sure that what you have is indeed asthma, and not something else. Here is what you can expect during an asthma diagnosis.

What the Doctor Looks for When Diagnosing Asthma

If you think that you might have asthma, the doctor will likely start with your past history to look for the telltale signs of asthma, which are difficulty breathing or shortness of breath, wheezing, and coughing. He will then look for evidence of these signs in the clinical examination of your nose and mouth, neck, and lungs.

Conditions Commonly Confused With Asthma

Lung infections as well as upper respiratory conditions like nasal allergies, nasal polyps, sinusitis, and enlarged tonsils can mimic the coughing and other symptoms of asthma. In rarer instances, problems with the heart, such as pulmonary hypertension, congestive heart failure, and an enlarged heart can also mimic asthma. In addition, anxiety, chronic obstructive pulmonary disease (COPD) from smoking, and bronchitis are three other common conditions that can behave a lot like asthma.

Tests to Diagnose Asthma

Since it is often difficult to catch the symptoms in action at the doctor's office — and asthma is sometimes confused with other conditions — doctors rely on two primary tools to determine if it's asthma. The first is a person's medical history and examination, and the second is testing.

The most common lung function test is spirometry, and it can be used successfully on older children and adults. A spirometry test measures how much air the patient breathes in, and how quickly the patient expels it. If the spirometry results are not normal, this is usually followed by giving the patient an inhalation of an asthma medication to see if the spirometry improves.

Finally, once the doctor suspects that asthma might be present, the patient may be asked to try one or more appropriate asthma medications for a period of time. If asthma is present, the symptoms should improve upon taking the medication. Antibiotics and over-the-counter cough and cold preparations will not make much difference if the symptoms are due to uncomplicated asthma.

Home Care for asthma

- If you are a smoker, stop smoking
- Avoid exposure of the patient to secondary smoke, such as being in a closed room with other smokers
- Identify and avoid potential asthma triggers when possible
- Purchase a peak flow meter, and use it on a daily basis, recording the results in a logbook (see below for more information on this)
- Do not take cold medication or antibiotics without your doctor's consent

- Take your asthma medications as directed :
 - Avoid running out of your asthma medications
 - Avoid skipping doses
 - Become familiar with any potential medication side effects
 - Understand how to properly use an inhaler with a spacer

Asthma Inhaler Use

Proper use of an inhaler **with a spacer**:

1. Remove the cap from the inhaler and hold the inhaler with the mouthpiece at the bottom.
2. Shake the inhaler well.
3. Insert the spacer if you have one and place your mouth around the spacer.
4. Tilt your head back slightly and gently exhale.
5. Begin a slow, deep breath and activate the inhaler.
6. Continue to inhale slowly and deeply over 3-5 sec.
7. Hold your breath for 5-10 sec.
8. Repeat steps 4 through 7 if you need more than one puff of the inhaler

Proper use of an inhaler **without a spacer**

1. Remove the cap from the inhaler and hold the inhaler with the mouthpiece at the bottom.
2. Shake the inhaler well.
3. Hold the mouthpiece 4 cm. in front of your mouth. **Your mouth should not touch the mouth piece.**
4. Tilt your head back slightly and open your mouth widely.
5. Exhale gently.
6. Begin a slow, deep breath and activate the inhaler.
7. Continue to inhale slowly and deeply over 3-5 sec.
8. Hold your breath for 5-10 sec.
9. Repeat steps 3-8 if you require more than one puff of the inhaler.

Tips on using an inhaler

- Keep your inhaler with you at all the time, and use it at the first sign of wheezing or chest tightness.
 - Use the inhaler every 15-20 minutes for up to three times. If you still notice significant wheezing, difficulty breathing, or chest tightness after the third use, go immediately to a hospital emergency room.
- Learn to use a spacer with the inhaler. If a proper spacer is not available, one can be simply made from a 250 – 500 ml. plastic water bottle (to be illustrated practically).

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.

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.
 - Note the point (in Liters/minute) that the indicator needle stopped at, and record the result in a logbook with the date and any observations.
- 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.
 - The indicator needle was not set at “0” on each use of the meter – be sure that this is done prior to each use.

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.

Asthma warning signs:

- Signs of severe difficulty breathing
 - Retractions of the chest between the ribs
 - Flaring of the nose with inspiration
 - Visible use of neck and shoulder muscles to help with breathing
- Severe Wheezing
- Mental confusion
- Peak flow in Red zone
- Peak flow remains in the Yellow zone despite treatment
- Wheezing that does not improve when you use your inhaler
- Severe cough
- Coughing up brown mucus
- Fever over 38°C.

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.

Take Control of Your Asthma

Many people believe they have no control over their health and wellness. Many ignore personal health decisions or simply leave them to doctors. Some patients have misconceptions about medication and the benefit of any treatments and any alternatives. You and your doctor must work together to jointly decide the best course of action to manage your health. This process is called “shared decision making”, in which your doctor becomes a guide and teacher and helps steer you toward the best treatment. Most doctors welcome this partnership, but you must learn about your illnesses for shared decision-making to work.

What is a treatment plan?

A treatment plan is what you and your doctor decide to do for management of your illness. Commitment to your doctor's instruction is so essential to get to the treatment goals.

3 simple questions can help you get the most from your treatment plan:

- What is my main problem?
- What do I need to do?
- Why is it important for me to do these things?

Other important points to consider:

- Be sure to understand your treatment plan.
- Stick with the treatment plan and allow time for improvements.
- Don't stop medicines when you feel better, check with your doctor.
- Your doctor should tell you what to expect and when to follow –up or call. However, if your condition worsens between follow-up appointments, call your doctor.

What should you know about your medications?

Every year many people become ill because of problems with medications. Remember to ask:

- What side effects to expect?
- What drug interactions are possible; both between two different medications, and with any foods, vitamins, nicotine and alcohol?
- Find out if a new medicine reacts with those that you are taking now.
- Many over-the-counter drugs and dietary supplements can also cause serious side effects and drug interactions; discuss these with the doctor before purchasing them.
- Make sure you can drive or operate machines safely while taking a medicine; ask if the medication could cause sleepiness or decrease in reflexes.
- Ask your doctor how much a prescription costs; Is there a less expensive option or generic version?

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