

# MANAGEMENT OF ASTHMA

A Guide to  
the Essentials of Good  
Clinical Practice

Second Edition  
2005

International Union Against Tuberculosis  
and Lung Disease



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The publication of this guide was made possible thanks  
to the support of the International Asthma Council



## Preface

Considerable progress has been made in asthma management in the last decade, and information has been disseminated worldwide on the subject with the 1995 report published by the Global Strategy for Asthma Management and Prevention.<sup>1</sup> In 1996, the International Union Against Tuberculosis and Lung Disease (the Union) published a Guide on the management of asthma in adults in low-income countries,<sup>2</sup> based on current knowledge about asthma management but adapted to the context of less industrialised countries. After the Guide was published, studies were conducted in pilot areas of several low- and middle-income countries to evaluate the feasibility of the measures it recommended. The results were presented in a workshop held by the Union Asthma Division in Paris in December 2000,<sup>3</sup> which brought together physicians who had conducted the evaluation studies and several international experts. The principal conclusions of the workshop were as follows: the technical measures set out in the Guide could be applied by health workers; they were effective, with reductions in the degree of severity of asthma for the majority of patients, along with almost complete disappearance of visits to emergency departments and hospitalisations. The measures were also cost-effective, given the dramatic reduction in health costs as a result of the reduced need for emergency treatment. However, the continued high costs of inhaled corticosteroids constituted a major obstacle to patients' access to treatment in several countries.<sup>4</sup> This obstacle can be overcome: a survey undertaken by the Union showed that for the essential asthma drugs recommended in the Guide, preparations of good quality generics are currently available at much lower prices than brand-name drugs. Their availability can make asthma treatment accessible for most patients worldwide.

The recommendations of the workshop<sup>3</sup> form the basis of this second edition of the Guide: to extend the technical recommendations to the management of asthma in children aged 5 years and over, to take account of the results of the evaluation of the first edition of the Guide in the second edition, and to change the title of the Guide, as the proposed technical measures can be considered essential for the management of asthma patients in any country.

As in the first edition, this new edition of the Guide proposes that the model adopted for management of tuberculosis in the health services should be applied to implement the "package of technical measures" for asthma management. The health

structures of the first level of referral were selected as the organisational base for the management of asthma patients, and patient care is provided in the context of the general health services.

The management measures target adults and children aged 5 years and over. Taking into account the shortcomings identified in the first edition, the section on the diagnosis of asthma has been improved and the treatment card and asthma register have been simplified.

Those physicians involved in the writing and evaluation of the first edition of the Guide were consulted: Prof N Behbehani, Kuwait; Dr L M Camara, Guinea; Prof R Chapela, Mexico; Prof A El Sony, Sudan; Prof M Gninafon, Benin; Prof B Keita, Mali; Prof S Mahi, Algeria; Prof Youssef Mohammad, Syria; Dr J A Odhiambo, Kenya; Prof O Tidjani, Togo; Prof O Sow, Guinea; Dr H Wembanyama Kasandji, Democratic Republic of Congo; Dr N White, South Africa; Prof N Zidouni, Algeria. The Guide was reviewed by experts in the Union's Scientific Section on Respiratory Diseases, Prof Margaret Becklake, Canada; Prof Peter Burney, UK; and Prof Moira Chan-Yeung, Canada; and other international experts Prof Jean Bousquet, France; Prof Tim Clark, UK; and Prof Elif Dagli, Turkey. The revision of the Guide was coordinated by Prof Nadia Aït-Khaled and Prof Donald A Enarson.

This edition of the Guide is dedicated to the memory of the late Professor Ann Woolcock, who worked all her life to identify the most effective management measures to reduce the suffering of asthma patients worldwide. We hope that this Guide will contribute to these aims.

## References

1. Global strategy for asthma management and prevention. NHLBI/WHO workshop report. Bethesda, MD: National Institutes of Health. National Heart, Lung, and Blood Institute Publication 95-3659. January 1995.
2. Aït-Khaled N, Enarson D. Management of asthma in adults. A Guide for Low Income Countries. Paris, France: IUATLD, 1996.
3. Aït-Khaled N, Enarson D A, Behbehani N, Chan Yeung M, Iriksen E. The Asthma Workshop. Report of a workshop organised by the International Union Against Tuberculosis and Lung Disease, Paris, 15-16 December 2000. *Int J Tuberc Lung Dis* 2001; 5: 973-977.
4. Aït-Khaled N, Auregan G, Bencharif N, Camara L M, Dagli E, Djankine K, Keita B, Ky C, Mahi S, Ngoran K, Pham D L, Sow O, Youssef M, Zidouni N, Enarson D. Affordability of inhaled corticosteroids as a potential barrier to treatment of asthma in some developing countries. *Int J Tuberc Lung Dis* 2000; 4: 268-271.

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# I Introduction

## 1. Why publish a guide on asthma management?

### 1.1 Asthma is common

Recent international surveys on childhood asthma and allergies, including the International Study on Asthma and Allergy in Childhood (ISAAC),<sup>1</sup> have shown that asthma is a frequent disease in most countries of the world. The declared prevalence of asthma symptoms in children aged 13-14 years varies from one country to another: it is highest in New Zealand (25%) and in most industrialised countries, but it is also high in certain African (10%) and Latin American cities (13%). Asthma occurs most frequently in children and young adults before the age of 45 years, but it can occur at any age. In children, the sex distribution is on average two boys for every girl, while in adults the prevalence is higher in women than in men. In low- or middle-income countries, an increase in asthma morbidity is expected due to the young age of the population, demographic growth, the reduced prevalence of infectious diseases, the increase in urbanisation and industrialisation and the progressive changes in the style of living.

### 1.2 Asthma kills

The lack of information in many low-income countries makes it difficult to estimate the rate of mortality due to asthma. In industrialised countries, the mortality rate is usually around 1 per 100 000 population per year, but may reach 9 per 100 000. Despite a better understanding of the disease and the availability of more effective treatment, an increase in the rate of avoidable deaths due to asthma has been noted in the last thirty years, mainly among the young. In industrialised countries, it is much higher among the poor in the population. The most obvious reason for mortality due to asthma is inadequate long-term management of patients.

**Asthma in the world:  
More than 200 million cases  
More than 100 000 deaths per year**

### **1.3 Treatment is often inadequate**

Negative effects can be seen when rational asthma management is not well organised, consultations are not programmed and care is increasingly given in emergency departments. As a result, long periods of hospitalisation become common, and inadequate treatment contributes to mortality among asthma patients.

### **1.4 The cost of the disease is very high**

The cost of the disease includes not only the direct costs of the drugs and use of the health services, but also the indirect costs linked to loss in productivity and the inevitable costs to the patient and the patient's family, which are often very high but are difficult to assess. The direct costs of use of emergency services and hospitalisations, as well as the indirect and intangible costs, are higher when adequate, long-term care of patients is not well organised. The average annual cost of drugs varies widely between countries. In 2002, the minimum annual cost of drugs to treat one case of moderate persistent asthma using the standardised treatment regimen recommended in the Union Guide varied between countries, from US\$ 54 in Algeria to US\$ 288 in Sudan, to US\$ 650 in Kuwait. The high cost of asthma drugs is one of the main obstacles to the organisation of long-term management of patients, not only in low-income countries but also in other countries, and particularly for patients who come from the poorest population groups. Most of these patients earn too little to buy the necessary drugs regularly, and in many countries their health expenses are not fully covered by the social services, while in others there is no coverage at all for asthma. In 2002, however, the use of generic drugs would have allowed a case of moderate persistent asthma to be treated for approximately US\$ 36.<sup>2</sup> The access of patients to asthma drugs can result in clear reductions in the burden of disease. The asthma management programme implemented in Finland in 1990 showed a gradual nationwide decrease in mortality and in the number of days of hospitalisation for asthma, with a simultaneous increase in the number of patients who, thanks to the programme, have had access to correct treatment in the last decade.

The development of a proposal to implement standardised asthma management, at a cost that is relatively reasonable and accessible to the majority of patients worldwide, is necessary due to the frequency, the potential severity and the cost of asthma. The first step of this standardisation is the publication of a Guide that summarises the key points of asthma management.

## **2. The purpose of the Guide**

The purpose of this Guide is to propose a method of asthma management applicable in any country, including low-income countries, and to introduce standardised treatment to improve the care of patients and to reduce the cost of such care.

This guide is not a medical textbook. It simply proposes essential measures for the management of the majority of asthma patients. Other measures that may be necessary to manage specific forms of asthma and for the minority of patients whose asthma is poorly controlled by the treatment recommended, are the responsibility of specialist referral services and are not described in this Guide.

### **3. The objectives of the Guide**

- 3.1 To promote accurate diagnosis and classification of the severity of a patient's asthma at the initial evaluation.**
- 3.2 To identify the list of essential drugs required for asthma management.**
- 3.3 To establish a treatment plan for the management of asthma patients.**
- 3.4 To adopt a method of classification for asthma attacks.**
- 3.5 To introduce a sound, adequate method of managing these attacks.**
- 3.6 To define the content, the methods and the mode of health education.**
- 3.7 To determine the functions of the different levels of the health services in the management of asthma patients.**
- 3.8 To determine the training needs of health personnel involved in the management of asthma patients.**
- 3.9 To introduce an information system that will provide the basis for the management of supplies and for evaluation.**

### **References**

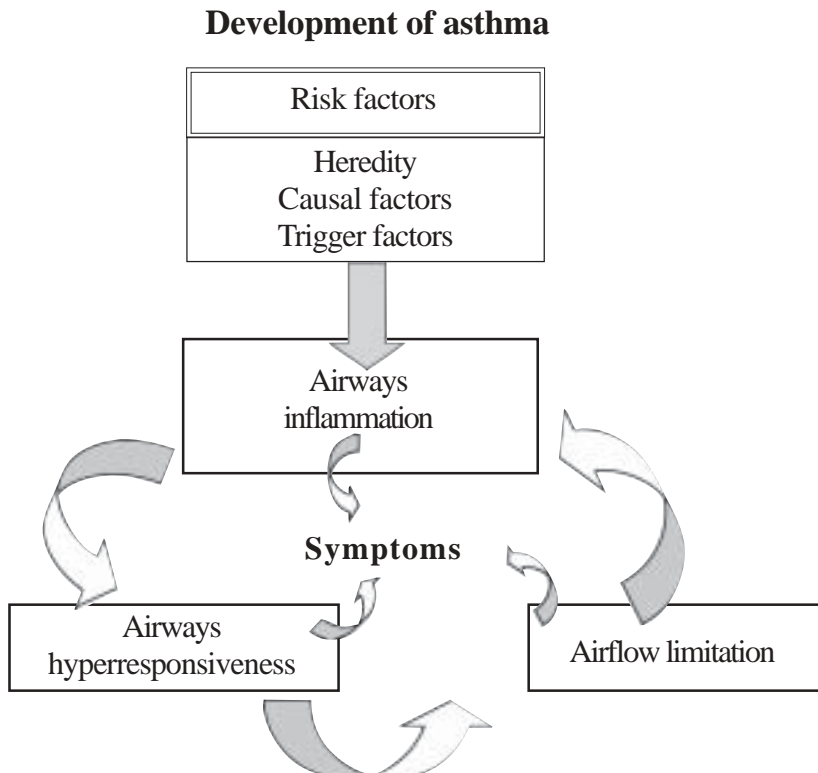
1. Beasley R, Keil U, Von Mutius E, Pearce N, on behalf of the ISAAC Steering Committee. Worldwide variations in the prevalence of asthma, allergic rhinoconjunctivitis and atopic eczema symptoms: the International Study of Asthma and Allergies in Childhood (ISAAC). *Lancet* 1998; 351: 1225-1292.
2. Ait-Khaled N, Enarson D A, Bousquet J. Chronic respiratory diseases in developing countries: the burden and strategies for prevention and management. *Bull World Health Organ* 2001; 79: 971-979.

## II What is asthma?

Asthma is a disease that is characterised by the spontaneous occurrence of attacks of breathlessness and wheezing, usually at night. The condition occurs with varying severity over a period of several years and sometimes throughout life. With good management the symptoms may diminish and even disappear, allowing the patient to lead a normal professional and social life. When asthma is poorly controlled, however, it can:

- become chronic with permanent airflow limitation;
- cause serious physical and social handicap;
- be fatal due to severe attacks.

An understanding of the mechanism by which asthma develops provides the basis for the methods of treatment currently proposed for its management. Asthma is considered to be caused by many factors in individuals who often have a genetic tendency towards the disease.



Some of the various determinants are factors causing chronic inflammation of the airways leading to airways hyperresponsiveness. These are known as *causal factors*. Other factors acting on the hyperresponsive airways provoke airflow limitation of varying severity and cause asthma symptoms; these are known as *trigger factors*. The airflow limitation and the symptoms aggravate the inflammation of the airways, causing a vicious circle of the condition, with the risk of a worsening of the symptoms if they are not treated adequately.

## **1. Definitions of asthma**

### **1.1 Technical definition**

The physiopathological understanding of this condition is the basis for the definition of asthma proposed by the International Consensus and by the “Global Strategy for Asthma Management and Prevention”:

“Asthma is a chronic, inflammatory disorder of the airways in which many cells and cellular elements play a role. The chronic inflammation causes an associated increase in airway hyperresponsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or in the early morning. These episodes are usually associated with widespread but variable airflow obstruction that is often reversible either spontaneously or with treatment.”<sup>1</sup>

This chronic inflammation causes pathological changes in the airways that can be irreversible, such as hypertrophy of the smooth muscle, new vessel formation, and deposition of collagens beneath the epithelium. Recent studies based on autopsies of patients who have died from asthma have demonstrated acute and chronic inflammation of the airways, including the smallest airways (< 2 mm in diameter) and even of the parenchyma. These results underline the importance of using inhaled corticosteroids.

### **1.2 Operational definition**

Any patient who presents to the health services with chest symptoms (including cough, breathlessness and/or wheezing, often at night) that come and go, vary from day to day, and especially if they cause the patient to wake and even to rise at

night, should be suspected of having asthma. Such patients should be examined with care; if no other cause is found and the symptoms persist for some period of time, they should be considered as having asthma.

## **2. Risk factors for developing asthma**

### **2.1 Predisposing factors for asthma**

Allergy is the most important predisposing factor in asthma. It is reflected in the tendency to produce abnormally high levels of immunoglobulin E (IgE) in response to exposure to substances in the environment.

Heredity also plays a predisposing role in asthma, and a family history of asthma is common among asthma patients.

### **2.2 Causal factors**

Some substances are capable of stimulating the immune system to react by producing specific IgE antibodies. When a predisposed individual is exposed to such an allergen, the T-lymphocytes in the immune system become Th2-lymphocytes, which produce an abnormal quantity of IgE. The person has thus become sensitised to the allergen. When the person is again exposed to the same substance, an immune reaction will occur, which leads to symptoms. The inflammatory process is triggered by cell mediators from mast cells activated by the reaction between the allergen and the IgE. Mediators are also produced by other cells, such as macrophages, lymphocytes and eosinophils.

There are many causal factors, and asthma is generally caused by a combination of these:

- allergens inside houses: house dust mites (the most common allergens worldwide), found in house dust— principally in bedding, carpets and rugs— reproduce most easily between 20° and 22°C, at humidity levels of > 55%; animals (cats, dogs, rats, cockroaches...); and moulds, which proliferate in dark, humid and unventilated spaces;
- allergens outside the house: pollens, moulds;

- substances in the workplace of chemical origin or contained in dusts;\*
- drugs: aspirin and some non-steroidal anti-inflammatory agents.

## 2.3 Contributing factors

These are factors that contribute to the *development* of asthma in individuals exposed to causal factors. There are a number of contributing factors:

- Environmental tobacco smoke: passive smoking is a very important risk factor for the development of asthma in young children, and mothers who smoke during pregnancy increase the risk of asthma in their children.
- The role of acute respiratory infections on the development of asthma is complex. The occurrence of a severe infection, particularly due to respiratory syncytial virus, before the age of 1-2 years, may favour the development of asthma. On the other hand, frequent acute respiratory infections after this age may protect the child from developing asthma.
- Air pollution inside the house also plays a role in triggering symptoms, but its role in the development of asthma has not been proven.

Some factors may, on the contrary, have a protective effect against the development of asthma:

- living in a rural environment, on a farm in contact with livestock (the “hygiene” hypothesis for the development of asthma);
- exposure during the first years of life to domestic pets;
- consumption of fish and fresh fruit.

## 3. Trigger factors for asthma

As trigger factors are often the same for a patient, they can be identified easily. Identifying them is necessary to propose preventive measures adapted to the case of each patient. Apart from the causal factors that can lead to attacks, other factors that have little or no effect on asthma development can be capable of triggering an attack and should be looked for:

- irritants: smoke from wood and other biomass, household aerosols, vehicle pollution;

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\* A regularly updated list of professions at risk of exposure can be found on the site: <http://asmanet.com>

- bacterial or viral infections in the upper and lower airways, in both adults and children;
- exercise may bring on short attacks, due to hyperventilation and inhalation of cold air, particularly in children and people who play sports;
- weather changes, such as a fall in temperature, humidity and fog;
- gastro-oesophageal reflux;
- pregnancy, menstruation or menopause may increase the number of asthma attacks in some women;
- stress and emotional situations;
- animals: cats, dogs...

## **4. Clinical aspects of asthma**

### **4.1 Clinical signs**

**The principal clinical signs of asthma are:**

- chest tightness;
- breathlessness;
- wheeze.

None of these clinical symptoms is specific for asthma, and all may occur with other chest conditions. As a result, asthma is often underdiagnosed and therefore poorly treated, or even not treated at all. Asthma must always be considered in case of the following:

- episodes of breathlessness occur mainly at night that wake the patient, especially in the early hours of the morning;
- breathlessness obliges the patient to sit up in bed to relieve the symptoms;
- the symptoms disappear either spontaneously or after taking asthma medication (bronchodilator);
- the symptoms appear in recurrent attacks;
- the patient has a personal history of allergies (allergic rhinitis, eczema) or there are allergies in the family (allergic rhinitis, eczema, asthma);
- the patient has a history of coughing spells;
- the patient has concomitant allergic conditions: allergic rhinitis, eczema;
- symptoms are brought on by a variety of factors such as dust, cold air or sudden changes in the weather;
- there are periods during the disease when the symptoms diminish.

## 4.2 Clinical patterns

**The typical pattern** of asthma is most commonly observed in adults and in children aged 5 years and over. It is characterised by frequent episodes of wheezing, cough and breathlessness that occur mainly during the night and vary in duration and severity. The periods between episodes vary and are punctuated by brief symptomatic episodes that resolve spontaneously when the condition is benign or moderate. Persistent breathlessness can occur in the most severe form of the condition due to the progression from reversible to irreversible airflow limitation. Severe progression of asthma is rare, and is linked to the development of irreversible lesions. This severe form of asthma is generally due to late or inadequate treatment.

**Less typical clinical features** are observed mainly in children:

- recurrent attacks of cough, particularly in the evening and/or at night, which do not respond to antitussives;
- chest tightness with wheezing that occurs only after exercise;
- a clinical pattern that is similar to that of an acute respiratory infection: moderate fever accompanied by respiratory symptoms with or without breathlessness and wheezing. In such cases, a diagnosis of asthma is only considered for the majority of cases after episodes have recurred several times over a relatively short period of time (more than three times in one year).

**Specific, rarer forms** must be identified, as they sometimes require more specialised care: individual management and, if possible, referral to a specialist.

In the case of *asthma due to aspirin allergy* or other non-steroidal anti-inflammatory agents, patients experience allergic skin reactions and severe attacks after taking aspirin or another type of pain-killer. It is very important for such patients to avoid any such exposure again, as it may lead to very severe and even fatal attacks. Nevertheless, even if aspirin and other non-steroid anti-inflammatory drugs are avoided, the asthma generally remains severe and requires specialised care to bring the condition under control.

*Occupational asthma* should be considered if symptoms occur in the workplace or immediately after work, and if they disappear or improve while the patient is on

holiday. If patients with occupational asthma are identified early, they can be cured or there can be significant improvement if further exposure to the substances causing the asthma is avoided. Patients suspected of having occupational asthma should be referred to a specialist for confirmation of the diagnosis and for legal action to be taken (change of occupation, compensation).

*Seasonal asthma* is a more common, specific form of asthma. Symptoms occur at the same season every year over several consecutive years. The asthma is often due to sensitisation only to pollens or moulds. Pollen-induced asthma is often preceded or accompanied by allergic manifestations, such as allergic rhinitis, which always occur during the same season. It can worsen after several years and become chronic due to progressive sensitisation to other risk factors.

## **References**

1. Global strategy for asthma management and prevention. NHLBI/WHO workshop report. Bethesda, MD: National Institutes of Health. National Heart, Lung, and Blood Institute Publication 95-3659. January 1995.
2. Global strategy for asthma management and prevention. Bethesda, MD: National Institutes of Health. National Heart, Lung, and Blood Institute. Revised 2002. [www.ginaasthma.com](http://www.ginaasthma.com)

## **III How to diagnose asthma and determine its severity**

Before treating a patient for asthma, it is necessary to:

- establish the diagnosis of asthma and identify the possible causal and trigger factors;
- determine the degree of severity of the disease.

### **1. How to diagnose asthma**

If the patient has already been examined during an attack, the diagnosis is obvious. Diagnosis is more difficult if the patient has never been seen during an attack.

#### **1.1 When should asthma be suspected?**

Asthma should be suspected if a patient with asthma presents with respiratory symptoms, mainly:

- wheeze;
- chest tightness;
- breathlessness;
- cough.

Nevertheless, any respiratory symptom can be due to asthma. The principal characteristic of asthma symptoms is their *variability*. The symptoms generally occur in episodes, and their occurrence and severity vary over time, even in patients with continuous symptoms: the symptoms vary over a day, from one day to the next, from one season to the next, and from one episode to the next. The standardised IUATLD questionnaire on bronchial symptoms, used in epidemiological asthma surveys, is based on research of these symptoms and their variability (Appendix 1).

#### **History of the disease**

History taking is the key to diagnosis. In taking the history it is important to use simple words, in a manner that is easy for the patient to understand (or the family, if the patient is a child). Open questions are asked to allow the patient or family to provide information about the history of the disease, and specific questions to

obtain information about the existence and the characteristics of the respiratory symptoms, their variability over time, causal and trigger factors, as well as factors that can improve the symptoms. Recurrent attacks of breathlessness, mainly at night, with wheezing, that wake the patient and oblige the patient to sit up to be able to breathe, are the symptoms most characteristic of asthma.

At the end of the interview, in the majority of cases the diagnosis of asthma is strongly suspected. In some cases the clinical history is less typical, and it may be possible that the patient is suffering from another condition with similar symptoms. The interview should therefore include questions that will help to confirm or exclude the diagnosis of another common condition suspected in a patient with recurrent chest tightness. The local situation is of particular importance; conditions that commonly occur in the region or country where the patient lives should be discussed in priority.

The most common conditions evoked in the differential diagnosis vary according to the age of the patient.

**Adults** with chronic bronchitis, bronchiectasis, respiratory symptoms associated with a heart condition or hyperventilation syndrome have symptoms that can be confused with those of asthma.

If the patient has productive cough every day (especially first thing in the morning) with little change from one day to the next, it is more likely that the patient has chronic bronchitis, particularly if the patient has a long history of smoking. If the patient experiences breathlessness after exercise which gradually worsens over time, chronic obstructive lung disease should be considered.

If the patient has a chronic productive cough with purulent sputum that occurs when the patient is in specific positions, a diagnosis of bronchiectasis should be considered.

If the patient experiences chest pain or tightness which comes on with exercise and is relieved by rest, and/or pain that spreads toward the neck or the left arm, the symptoms are more likely to be ischaemic heart disease.

Breathlessness on lying down with swelling in the lower legs may indicate cardiac decompensation.

A sensation of breathlessness, with no other respiratory symptom, and which generally occurs during the day, accompanied by a feeling of numbness or tingling in the fingers, panic or fear, may be due to hyperventilation. This type of breathlessness occurs most often among young women.

**In children aged 5 years and over**, other diagnoses can be considered:

Acute respiratory infections, particularly when the respiratory episode is accompanied by fever. If the condition recurs more than three times in one year, however, the most probable diagnosis is asthma.

In case of partial obstruction of the airways and wheezing, inhalation of a foreign body should be considered, particularly if the wheezing is unilateral. In case of strong suspicion an X-ray, and if possible fibroscopy, should be performed.

Bronchiectasis, when the principal symptom is chronic productive cough with purulent sputum, particularly if the patient has a history of severe infection as an infant, such as post-measles chest disease.

In both adults and children, tuberculosis can be suspected, particularly in countries that are endemic for tuberculosis, when one or more typical signs are present (significant weight loss, cough and fever of several weeks' duration, night sweats, and contact history in case of children).

### **Clinical examination**

If the patient presents during a symptom-free period, the results of the clinical examination often do not lead to a diagnosis of asthma. The presence of wheeze is consistent with asthma; however, the presence of crackles is suggestive of other conditions. Nevertheless, the absence of wheeze does not exclude asthma, as during symptom-free periods there is no evident abnormality and the auscultation is normal.

### **Chest X-ray**

Although chest X-ray has no place in the diagnosis of asthma, it is nevertheless used:

- if conditions other than asthma are suspected that are likely to cause the symptoms mentioned by the patient; or
- if a complication of asthma is suspected, such as pneumothorax or pneumonia.

## 1.2 How to confirm a diagnosis of asthma

Lung function tests should be conducted for all persons suspected of having asthma. In most cases the diagnosis is confirmed by peak expiratory flow (PEF) measurement using a simple peak flow meter. The PEF allows the airflow limitation to be measured. It correlates well with the evaluation of the forced expiratory volume in one second ( $FEV_1$ ), which is measured by spirometry. Measurement of the PEF or other lung function tests performed using a spirometer or other tools that measure lung function can be used in specialised health services. However, due to its simplicity, the peak flow meter is the most practical tool for demonstrating PEF variability.

The PEF measurements should be taken at the moment when the patient has symptoms, but also when the symptoms diminish or disappear. These measurements can also be taken before and after treatment. *Variability of the PEF* is characteristic of lung function in asthma patients. When PEF variability  $\geq 20\%$  is noted, the diagnosis of asthma is almost certain and the patient can be registered as having confirmed asthma.

If such PEF variability has not been demonstrated, the physician can nevertheless record a diagnosis of probable asthma after elimination of other possible diagnoses.

## 1.3 How to measure peak flow

The peak flow meter is a tool that is reliable, robust, practical and cheap, used to detect airflow limitation. The degree of airflow limitation can be evaluated by comparing the patient's PEF level with the 'normal' value of PEF expected. Predicted or 'normal' values of PEF are given in tables by age, sex and height for adults, and by height only for children.

It is useful to perform PEF measurements in an asthma patient several times over several days, both during an attack and after administration of asthma drugs. As the most typical feature of asthma is the variation in airflow limitation from day to day, and in different circumstances (before and after treatment, during and outside periods of symptoms, every morning and every night before taking medication), the results of PEF measurement depend a great deal on the manner in which the test is

performed. The technical aspects of carrying out PEF measurement are included in Appendix 2. Peak flow measurement can be difficult in children aged less than 5 years and in certain elderly people.

The PEF should be measured whenever the patient attends the health service. Each time it is important to ensure that the test has been carried out correctly, and the best result of three consecutive attempts should be recorded (Appendix 2). The PEF is recorded in l/min, and should be compared with the predicted PEF to evaluate the patient's lung function against the norm. The PEF is thus expressed as the percentage of the PEF predicted.

**PEF in percentage of the patient's predicted value**

$$\text{PEF \% predicted} = \text{PEF l/min} / \text{PEF predicted in l/min} \times 100$$

If the PEF has been measured correctly, the diagnosis of asthma can be confirmed by evaluating the variability of the patient's PEF measured on different occasions before and after bronchodilator or corticosteroid test, before and after treatment, and at different appointments.

**Calculating the variability of the PEF between two measurements**

$$\text{Variability of PEF \%} = \frac{\text{maximum PEF in l/min} - \text{lowest PEF in l/min}}{\text{lowest PEF in l/min}} \times 100$$

*The variability* of the results of the test is characteristic of asthma and allows the diagnosis to be confirmed (Appendix 3). Values that are lower than the norm will improve after treatment, and normal values will decrease when the symptoms return.

**What other examinations are useful for diagnosis?**

Spirometry is another method used to test lung function. It is more accurate than the peak flow meter, but in most low- or middle-income countries, it is only available in large hospitals and some specialised referral centres.

Other tests (measurement of airway hyperresponsiveness, allergy skin tests, measurement of specific and total IgE and of eosinophils) usually have no place in routine practice, as they are of little use in managing the majority of asthma patients and, furthermore, are very costly. These tests can be used in the specialised referral

centres for cases that are difficult to diagnose, for unusual forms of asthma or for research.

The following patients should be considered as having asthma and managed with asthma treatment:

**Confirmed asthma:** a patient with symptoms that are typical of asthma and PEF variability  $\geq 20\%$

**Probable asthma:** any other patients with symptoms that are typical of asthma and a history of disease that is characteristic of asthma, after exclusion of other diagnoses

## 2. How to determine the severity of asthma

Determination of asthma severity is an important stage of patient management, as it allows the health personnel to propose appropriate treatment. The evaluation is based on the history of the condition and the measurement of the patient's *best PEF*. Using only these two methods it is possible to determine the degree of clinical severity of the asthma based on the characteristics of the symptoms, the level of lung function and, for patients who are already on treatment, the type of drug and the quantity usually used.

### 2.1 Conduct a clinical evaluation

The clinical evaluation is based on the average frequency and severity of the clinical symptoms over a long period prior to the evaluation. Collecting information on the symptoms is only partly reliable because of its subjectivity, as it is based on the judgement and memory of the patient and also, to a certain extent, on the judgement of the health personnel. Asthma severity should be evaluated before the patient starts long-term treatment. The most important way to judge the severity of the condition is by determining the average frequency of the symptoms over a long period, by which one can estimate whether the symptoms are:

- **Intermittent:** symptoms disappear for long periods. When they return, they may occur less than once a week. The periods of attacks last only a few hours or a few days; when there are nocturnal symptoms, they occur less than twice a month.

- **Persistent:** symptoms never disappear for more than one week: when symptoms occur more than once a week, they are called persistent:
  - *mild persistent:* symptoms occur less than once a day; nocturnal symptoms occur more than twice a month;
  - *moderate persistent:* symptoms occur daily; attacks affect activity and sleep patterns more than once a week;
  - *severe persistent:* symptoms are continuous with frequent attacks, limiting physical activity, and often occurring at night.

In the specific case of seasonal asthma, which is often linked to a pollen allergy, the severity of the symptoms will be determined according to their frequency *during the season* to decide on the long-term treatment the patient will need at least during that season.

## 2.2 How to measure lung function

The level of lung function is an objective criterion of the severity of the condition which is provided by the *best PEF* of the patient. It should be determined during a stable period (e.g., after oral corticosteroid treatment) and after using a bronchodilator. It should be expressed in percentage of the patient's predicted PEF. There are three functional levels:

- *Absence of obstruction:*  $PEF \geq 80\%$  of predicted PEF
- *Moderate obstruction:* PEF 60-79% of predicted PEF
- *Severe obstruction:*  $PEF < 60\%$  of predicted PEF

## 2.3 How to determine the degree of severity of asthma

During initial management, asthma patients can be classified according to their degree of severity according to the criteria described in the following Table.

## Classification according to the degree of severity of asthma\* on initial presentation

Asthma severity	Frequency of symptoms	Level of best PEF (% of predicted value)
Severe persistent	Continuous	<60
Moderate persistent	Daily	60-79
Mild persistent	Weekly	≥ 80
Intermittent	< Weekly	≥ 80

\* *The highest degree of severity observed among all the evaluations made is used to define the level of asthma severity.*

### Important remarks

- In most cases there is a correlation between the level of lung function and the severity of symptoms.
- When there is a lack of agreement between the clinical examination and the lung function test, the highest degree of severity noted by either of the two evaluations will be used to define the level of asthma severity. It is better to overestimate than underestimate the severity (underestimation would result in inadequate treatment).
- In the rare cases of children or elderly people for whom correct PEF values cannot be obtained, the classification of the condition will be based only on clinical examination and response to treatment.
- In cases of strictly seasonal asthma, the degree of severity will be determined by the clinical and functional evaluation *during the season when symptoms occur*.
- If a patient is already taking regular treatment, the severity of the condition is more difficult to determine. It is based on the patient's PEF level and the minimum long-term treatment necessary to control the asthma (see section on treatment).

## IV What is the essential long-term treatment for asthma?

Asthma requires long-term treatment, usually for several years, and often throughout life. Consequently, as for all chronic patients, treatment of asthma patients creates problems of cost, adherence, organisation of management and drug supplies. Prevention measures that allow the patient to avoid exposure to any of the trigger factors identified can contribute to the prevention and reduction of symptoms.

Treatment always requires a bronchodilator to remove the obstruction, and ongoing anti-inflammatory treatment to control the disease.

Cost-effectiveness should be the main criterion for the selection of treatment measures.

### 1. Objectives of treatment

The treatment objectives should be explained to the patient and/or the patient's family from the start of treatment. It should also be explained that treatment is long term and that it is impossible to determine immediately how long it will take to attain these objectives. Asthma is under control when the following objectives are reached:

#### **Clinical objectives**

- diminution and even total disappearance of symptoms, particularly nocturnal;
- absence of visits to the emergency services;
- no limitation of activities.

#### **Functional objective**

- PEF normal or  $\geq 80\%$  of PEF predicted.

#### **Treatment objective**

- No need, or only occasional need to use bronchodilator.

In the most severe persistent cases, these objectives may not be attainable due to

irreversible inflammatory lesions of the bronchial mucosa. The objectives of treatment are more modest: clinical and functional improvement, trying to obtain the best results possible with the minimum of side effects.

## 2. Preventive measures

Preventive measures consist of avoiding or controlling both the causal factors of asthma (such as house mites, domestic pets, moulds, occupational exposure, depending on the case) and the factors that trigger symptoms (tobacco, pollution, aspirin, etc).

Parents of children with asthma should be informed that it is harmful to expose their child to passive smoking.

Specific desensitisation, which is costly and of limited effectiveness, has no place in routine practice in the management of asthma in low- or middle-income countries.<sup>1,2</sup>

## 3. Essential drugs for asthma treatment

To organise the management of asthma patients, the drugs must always be available. A limited number of drugs are necessary for long-term treatment of asthma; they are included in the WHO list of essential drugs.<sup>3</sup>

### Essential drugs for asthma treatment

Type of drug	Generic name	Mode of administration and dosage
Anti-inflammatory		
Corticosteroid	Beclomethasone Prednisone	Aerosol: 250 µg per puff Tablets: 5 mg
Bronchodilator		
Short-acting beta 2-sympathomimetic	Salbutamol	Aerosol: 100 µg per puff

## 3.1 Anti-inflammatory drugs

### Inhaled corticosteroids (beclomethasone)

Because of its effectiveness and low rate of side effects, inhaled beclomethasone in high doses, available in generic form, is the treatment of choice for cases of persistent asthma. Due to its anti-inflammatory action, it progressively reduces bronchial hyperresponsiveness and thereby the symptoms of asthma.

The side effects are minimal. Local effects such as hoarseness, mild sore throat, and occasionally yeast infection of the mouth can occur, usually if daily treatment consists of doses  $\geq 1000 \mu\text{g}$ . These can be avoided by advising patients to use a large volume spacer and to rinse out the mouth after taking inhaled corticosteroids. Inhaled corticosteroids have almost no serious side effects. Their harmlessness (including in relation to growth) has also been demonstrated in children when used in doses of  $\leq 800 \mu\text{g}$ .

### Systemic corticosteroids (oral prednisone)

These can be used in short- or long-term treatment:

- Short-term: they are used to treat attacks for a short period, then stopped. In this case they have few harmful side effects.
- Long-term: due to their harmful effects, they should only be used for the most severe cases of asthma that no other treatment can control. Harmful effects such as infections (in particular tuberculosis), diabetes, high blood pressure and osteoporosis are common complications of long-term corticosteroids. Furthermore, acute adrenal insufficiency can occur if long-term oral corticosteroids instituted for several years are suddenly interrupted.

## 3.2 Bronchodilators

Beta 2-sympathomimetics are the most powerful bronchodilators. They relax the bronchial smooth muscle and assist in clearing the airways of bronchial secretions.

Short acting beta 2-sympathomimetics are the drugs of choice for asthma attacks and for preventing exercise-induced asthma. They are very well tolerated, and systemic side effects (tachycardia, tremors, hypokalaemia) are rare.

Administration is preferably by inhalation, due to the efficacy of small doses, its rapid action (attaining its maximum in a few seconds) and the almost total absence of side effects.

Salbutamol, which exists in generic form, is one of the best short-acting beta 2-sympathomimetics.

### **3.3 Other medications**

The essential drugs for long-term treatment of asthma patients are shown in the table on page 24. Although numerous other asthma drugs exist, their use adds little or nothing to treatment outcome for the great majority of patients. Furthermore, increasing the number of drugs prescribed will lead to a reduction in treatment adherence and an increase in cost. Some of these drugs can be used in specialised services for cases of asthma that are particularly difficult to control.

In case of associated allergic rhinitis, first generation antihistamines and nasal beclomethasone can be used according to the recommendations of the “Allergic Rhinitis and its Impact on Asthma” (ARIA) initiative:<sup>2</sup> H1 oral antihistamines for mild hay fever and nasal beclomethasone (100-400 µg/day), depending on the degree of severity, for moderate or severe allergic rhinitis.

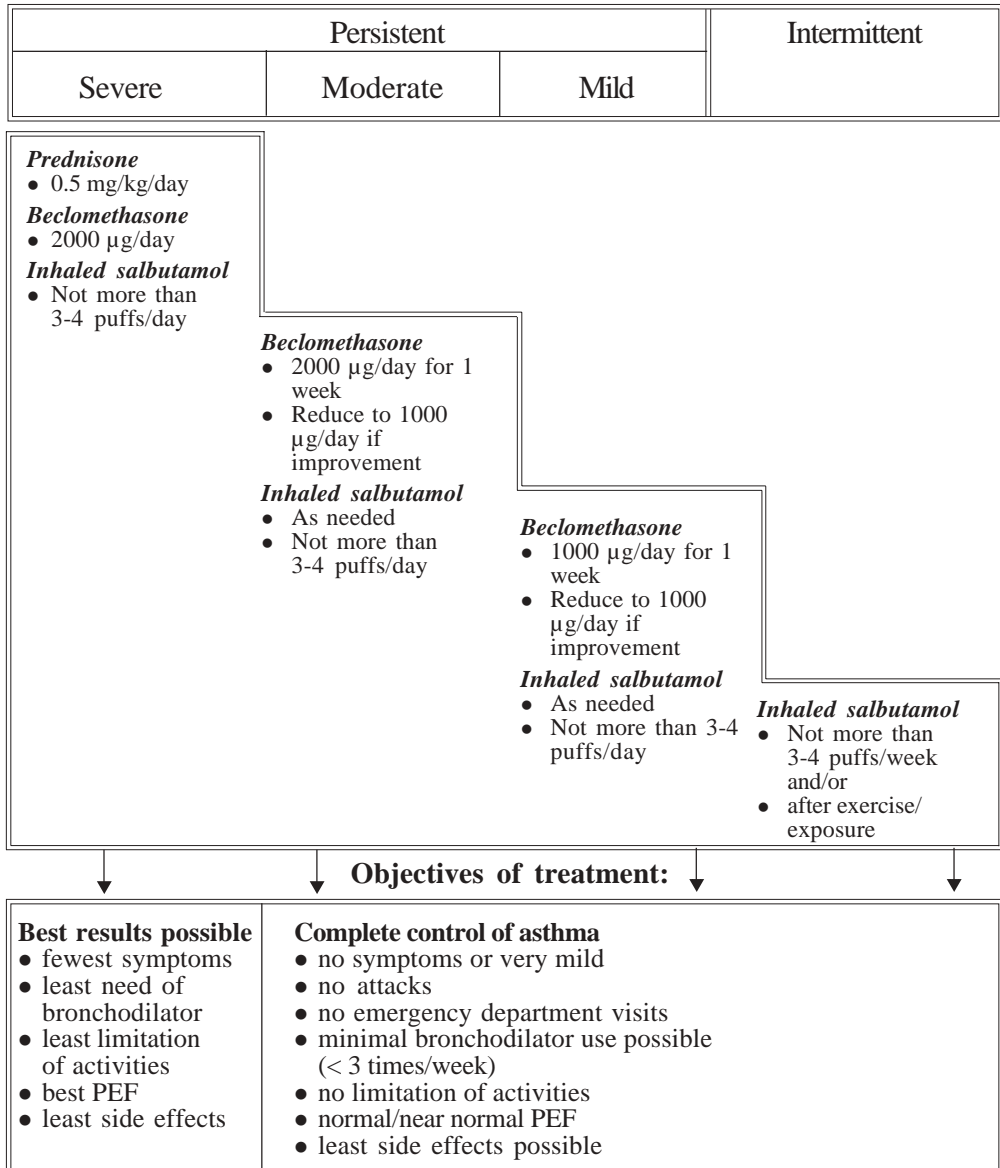
Certain drugs, such as antitussives, mucolytics, antihistamines (except in the case of allergic rhinitis or other associated allergic conditions) and antibiotics (except in the case of a clear bacterial infection), represent a huge waste of money, are of no benefit to the patient and should not be prescribed.

### **3.4 Mode of administration: the inhalation route**

This mode of administration of both bronchodilators and corticosteroids is the most effective and the least harmful. The technique of inhalation of the drugs is the most important factor for treatment success. If the technique is poor, the benefit for the patient will be slight. This is why the patient should be taught carefully how to inhale the drugs correctly. The instructions should be repeated often, and the patient should perform the technique in front of the health personnel to check that the correct technique is being used. A description of the inhalation technique is given in Appendix 4.

## Staged treatment approach for adults with asthma\*

### Degree of severity



\* For children aged 5 years and over, the dosages of beclomethasone are lower than those given to adults

**Increase in intensity of treatment:** If the asthma is not brought under control by the treatment prescribed, even though it has been taken correctly, the dosages are doubled at every step

**Decrease in intensity of treatment:** Once the objectives of treatment have been reached, treatment is maintained over several months, and the dosages are halved at each step until the minimal treatment has been determined.

For those patients who fail to acquire the technique of direct inhalation despite adequate training (small child, elderly person), and for those who receive 1000 µg or more of beclomethasone, it is recommended to use a spacer. A home-made spacer, which is very effective, is recommended (Appendix 5).

## **4. Commencing treatment**

Apart from patients with intermittent asthma who only need inhaled salbutamol on demand, all other patients should receive long-term inhaled corticosteroids at a dose adapted to the degree of severity of their condition.

When a patient has to be treated for persistent asthma, treatment must be started immediately with drugs capable of rapidly reducing the inflammation of the airways and of relieving the symptoms. In most cases this consists of a short course of oral corticosteroids administered at the following dosages:

- For adults, 20 mg prednisone, 2000 µg beclomethasone at 250 µg (8 puffs) and 400 µg of salbutamol (4 puffs) daily.
- For children aged 5 years and over, prednisone 0.5 mg/kg and/or 750 µg beclomethasone and 400 µg salbutamol.

After 8 days (sometimes a little more), the patient should be completely stabilised, and the symptoms should have improved or disappeared. The patient's best PEF can be measured and the severity of disease evaluated. Long-term treatment adapted to the grade of severity of asthma can then be instigated.

## **5. Continuing treatment**

The choice of long-term treatment to be given to an asthma patient is determined by the severity of the disease. As asthma evolves in a dynamic way over time, treatment must be adapted to patients' intra- and inter-individual variability. When a patient's condition has been stabilised by initial treatment with oral corticosteroids, the severity of disease can be evaluated. Treatment can then be reduced to the level recommended for the degree of severity of the disease, which should normally allow the asthma to be controlled.

Stepwise treatment adapted to the degree of severity of the disease is recommended. All patients suffering from persistent asthma will continue to receive:

- long-term aerosol corticosteroid treatment at the doses recommended according to the degree of severity of the disease;
- inhaled salbutamol as needed, in case of symptoms.

## **5.1 Severe persistent asthma**

Severe persistent asthma requires full treatment with all available medications:

- oral prednisone 0.5 mg/kg/day;
- inhaled beclomethasone at doses of 2000 µg (8 puffs) for adults and 750-1000 µg (3-4 puffs) for children; and
- 1-2 puffs of inhaled salbutamol as needed.

When the patient is stable, with PEF at a plateau, the dose of prednisone can be progressively reduced. For many patients, prednisone can thus be stopped and asthma controlled with high doses of inhaled beclomethasone.

If the asthma is not brought under control within 3 months, and it has been verified that the prescribed treatment has been administered correctly, long-term treatment with oral corticosteroids at minimum doses may need to be prescribed to obtain the best possible control of asthma.

## **5.2 Moderate persistent asthma**

Treatment begins with a high dose of beclomethasone: 2000 µg/day (8 puffs) for adults and 750 µg for children. When the asthma is under control and the PEF has been improved for 2 weeks, the dosages can begin to be reduced to 1000 µg/day in adults and to 500 µg in children.

If the asthma is not brought under control, and it has been verified that the prescribed treatment has been administered correctly, the next step of treatment should be prescribed.

## **5.3 Mild persistent asthma**

The recommended dose of beclomethasone for the control of mild persistent asthma, 500 µg for adults and 250 µg for children, should be reached progressively.

If the asthma is not controlled, and it has been verified that the prescribed treatment has been administered correctly, the next step of treatment should be prescribed.

### Recommended daily treatment by degree of severity

Degree of severity	Adults	Children aged 5 years and over
Persistent severe asthma	Inhaled beclomethasone 2000 µg Inhaled salbutamol as needed (<4 puffs/day) ± prednisone	Inhaled beclomethasone 750-1000 µg Inhaled salbutamol as needed (<4 puffs/day) ± prednisone
Moderate persistent asthma	Inhaled beclomethasone 1000 µg Inhaled salbutamol as needed (<4 puffs/day)	Beclomethasone 500 µg Inhaled salbutamol as needed (<4 puffs/day)
Mild persistent asthma	Beclomethasone 500 µg Inhaled salbutamol as needed (<4 puffs/day)	Beclomethasone 250 µg Inhaled salbutamol as needed (<4 puffs/day)
Intermittent asthma	No beclomethasone Inhaled salbutamol as needed (<4 puffs/day)	No beclomethasone Inhaled salbutamol as needed (<4 puffs/day)

Whatever the severity of the asthma, symptomatic episodes (including for intermittent asthma, for which it is the only treatment) are treated by inhaling 1 to 2 puffs of salbutamol. If the asthma is not controlled, even with the addition of salbutamol 3 times daily, the patient should be considered to have a higher degree of severity and treated accordingly.

Once well established, long-term treatment that controls the asthma should be maintained for at least three months before any reduction is to be considered.

### **Note**

Long-term asthma treatment as proposed in this guide is a model that uses only the two drugs included in the WHO list of essential drugs. This is one of the most cost-effective treatments currently available. Nevertheless, national authorities who wish to implement management of asthma using other drugs may select effective treatment recommended by international consensus taking into account the availability of the drugs, their cost and their accessibility for the majority of patients. The following basic principles should always be respected: standardisation of treatment for all stages of treatment according to the severity of the condition, and long-term daily prescription of inhaled corticosteroids for all cases of persistent asthma.

## **6. Adjusting treatment during follow-up**

Once the treatment objectives have been fixed, the physician will decide to adapt treatment during follow-up visits. Judging whether the asthma is under control will be based on the clinical evaluation since the previous visit and on the PEF measurement.

### **6.1 When should treatment be intensified?**

If the asthma is poorly controlled, the initial treatment step that was selected may be inadequate. The physician should therefore envisage moving to the next step of treatment, but before taking this decision it is imperative to ensure that:

- the prescribed treatment has really been taken by the patient;
- the correct inhalation technique is being used to take the drugs;
- it is not a simple, temporary deterioration of symptoms associated with a temporary complication (acute respiratory infection, changes in the weather, accidental exposure to an allergen);
- avoidable factors that trigger asthma attacks have truly been avoided.

### **6.2 How should treatment intensity be reduced?**

After 3 to 6 months of adequate, well conducted treatment, asthma will be brought under control in the majority of patients. The intensity of treatment is always reduced with care. When the asthma has been brought under control, treatment can be reduced by stages, halving the dose of beclomethasone. This new dose should

be maintained for at least 3-6 months before a new reduction of treatment can be envisaged. The minimal dose of inhaled corticosteroids that will permit the control of asthma is generally maintained for several years.

## **7. When should short courses of cortisone treatment be prescribed?**

Whatever treatment is used to control asthma in a patient, the addition of a short course of corticosteroids to the usual treatment is sometimes necessary when the patient's condition deteriorates temporarily. The most common indications are:

- progressive deterioration with recurrence of symptoms in an individual whose asthma was under control;
- recurrence of nocturnal attacks;
- drop in PEF to less than 60% of the patient's previous best PEF;
- reduced response to beta 2 with an increase in dosage necessary.

Treatment consists of prednisone prescribed at 0.5 mg/kg/day for 8 days, for both adults and children. It is important to look for the causes of this temporary deterioration of the condition:

- poor adherence to treatment;
- acute complication: respiratory infection, sudden change in temperature;
- incidental exposure to an allergen: paint, animals, dust;
- temporary change of residence (e.g., staying in a holiday house. If the house is not exposed to air or sunlight for long periods, allergens, particularly moulds, will proliferate – these are harmful for patients suddenly exposed to this new environment).

For a certain number of cases, identifying the cause of the deterioration will permit preventive measures to be considered that limit or prevent recurrence.

## **8. Specific issues in asthma management**

Regular physical exercise is useful for most asthma patients, even if they suffer from exercise-induced asthma. Occasionally, exercise can provoke an asthma attack or breathing problems. When this occurs often, it is important to verify that the patient

is taking daily treatment as prescribed; the dose of inhaled corticosteroids may need to be increased. If, in spite of the above, exercise still induces an asthma attack, it can be prevented by the inhalation of two puffs of inhaled salbutamol a few minutes before effort. Sport should be encouraged for all asthma patients, including those who have exercise-induced asthma.

All patients should be advised to avoid tobacco smoke. Smokers should be encouraged to stop smoking. Exposure of patients to the smoke of others (passive smoking) should be strongly advised against. For children who are exposed, the first prevention measure that is necessary is for the parents to stop smoking.

Asthma may be affected by pregnancy (improvement or deterioration). Anti-asthma drugs are not dangerous for the foetus. Pregnant women should be warned that the greatest risk their baby may run is poor control of their asthma due to inadequate treatment.

The use of beta blockers should be avoided in asthma patients, if possible, as these drugs can aggravate their asthma.

If an asthma patient requires surgery, it is important to ensure that the asthma is well under control before the operation. During and after surgery, the patient may experience an increase in airflow limitation and of bronchial mucous secretions. Before major surgery, it is usually useful to increase the dose of inhaled corticosteroids by one step. For patients receiving oral corticosteroids, treatment should be maintained and an increase in dosage should be considered before, during and for some time after the operation.

## **9. Which patients should be referred to a more specialised level?**

Certain patients should be sent to a more specialised referral level if examinations that are not available at the first level are necessary to confirm a diagnosis, to eliminate certain differential diagnoses or due to concomitant conditions. Other patients may be referred for treatment advice.

A patient whose asthma is not under control after well-conducted management should be referred to a more specialised level. However, by applying the measures

recommended in this guide, asthma can be controlled in the majority of cases. Before referring the patient, it is therefore necessary to verify whether the treatment has been followed correctly and if the patient's inhalation technique is correct.

If a patient is identified with asthma due to intolerance to aspirin and/or non-steroidal anti-inflammatory drugs, these drugs should be stopped immediately. Such patients are often affected by severe, unstable asthma and should be referred, if possible, to a higher level of reference to confirm the diagnosis and for treatment advice.

Patients in whom the main trigger factor of symptoms seems to be situated in the workplace should also be sent to a higher referral level to confirm the diagnosis of occupational asthma and, if necessary, to seek legal compensation.

## References

1. Sterk PJ, Buist SA, Woolcock AJ, Marks GB, Platts-Mills TAE, Von Mutius E, Bousquet J, Frew J, Pauwels R, Ait-Khaled N, Hill SL, Partridge MR. The message from the 1998 World Asthma Meeting. *Eur Respir J* 1999; 14: 1435-1453.
2. Bousquet J, Van Cauwenberg P, Khaltayev N: ARIA Workshop Group, World Health Organization. Allergic rhinitis and its impact on asthma. ARIA workshop report in collaboration with WHO. *J Allergy Clin Immunol* 2001; 108 (5 Suppl): S147-S334.
3. World Health Organization. Model list, Essential Medicines. 12<sup>th</sup> ed. Geneva, Switzerland: WHO, 2002.

## V How to manage asthma attacks

Asthma attacks are paroxysmal episodes of acute breathlessness with wheeze, linked to airflow limitation. These attacks can occur at any moment, but mainly at night, waking the patient and obliging him/her to sit up in bed to relieve the symptoms. They can occur even in a patient whose asthma is well controlled, due to exposure to a specific trigger factor, but they most often indicate failure in the long-term management of the patient.

### 1. What is the degree of severity of an attack?

The severity of attacks varies from a mild attack that is reversible in a few minutes, to severe attacks that are life-threatening. In these latter cases, deterioration is visible in several hours or days, but can occasionally occur dramatically, within a few minutes (sudden catastrophic attack). The severity of an asthma attack is linked to the degree of airflow limitation (if the limitation reaches more than 50% of the airways, the life of the patient is in danger), whether the limitation is reversible, and how quickly it is reversible under treatment.

Although the clinical signs of an asthma attack are quite typical, it is sometimes important to consider other causes of acute breathlessness, in particular pneumothorax.

#### 1.1 What elements should be used to measure the severity of an asthma attack?

The evaluation of the severity of an attack is based on different signs indicative of respiratory difficulties and their repercussions on the system.

##### Clinical signs

Rapid interrogation and physical examination of the patient allow the severity of an attack to be determined:

- Characteristics of breathlessness:
  - Does it occur while walking, speaking or lying down?
  - Is the breathing rate increased?

- Is wheeze present, moderate, strong, or on the contrary has it disappeared?
- Have the respiratory muscles retracted; are there paradoxical chest or abdominal movements?
- Is the pulse rapid or slow?
- What is the patient's state of consciousness? Is the patient agitated? Sleepy? Unconscious?

## **Measurement of lung function**

Measurement of the PEF before and after inhalation of salbutamol is the most objective criterion for evaluating the severity of the airflow limitation and its reversibility. To evaluate the severity of the limitation at the time of an attack, a patient's PEF after salbutamol should be expressed in percentage of the patient's best PEF (or the PEF predicted). It is important for the patient to know his/her own best PEF and for this information to be recorded on the individual patient card.

### **1.2 What scale should be used to evaluate the severity of an attack?**

The International Consensus has proposed the table on page 34 to evaluate the severity of an asthma attack.

Based on clinical signs and lung function measurements, this table allows four degrees of severity in asthma attacks to be distinguished: mild, moderate, severe and imminent respiratory arrest.

The PEF is measured if possible as soon as the patient arrives at the emergency services, and most importantly 10-15 minutes after taking inhaled salbutamol.

All the criteria of the same category of severity are not always necessarily present in a patient. When several signs are present, the highest degree of severity will be taken into account.

The evaluation of severity can be modified, and a higher degree of severity can be attributed to an attack if specific risk factors are found during history taking. Rapid questioning of the patient or the patient's family (if the patient cannot respond to the questions) sometimes makes it possible:

- to identify a high risk factor for fatal asthma:
  - current or very recent treatment with prednisone;
  - hospitalisation or frequent visits to the emergency services for asthma in the last year;

- previous intubation for asthma;
- a severe psychiatric disorder.
- and/or to discover that the patient has already attempted unsuccessfully to instigate emergency treatment before presenting to the emergency services.

### **Evaluation of the severity of asthma attacks\***

(From the International Consensus)

<b>Clinical signs</b>	<b>Mild</b>	<b>Moderate</b>	<b>Severe</b>	<b>Imminent respiratory arrest</b>
Breathlessness	On walking, can lie down	On talking, prefers to sit up	On lying down remains lying down	
Speaks in	Phrases	Bits of phrases	Words	Unable to speak
Level of consciousness	May be agitated	Usually agitated	Always agitated	Sleepy or confused
Respiratory frequency	Increased	Increased	Often >30/min	
Muscle retraction	No	Moderate	Intense	Paradoxical movements
Wheezing	Moderate, end of expiration	Strong	Very strong	Absent
Pulse/minute	<100	100-120	>120	Bradycardia
Child aged $\geq$ 5 years	<120	120-130	>130	Bradycardia
PEF after inhalation of salbutamol (in % of best PEF or in % of the patient's PEF predicted)	> 70%	Between 50% and 70%	<50% or <100 l/min	Impossible to measure

*\* The severity of the attack is indicated by the highest category of severity, where several signs are present (but not necessarily all). If the interview indicates a factor of high risk of fatal asthma and/or previous ineffective treatment at home, the upper degree of severity is attributed to the attack.*

## 2. How to treat an asthma attack

### 2.1 What are the objectives of treatment?

- to prevent death;
- to restore the clinical and functional status to its best level as soon as possible by removing the obstruction;
- to maintain optimal respiratory function;
- to prevent early relapse by treating the inflammation.

### 2.2 What treatment should be given?

#### Salbutamol

Salbutamol is the most effective and least toxic drug. It can be used in different forms:

- *Inhaler*: used with or without a spacer, according to the severity of the attack, the patient's technique and the capacity to inhale. The doses can vary from 4 to 8 puffs at a time.
- *Nebulisation*: for each nebulisation, 1 ml of solution is used in 3-4 ml of isotonic solution. Nebulisation is performed either by using a nebuliser (electric or by foot-action pump) or by connecting the apparatus directly to an oxygen source.

#### Corticosteroids

In emergency situations, corticosteroids are always administered systemically. Due to their anti-inflammatory action, they accelerate the resolution of attacks that do not respond to bronchodilators alone, and above all they prevent relapse. The clinical improvement caused by corticosteroids, whatever the mode of administration, takes at least 4 hours; there is therefore no benefit in giving them intravenously, which is only used for patients who have problems of absorption or digestive intolerance, or, in very severe attacks, patients who already have an intravenous catheter in place. Thus 0.5-2 mg/kg/day of oral prednisone (on average 30-60 mg/day in adults) will be given, or, if necessary, 100-200 mg of hydrocortisone intravenously every 4-6 hours.

## Essential drugs for emergency treatment of asthma

Type of drug	Generic name	Mode of administration and dosage
Bronchodilator		
Sympathomimetic	Salbutamol	Aerosol: 100 µg per puff Nebulising solution: 5 mg/ml
Anti-inflammatory		
Corticosteroid	Hydrocortisone Prednisone	Vial: 100 mg (IV) Tablets: 5 mg

### Oxygen

As soon as an attack is classified as severe, the patient should be given oxygen therapy. The oxygen should be humidified and administered at a high flow rate (6 l/min), at the strongest concentration available. In low-income countries where emergency services do not always have wall oxygen or oxygen cylinders, if electricity is available oxygen extractors can be used; two extractors in parallel are necessary to obtain a flow rate of 6 l/min.

### 2.3 How to manage patients in the emergency services

As soon as the patient arrives, it is necessary to:

- determine the severity of the attack;
- use the best treatment available at the centre;
- organise follow-up of the patient.

The physician must not leave the patient alone during the first 15 minutes, as the state of the patient can worsen suddenly. The physician should verify the patient's state every 20 minutes during the first hour, and every hour after that, to evaluate the treatment response. The PEF should be evaluated in relation to the best PEF, if known, or if not in relation to the PEF predicted (if the patient's best PEF is unknown, evaluation of the severity of the attack and surveillance of its progress can be difficult, as in those patients with moderate persistent or severe asthma the best PEF is most often below normal).

The evolution of the attack during treatment will be judged using the following criteria:

- complete response: near-total disappearance of clinical signs; PEF > 70% or 80%;
- incomplete response: improvement without disappearance of clinical signs; improvement of the PEF, which nevertheless remains < 70%;
- no response or deterioration: no improvement or worsening of clinical signs; PEF < 50%.

Clinical follow-up must be precise. The clinical signs and PEF should be evaluated regularly, and the results should be registered on a surveillance card.

The patient should leave the emergency department only if the treatment response is complete and stable. Stability should be confirmed by keeping the patient under observation for an additional hour after a complete response, checking that the patient's state remains unchanged. The objective of surveillance is to identify any evidence of immediate relapse which, although rare, is usually severe.

Various management plans can be proposed depending on the severity of the attack.

### **Severe attack**

Full immediate treatment is instigated, as follows:

- Concentrated oxygen therapy, at high flow rate (6 l/min).
- High-dose inhaled salbutamol: 10 to 15 puffs at each administration. The same dose is administered every 20 min during the first hour via a spacer. Nebulisation is not more effective than inhalation via a spacer. Nevertheless, in certain cases, such as if the patient is exhausted, particularly in children, it may be preferred to use nebulisation with a solution of salbutamol 5 mg/ml. Nebulisation should be performed every 20 minutes for the first hour, using 20-25% of the vial, i.e., 1000-1500 µg of salbutamol, at each administration. (Continuous administration may, however, be preferred using a vial that will be nebulised during the first hour). Salbutamol can be nebulised using oxygen instead of air by attaching the nebuliser to the oxygen source.
- Subcutaneous salbutamol may be given.
- Intravenous hydrocortisone at doses of 100-200 mg (2-4 mg/kg). Intravenous cortisone treatment is not more effective than when given orally at doses of approximately 60-80 mg of prednisone/day. If oral administration is selected, treatment should be given in a single daily dose.

After the first hour, treatment should be continued as follows:

- continuous oxygen therapy at a regular flow rate;
- intravenous corticosteroids (if this method of administration has been selected), at the same dose, every 4 hours;
- inhaled salbutamol at the same dose every 4 hours.

Follow-up of severe attacks should be continued for at least 6 hours. An evaluation of the patient's status at the end of this period should be made before deciding whether the patient should be discharged or hospitalised:

- In the case of non-response or deterioration, for example if the clinical signs of a severe attack do not improve, if signs of imminent arrest occur, or if the PEF is  $< 30\%$ , the patient should be referred, if possible, to a centre where a competent specialist physician or intensive care is available and mechanical ventilation can be performed.
- In the case of incomplete response, when the clinical signs indicate a moderate attack and the PEF is between  $30\%$  and  $70\%$ , the patient should be hospitalised in a medical ward to continue treatment.
- In the case of a satisfactory response, i.e., the clinical signs disappear and the PEF is  $> 70\%$ , the patient can be discharged once the physician has confirmed that the improvement is stable one hour after the last dose of salbutamol.

### **Imminent respiratory arrest**

For all patients in a state of imminent respiratory arrest, treatment (at least for severe attack) should be instigated as soon as the patient arrives in the emergency services, and the patient should be transferred immediately, if possible, either to an intensive care ward, or to a centre that has a competent specialist and where mechanical ventilation is possible.

### **Moderate attack**

Treatment involves administration of:

- inhaled salbutamol, if possible using a spacer, at doses of 4-8 puffs at a time. Treatment should be repeated, at the same dose, every 20 min for the first hour, and if necessary every hour thereafter in case of incomplete response;
- oral prednisone at a single dose of 0.5-1 mg/kg.

The patient should be monitored for 1 and a half to 2 hours. If there is a complete and stable response, one hour after the last dose of salbutamol, the patient can be

discharged. In case of non-response or incomplete response, management should continue as for a severe attack.

### **Mild attack**

Treatment consists of the administration of inhaled salbutamol, at doses of 4-8 puffs at a time, either directly or using a spacer. In the case of incomplete response, treatment can be renewed every 20 minutes for the first hour. The patient should be monitored for 1 and a half to 2 hours. The patient can be discharged one hour after complete response has been obtained. In case of non-response or incomplete response, management should continue as for a moderate attack.

## **2.4 What are the indications for hospitalisation?**

The decision to admit a patient to an emergency ward or hospitalisation at different levels of care can be taken immediately for a severe attack or when treatment has not led to complete resolution.

### **Immediate hospitalisation in a specialised service**

The following patients should be transferred as rapidly as possible to an intensive care ward or to a specialised centre where there is a competent specialist and/or oxygen therapy is available:

- imminent respiratory arrest;
- severe attack with one or more risk factors for fatal asthma.

Other patients should be transferred to the emergency services and monitored while on the treatment that has been instigated:

- severe attack that deteriorates under treatment with signs of imminent respiratory arrest;
- severe attack that does not improve after adequate treatment for 12 hours.

### **Admission to an emergency service for 6-12 hours**

Due to the severity of their attack, certain patients should be hospitalised in the emergency service for at least 6 hours:

- severe attack with PEF < 50%;
- moderate attack that does not respond to initial treatment;
- moderate attack occurring in a patient who presents one or more risk factors for fatal asthma.

## **Hospitalisation in a medical service after the 12th hour of surveillance**

After the 12th hour of treatment and surveillance in the emergency services, patients who have presented with a moderate or severe attack and whose condition has deteriorated or not improved with adequate treatment (PEF between 30% and 70%) should be hospitalised in a medical ward.

### **2.5 What are the conditions of discharge from a health service during an attack?**

Most patients at risk of dying from asthma are those who frequently present to the emergency services with asthma attacks. This is why the discharge of an asthma patient after attending the emergency services should be accompanied by measures to prevent relapse and improve long-term management of the condition:

- try to identify the causes of the attack to find a solution (non-adherence to treatment, absence of long-term management, bronchial infection, co-morbidity);
- verify that the correct inhalation technique is being used;
- provide a prescription that includes not only inhaled beta 2-sympathomimetics, but also a short course of corticosteroids to prevent relapse;
- the health centre where the patient is (or should be) registered must be informed about the care given to the patient in hospital, the type and severity of the attack, and the drugs used to treat it.

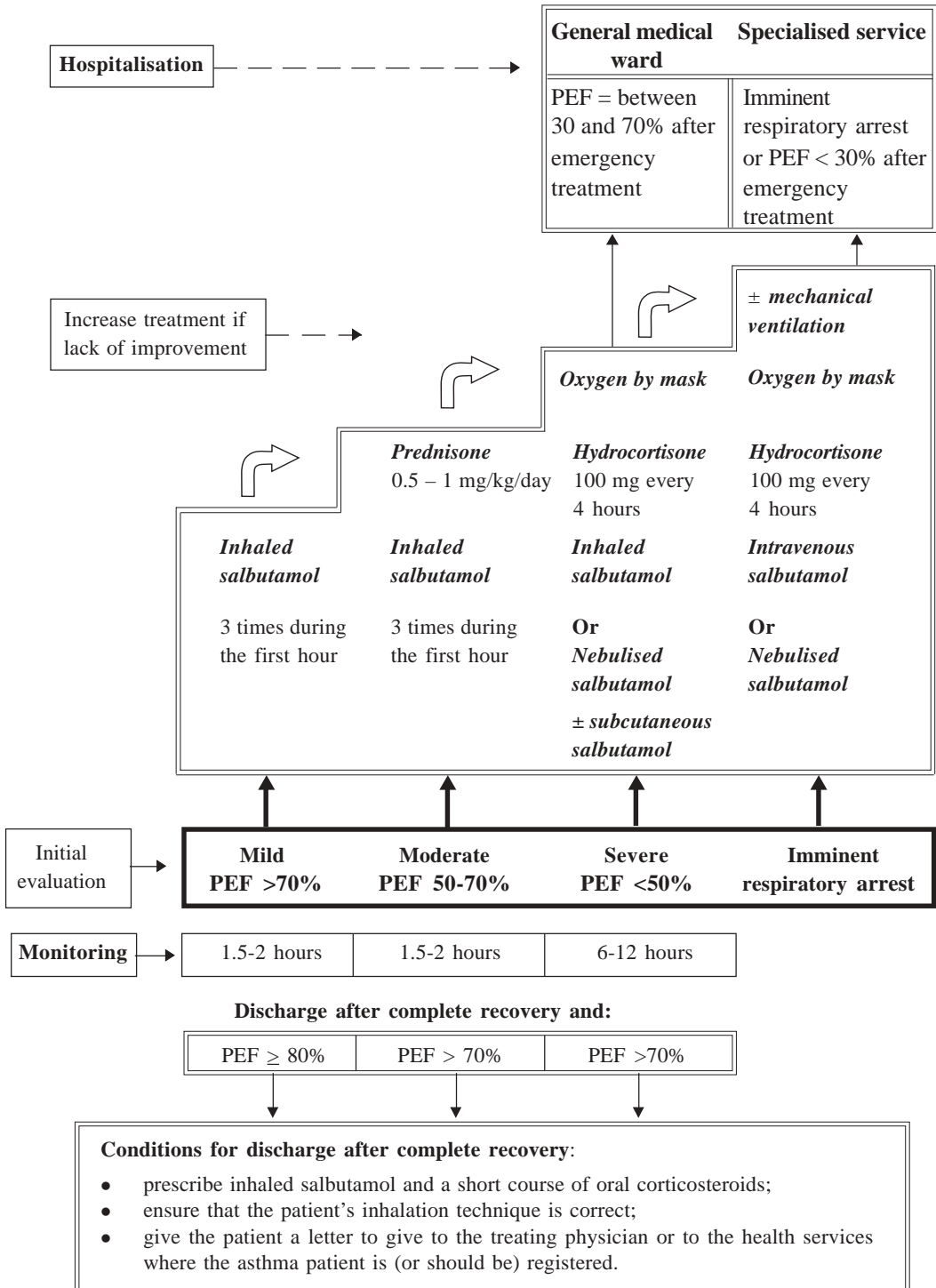
## **3. Treating an attack at home**

If the patients and/or parents have received suitable health education, they should be able to recognise the signs of deterioration and to treat the episodes themselves as soon as the first clinical signs of an attack appear. For such patients, a visit to the emergency services only becomes necessary when they suffer from an attack that immediately seems unusually severe or if it does not respond to the emergency treatment recommended in the treatment plan explained by the health personnel to the patients or their parents.

## **Reference**

International Consensus Report on Diagnosis and Treatment of Asthma. Bethesda, Maryland. National Heart, Lung, and Blood Institute, National Institutes of Health, Publication N° 92-3091, March 1992.

## Stepwise treatment of asthma attacks



## **VI How to organise the care of asthma patients**

Patient health education (or, in the case of children, education of patients' families) is essential if they are to take responsibility for the management of their condition. Education should allow patients to adhere to regular treatment and should also make them able to recognise signs of deterioration and to modify their own treatment in case of exacerbation.

Health education is the only means of allowing a patient (and/or the patient's family) to understand the condition affecting him/her and to change his/her behaviour towards the condition. It allows the patient's skills and capacities to be improved progressively (or, in the case of a child, those of the parents) to participate actively in the rational management of the disease.

### **1. Health education: what does the patient need to know?**

The goal of health education is to improve relations between the patient and his/her family on one hand and the health team on the other. The quality of this relationship strongly determines treatment adherence, and the ability of the patient (or the patient's parents) to participate in the management and control of the condition.

To attain these goals, health education should be ongoing, evaluated regularly, repeated, and above all adapted to the patient's social and cultural level.

#### **1.1 The content of health education**

The health education of a patient consists of listening, informing, teaching techniques and improving the rapport between the patient and the health personnel.

##### **Listening**

The prerequisite to any health education is to listen attentively to the patient and establish a good rapport between the physician and the patient. Listening will allow the physician to understand:

- how the patient sees the disease;
- the patient’s understanding of the disease and the drugs;
- the effects of the condition on the patient’s quality of life;
- the patient’s social and cultural level;
- what the patient hopes to gain from treatment.

## **Inform the patient**

Apart from the information requested by the patient, which the physician must respond to carefully, the physician should give the patient information that can aid in improving treatment adherence and help the patient to acquire the ability to participate actively in managing the disease.

### ***About the disease:***

- the diagnosis of asthma should be clearly spelt out;
- the condition should be explained using simple, non technical words, so as to:
  - convince the patient of the need for long-term treatment;
  - explain the results that can be expected from this kind of treatment.

### ***About its treatment:***

The physician should ensure that the patient and/or family have clearly understood the following information:

- two types of drugs are used to treat asthma: those that treat the symptoms by removing the obstruction, and those that act on the inflammation by preventing the appearance of symptoms and reducing the severity of the disease;
- long-term treatment must never be interrupted, and the patient should always have a reserve stock of drugs available;
- the inhalation route is preferable to the other modes of administration, as the drugs arrive directly in the airways and are thus very effective, rapid acting, and have few or no side effects.

The physician should also ensure that the patient and/or the parents have clearly understood how to participate actively in the management of the condition, by teaching them:

- how to recognise signs of deterioration and how to increase the usual treatment while waiting to be able to consult the physician;

- how to recognise those attacks that require a visit to the emergency services immediately after taking the treatment recommended by the health personnel for this kind of attack;
- when and where to go if symptoms deteriorate.

### ***About a healthy lifestyle***

The patient should be advised:

- to avoid exposure to factors that have been identified as triggering the attacks;
- to lead an active life, including practising a sport. Sport should be encouraged even in the case of exercise-induced asthma. Some patients with poorly controlled severe persistent asthma have a handicap that prevents them from participating in a sport. Even in the most severe cases, taking regular exercise is always helpful.

### **Learning the techniques**

#### ***Inhalation with a metered dose inhaler***

The patient should be taught the technique of using a metered dose inhaler (Appendix 4):

- a single training session is not sufficient; the patient's technique should be verified at every consultation;
- treatment failures are usually linked to poor use of inhaled drugs;
- if the patient is incapable of obtaining correct coordination between the hand that is pressing on the inhaler and the inhalation movements, a spacer can be used. If commercial spacers are not available in the country, the patient can be taught to make one from a plastic bottle (Appendix 5).

#### ***Peak airflow measurement***

- the patient must learn to perform a satisfactory peak airflow measurement;
- three attempts should be made and the best result recorded;
- the measurement should be made before and after taking salbutamol, to enable the patient to observe the efficacy of salbutamol treatment.

## **1.2 Encouraging partnership and organising long-term surveillance**

Adhering to regular treatment and adapting it immediately to the progressive episodes of the disease are the keys to success. To achieve this it is necessary to develop a true partnership between the physician and the patient.

## **There are several ways of helping this partnership to develop**

### ***Select and prescribe the best possible effective, applicable treatment:***

- Effective treatment will lead automatically to instant treatment adherence; it is therefore important not to underestimate the severity of the condition to choose the best treatment.
- The choice of treatment is made together with the patient, verifying that he/she can follow the proposed regimen (Can the patient buy the drugs? Is the patient able to inhale the drugs? Has the patient understood the function of each drug?).
- It is also important to ensure that the patient understands the importance of and indications for short-course treatment with oral corticosteroids.

### ***Limit the number of drugs prescribed and the number of times they are taken:***

- Long-term treatment usually requires two drugs, salbutamol and inhaled beclomethasone.
- The number of times the drugs are taken should be reduced to a minimum; for most cases this is 1 or 2 times per day.

### ***Explain the prescription clearly:***

- The prescription should be written out very clearly so it can be read by the patient or a member of the family.
- The prescription should be given to the patient with very clear explanations, if possible, showing the drugs (or even empty containers). These containers should always be available at the clinic for this reason.
- A number of boxes of each drug should be provided until the next visit, with a little over to avoid treatment interruptions.

The technique of taking the drugs should be explained very clearly; the patient or a family member should be able to repeat the treatment to the health personnel who has explained it.

## **Organising long-term follow-up**

With long-term follow-up, the patient's understanding can improve gradually; treatment can be adapted according to the evolution of the asthma; the patient can feel secure and the psychological support that is always necessary for chronic illnesses can be provided.

Follow-up involves two types of consultation:

***Regular visits by appointment:***

- The first visits to manage the treatment of an asthma patient are often closely spaced (every week). The goal is to identify the best long-term treatment that will control asthma, to check whether the treatment is well accepted by the patient and to begin the patient's health education. The subsequent appointments will be more spread out (on average every 3 months).
- During these visits, the health personnel should be careful to check:
  - clinical status: number and severity of episodes since the last visit, number of times the patient has visited the emergency services;
  - PEF before and after bronchodilator;
  - treatment really taken by the patient;
- If non-adherence to treatment is noted, it is important to identify the cause and find a solution.

***Emergency consultations:***

- During the regular consultations, the patient will be informed of centres that can be visited day or night in the case of an emergency.
- The health personnel working in the clinics and those working in the emergency services should work together to reduce the use of emergency services and the risk of death.
- Changes in long-term treatment should only be decided upon by the health personnel who are in regular contact with the patient.

**Encourage the patient to participate in his management: the treatment plan**

The main goal of health education is to fully involve the patient in the long-term management of the condition and to give the patient adequate knowledge about the condition and the drugs so that he/she can take the responsibility of modifying treatment alone when necessary, according to a recommended treatment plan.

**1.3 Which treatment plan?**

Examples of treatment plans are proposed in different consensus guidelines so that patients can adapt their own treatment. These plans define three treatment zones based on the patient's PEF and clinical results.

In most low- or middle-income countries, treatment plans based on individual monitoring of peak flow levels are not feasible for the majority of patients (due to high rates of illiteracy and lack of access to peak flow meters). Furthermore, it has been demonstrated that self-management plans based uniquely on clinical signs yield results that are equivalent to those based on PEF measurements. This plan, which distinguishes three zones, should be recorded on a personal card that is given to the patient by the treating physician:

***Green zone (stable state):***

- The patient does not experience asthma attacks.
- The patient does not experience nocturnal symptoms.
- The patient can lead a normal life.

This zone corresponds to asthma that is under control. Long-term treatment to control the asthma is noted; this is the patient's usual treatment.

***Yellow zone (deterioration):***

- Symptoms of cough or breathlessness are frequent.
- They interrupt the patient's sleep and/or activities.
- The symptoms are always worse than the day before.

The supplementary treatment that the patient needs to follow is written on the card and has been thoroughly explained. The physician will usually recommend a short course of oral corticosteroid treatment and/or double the dose of inhaled beclomethasone, and will ask the patient to come back as soon as possible if there is no improvement. If the asthma improves, the patient can resume normal treatment after one week.

***Red zone (attack):***

- Severe attack, acute breathlessness with difficulty in speaking and walking.
- Treatment has been given as for the yellow zone, but without effect.

The patient should present to the emergency services immediately after taking the treatment recommended for such a case by the physician. Treatment usually consists of several puffs of salbutamol in a spacer and oral corticosteroid treatment (1 mg/kg) in a single dose.

## **Which patients need a treatment plan?**

Patients with moderate persistent or severe asthma and who suffer from more frequent and often more severe attacks are those who will benefit the most from a treatment plan. The treating physician is responsible for providing a treatment plan when it is thought necessary and when it can be understood by the patient.

## **When should a patient be given a treatment plan?**

Giving a treatment plan to a patient represents the ultimate stage of health education. The physician will only entrust such a responsibility to a patient (or to the parents, if it is a child) once it is clear that the patient can assume it. The physician should verify that the patient (or parents) has perfectly understood:

- the long-term importance of the treatment;
- the role of each drug used;
- the technique of taking the drugs;
- the signs of deterioration.

The physician should also check the patient's treatment adherence during follow-up visits.

A treatment plan is therefore never given to a patient during the first visit, but depends on the time it takes the patient to acquire the basic elements of health education. The treatment plan is generally given more rapidly to those patients with severe asthma who have frequent attacks, in an attempt to limit their severity.

## **How should the treatment plan be given to the patient?**

The patient will receive an individual patient card (see Document 1), on which the patient's diagnosis, treatment plan and best PEF are recorded.

The card also contains personal information about the patient, on the drug inhalation technique and on emergency services.

It is given to the patient at the first consultation. The treatment plan is recorded on it only once the physician has judged that the patient is capable of adapting treatment alone.

## 1.4 Methods of health education

Different methods can be used to provide patients with health education.

### *The individual method:*

Individual education is provided mainly by the physician responsible for management of the patient; other members of the health team can participate. The messages should be simple and adapted to the cultural level of each patient. Progress will be evaluated by the personnel who will judge when each patient is ready to receive a treatment plan.

### *The group method:*

This type of education can be given to a group of patients by the staff of the health centre to reinforce individual health education, although it can under no circumstances replace it.

## 2. Organising care in the health system

Management of asthma patients is provided by GPs and by specialists. Improved, rationalised asthma management should be organised in the general public health services. This presupposes that there are several levels differentiated by the degree of specialisation of the health personnel, the types of health centre and the equipment available.

Management of asthma patients can be conceived as having three levels of intervention that are in constant communication to ensure that patient and medical information are easily transferred between centres.

### 2.1. At the peripheral level

At this level, there may be a GP or at times a nurse. They can participate in the management of asthma patients, depending on their competence and the equipment available in their centres.

#### **Tasks of the health personnel in the peripheral centres**

- Identify suspected asthma cases.
- Diagnose the majority of asthma cases and judge their severity.
- Manage all cases of intermittent asthma.

- Refer all cases of persistent asthma to the first level of referral.
- Refer all patients who pose problems of diagnosis or treatment to the next level.

## **2.2 At the first referral level**

In a population of 50 000 to 200 000, there are several peripheral centres and a referral centre, which is usually based in the district's largest city and sometimes inside the hospital. Asthma patients with persistent disease should be managed at the first level referral centre where there is a chest specialist or GP especially trained in the management of chest diseases.

Several different specialised services are grouped together in the referral centre (including the diagnosis and treatment unit of the national tuberculosis programme, in most low- and middle-income countries). These services are integrated and form the first specialisation level. The physician or physicians practising in this centre are responsible for ensuring that correct care is provided at the peripheral level (primary health care level), including the care of asthma patients. The district hospital is usually under the responsibility of one of the physicians of this centre.

### **Tasks of the health personnel at the first referral level**

- Provide diagnosis, health education, treatment and follow-up of the asthma patients in the district.
- Manage all cases of persistent asthma in the district.
- Manage referred cases of unusual or complicated asthma.
- Refer patients to the higher referral level if necessary.
- Provide ongoing medical training on asthma and its management for district health personnel.
- Undertake or participate in operational research at district level.
- Record all new cases of persistent asthma identified in the district.
- Regularly record treatment results for all cases of persistent asthma.

A member of the health team at this centre should be responsible for upkeep of the recording and reporting system and for supplies of drugs and equipment. At this level, the health personnel have access to the information system (records, files) and a peak flow meter. They should have access to an X-ray machine and an

emergency service capable of managing severe attacks of asthma. The emergency services should have access to at least a peak flow meter, a spacer and oxygen.

### 2.3 The second specialised referral level

The second specialised referral level is represented by the tertiary hospitals or large, well-equipped hospitals with chest specialists. These services act as reference centres for all the other levels of the health services.

#### Equipment necessary at the second referral level

These referral services must:

- be equipped with a spirometer and, if possible, arterial blood gas analysis;
- have access to an X-ray unit;
- have access to an emergency services unit or a specialised service capable of providing mechanical ventilation.

#### Tasks of personnel at the second referral level

In addition to the tasks assumed at the first referral level, these specialised services must care for the more complicated cases referred by the first referral level.

#### Coordination of the different levels of the health services

Level	Structure	Personnel	Equipment
Peripheral	Health centre	GPs	Peak flow meter
First referral level	Hospital or specialised health centre	Specialists	Peak flow meter Spirometer (if possible) Oxygen Spacer Nebuliser
Second referral level	Hospital	Specialists	Spirometer Arterial blood gas analysis X-ray

## **2.4 Coordination between the different levels**

Whatever level of care is available at the centre where the patient is managed, the following principles must be applied:

- The patient should be referred to the next level if the nature of the asthma is beyond the capacity of the current level.
- The patient should be sent back to the previous level once the problem for which the patient was referred has been adequately resolved.
- A letter should always accompany a referred patient, explaining the reason for the referral, the patient's current state of health and any treatment the patient has received.

## **2.5. Organising the management of asthma patients at national level**

A designated National Coordinator should be responsible for the surveillance of the number of cases, the quality of management provided to all the patients in the country, and the quality and regularity of supplies. The coordinator should be supported by a larger committee to cover the following tasks:

- developing a national plan for the standardised management of cases;
- creating and participating in a programme of ongoing training for health personnel involved in the management of asthma patients;
- supervising regular evaluation of the epidemiology and management of asthma in the country;
- promoting and participating in research that will enable them to improve the management of asthma patients.

All physicians, both GPs and specialists practising in the private sector, are involved in the management of asthma patients. They should be able to participate in training sessions to adhere to the general plan of management adopted at the national level.

## VII Providing a service of quality

### 1. Why should care be standardised?

It is important to give asthma patients good quality standardised care for a number of reasons:

- if non-standardised care is given, many patients will not reach their optimal level of health;
- a systematic, standardised approach is necessary due to the chronic nature of the condition;
- if care is not standardised and the results are not recorded and evaluated, health costs will rise for patients, their families and the community.

### 2. How can the quality of the health services be guaranteed? Evaluation of activities

The only method that allows the quality of services to be monitored is the collection and evaluation of information about the care of each patient. Recording the number of patients in an institution or a community and evaluating their outcome provides the information necessary to analyse the treatment results, plan the provision of care, determine the analysis of the situation, and revise the management strategy if the results are not satisfactory.

The recording process should be systematic and complete, using the cohort approach. This means that all patients targeted by the health intervention are registered and evaluated, and none is omitted or excluded from the evaluation. This is why it is recommended that all patients with persistent asthma (confirmed or probable) for whom long-term treatment has been decided should be registered.

The group of patients with persistent asthma is selected for regular, ongoing surveillance because they are the most ill; their condition, if poorly treated, will have the greatest impact on their lives and those of their families; they use the most resources; and it is they who are also at most risk of dying.

### **3. Elements to monitor**

#### **3.1 The quality of clinical care given to patients**

Indicators of the quality of care include:

- the proportion of cases confirmed according to the definition in relation to all cases;
- the agreement between the clinical signs, the PEF level and the severity attributed to the condition;
- the agreement between the degree of asthma severity and the treatment prescribed.

#### **3.2 The outcome of patients under treatment**

Regular re-evaluation of patients under treatment provides a means of analysing the benefits and efficacy of treatment. Recording the variations in the degree of asthma severity is a good indication of the efficacy of treatment.

#### **3.3 Impact of the services provided to patients**

By monitoring the outcome of each patient, their condition is registered and the impact of the services can be evaluated. The most important indicators are:

- the proportion of patients who have died while on treatment;
- the frequency of unplanned visits to the health services for asthma treatment.

If treatment is of good quality, few patients will die and the number of unplanned visits to the health services (especially to the emergency services and the hospital) will diminish considerably.

#### **3.4. What are the recommended information systems?**

At the level of the first level referral health centre, the following documents are recommended:

- Patient card (Document 1: personal card given to the patient)
- Treatment cards (Document 2: kept at the health centre)
- District register of new cases of persistent asthma (Document 3: kept at the health centre)

- Quarterly report on new cases (Document 4: filled out by the health officer at the centre and sent to the National Coordinator)
- Annual report on treatment results (Document 5: filled out by the health officer at the centre and sent to the National Coordinator)
- Quarterly order form for treatment supplies (Document 6: filled out by the health officer at the centre and sent to the National Coordinator).

#### **4. How to guarantee supplies at national level**

One of the most important elements for the successful treatment of a chronic disease such as asthma is to ensure regular supplies of drugs and diagnostic material. Ongoing needs and the reserve stock should be based on the estimated needs recorded in the regular reports on patients managed in each region. It is necessary to know the number of new patients and the mortality and treatment default rates. It is also necessary to do some extrapolating, as information collected in routine practice is based on the first referral level and provides no information on the situation in the peripheral centres.

To calculate the requirements, the following hypotheses are used:

- In the community, for each case of severe persistent asthma, there are 2 cases of moderate persistent asthma, 5 of mild persistent asthma and 25 of intermittent asthma.
- Treatment of a case of severe persistent asthma requires, on average, 5 mg of prednisone, 8 puffs of beclomethasone and 4 puffs of salbutamol per day.
- Treatment of a case of moderate persistent asthma requires, on average, 4 puffs of beclomethasone and 4 puffs of salbutamol per day.
- Treatment of a case of mild persistent asthma requires, on average, 2 puffs of beclomethasone and 4 puffs of salbutamol per day.
- Treatment of an intermittent case requires, on average, 1 puff of salbutamol per day.

For children aged 5 years and over, drug needs can be evaluated as for adults: they are equivalent for inhaled salbutamol and reduced by approximately half for inhaled beclomethasone.

As there are 200 doses of beclomethasone and salbutamol in each inhaler, requirements can be calculated, including the reserve stock, for each period.

Asthma attacks that require use of emergency services are estimated as follows: for severe cases 5 times per year; for moderate cases twice, and for mild cases once only.

The order form proposed in the Appendix (Document 6) is based on the number of cases of persistent asthma registered in a district. It was designed for adults based on the above hypotheses.

## **5. Training: how to organise it**

### **5.1 In medical schools**

All of the country's medical and nursing schools should provide adequate training to allow health personnel to assume the responsibility of patient management. The training programme should be developed after consultation with the National Co-ordinator, and should respect the national guidelines on asthma management.

### **5.2 Through continuing education**

Ongoing training of health personnel involved in the management of asthma patients is essential to ensure that patients are managed correctly. When a national programme is introduced in a country, it is useful to select a few districts as "pilot areas" to launch the programme. This introduction should begin with a training programme of several weeks, including:

- the scientific bases of the national programme;
- technical and organisational aspects;
- the recording and reporting system used: individual patient files, registers, reports.

From the start of the programme, the most important element of ongoing training consists of regular supervisory visits to the different intervention levels to ensure that patients are managed correctly, as well as data collection and the quality of supplies of drugs and equipment.

Regular (at least annual) meetings of the health personnel involved in patient management should be organised at each level of intervention of the health system to discuss the notification of new cases, the results of management and to resolve any problems encountered.

## **6. Adapting to local situations**

The intervention and the recording and reporting forms used to organise the management of asthma patients should be adapted to the local situation in each country. In particular, the organisation of the health services and national consensuses or recommendations should be taken into account. The adoption of recording systems is of fundamental importance for the ongoing evaluation of the results of the intervention.

The intervention should be implemented in stages:

- implementation in a few pilot health zones;
- analysis of the results;
- possible modifications of the intervention based on the results;
- progressive spread of the intervention into other zones, with ongoing analysis of the results.

## **7. What is the role of research?**

Research is an important aspect of all intervention programmes in the health services. Only systematic, rigorous research will enable such conditions and the means of controlling them to be understood and the systems providing care to be improved. Research through the programme is usually conducted using the evaluation component of the programme. Information collected in routine practice is used as the starting point and allows questions to be asked for which research must find the responses. The International Committee on the Development of Health Research recommends that a fixed percentage (5%) of the budget of any health programme should be attributed to research. This recommendation is logical, as research provides new knowledge that is a powerful tool for change.

As a result, operational research within the programme is the most suitable. This type of research involves the personnel responsible for patient management, provides them with new knowledge and helps them to learn to resolve problems that they confront on a regular basis. The distribution of asthma in the community, its determinants and the cost-effectiveness of the different interventions are the most appropriate subjects for this type of research.



## Appendices

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<b>IUATLD Research Questionnaire on bronchial symptoms (1984)</b>
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Please respond to the questions with “Yes” or “No”. If you are unsure of the answer, please choose “No”

### Wheeze and tightness in the chest

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- |  |           |            |
|--|-----------|------------|
| 1. Have you had wheezing or whistling in your chest at any time in the last <u>12 months</u> ?                                       | No<br>[ ] | Yes<br>[ ] |
| 2. Have you woken up with a feeling of tightness in your chest first thing in the morning at any time in the last <u>12 months</u> ? | No<br>[ ] | Yes<br>[ ] |

### Shortness of breath

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- |   |           |            |
|---|-----------|------------|
| 3. Have you, at any time in the last <u>12 months</u> , had an <u>attack</u> of shortness of breath that came on during the day when you were not doing anything strenuous? | No<br>[ ] | Yes<br>[ ] |
| 4. Have you had an <u>attack</u> of shortness of breath that came on after you stopped exercising at any time in the last <u>12 months</u> ?                                | No<br>[ ] | Yes<br>[ ] |
| 5. Have you, at any time in the last <u>12 months</u> , been woken at night by an attack of shortness of breath?  | No<br>[ ] | Yes<br>[ ] |

### Cough and phlegm from the chest

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- |   |           |            |
|---|-----------|------------|
| 6. Have you, at any time in the last <u>12 months</u> , been woken at night by an attack of coughing? | No<br>[ ] | Yes<br>[ ] |
| 7. Do you <u>usually</u> cough first thing in the morning?  | No<br>[ ] | Yes<br>[ ] |
| 8. Do you <u>usually</u> bring up phlegm from your <u>chest</u> first thing in the morning?           | No<br>[ ] | Yes<br>[ ] |

9. Have you brought up phlegm from your chest like this on most mornings for at least 3 months each year? No Yes  
[ ] [ ]

### Breathing

---

10. Which of the following statements best describes your breathing?

Tick one box only

- a. I never or only rarely get trouble with my breathing. [ ]
- b. I get repeated trouble with my breathing, but it always gets completely better. [ ]
- c. My breathing is never quite right. [ ]

### Animals, dust, feathers

---

11. When you are in a dusty part of the house or with animals (for instance, dogs, cats or horses) or near feathers (including pillows, quilts and eiderdowns), do you ever:

- a. Get a feeling of tightness in your chest? No Yes  
[ ] [ ]
- b. Start to feel short of breath? No Yes  
[ ] [ ]

### Asthma

---

12. Have you ever had asthma? No Yes  
[ ] [ ]
13. Have you had an asthma attack at any time in the last 12 months? No Yes  
[ ] [ ]
14. Are you currently taking any medicines (including inhalers, aerosols or tablets) for asthma? No Yes  
[ ] [ ]

### Smoking

---

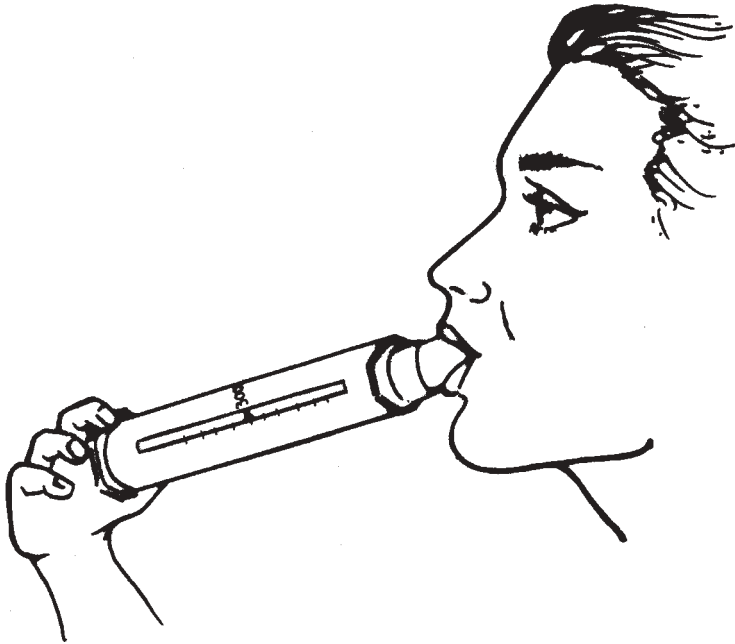
15. Have you ever smoked for as long as a year? No Yes  
[ ] [ ]

[This means at least one or more cigarettes a day (or one or more cigars a week, or 30 g of tobacco a month) for as long as a year.]



## Measurement of peak expiratory flow (PEF)

---



### Equipment

Peak flow meter and cardboard disposable mouthpiece or plastic mouthpiece to clean after each use.

### Measure the PEF of a patient in l/min

- 1 Fit a disposable mouthpiece to the end of the peak flow meter, and set the marker at the zero level (bottom of the scale).
- 2 While standing, the patient should hold the peak flow meter by the other end, horizontally, without restricting the movement of the marker.
- 3 Explain the necessary movements to the patient: take a deep breath, seal the lips around the mouthpiece and blow as quickly as possible (as though blowing out a candle). The marker will go up to a different level: record the result in l/min shown by the marker.
- 4 Repeat the measurement two more times: the highest of the three readings will be recorded.

**Evaluate the respiratory function: patient's PEF in % of its predicted value**

The PEF in l/min is expressed as % of the predicted value, so that the patient's respiratory function can be assessed. Norm tables indicate the PEF predicted values in children (aged under 15) and in adults, according to sex and height. The calculation of the patient's PEF in % predicted is given by the following formula:

$$\text{Patient's PEF \% predicted} = \text{observed PEF} / \text{PEF predicted} \times 100$$

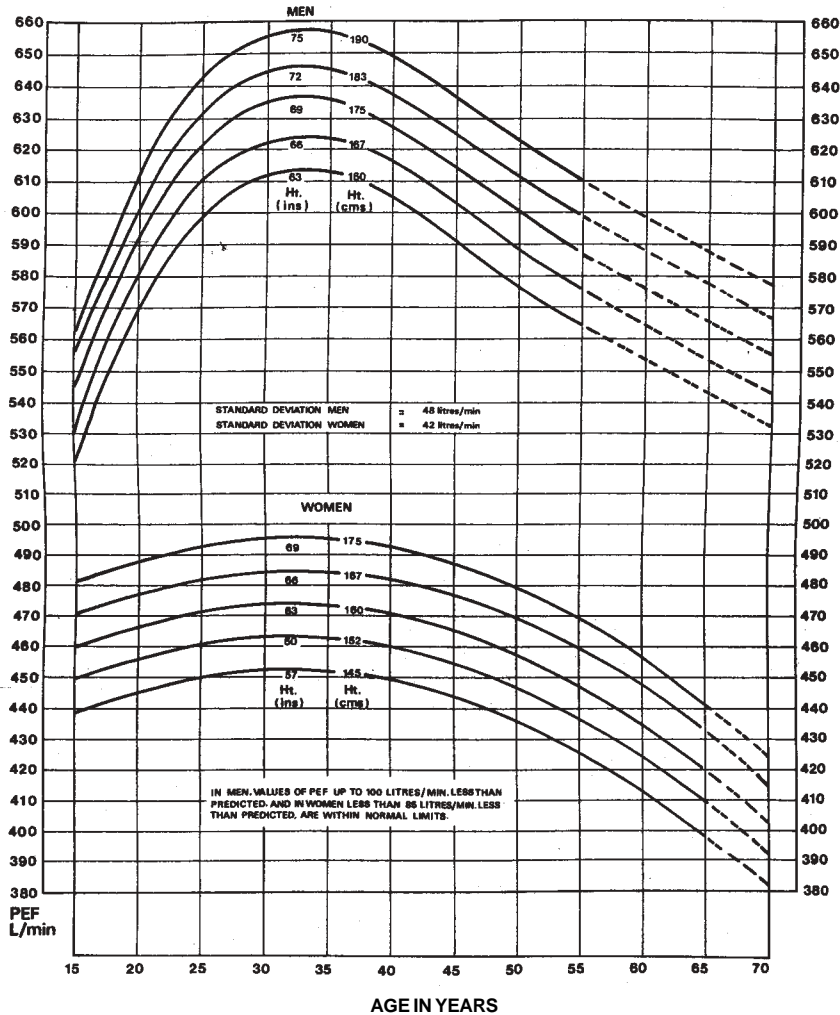
Example of the calculation of PEF in percent PEF predicted in a 40-year-old male, 1.67 metres tall. PEF predicted: 620 l/min

Observed PEF = 500 l/min PEF% predicted=  $500/620 \times 100 = 81\%$

# Table of PEF norms for adults

## PEAK EXPIRATORY FLOW IN NORMAL SUBJECTS

IAN GREGG, A.J. NUNN, *British Medical Journal*, 1973, 3, 282.



WRIGHT, B.M., and MCKERROW, C.B. (1959), *Brit. Med. J.* 2.1041. Maximum forced expiratory flow rate as a measure of ventilatory capacity. With a description of a new portable instrument for measuring it.

NAIRN, J.R., BENNETT, A.J., ANDREW, J.D., and MACARTHUR, P. (1961), *Arch. Dis. Childh.* 36.253. A study of respiratory function in normal school children; the peak flow rate.

SHEPARD, R.J. (1962), *Thorax*. 17.39. Some observations on peak expiratory flow.

FAIRBAIRN, A.S., FLETCHER, C.M., TINKER, C.M., and WOOD, C.H. (1962), *Thorax*. 17.168. A comparison of spirometric and peak expiratory flow measurements in men with and without chronic bronchitis.

LEINER, G.C., ABRAMOWITZ, S., SMALL, M.J., STENBY, V.B., and LEWIS, W.A. (1963), *Amer. Rev. Resp. Dis.* 88.644. Expiratory peak flow rate. Standard values for normal subjects. Use as a clinical test of ventilatory function.

GREGG, I. (1964), *J. Coll. Gen. Pract.* 7.199 and 215. The measurement of peak expiratory flow rate and its application in general practice.

ANDERSON, J.P. (1966), *Brit. J. Clin. Pract.* 20.635. The low-range flow meter used by school entrants.

LEONARDS, A.K. (1966), *ACTA Allergy*. 21.99. Der Maximale Expirationsstrom.

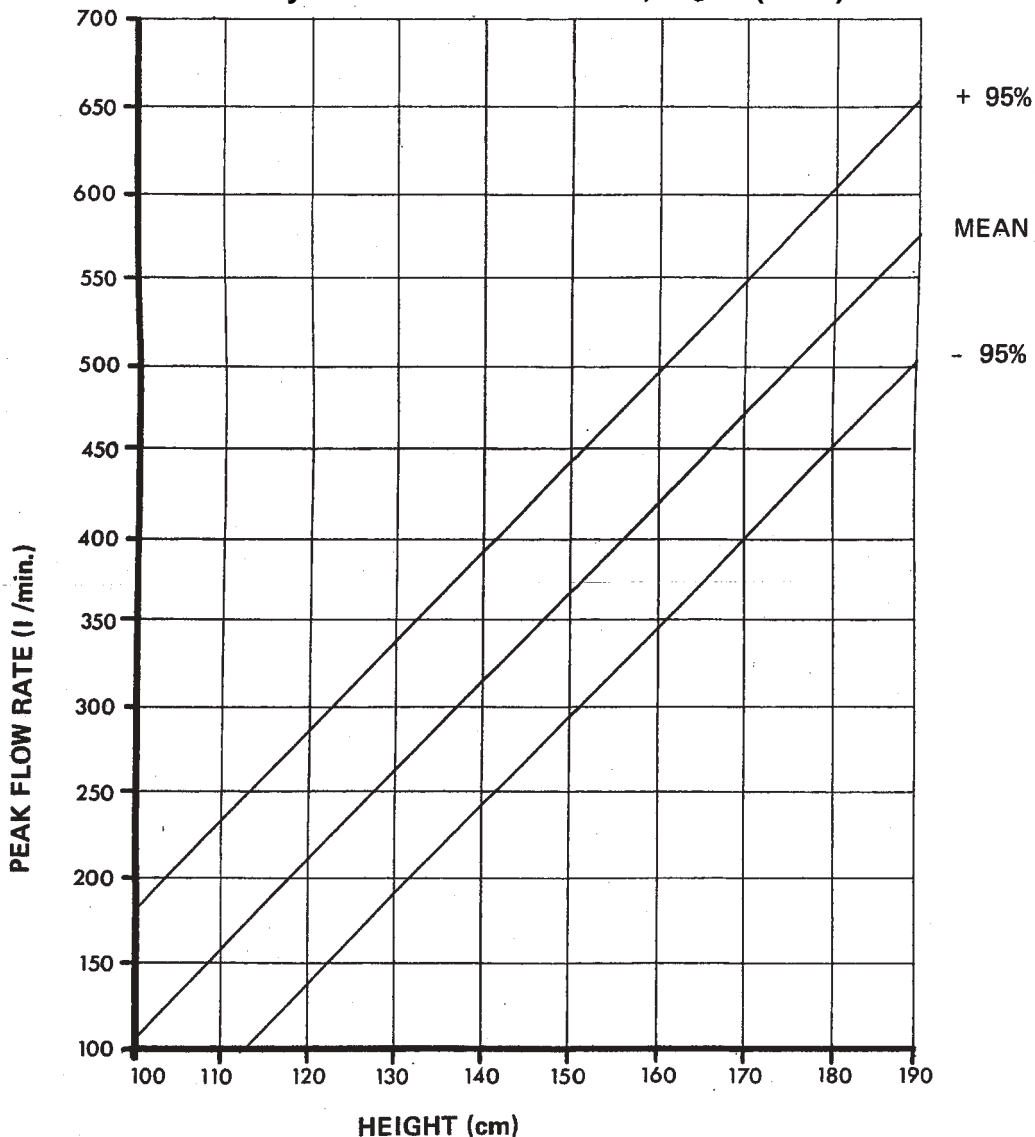
CHAI, H., PURCELL, K., BRADY, K., and FALLIERS, C.J. (1968), *J. Allergy*. 41.23. Therapeutic and investigational evaluation of asthmatic children.

EPSTEIN, S.W., FLETCHER, C.M., and OPPENHEIMER, E.A. (1969), *Brit. Med. J.* 1.223. Daily peak flow measurements in the assessment of steroid therapy for airway obstruction.

WILLIAMS, M.H. (1979), *Chest*. 76.3-4. Evaluation of Asthma.

## Table of PEF norms for children aged 5 years and over

Nomogram redrawn from original data of  
Godfrey et al Brit. J. Dis. Chest, 64, 15 (1970)



This nomogram results from tests carried out by Dr. S. Godfrey and his colleagues on a sample of 382 normal boys and girls aged 5 to 18 years. Each child blew 5 times into a standard Wright Peak Flow Meter and the highest reading was accepted in each case. All measurements were completed within a 6-week period. The outer lines of the graph indicated that the results of 95% of the children fell within these boundaries.

## Confirm the diagnosis of asthma and evaluate the severity of functional impairment

---

### 1. To confirm asthma

#### Salbutamol bronchodilation test

PEF before salbutamol (in l/min): measure the PEF before inhalation of salbutamol.

- Ask the patient to inhale two puffs of salbutamol
  - either from a metered-dose inhaler;
  - or with a spacer (commercial or home-made).
- Remove the inhaler and ask the patient to hold the breath for 10 seconds (to facilitate diffusion of the salbutamol).
- Wait 10 minutes, then measure the PEF after salbutamol (in l/min).

#### Reversibility testing with corticosteroids:

The same test can be performed in a patient by measuring the PEF before and after oral administration of prednisone at 0.5 mg/kg for 8 days.

#### Measurement of PEF on different occasions:

The PEF can also be measured on different occasions: before and after treatment, during and after an attack, at different consultations, and at different times of the day.

$$\text{Variability of PEF} = \frac{\text{highest PEF in l/min} - \text{lowest PEF in l/min}}{\text{lowest PEF in l/min}} \times 100$$

The measurement of PEF variability allows the diagnosis of asthma to be confirmed in a large number of cases.

#### To confirm the diagnosis of asthma:

A variability of PEF  $\geq 20\%$  observed after bronchodilation or corticosteroid test, or even between PEF measurements taken at different moments, can confirm a diagnosis of asthma.

## **2. To evaluate the functional severity of the disease**

### **Measurement of the patient's best PEF**

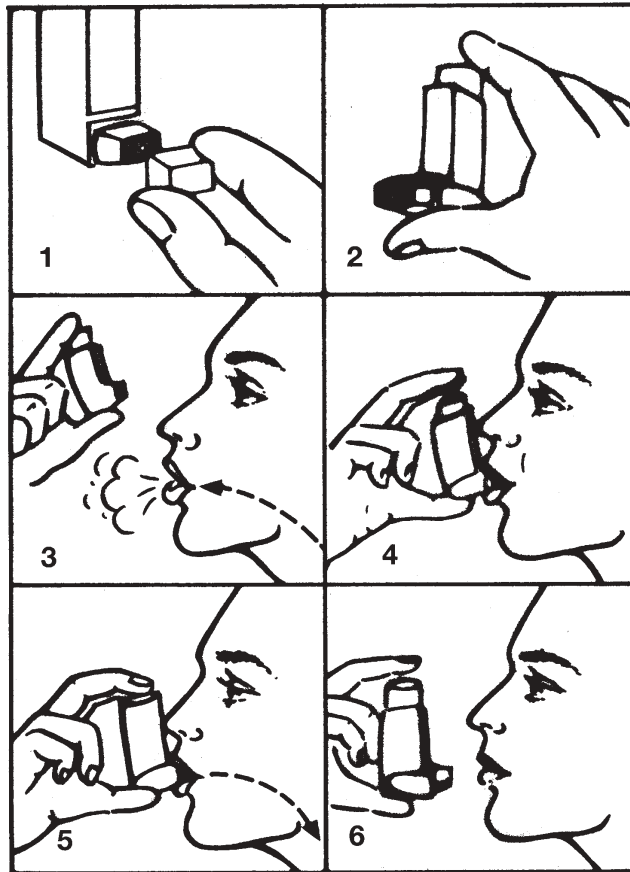
This measurement should be taken in a patient whose condition has stabilised and who shows no symptoms, after treatment of symptoms with inhaled salbutamol and a short course of oral corticosteroids. The best PEF, expressed in percentage of the patient's predicted value, provides a measurement of lung function, which will aid in estimating the severity of the asthma disease when the patient is registered for treatment.

### **To evaluate the functional severity of asthma**

The best PEF in % predicted value when the patient is in stable state allows the functional severity of the disease to be evaluated at initial management. It should be recorded on the patient card and on the treatment form.

## How to use a metered dose inhaler

---



1. Remove the protective cap.
2. Shake the inhaler well.
3. Breathe out deeply to empty the lungs.
4. Insert the mouthpiece in your mouth, sealing the lips around the mouthpiece.
5. Breathe in deeply while pressing on the base of the inhaler to help the aerosol penetrate deeply into the airways.
6. Remove the inhaler and hold your breath for 10 seconds, without breathing out.
7. Breathe out, then breathe normally.

## How to make and use a spacer

---

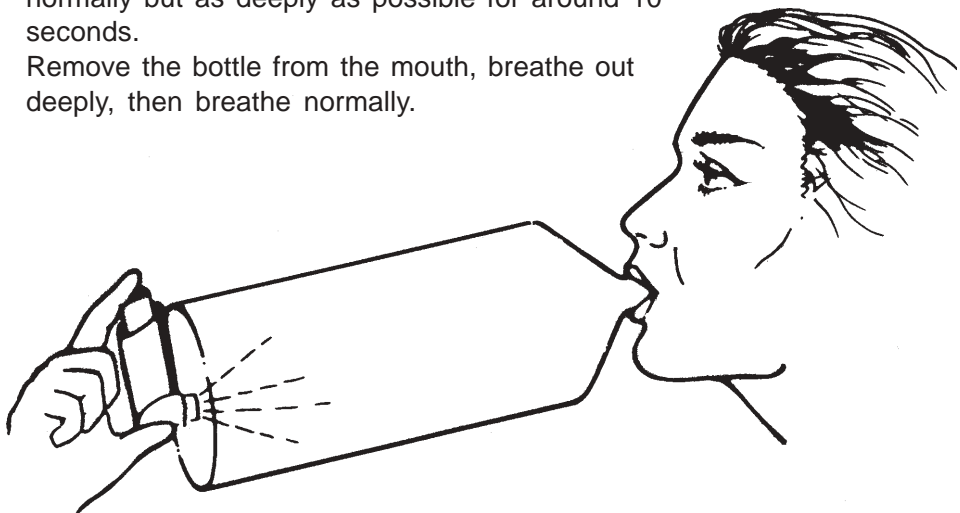
### Making a spacer from a plastic bottle

1. Remove the cap of the inhaler and fit the mouthpiece of the inhaler at the bottom of a clean, empty plastic bottle at least 1 litre in size (the mouthpiece of the inhaler should be directly opposite the mouth of the bottle).
2. Trace the shape of the mouthpiece of the inhaler on the base of the bottle.
3. Cut an opening in the base of the bottle exactly the size of the line traced (the opening should be just big enough to insert the mouthpiece of the inhaler without allowing any leaks when using it).

If the bottom of the bottle is too hard it can be pierced using a utensil that has been heated red hot; the mouthpiece can then be inserted into the softened plastic.

### Using the bottle spacer

1. Shake the inhaler and insert the mouthpiece into the opening made in the base of the bottle.
2. Breathe out deeply to empty the lungs.
3. Hold the opening of the bottle in the mouth.
4. Press the bottom of the aerosol to release a dose of the product into the bottle (2 to 15 puffs, depending on the prescription).
5. **Inhale** the air and the product in the bottle: breathe through the mouth normally but as deeply as possible for around 10 seconds.
6. Remove the bottle from the mouth, breathe out deeply, then breathe normally.



## **Documents**

- |                                  |   |
|----------------------------------|---|
| <b>1. Document 1</b>             | <b>Patient card</b>   |
| <b>2. Document 2</b>             | <b>Asthma treatment cards</b>   |
| <b>3. Document 3</b>             | <b>District register of new cases of persistent asthma managed at the health centre</b>   |
| <b>4. Document 4</b>             | <b>Quarterly report on new cases of persistent asthma</b>   |
| <b>5. Document 5</b>             | <b>Annual report on the results of treatment of cases of persistent asthma registered in the year ending 12 months previously</b> |
| <b>6. Document 6</b>             | <b>Quarterly order form for treatment supplies</b>  |
| <b>7. Appendix to Document 2</b> | <b>How to fill in the treatment cards</b>   |
| <b>8. Appendix to Document 3</b> | <b>How to fill in the register</b>  |





**Treatment plan**

**Stable**

*Continue same treatment*

**Worse**

(needs more salbutamol)

*Prednisone ..... tablets for ..... days  
Double usual treatment until  
improvement*

**Attack**

(symptoms severe and/or not improved after salbutamol)

*Start emergency plan immediately*

District:

Registration number:

Name:

Address:

**Patient Card**

Treatment centre:

**Treatment plan**

**Stable**

*Continue same treatment*

**Worse**

(needs more salbutamol)

*Prednisone ..... tablets for .... days  
Double usual treatment until  
improvement*

**Attack**

(symptoms severe and/or not improved after salbutamol)

*Start emergency plan immediately*

District:

Registration number:

Name:

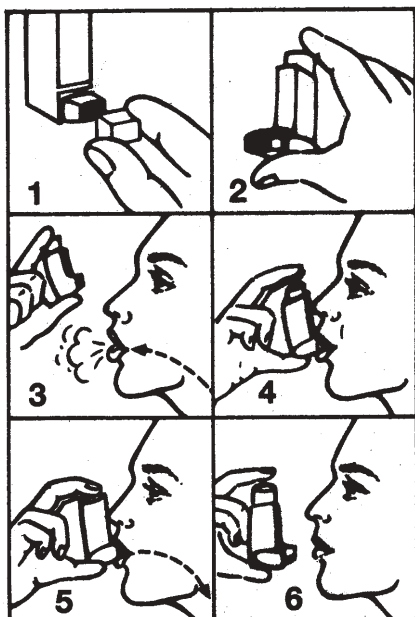
Address:

**Patient Card**

Treatment centre:



**How to use your inhaler:**



**Asthma severity:**

PEF predicted: ..... l/min

Best PEF: .... l/min ... % predicted

**Usual treatment:**

**What to do in an emergency**

1. Treatment to take:
2. If no immediate improvement, go to the emergency services

**Regular annual appointments:**

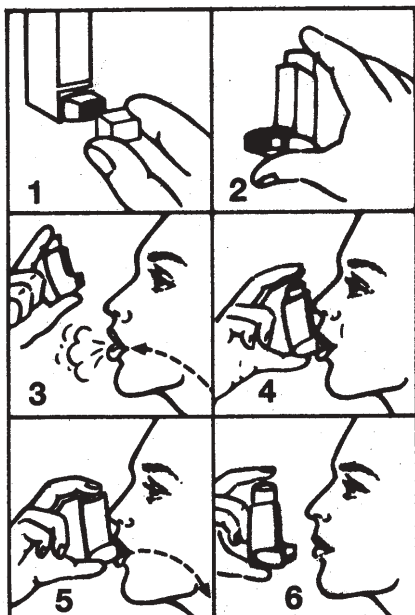
First:

Second:

Third:

Fourth:

**How to use your inhaler:**



**Asthma severity:**

PEF predicted: ..... l/min

Best PEF: .... l/min ... % predicted

**Usual treatment:**

**What to do in an emergency**

1. Treatment to take:
2. If no immediate improvement, go to the emergency services

**Regular annual appointments:**

First:

Second:

Third:

Fourth:





# Annual check-up form during treatment follow-up

## Annual follow-up over several years

Date of evaluation	Symptoms	PEF (% predicted)	Asthma severity	Drugs	Use of emergency services	No longer under follow-up
First year:						
Second year:						
Third year:						

**Symptoms**  
 Asymptomatic  
 Intermittent  
 Mild persistent  
 Moderate persistent  
 Severe persistent  
 Persistent

**Asthma severity**  
 Intermittent  
 Mild persistent  
 Moderate persistent  
 Severe persistent

**Daily treatment**  
 B = beclomethasone (500, 1000..)  
 P = prednisone (5, 10, 20...)  
 (e.g., B1000, P5)

**Use of emergency services since the previous evaluation**  
 E = visit to the emergency services  
 H = hospitalisation on a medical ward  
 I = hospitalisation in intensive care  
 (e.g., E2, H1)

**No longer under follow-up**  
 D = died  
 T = transferred  
 LTF = lost to follow-up

Remarks: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# District register of new cases of persistent

## Registration when a decision is made about long-term treatment

Date of registration	Registration number	Name	Address	Age (years)	Sex (M/F)	Smoking habits	Symptoms	Best PEF		Asthma severity	Use of emergency services in the previous year	Long-term corticosteroids prescribed
								Level l/min	% predicted			

**Definitions:**

**Smoking habit:**

N = non smoker  
 S = smoker  
 E = not in the last month

**Symptoms:**

I = Intermittent  
 MildP = Mild persistent  
 ModP = Moderate persistent  
 SP = Severe persistent

**Best PEF after stabilisation**

PEF level in l/min and PEF in % PEF predicted

**Asthma severity:**

MildP: Mild persistent  
 ModP: Moderate persistent  
 Severe persistent  
 SP: Severe persistent

**Use of emergency services**

E = emergency services  
 H = hospitalisation in medical ward  
 I = hospitalisation in intensive care (e.g., E5, H2, I1)

**Corticosteroids**

B = beclomethasone (B500, B1000...)  
 P = prednisone (P5, P10...)





## Annual report on the results of treatment of cases of persistent asthma registered in the year ending 12 months previously

**Example:** In January 2006, give the treatment results of patients registered during the year 2004 (1 January to 31 December 2004)

<b>Name of centre</b> _____  Patients registered in 20 _____	<b>Coordinator of the centre</b> _____  Signature _____ Date _____
--	---

### Outcome of all cases of persistent asthma registered in the year ending 12 months previously

Distribution of cases according to asthma severity at registration	Number of cases registered	Success	Under control	Failures	Died	Lost to follow-up	Transferred
Mild	.....a						
Moderate	.....b						
Severe	.....c						
Total cases	.....d						

**Success:** severity of the condition diminished and no use of emergency services

**Under control:** severity of disease stable or reduced and fewer visits to the emergency services

**Died:** whatever the cause of death

**Lost to follow-up:** didn't turn up for the annual follow-up visit at least in the 2 months following the appointment

**Transferred:** transferred for follow-up in another health centre

**Failure:** all other cases

*(a, b, c, d) Sum of the figures taken from the four "Quarterly reports on new cases of persistent asthma" from the year ending 12 months previously*

## Quarterly order form for treatment supplies

Drugs	Severe (A)	Moderate (B)	Mild (C)	Intermittent (D)	Current requirements (E=A+B+C+D)	Reserve requirements F=(E/2)	Total (E + F)
Salbutamol inhaler, 100 µg	....x 2 =	....x 2 =	....x 1 =	(C) x 5 =			
Beclomethasone inhaler, 250 µg	.....x 4 =	....x 2 =	.....x 1 =	= 0			
Prednisone tablets, 5 mg,	.....x 800 =	= 0	= 0	= 0			
Hydrocortisone, IV vial, 100 mg							
Salbutamol, IV vial, 0.5 mg/ml							
Salbutamol solution for nebulisation 5 mg/ml							

1) Number of inhalers needed each quarter for each degree of severity of persistent asthma: multiply the number of boxes of each degree of severity recorded during the previous quarter by a factor, as follows:

**Factors to use to calculate the number of salbutamol inhalers:**

- Severe persistent or moderate asthma: 4 puffs/day x 90 days = 360 puffs/quarter, i.e., on average 2 inhalers of 200 puffs per quarter; the factor is **2**, i.e., the average number of inhalers for each patient
- Mild persistent asthma: 2 puffs/day, i.e., on average 1 inhaler/quarter; the factor is **1**

**Factors to use to calculate the number of beclomethasone inhalers:**

- Severe persistent asthma: 8 puffs/day x 90 days = 720 puffs/quarter, i.e., on average 4 inhalers; the factor is **4**
- Moderate persistent asthma: 4 puffs/day, i.e., an average of 2 inhalers of 200 puffs/quarter; the factor is **2**
- Mild persistent asthma: 2 puffs/day, i.e., on average 1 inhaler of 200 puffs/quarter; the factor is **1**

2) Number of salbutamol inhalers needed for cases of intermittent asthma: 1 puff/day/patient, i.e., 1 inhaler/quarter. Given that in the community there are approximately 5 times more cases of intermittent asthma than of mild persistent asthma, the number of cases of mild persistent asthma is multiplied by a factor **5**

3) Prednisone tablets: the average number of tablets needed each quarter for each case of severe persistent asthma is 90; but as the drug is also used for short-course oral corticosteroid and emergency treatment, a factor **800** is used, based on the expected number of emergencies discussed in the guide.

4) For the other drugs, which are used much less often, orders will be based on consumption in the previous quarter.



## Appendix to Document 2

### How to fill in the treatment card

A treatment card is filled in for every patient treated for probable asthma for the first time in a health centre.

### Front of treatment card

#### 1. Top of card, above table

**Name of centre:** record the name of the centre.

**Number:** Record the number of the card once the patient is stabilised and the diagnosis of the asthma severity has been made. Each time a case of persistent asthma is diagnosed the patient is given an identification number that includes the year, followed by the series number. All cases of persistent asthma will thus be given consecutive numbers, in chronological order (e.g., for the first three patients presenting with persistent asthma and treated in 2004, the following numbers will be attributed: 2004/1, 2004/2, 2004/3). These patients will be given the same numbers in the health centre's Persistent asthma register.

For intermittent asthma, the patients will have the same card, but they will not be recorded in the Register. Another type of numbering can be used, if desired, to easily identify the forms of patients with intermittent asthma; these forms should be filed in another cabinet (e.g., the letter b can be noted after the chronological number, and thus the first three patients with intermittent asthma in 2004 will receive the following numbers: 2004/1b; 2004/2b, 2004/3b)

The forms should only be numbered once the patient's state is stable and the asthma severity has been estimated.

**Name:** Patient's first and last name.

**Sex:** M for male and F for female.

**Age:** Patient's age in years.

**Height:** Patient's height in centimetres.

**Occupation:** Patient's occupation.

**Workplace:** The type of industry in which the patient works, if relevant.

**Address and telephone number:** Full address to enable the patient to be traced. Record the telephone number if the patient has one.

## 2. First column of table

2.1 Upper section (Clinical history): Check Y (yes) or N (no) for each item.

**Time since diagnosis:** tick the box 'yes' after **New case** if the patient has never been treated for asthma before. For patients who have already received treatment for asthma ('no' after **New case**) record the number of years since the beginning of the condition: **Treated for \_\_\_\_\_ (years).**

**Other allergic disease:** Tick the corresponding box(es) if the patient also suffers from one or more other allergic conditions: **allergic rhinitis, eczema/rash.**

**Smoking:** Tick one of the three boxes corresponding to the patient's smoking habits; **Non-smoker** if the patient has never smoked, **Current smoker** if the patient still smokes, or **Ex-smoker** if the patient has been a smoker but has stopped smoking for at least 1 month.

**Family history of allergies:** If there is a family history of allergy tick the corresponding box.

**Principal trigger factors:** List the main trigger factors reported by the patient. Don't forget to investigate whether there may be an occupational trigger factor or if the patient has an allergy to aspirin. **If there are no trigger factors, write "none".**

2.2 Lower section:

Record **the number of times the patient has used the emergency services for asthma during the year prior to** being registered for management in this centre. This information should be as precise as possible, as it will be used as an indication of the progress of the patient under treatment:

**Emergency services:** Number of visits to the emergency services.

**Hospitalisations:** Number of hospitalisations in a medical ward.

**Intensive care:** Number of hospitalisations in an intensive care ward (or equivalent specialised service).

**If there have been no visits to the emergency services, note 0.**

### 3. Second column of table

3.1 Upper section (Symptoms during the previous year): Check Y (yes) or N (no) for each of the symptoms; if yes, indicate frequency.

**During the day: Next to each symptom** record the average frequency of the symptoms and the regularity at which they occur. For example, if a patient coughs almost every day and has shortness of breath with wheeze approximately twice per week, complete the table as follows: Cough **1** time per **day**, Breathlessness **2** times per **week**, Wheezing **2** times per **week**.

**At night:** proceed in the same way.

3.2 Lower section (Severity of symptoms): check only one

Based on the frequency of the symptoms noted in the upper section, estimate the severity of the symptoms during the previous year as defined in the guide, and tick the relevant box.

**Intermittent:** symptoms < once weekly, nocturnal symptoms < twice per month.

**Persistent:** symptoms > once per week

- **mild persistent:** symptoms < once daily but several times a week; nocturnal symptoms < twice per month;
- **moderate persistent:** daily symptoms, affecting activity and sleep > once per week;
- **severe persistent:** continuous symptoms, frequent attacks at night and limitation of physical activity.

### 4. Third column of table

4.1 Upper section

**PEF predicted:** Patient's PEF predicted in l/min, as indicated in the table of norms.

**PEF before bronchodilation:** Patient's PEF in l/min at the time of the first consultation.

**PEF after bronchodilation:** Patient's PEF in l/min after a bronchodilation test.

**Best PEF in l/min (after initial treatment and/or after corticosteroid test):** Patient's best PEF in l/min after patient stabilisation, after initial treatment and/or after corticosteroid test. This should be the best (highest) patient PEF obtained after bronchodilation test since the first consultation.

**Best PEF % predicted:** Calculate the patient's best PEF in % of the predicted value after stabilisation according to the formula: patient's best PEF in l/min / patient's PEF predicted x 100.

**Variability of PEF in %:** Calculate, then record the variability of the PEF in % according to the formula: highest PEF in l/min - lowest PEF in l/min / lowest PEF in l/min x 100.

The lowest PEF in l/min is the lowest patient PEF obtained after bronchodilation test since the first consultation.

#### 4.2 Lower section

**Functional severity of the PEF:**

Tick one of the three boxes corresponding to the level of the best PEF % predicted obtained after stabilisation of the patient.

### 5. Bottom of card, underneath table (conclusion)

This is the conclusion of the clinical and functional evaluation

**Confirmed asthma:** Tick this box if the variability of the PEF is  $\geq 20\%$ .

**Probable asthma:** Tick this box if the variability of the PEF is  $< 20\%$ .

**Asthma severity:** Tick the box corresponding to the degree of severity of the patient's asthma.

**Intermittent:** Best PEF  $\geq 80\%$  and intermittent symptoms (less than once a week).

**Mild persistent cases:** PEF  $\geq 80\%$  and persistent mild symptoms.

**Moderate persistent cases:** PEF 60-79% and symptoms less than severe or moderate persistent symptoms and PEF  $> 60\%$ .

**Severe persistent cases:** PEF  $< 60\%$  whatever the severity of the symptoms or severe persistent symptoms whatever the PEF.

**Date of start of long-term treatment:** Date of prescription of long-term treatment (e.g., 12/03/2003).

**Long-term treatment:** Daily treatment prescribed for the patient along with the doses (e.g., beclomethasone 1000  $\mu\text{g}$ , salbutamol 100  $\mu\text{g}$  when necessary).

## **Back of treatment card (Treatment follow-up card)**

The back of the card is used to record information about the patient's progress under treatment at each consultation during the first year. A second page can be added if necessary for the first year and for subsequent years of follow-up.

### **1. First column**

**Date of evaluation:** The date of each visit (day, month and year).

### **2. Second column**

**Symptoms:** Average severity of the symptoms since the last visit: asymptomatic, intermittent, mild persistent, moderate persistent, severe persistent.

### **3. Third column**

**PEF % predicted:** Patient's PEF % predicted on the day of the consultation.

### **4. Fourth column**

**Drugs:** Record only the daily cortisone treatment actually taken by the patient since the last consultation, using the abbreviation of the drug followed by the dose: B = beclomethasone (500, 1000, etc.); P = prednisone (5, 10, 20, etc.). e.g., If the patient takes 1000 µg of inhaled beclomethasone and 5 mg of prednisone daily, write: B1000, P5.

### **5. Fifth column**

**Use of emergency services:** The number of times the emergency services in a health centre have been visited for asthma since the previous evaluation. Use the following abbreviations: E = visit to the emergency services, H= hospitalisation in a medical ward, I = hospitalisation in intensive care (e.g., for a patient who has had two visits to the emergency services, one hospitalisation on a medical ward and one in intensive care, record E2, H1, I1).

### **6. Sixth column**

**Comments:** For those patients who have not attended their regular check-up, note the outcome of the patient since the last consultation if known: D = died (record the cause, if possible), T= transferred.

For the others, provide comments that can be useful to understand the patient's progress on treatment: adherence, inhalation technique, side effects, social problems, any changes in smoking habits.

## **Annual check-up during treatment follow-up**

This form allows the patient's situation to be summarised at the end of each year of treatment. One line is used for each year of follow-up (additional lines or forms can be added for patients followed up over several years).

### **1. The 5 first columns**

For those patients who are still under follow-up. These columns are the same as those on the back of the treatment card and are filled out in the same way.

### **2. The 6th column**

For those patients who no longer attend regular appointments, their outcome is entered in capital letters: D = died; T = transferred; LTF = lost to follow-up. If the cause of death is known it should be noted.

## **Appendix to Document 3: How to fill in the Register**

Record each new patient treated in the health centre for persistent asthma. A patient should be recorded after the condition has stabilised, once regular long-term treatment has been decided. All the information recorded in the register is the same as that shown in the treatment form.

### **Page 1 of Register**

**Date:** Date of registration (day, month and year)

**Number:** The identification number of the first new patient with persistent asthma treated in the health centre will include the 4 digits of the current year, followed by the number 1 (2004/1). Successive numbers will be given for the following patients recorded in the register. This number is the same as that on the treatment form.

**Name:** Patient's first and last name.

**Address:** Patient's full address to enable the patient to be traced.

**Age:** Patient's age, in years.

**Sex:** **F** for female, **M** for male.

**Smoking habits:** **S** for smokers, **E** for patients who stopped smoking at least one month before registration, and **N** for those who have never smoked.

**Symptoms:** Record the severity of the symptoms evaluated according to their mean frequency over a long time period (a year or several months) before registration of the patient. The severity is recorded in the bottom section of the table in the patient's treatment form.

Use the following codes: **I** = intermittent; **MildP** = mild persistent; **ModP** = moderate persistent; **SP** = severe persistent.

**Best PEF:** Record the best PEF, after the patient has stabilised and before the prescription of long-term treatment, in l/min in the first column and in % predicted in the second column (as recorded in the treatment form).

**Asthma severity:** Record the severity of the condition as you have estimated it, using the following codes: **I** = intermittent asthma; **MildP** = mild persistent asthma;

**ModP** = moderate persistent asthma; **SP** = severe persistent asthma. The evaluation of asthma severity is based on the severity of the symptoms and on the level of the patient's best PEF, as explained in the text.

**Use of emergency services during the previous year:** In this column record the patient's use of emergency services *during the previous year* using the following codes: **E** = emergency services; **H** = hospitalisation on a medical ward; **I** = hospitalisation in intensive care, e.g., E5, H2, I1.

**Long-term corticosteroids prescribed:** This column is used to record drugs prescribed on a long-term basis, uniquely for daily corticosteroids in regular treatment (the other drugs prescribed are recorded in the treatment form but not in the register). Use the following codes: for inhaled corticosteroids (beclomethasone is most commonly prescribed) write **B**, followed by the daily dosage. For oral corticosteroids, as prednisone is most commonly prescribed, write **P** followed by the dose in mg (e.g., if a patient receives 2000 µg inhaled beclomethasone daily and 5 mg prednisone daily, write **B2000 P5**).

## Page 2 of Register

This page is used for the annual follow-up of the patient over several years. For each annual evaluation, two large columns are provided.

### 1. First column: patients still under follow-up

For those patients under follow-up after 1 year of care. This column is divided into 3 sub-columns to permit the progress of the disease to be evaluated.

**Asthma severity:** Record the current severity of the disease after 1 year of management using the following codes: **I** = intermittent; **MildP** = mild persistent; **ModP** = moderate persistent; **SP** = severe persistent; **A** = asymptomatic.

**Number of visits to the emergency services:** Record the total number of visits to the emergency services *during the year of follow-up* apart from the patient's regular appointments. Record 0 if the patient made no such visit.

**Number of hospitalisations:** Record the patient's total number of hospitalisations for asthma *during the year of follow-up*, whatever the ward in which the patient was hospitalised (medical, intensive care). Record 0 if the patient has not been hospitalised in the last year.

## **2. Second column: All patients registered at the beginning of treatment**

For those patients who are no longer attending the health centre for follow-up, check **ONE** of the 6 sub-columns corresponding to their outcome after 1 year:

**Died:** Any patient who has died of whatever cause during the year of follow-up.

**Transferred:** Any patient for whom the results of care are unknown and who has been sent to another health centre to continue care.

**Lost to follow-up:** Any patient who has not attended the health centre for the annual check-up at least in the 2 months following the appointment.

**Success:** Any patient for whom the severity of disease has diminished since the beginning of treatment **and** who has had **no visits** to the emergency services during the year of follow-up.

**Under control:** Any patient for whom the **severity** of the disease is stable or has diminished **and** for whom the number of visits to the emergency services has diminished.

**Failure:** Any patient whose case does not correspond to the other types of outcome.





