

ASTHMA

**A BACKGROUND PAPER FOR THE
ADULT LUNG HEALTH INITIATIVE**

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1. INTRODUCTION

Because of its frequency and the health costs it incurs, asthma is a world-wide public health problem. This is aggravated by the fact that most countries lack a rational method of managing this chronic disease.

Considerable efforts have been made to attempt to rationalise the management of asthma patients: in 1990 several National Consensus reports (1-7), and in 1992 an International Consensus Report (8) were published; in 1995 the National Heart, Lung, and Blood Institute (NHLBI) and the World Health Organization (WHO) collaborated in the preparation of a document entitled 'Global Initiative for Asthma (GINA)' (9), which proposes guidelines that are based on the latest scientific developments and are adaptable to the different situations in each country. In 1996, the International Union Against Tuberculosis and Lung Disease (IUATLD) adapted these guidelines in a publication entitled 'Management of Asthma in Adults: a Guide for Low Income Countries' (10), to be used as a basis for organising asthma management in developing countries, and in 1998 the third Pediatric Consensus Statement on the management of childhood asthma was published (11).

2. EPIDEMIOLOGY

2.1 Case definition

2.1.1 Current definition of asthma

The following definition was proposed by the International Consensus, and adopted by GINA: "Asthma is a chronic, inflammatory disorder of the airways in which many cells play a role, in particular mast cells, eosinophils and T lymphocytes. In susceptible individuals, this inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and cough, particularly at night and/or in the early morning. These symptoms are usually associated with widespread but variable airflow limitation that is least partly reversible either spontaneously or with treatment. The inflammation also causes an associated increase in airway responsiveness to a variety of stimuli."

This definition summarizes the progress made in the understanding of the pathology of asthma and its functional consequences; however it is not particularly operational.

2.1.2 Clinical operational definition

The operational definition proposed in the IUATLD Asthma Guide is essentially clinical: "Any patient who presents to the health service with chest symptoms which come and go, vary from day to day, and especially if they cause the patient to wake from sleep, should be suspected of having asthma and should be evaluated for it. If no other cause is found and the condition persists for some period of time, the patient should be considered to have asthma."

3. BURDEN OF DISEASE

Asthma is prevalent in most countries, including developing countries.

3.1 Asthma prevalence

The first surveys performed showed that the point prevalence of asthma varied from 0% in rural Gambia (12) to 25% of the adult population on the island of Tristan Da Cunha (13). In Africa, between 1976 and 1986, the highest rates were observed in the Ivory Coast, Tanzania and Kenya (3-9.8%), moderate prevalence in Algeria, Tunisia, Morocco, Nigeria, Benin and South Africa (1-5%), and very low prevalence in the Gambia and Zimbabwe (<1%) (14). However these surveys are difficult to compare given the differences in the methodologies used.

In 1986 the IUATLD published an international questionnaire which is currently used in most epidemiological surveys on asthma (15). The first international survey to employ this questionnaire using a standardised protocol was the 'European Community Respiratory Health Survey' (ECRHS), conducted in adults aged 20 - 44 years, in 48 centres and 22 countries (16). Only two centres in developing countries participated in the survey (Algiers and Bombay). The evaluation of the prevalence of asthma was made based on the prevalence of reported respiratory symptoms. This survey confirmed that the prevalence of asthma is variable from country to country, from one part of a country to another, and from one region of the world to another.

The European Community Respiratory Health Survey (ECRHS) Estimation of the prevalence of asthma in adults aged 20 - 44 years

Region or country	Prevalence
Australia and New Zealand	6.8 - 9.7%
USA and Northern Europe	> 5%
Western Europe and Mediterranean countries	1 - 4%
Algiers (Algeria)	2.4%
Bombay (India)	2.6%

A second international survey using a standardised protocol, the International Study of Asthma and Allergies in Childhood (ISAAC) (17) calculated the cumulative prevalence of asthma in children aged 13-14 years in 155 centres in 58 countries. The highest prevalences were found in Oceania (25.9%) and North America (16.5%), slightly lower rates in Latin America (13.4%), Western Europe (13%), the Eastern Mediterranean (10.7%), Africa (10.4%) and Pacific Asia (9.4%), and the lowest in South-East Asia (4.5%) and Eastern Europe (4.4%). This study confirmed not only that the prevalence of asthma is higher in industrialised countries, but also that it is already worryingly high in Latin America and Africa.

Whatever the country, the prevalence of asthma is higher in urban than in rural areas, and higher in children than in adults. Three quarters of asthma patients experience their first attack before the age of 20. In children asthma is more frequent in boys than in girls (sex ratio 1.5 - 3.3).

Since 1960 the trend of asthma prevalence in industrialised countries has risen: by about 6 - 10% in children (18) and even more in the USA, where it has risen by almost 50% in 10 years, mainly in poorer population groups (19). This augmentation is probably linked to a change in environmental factors, both inside (hermetically sealed windows, air conditioning, rugs and carpets, house pets, increased frequency of cockroaches and house mites), and outside (pollution, urbanisation) (20). Some of these factors are linked to a 'western' lifestyle: economisation of energy, changes in living habits; in Papua New Guinea, asthma prevalence rose from 0.2% to 7.3% in 15 years, coinciding with the introduction of blankets (21). In developing countries an increase in asthma prevalence has already been observed in certain countries and will no doubt become more problematic in the near future, with urbanisation and unhygienic living conditions, the often warm and humid climates which favour the proliferation of house mites and moulds, increases in pollution and the adoption of western lifestyles by a greater proportion of the population.

3.2 The severity of asthma

Morbidity

Asthma morbidity has increased world-wide in the last 20 years (20,22) particularly in terms of hospitalisations. The increases, observed particularly in the United Kingdom and in the USA, are only partly due to the rise in prevalence, and seem to be linked to deficiencies in patient management, especially in disadvantaged population groups: lack of access to health care, absence or under-utilisation of inhaled corticosteroids, and lack of patient health education. However, since 1990 this trend seems to have reversed, particularly in New Zealand (23).

Mortality

Although mortality data are difficult to interpret (due to under-notification, changes in the International Classification of Diseases [ICD] in 1979, and current better understanding of asthma), the rise in asthma mortality rates in most industrialised countries seems to be a reasonable reflection of the truth. Between 1985 and 1987 the following rates were recorded: 2 per 100 000 population in the USA and Hong-Kong, 7/100 000 in New Zealand, and more than 9/100 000 in the former German Federal Republic. Within countries the rate was much higher in disadvantaged population groups: it was three times higher in the black population than among whites in the USA, and five times higher in the Maori than the European population in New Zealand (24) These deaths occurred mainly in the young, and in 50-60% of cases at the patient's home. The results of case-control studies led to the conclusion that these deaths were avoidable: they took place after severe asthma attacks whose severity was underestimated and under-treated, in individuals who were most often not or inadequately treated in the long term.

Since 1990 this rising trend has stopped or been reversed in certain industrialised countries. Thus in the United Kingdom (25) the trend has fallen since 1990, particularly in the youngest population. This drop in mortality, despite the rise in prevalence, is probably linked to better use of inhaled corticosteroids.

Thus better access to health care, appropriate use of inhaled corticosteroids and patient health education should lead to a reduction in asthma morbidity and mortality.

3.3 Cost and economic repercussions

The economic repercussions of asthma disease are heavy, both for the community and for patients and their families.

Cost of asthma

The cost of asthma includes direct costs (the cost of medications, consultations and hospitalisations), indirect costs linked to loss of productivity (days lost from work or school, job losses, premature death), and intangible costs, which are often important but difficult to calculate (effects on family and social life and sporting activities, or professional or emotional repercussions) (26).

In 1990 in the USA the cost of asthma represented 0.5-1% of all health expenditure (27,28). The direct cost of asthma was 3.64 billion US dollars, while the indirect cost was 2.6 billion dollars; the cost of asthma per year and per patient was calculated at \$640 US. This varies according to country (from \$326 US in Australia in 1991 to \$1315 US in Sweden in 1975) and according to asthma severity (it was estimated that 80-90% of health expenditure was allocated for fewer than 10% of asthma patients - those with severe asthma). One study has shown that the introduction of high-dose inhaled corticosteroids in the treatment of patients presenting with severe asthma reduced the number of hospital days by 80%, which led to a huge fall in health costs for these patients (29). One can therefore understand that the cost of the disease depends enormously on the choice of methods of patient management, and why it is so different from one country to the next.

Disability-adjusted life years (DALYs)

Respiratory diseases represented, in 1990, 18% of the global burden of disease measured by DALYs (30). In 1990 the DALY for asthma was lower than for tuberculosis: 3.4 for tuberculosis vs 0.9 for asthma. The DALY for asthma differs from one region of the world to another: sub-Saharan Africa (0.6), India (0.6), China (1.8), low and middle-income Asian economies and Pacific and Indian Ocean Islands (0.8), Latin America and the Caribbean (1.1), the Middle-Eastern crescent (0.8), the former socialist economies of Eastern and Central Europe (0.9), and established market economies (1.2).

4. ETIOLOGY/PATHOGENESIS

A number of risk factors are associated with asthma. Some cause asthma and lead to chronic inflammation of the airways, resulting in airways hyperresponsiveness. Other risk factors contribute to exacerbations of asthma (triggers), and when they act on these hyper-reactive airways they provoke airways obstruction of variable intensity, leading to symptoms of asthma. The airways obstruction and the symptoms aggravate the inflammation, thus creating a vicious circle. The chronic nature of asthma is based on the onset and aggravation of inflammation in the airways.

4.1 Factors leading to the development of asthma

Predisposing factors correspond to a subject's individual susceptibility (31), *atopy*, which is linked in part to genetic transmission, is the principal predisposing factor; a number of genes are involved, underlining the importance of *genetic factors*. The *predominance of male asthmatics* seems to be linked to narrower airways and greater airway tone in boys than in girls. After puberty, when the size of the airways is the same in both sexes, this difference in prevalence disappears.

Causal factors lead to the onset of disease: *many domestic allergens are found inside houses* (32,33): *house mites* (dermatophagoides) are the most commonly found, and constitute the principal asthma-inducing factor world-wide. *Warm-blooded domestic animals*, rodents, dogs, and especially cats, produce different allergens. *Cockroaches* also seem to be important causal factors in some parts of the world. Finally, *moulds* (alternaria, aspergillus, candida), which proliferate in dark, humid and unaired houses, are frequent causes of asthma. *Exterior allergens* consist mainly of *pollens*, whose concentration varies depending on environmental and atmospheric conditions, and environmental *moulds*. There are many *occupational sensitizers* (such as flour, wood dust, isocyanates, soy bean dust, latex), which can be found in a large number of professions (34). *Medications* such aspirin and non-steroid anti-inflammatories can cause asthma attacks in certain individuals.

Contributing factors increase the risk of developing asthma in subjects exposed to causal factors. These are mainly *passive smoking*, particularly in children aged under 2 years (35); *active smoking*, which heightens the risk of triggering occupational asthma in exposed workers; *domestic pollution* through oxides and formaldehyde released during cooking (natural gas, propane, wood) or during construction work (paint, isocyanates); *viral respiratory infections*, particularly in small children (36). The contributing role of *air pollution* is still under debate, but certain industrial (sulphur dioxide) et photochemical (ozone and oxidants) pollutants have been incriminated (35). Other factors associated with asthma, such as *low birth weight* (< 2.5 kg), and *allergen-containing elements in infants' diets* have also been identified.

Alimentary factors have been incriminated in the development of asthma; changes in diet due to a 'westernised' life style could be one of the factors that would explain the increase in asthma prevalence in recent decades in industrialised countries (38). Reduced consumption of certain foods (green vegetables, fresh fruit, red meat, fresh fish, and animal saturated fats) that contain elements with antioxidant activity (Vitamins A and C, carotene, zinc, magnesium) seems to create weaknesses in the organism's defences against certain allergens (38,39). A recent study provides evidence that diet may have a modulatory effect on bronchial reactivity, which is consistent with the hypothesis that the observed reduction in antioxidant intake in the British diet over the last 25 years has been a factor in the increase in asthma prevalence in this population over the same period (40).

4.2 Trigger factors

These factors create inflammation and provoke airflow limitation. They include not only *causal or contributing factors*, but also other factors that cannot lead to disease but can exacerbate it. These factors are often the same for a patient and should be identified carefully, so as to propose

preventive measures that are adapted to each patient. *Ear, nose and throat (ENT) and bacterial or viral infections* and *changes in climate/weather* (cooling temperatures, humidity, fog) are the most frequently observed trigger factors, both in adults and in children. *Exercise* is a factor that can trigger brief episodes of chest tightness, particularly in children and athletes. *Endocrine factors* are often observed in women for whom attacks are triggered by menstruation, pregnancy or menopause. Other factors are more rare, such as *violent emotion, laughing, gastro-oesophageal reflux, certain foods or additives* (monosodium glutamate, preservatives, food colouring).

In most asthma patients several of the above factors can be found (41,42), except in the case of occupational asthma at the beginning of its evolution, where the only factor observed will be occupational.

5. PROVISION OF HEALTH CARE

5.1 Objectives

The organisation of the distribution of health care delivery has as its main target the diminution of the 'burden of disease'. It should allow the best possible management of patients through application of the most cost-effective measures. Standardised management provides consistent, reproducible and cost-effective results. Patient follow-up, often neglected, can be incorporated easily into a standardised management strategy.

5.2 Health system structure

Due to its relation with other respiratory disease, the invalidating consequences if not well managed, and its frequency (asthma is much more frequent than tuberculosis), the organisation of asthma management should be integrated into the general health services, and thus be included in the district's 'minimum package of activities' (MPA).

5.3 Current health care distribution

Limited studies conducted in developing countries, particularly in Northern Africa (43-46) have shown that asthma patients are rarely offered regular management by a single centre; they present as and when necessary, in different centres, rarely take adequate long term treatment, and often end up treating themselves or using traditional medicines. There is therefore an over-consumption of drugs that have little (long-acting theophylline taken for an insufficient duration) or no (antibiotics, bromhexin) effect, or drugs that have dangerous side effects (long term systemic or oral corticosteroids).

The ineffective management of asthmatics by the public health services has led to the population's loss of trust in centres that do not respond to their needs. The private, and preferably specialised, sector is therefore a more attractive choice for those patients who wish to obtain a more effective answer to their problems; however only a minority of patients can afford their services.

6. DIAGNOSIS

6.1 State of the art technology/options

The tools necessary for diagnosis

History taking

This is brief when the patient is seen during an asthma attack and the diagnosis is obvious. However it must be performed thoroughly in periods between attacks. History taking allows one to retrace previous episodes of the disease, to identify the risk factors and to measure the severity of the symptoms. The use of a standardised, detailed questionnaire will facilitate systematic verification of all causal and trigger factors. A standardised form for recording the different elements during history taking is provided in the IUATLD Asthma Guide (Appendix 1: Asthma treatment card).

Clinical examination

During attacks clinical signs secondary to airways obstruction, including dyspnea, wheezing and hyperinflation, are very characteristic of asthma and enable a diagnosis to be made rapidly. Otherwise, in the phase of stabilisation, the examination can be performed normally and should not yield abnormal symptoms, except in the case of severe persistent asthma where symptoms are continuous.

Measurement of peak expiratory flow (PEF)

The peak flow meter is a small tool that is practical, reliable and cheap, for detecting a patient's peak expiratory flow in a few moments. The peak flow generally correlates well with the one second Forced Expiratory Volume (FEV₁), and thus enables the measurement of the subject's airflow limitation. This measurement is very simple; however like all function tests the result depends on a rigorously applied technique. As it can be repeated very easily, the PEF measurement is the main tool for measuring progress in asthma management (47,48).

In order to avoid contamination a disposable carton mouthpiece is used for each patient. If no disposable ones are available, the plastic mouthpiece should be disinfected between patients. The PEF is simple to maintain: it should be dismantled and washed thoroughly with soapy water every six months.

PEF measurement before salbutamol

The patient's real PEF (PEFR) is measured at each appointment. The results (in litre/min) of the PEF recorded are compared to the norms, thus permitting the calculation of the percentage of his PEF in relation to the predicted PEF. This percentage (PEFR %) allows the level of airflow limitation presented by the patient at the time of measurement to be calculated.

PEF measurement after salbutamol

This is measured 5-10 minutes after inhalation of two puffs of salbutamol by the patient. A comparison of the two PEF measurements before and after salbutamol enables the patient's degree of airflow reversibility to be measured.

The asthma patient's best personal PEF

This PEF measurement is performed once the maximal regression of symptoms seems to have been obtained, possibly after a short period of corticosteroid treatment. This measurement permits an evaluation of the presence or absence of airflow limitation between attacks, and provides an objective measurement of the disease's severity.

PEF variability

Whatever the severity of the asthma, it is characterised by episodes of reversible airflow limitation, which can be observed in the PEF variability. Observation of PEF variations of more than 20% before and after salbutamol, or at different times of the day, or from one day to the next, is a characteristic indication of reversible airways limitation. This reversibility allows a clear diagnosis of asthma to be made.

Other lung function tests

Spirometry

Spirometers are used to measure Forced Vital Capacity (FVC), FEV₁ and the FEV₁/FVC index, which calculate airflow limitation more accurately than a peak flow meter. This measurement can also be made before and after salbutamol.

The most robust apparatus for measuring is the mechanical spirometer (e.g. spiograph, vitalograph). This costly function test must be performed by experienced technicians. Despite its greater accuracy, it in fact provides less information on the variations in the patient's flow limitation and on the severity of the disease than regular measurement by peak flow meter.

Bronchial provocation tests

Because of the almost constant hyperresponsiveness in asthma patients, the inhalation of a bronchoconstrictor (such as histamine or carbachol) will provoke airflow limitation. A drop in FEV₁ of at least 20%, which is entirely reversible after the inhalation of salbutamol, is a clear sign of asthma.

This test is not necessary for confirming asthma when the clinical signs are typical and PEF variability has been observed. It is useful, however, in specific cases where diagnosis is difficult or for research.

Other tests

Atopic tests, such as skin-prick tests with the principal allergens, if they are done appropriately, can confirm the existence of allergic factors among the trigger factors. Measurement of specific IgE, which is much more costly, requires the services of a specialised laboratory, and is not more specific than skin testing. In practice, particularly in developing countries, they are of no interest, either for diagnosis or for patient management.

On the whole, the most effective tools for diagnosing asthma are a combination of standardised history taking and a peak flow meter.

6.2 Methods to use depending on the circumstances of diagnosis

Patient seen during an attack

The objectives of the diagnosis are to confirm the diagnosis of an asthma attack and to evaluate its severity in order to decide what treatment to give.

Confirming the diagnosis of asthma attack

During an asthma attack the clinical signs are obvious. The patient or family should be questioned briefly, mainly to ascertain whether or not the patient is known to be asthmatic, the time of the beginning of the attack and, if possible, any treatment taken before the consultation.

Evaluating the degree of severity

Evaluation of the severity is paramount and should be done rapidly in order to begin urgent treatment. This evaluation is done by checking the gravity of the clinical signs and measuring the PEF of the patient before and after bronchodilation. In the most severe attacks measurement of arterial oxygen saturation and blood gas analysis are also used to evaluate its severity. A table for evaluating the degree of severity is given in the GINA report.

Patient seen outside of an asthma attack

Confirming the diagnosis of asthma

If the patient has been examined previously during an attack the diagnosis is clear. Diagnosis can be more difficult if the patient has never been seen during an attack. In such cases the diagnosis is possible with a patient who complains during consultation of 'recurrent breathing difficulties', or of less characteristic symptoms such as cough or phlegm, but which, given their recurrent nature, seem to indicate a diagnosis of asthma. The history taking should be precise and should look for the presence and characteristics of each respiratory symptom, factors leading to the development of asthma, and trigger factors which can indicate asthma.

In less clear cases history taking should end with questions aimed at eliminating or confirming the diagnosis of other frequent diseases that can be indicated in patients complaining of recurrent breathing difficulties: chronic bronchitis, another chronic bronchial disease, recurrent paroxysmal dyspnea in a cardiac patient, or neurotonic dyspnea. The majority of asthma cases

can be diagnosed by a thorough clinical examination. Measurement of peak flow before and after bronchodilation can confirm the diagnosis immediately, or during subsequent consultations observing PEF variability over time.

Evaluating the severity of the disease

The interview and PEF measurement can determine the frequency and severity of clinical symptoms and the level of lung function impairment.

An evaluation of the severity of clinical symptoms is based mainly on their frequency and importance. It is before beginning treatment, during the initial assessment, that it should be established whether the symptoms are:

- ***Intermittent***: the symptoms disappear for long periods of time. When the symptoms appear, they occur less than once a week. The attacks last only a few hours or days.
- ***Persistent***: the symptoms occur more than once a week. They are classified as *Mild persistent* (symptoms occur less than once a day); *Moderate persistent* (symptoms are daily, and the attacks have an effect on activities and sleep); *Severe persistent* (symptoms are continuous, with frequent attacks, symptoms limit physical activity and often occur at night). If the patient is already under treatment it is useful to make a note of the use of bronchodilators, which gives an objective idea of the episodes of bronchial obstruction.

The level of functional impairment is the unique objective criterion of the disease's severity. It must be performed in a patient when in a stable condition. The measurement of the patient's best PEF after bronchodilation or a study of diurnal variability can distinguish between three grades of increasing severity:

- PEF \geq 80%, variability $<$ 20%
- PEF \geq 60 - 80%, variability 20 -30%
- PEF $<$ 60%, variability $>$ 30%

Classification of patients according to asthma severity

The classification of patients according to severity is necessary in order to begin adequate treatment. This classification is never definitive, due to the naturally evolving nature of the disease and the effects of treatment. The classification proposed in the GINA report, based on the severity of symptoms and of functional impairment, distinguishes four grades of increasing severity: intermittent asthma, mild persistent asthma, moderate persistent asthma and severe persistent asthma.

b) Applicability to developing country settings

Patient seen outside of an attack

The diagnosis of asthma and the classification of patients according to severity requires an initial assessment comprised of interview, clinical examination and PEF measurement (9,10). No other tests are necessary for the management of the majority of asthma patients. Because of the

low cost of these tools, the diagnosis of asthma can be performed in developing countries in line with the latest scientific concepts. An adapted version of the Classification of Asthma Severity published in the GINA report is given in the IUATLD Asthma Guide (Appendix 2.1).

Patient seen during an attack

In developing countries arterial blood gas and oxygen saturation analysis are usually unavailable, and will no doubt continue to be so in the future, except in some University Hospitals. In these countries the classification of asthma severity can be done only by clinical evaluation and measuring the PEF of the patients. The IUATLD's simplified version of the table published in the GINA report (Appendix 2.2) permits classification of attacks into mild, moderate, severe, and imminent arrest.

e) Applicability by level of health facility

All district health facilities should participate in asthma diagnosis.

Central district health facility - Reference Centre: apart from diagnosing the majority of asthma cases presenting along with other patients at the health centre, the physician must also diagnose those cases referred by other physicians or nurses in the district due to problems of difficult diagnosis or for a better evaluation of functional impairment. Cases suspected of occupational asthma or who represent a specific diagnostic problem that need to be referred to an upper level facility should be identified.

District health facility with a physician: the majority of asthma cases are identified, as are cases of difficult diagnosis to refer to the District Health Centre.

District health facility with a nurse: asthma attacks are identified and classified according to severity; suspected asthma patients are identified.

Health post with community health workers. At the community level, health workers can participate in the identification of asthma suspects, for example by recognising asthma attacks.

d) Cost-effectiveness of diagnostic options

The goal is to ensure the correct diagnosis of the majority of asthmatics in a district at minimum cost.

The peak flow meter is robust, trustworthy, cheap (approx \$20 US). This tool, which permits not only confirmation of the diagnosis for most asthmatic patients but also monitoring of the patient's long-term evolution, is clearly cost-effective. No other tests, lung function or otherwise, which cost much more and which, furthermore, have even higher running costs (consumables, maintenance, technician training and salaries), without the same level of performance, have been retained for confirming diagnosis.

It is not essential for the district health centre to be equipped with a spirometer for the diagnosis of asthma. However, if this tool is available, it may be used to evaluate the level of limitation of a severe case of asthma more accurately (49). A spirometer is necessary, however, at regional level.

6.3 Performance and quality indicators

The number of new cases of asthma diagnosed by district, and classified by severity each year, is the district's basic performance indicator. In order to assess the quality of diagnosis, it is useful to check, for each patient, the relation between the disease's severity and the two criteria used to evaluate it: the severity of the symptoms and the level of functional impairment, measured by PEF (as suggested in the IUATLD Guide). These two evaluations can be noted, in the patient's file or on the patient card, at the first appointment and at each subsequent consultation during long-term monitoring. The notification of persistent asthma cases in a register, as proposed by the IUATLD in its Asthma Guide, means that by a simple verification of the register it can be checked that each patient has both measurements.

6.4 Integration into the Minimum Package of PHC activities

a) Aspects already integrated

In most developing countries, and particularly in Africa, there are no specialised services for asthma management, and peak flow meters are rarely available. Some University Hospitals have spirometers or vitalographs, and few have bronchial provocation tests. The diagnosis of asthma is usually clinical, and is performed in the general medical services, the former tuberculosis clinics, the chest services and the private sector.

b) Aspects that can be integrated effectively

The following aspects of asthma management can be integrated easily into the district's general health services:

- *Identification and severity classification of asthma attacks.*
- *Identification of the majority of asthma cases and classification of patients according to disease severity.*
- *Identification of cases needing referral to an upper level facility or to a specialist for diagnosis: difficult diagnosis, cases suspected of occupational asthma (49,50).*

c) Drugs, equipment and tools necessary for the intervention

Central District Health Facility

Basic equipment consists of peak flow meters, spacers, and inhaled salbutamol for bronchodilation tests. A mechanical spirometer may be useful, if available, but it is not essential at this level (50,51).

The main tool is a standardised questionnaire aimed at identifying asthmatic patients and evaluating the severity of their disease. This questionnaire can be used with a standardised patient card, where the results of the questionnaire and the PEF are recorded. A model is given in the IUATLD Asthma Guide (Appendix 1). An algorithm for differential diagnosis, and a table for evaluating the severity of the attacks and the disease can also be made available in the facility (e.g. in the form of posters).

For case notification a register for recording new cases of persistent asthma and a three-monthly asthma notification card would be useful for evaluating the district's diagnostic activities. Models are given in the IUATLD Asthma Guide and are undergoing testing.

District health facilities with physicians

The only necessary equipment consists of peak flow meters, a spacer, and inhaled salbutamol. The most important tools are once again the standardised questionnaire for identifying asthmatic patients and the severity of their disease, an algorithm for differential diagnosis, and tables for the classification of the severity of the attacks and the disease.

District health facilities with nurses

A standardised questionnaire for identifying asthmatic patients, algorithms for differential diagnosis and possibly a table to allow them to evaluate the severity of attacks according to clinical signs. If possible, peak flow meters are very useful at this level.

Health post with community health workers (at the community level)

Posters of clinical signs indicating asthma, and possibly an algorithm for identifying asthma patients can be useful if the health worker has the ability to use them.

Training of all health personnel must be assured. It should include a theory module to allow them to acquire current scientific knowledge on asthma diagnosis, and practical training to teach them how to use a peak flow meter and other tools correctly.

Supervision of the District Health Centre should be assured by an upper level facility (regional or central); supervision of the other facilities should be one of the duties of the physician in charge of the District Health Centre.

6.5 Role of the private sector

The private sector participates in the identification of asthma cases. Publication of consensus reports or guidelines can improve both the quality (use of the peak flow meter) and the effectiveness of diagnosis in this sector (progressive abandoning of expensive and unnecessary initial tests such as sputum eosinophil counts, skin-prick tests, total and specific IgE, chest X-ray).

7. TREATMENT

7.1 State of the art technology/options

The two main aspects of asthma management are emergency treatment of asthma attacks and long term treatment of persistent asthma.

The principal objectives of treatment are the following:

- for **attacks**: to give immediate relief to the patient by relieving the airflow limitation as rapidly as possible, to prevent relapse, and in severe attack to prevent death.

- for **long term treatment**: to control the asthma with a lessening (and if possible complete disappearance) of symptoms, and maximum normalisation of PEF.

a) Medications

The essential medications for asthma can be classified into **relievers** (those that relieve the patient's symptoms) and **controllers** (those that are taken daily on a long term basis and control the disease).

Controller medications

Among the controllers, **corticosteroids** are the most effective drugs and are the only ones with a powerful anti-inflammatory action. **Systemic corticosteroids** used over a long period can have major side effects: osteoporosis, hypertension, diabetes, obesity, cataracts, and adrenal suppression. For this reason long term treatment is indicated only for persistent severe asthmas that cannot be controlled by another treatment. **Oral corticosteroids** (such as prednisone and methylprednisone) have slightly less severe side effects than systemic corticosteroids; however, when used long-term they have a high level of systemic toxicity. Because of their great effectiveness and minor side effects, **inhaled corticosteroids** were an important discovery in asthma treatment (52,53). In most cases asthma is controlled from the first month of treatment. Local secondary effects are minor (dysphonia, oral candidiasis). Systemic effects have been described mainly in children: skin thinning, adrenal suppression and decrease of bone metabolism. These side effects, both local and systemic, can be prevented or reduced by asking the patient to use a spacer and to rinse the mouth after inhaling. At doses of 400µg/day in children and 800µg/day in adults, inhaled corticosteroids are safe (54). The main inhaled corticosteroids are **beclomethasone dipropionate** (the oldest in use); **budesonide**, more recently introduced, is more expensive and of an efficacy comparable with that of beclomethasone, dose for dose; **fluticasone**, the most recent and the least toxic. Dose for dose, fluticasone is as effective as twice the amount of beclomethasone on airways hyperresponsiveness, without increasing systemic activity (55).

Other drugs are considered as controllers, but in fact have a lesser effectiveness than inhaled corticosteroids. The anti-inflammatory action of **inhaled sodium cromoglycate** is not fully understood; it seems to act on early- and late-phased allergen-induced airflow limitation. It reduces the symptoms and prevents attacks recurring in a number of asthmatic patients, and has almost no side effects (56). **Inhaled nedocromil sodium** seems to inhibit the activation of several types of inflammatory cells, but has no effect on the chronic inflammatory changes in the airways. It reduces symptoms and airway responsiveness in both children and adults. No side effects have been observed (57).

Finally, **long action bronchodilators** can be included in the category of controller medications, as long term daily treatment with these reduces the symptoms of asthma. Their role in long term asthma treatment is still under discussion. **Sustained-release theophylline** inhibits both early and late allergic reactions. Essentially a muscle relaxant, it also has a minor effect on airway hyperresponsiveness and inflammation. Theophylline has a narrow therapeutic margin: below a serum concentration of 5 µg/ml, it is ineffective, above 15 µg/ml serious, and sometimes even fatal, side effects may occur. The most frequent side effects are

gastrointestinal (nausea, vomiting, diarrhoea, anorexia), cardiac (tachycardia, arrhythmia) symptoms, or related to the central nervous system (headaches, insomnia, seizures). Theophylline metabolism varies from one individual to another; it can alter with pregnancy and during certain infections (febrile illness, congestive heart failure, liver disease) or when other medications are being taken concomitantly (macrolides, cimetidine). For these reasons appropriate dosing should be based on serum concentrations that are monitored regularly and checked if adverse effects develop (58,59). As serum concentrations of theophylline cannot be measured in developing countries, except in the rare laboratories in University Hospitals, it is difficult to recommend its use in these countries. **Long acting beta₂ agonists**, taken orally, are bronchodilators whose 12 hour duration of action permits a better control of asthma by reducing nocturnal symptoms. Side effects are frequent, and consist of palpitations, anxiety, pyrosis and skeletal muscle tremor. **Inhaled long acting beta₂ agonists** have a better bronchodilator action; they inhibit allergic early and late allergen-induced reaction, but have no anti-inflammatory action. They reduce airway hyperresponsiveness, and no rebound phenomenon is experienced when treatment is stopped. Their duration of action of at least 12 hours is useful for preventing nocturnal symptoms (60,61). Side effects, mainly cardiovascular stimulation, are rare. Forms currently in use are salmeterol (50µg a puff) and formoterol (24µg). Among controllers neither drug is of any significant value in young people or in adults when compared with the great value of inhaled steroids.

It seems that the addition of theophylline or long acting beta₂ agonists to inhaled corticosteroids in uncontrolled persistent asthma controls the asthma in a number of cases without the need to double the dosage of inhaled corticosteroids (62-64). Their very high cost is, however, an obstacle.

Reliever medications

These are drugs that act quickly to relieve bronchoconstriction; **short acting inhaled beta₂ agonists** are the most effective. As the effects of low drug doses by the inhaled route are rapid, this is by far the preferred method, and they are the method of choice for all exacerbations and for prevention of exercise-induced asthma. The different inhaled beta₂ (salbutamol, fenoterol, terbutalin) have a similar effectiveness. The rare side effects (palpitations, skeletal muscle tremor, hypokalemia) have been observed mainly with fenoterol, which is the least beta₂ selective, and almost never with salbutamol. If taken frequently or regularly for a long duration, tachyphylaxis, which can be treated with corticosteroids, can occur. These are grounds for much debate concerning the respective advantages of two methods of prescribing inhaled beta₂ agonists: regular or on demand.^{65,66} **Short course systemic corticotherapy** is used with inhaled beta₂ agonists to treat bronchoconstriction in moderate or severe exacerbations of asthma. It begins to act only 4-6 hours after application, but as it acts on the inflammation, it aids in the liberation of the airways, and above all it prevents relapse. **Prenisone** 20-40 mg is used most often; the duration of treatment is usually 8-10 days and must allow patients to return to their best PEF.

The other relievers are not very effective and play a minor role, if any, in asthma management. **Inhaled anticholinergics** such as **ipratropium bromide** have a bronchodilating action and reduce the intrinsic vagal tone. They have no action on early and late allergic reaction or on exercise-induced asthma. They are of poor effectiveness and slow action (30-60 minutes). **Short acting theophylline**, administered orally or parenterally, is much less efficient

than inhaled beta₂ agonists. Used in conjunction with an inhaled beta₂ agonist, it has no significant additional effect on bronchodilation. Its use is difficult due to the frequent and severe side effects it can have when overprescribed.

Long term treatment of asthma is a stepwise approach, where each step corresponds to a degree of the disease's severity. Long term monitoring of a patient consists of transitions from one step to the next, as the disease progresses. The treatments proposed in the GINA report, both long term and emergency, are stepwise approaches. All the medications mentioned above can be used. In this approach, it is best to start with higher effective levels of treatment and then reduce dosage once control has been achieved.

b) Applicability to developing country settings

A wide range of medications is used to treat asthma, most of which are costly (Appendix 3). For developing countries, the choice of medications and of management practices must be based on several criteria, namely the best cost-effectiveness ratio, minimal side effects, and optimal acceptability, so as to improve compliance and the development of health services (10).

For long-term treatment

Among the *controller medications*, *inhaled corticosteroids* are the only ones with a powerful anti-inflammatory action and low toxicity. As per its definition, asthma is a chronic inflammation of the airways, and therefore this medication is essential for correct management of persistent asthmas, including those in children. The alternative proposed in the GINA report for children - cromoglycate - cannot be adopted in developing countries due to its prohibitive cost. Long term oral corticotherapy is restricted to the treatment of severe persistent asthma that cannot be controlled by a dose of 2000 µg inhaled corticosteroid.

The association of other controller medications with inhaled corticosteroids in severe persistent asthmas cannot be envisaged in developing countries because of the only very slight increase in effectiveness in these very expensive drugs (as in the case of long action inhaled beta₂ agonists), or because they are impossible to prescribe safely in these countries (as in the case of sustained release theophylline).

Among reliever medications, the least expensive and most effective *inhaled beta₂ agonists* can be selected. *Short course oral corticotherapy*, which is very cheap and non toxic, can be prescribed in the case of clinical deterioration or moderate or severe exacerbation. Association with other relievers cannot be envisaged, due to the minimal gain in efficacy, an increase in side effects, and the unnecessary increase in treatment costs.

Based on these choices, long term treatment can be organised as proposed in the IUATLD Asthma Guide (Appendix 4). For the management of children aged over 5 years the same treatment schedules can be used, halving the dose of inhaled beclomethasone.

For attacks

In the treatment of attacks, if most of the measures proposed by the GINA report are applicable, others, particularly the evacuation measures, which are based on the development of health services in the industrialised countries, cannot always be applied in developing countries. Consequently, for severe attacks and imminent respiratory arrest, transfer by an ambulance equipped with oxygen to a specialised emergency service is usually impossible. The staged treatment approach for patients given in the IUATLD Asthma Guide attempts to address these problems (Appendix 5). Supplementary essential drugs are necessary: *injectable hydrocortisone* and *inhalable and injectable salbutamol*. Other tools are necessary for a service equipped for intensive care, where the most severe attacks will be treated: *a nebuliser* and *a source of oxygen* (bottled, or even better, if the unit has access to electricity, an oxygen concentrator). If the District Health Centre does not have this equipment, particularly oxygen, the maximum emergency treatment must be given, and attempts must be made to evacuate the patient to the nearest medical service that has access to oxygen.

The prescription of antibiotics is unnecessary unless clinical signs are indicative of concomitant acute respiratory infection (high temperature and/or purulent sputum).

c) Applicability by level of health facility

Central district health facility: reference centre or district hospital. A number of services can be provided (67,68):

- complete management of cases of severe persistent asthma;
- decision-making concerning the initial treatment and annual evaluation of cases of persistent
- asthma in the district;
- management of asthma attacks, particularly in the case of severe asthma.

District health facility with physician

This facility can carry out a large number of management-related services:

- management of intermittent asthma;
- long term surveillance of cases of persistent asthma in the community, in coordination with the District's Chief Medical Officer;
- initial management of asthma attacks of whatever severity, evacuating severe attacks to centres equipped with oxygen at least.

District health facility with nurse

This type of centre can take charge of cases with intermittent asthma and refer cases with persistent asthma to the central district health facility. For asthma attacks, this facility can

manage mild attacks and refer moderate and severe cases to the nearest health facility with a physician (after administering first aid - salbutamol inhalation and corticosteroids in tablet form).

Community level

Recognition of asthma attacks and referral to the nearest health facility.

d) Cost-effectiveness of treatment options

Long term treatment of asthma must consist of at least a corticosteroid and a bronchodilator. The cost-effectiveness of inhaled corticosteroids has been proven in a number of studies performed in industrialised countries (69-71), and in at least one study in a developing country (Sri Lanka (72)). Among inhaled corticosteroids, beclomethasone, whose effectiveness needs no further proof, is the least costly, and given the length of time it has been on the market its price may well fall even further in the future. Prednisone, a relatively cheap corticosteroid, is already widely used in developing countries. Of the bronchodilators, inhaled salbutamol is one of the most effective and least expensive drugs.

The idea of basing treatment on only three drugs has a number of advantages: it keeps side effects to a minimum, it improves compliance, and costs are not increased for a minimal gain in efficacy. However, even if this kind of treatment schedule is adopted, because of the high costs the drugs remain inaccessible for the great majority of asthmatics, especially in sub-Saharan Africa (73).

Taking the basic price of anti-asthmatics on the French market, the cost of one year's standard treatment consisting of 250 µg inhaled beclomethasone and 100 µg inhaled salbutamol, as given in the IUATLD Guide (persistent mild asthma: 730 doses of inhaled beclomethasone and 1095 doses of inhaled salbutamol; persistent severe asthma: 2920 doses of inhaled beclomethasone and 1095 doses of inhaled salbutamol), comes to approximately \$145 and \$465 US, respectively, for persistent mild asthma and persistent severe asthma. However, if one takes into account the lower prices offered to the IUATLD by one independent laboratory, these prices would fall to \$18 and \$50, respectively (Appendix 3, c). This huge difference in cost shows that in the future it will be possible to obtain reasonably priced treatments, provided that national and international actions are taken to acquire these essential drugs at the best prices.

The idea of centralising the management of all cases of persistent asthma at the District Health Centre from the beginning of initial treatment is debatable, particularly if there are physicians in other health facilities who are capable of managing them. The following reasons are given:

- notification of persistent asthma cases can be done by a single district health facility where a register of patients with chronic respiratory infections can be established;
- the initial long term treatment can be recorded in this register;

- the beginning of initial treatment and its annual evaluation can be performed by a physician who will thus have more experience, given the number of patients managed at that centre;
- at the start of the implementation of the integrated programme, physician training can target the doctors in these health facilities.

8. INDICATORS FOR MONITORING PERFORMANCE

The main indicator is the distribution of the treatment schedules of new cases of persistent asthma diagnosed in the district each year. The quality of the treatment regimens prescribed can be checked by comparison with the disease severity on the patient card, or the register if there is one.

The amount of inhaled corticosteroids used by the district, if available, would be a good indicator of the number of cases of persistent asthma who are really following treatment in the district (total consumption includes newly diagnosed cases and those still on treatment).

The results of treatment can be given by cohort, if the IUATLD register is used, by studying the outcome of patients recorded in the register each year, over a period of five years.

9. INTEGRATION INTO THE MINIMUM PACKAGE OF PHC ACTIVITIES

a) What aspects are already integrated?

There are very few specialised services caring for asthmatic patients in developing countries. In middle income countries some clinics with chest or allergy specialists manage those patients who can afford their services. Management of all other patients, i.e. the majority of asthma patients, is assured by the general health services.

b) What aspects can be efficiently integrated?

The management of asthma patients can be totally integrated into the general health services, on condition that the health personnel involved are trained and/or retrained and supervised.

In order for integration to be successful, a physician at the intermediate level needs to work in coordination with the districts in order to ensure care for the patients referred by the districts, to organise training and retraining of health personnel (74), and to ensure supervision and evaluation of all of the districts in the region.

c) List of the essential drugs, equipment and tools needed for intervention

Essential drugs

Type of medication	Generic name	Mode of administration and dosage
Anti-inflammatory Corticosteroid	Beclomethasone Prednisone Hydrocortisone*	Aerosol: 250 µg per puff Tablets: 1 mg, 5 mg Vial: 100 mg (i.v.)*
Bronchodilator Beta ₂ sympathomimetic	Salbutamol	Aerosol: 200 µg per puff Nebulizer solution: 5mg/ml*

* to use only for an asthma attack

9.1 Essential equipment

Apart from the peak flow meters and spacers already necessary for diagnosing asthma, some centres will need a source of oxygen and, particularly for children, a nebulizer, for the management of patients with severe attacks.

9.2 Essential tools

Before implementation, a number of tools need to be developed (Appendix 6): a standardised patient card where the different diagnostic elements and the treatment schedule can be recorded; a register for recording cases of persistent asthma for the district or for recording all cases of chronic respiratory disease in which persistent asthma cases are included; both the degree of severity and the treatment selected are useful tools for evaluating treatment decisions (a register obviates the need to read individual patient records).

In order to manage asthma patients all the health personnel involved will need training and/or retraining:

- district general practitioners;
- district nurses;
- a referral physician at intermediate level to take care of the persistent asthma cases that the District Chief Medical Officer cannot control until stabilisation;
- a physician at central level to coordinate training, supervision and evaluation of the districts with the intermediate level physician.

Supervision of the District Health Centre physicians should also be organised from the central level.

To implement the intervention, other basic tools are necessary:

- a guide for management of asthma patients, or an integrated guide for the management of lung diseases that includes guidelines for asthma patients;
- a training module for physicians;
- a training module for nurses;
- a guide for the supervisor (integrated if possible).

10. THE ROLE OF THE PRIVATE SECTOR

As in the case of diagnosis, the private sector already plays an important role in middle income countries. This role becomes crucial when public services are not equipped to take charge of asthma patients. Whatever the level of development of the public health service, the role of the private sector in managing asthma patients will always be important because of the chronic nature of the disease and the patient's constant hope of a permanent cure. Patients

charge of asthma patients. Whatever the level of development of the public health service, the role of the private sector in managing asthma patients will always be important because of the chronic nature of the disease and the patient's constant hope of a permanent cure. Patients often put their hope in private specialists. The compliance of the private sector with effective national guidelines on management can be improved by training and the circulation of information.

11. HEALTH EDUCATION AND PREVENTION

As asthma is a chronic disease with frequent episodes of exacerbation, the treatment prescribed often has to be adjusted, sometimes by the patient, in order to avoid the onset of severe attacks. Communication with the patient and provision of information about the disease will enable the patient not only to comply with long term treatment but also to increase the treatment if necessary to avoid a severe attack (75).

The goal of health education is to improve the patient's understanding of the disease, the medications and the use of the health services. To attain this objective, health education must be regular, repetitious and adapted to the patient's socio-cultural level, particularly in developing countries where there are high rates of illiteracy.

12. THE CONTENT OF HEALTH EDUCATION

Health education consists of listening to and informing the patient, and teaching basic techniques, thus encouraging patient collaboration with the physician.

12.1 Listening

Listening forms the basis of health education, as it permits the health worker to adapt the approach to each patient. It is important to understand how the patient perceives the disease, how much is known about the disease and the medications, and how the patient's lifestyle is affected.

12.2 Information

Using simple language that is easily understood, the patient can be informed about:

- the disease: asthma and the results obtained with correct treatment, and the utility of long term treatment;
- the treatment prescribed: the role of each medication, the better results obtained from inhaled treatments, and the signs of worsening which indicate that the patient needs supplementary treatment;
- the patient's lifestyle: the importance of leading an active life and practising sporting activities; the importance of avoiding all factors that can trigger an attack.

12.3 Teaching basic techniques

Correct inhalation techniques: the most common reason for treatment failure is incorrect inhalation of the drugs. The patient must be taught to perform the technique correctly, and should be checked at each subsequent appointment. In 10 - 20% of cases the patient does not succeed, and needs to use a spacer. If the patient cannot afford one, health personnel can make one out of a plastic bottle.

The patient must learn how to perform the peak expiratory flow measurement correctly. Most patients, including children aged over 7-8 years, have no difficulties in learning the technique. Younger children and the elderly have rather more difficulty, or cannot perform the technique correctly.

12.4 Encouraging collaboration

The quality of the doctor-patient relationship is the key to the success of long-term treatment. It depends on the doctor's ability to gain the patient's confidence, to enlist the patient's aid in choosing the best treatment, limiting the number of drugs and doses to a minimum, organising regular management, and, in the long term, by encouraging the patient to take responsibility for the disease, e.g. by taking an independent decision on when to adjust the treatment on a temporary basis.

Providing patients with a written treatment plan based on self monitoring of the PEF, as is recommended in industrialised countries, will be much more difficult in developing countries because of the high rates of illiteracy and the consequent difficulties involved for patients to monitor their PEF. Other solutions can be found, such as a simple plan based on clinical evolution, or, even more simply, the provision of a prescription for the patient to use if the condition deteriorates.

13. PREVENTION STRATEGIES

13.1 Primary prevention

The principle measures recommended are an attempt to reduce the factors that favour development of asthma in children, especially if one or more members of the family has an allergic disease:

- reduce the risk of low birth weight by improving the mother's diet;
- encourage breast feeding and avoidance of solid foods before the age of 6 months ;
- reduce domestic factors, at least in the children's bedrooms (airing the rooms, removal of all carpets, feathers, domestic pets);
- avoid passive smoking;
- when it becomes available, vaccination against the syncytial respiratory virus may be recommended.

Other measures include taking part in actions aimed at improving the environment: pollution control, limiting the use of products that cause occupational asthma, and creation of collective protection measures for workers.

13.2 Secondary prevention

All possible preventive measures that can lead to the elimination or reduction of causal factors (mites, domestic pets, moulds) and trigger factors (tobacco, pollution) should be taken.

Specific desensitisation for allergies, which is costly and of debatable value, has no place in asthma management in developing countries.

OPERATIONAL ASPECTS/QUESTIONS FOR THE WORKING GROUP

14. UNRESOLVED ISSUES

Apart from the fact that asthma management practices currently used in different countries are little known and need to be evaluated, in order for the integration of the management of respiratory diseases to be feasible a number of issues should be resolved:

- guaranteed availability of means for the intervention (medications, minimal equipment);
- guaranteed access to treatment for patients. In the specific case of asthma a reduction in the cost of inhaled corticosteroids must be obtained, as these are currently only available for a minority of patients; systems of medical insurance or community support need to be studied to enable patients to gain access to the medications they need;
- preparation of the tools for the intervention: guides, diagnostic and treatment algorithms, registers, training modules;
- training of medical students and other health workers in the integrated management of lung diseases in order to form a solid base of health personnel for the future.

Furthermore, the efficacy of the intervention in improving the performance of the National Tuberculosis Programme (NTP) has not yet been proven. The measures that need to be taken in order to attain the principal objective, i.e., to improve the NTP, must be determined. This integrated approach should be undertaken *only* if all of the measures that led to the success of the NTP can be retained.

15. RESEARCH REQUIRED/PROPOSALS

A research programme must aid in the organisation of an intervention and evaluate its effectiveness. The following non-exhaustive list of research themes can be proposed:

- 1 Prevalence studies to measure the size of the problem of the different respiratory diseases prevalent in the community, and surveys of the demand for care for these diseases in the health services.

- 2 Studies of current management practices for these respiratory diseases in different countries.
- 3 Evaluation of the tools used (diagnostic and treatment algorithms, guides).
- 4 Cost-effectiveness study of the proposed intervention.
- 5 Effect of the intervention on the performance of a tuberculosis programme by epidemiological studies, e.g. before and after the intervention.

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Asthma Treatment Card

Registration number:

Name: _____ Sex (M/F) _____ Age: _____ Height: _____

Address: _____ Occupation: _____

Clinical History	Past History	Present Clinical Signs*		Trigger Factors
Admissions in previous year: Hospital no...[] Emergency no...[]	Other illnesses:	Symptoms: During the day: Wheeze Chest Tightness Breathlessness Cough Other (specify)	How often? (per day/week/month) ...[] times per [] ...[] times per [] ...[] times per [] ...[] times per [] ...[] times per []	Change in weather Humidity Dust Pollution Tobacco Smoke Other Smoke (cooking/heating) Fumes Exercise Infection (cold) Pets Worst Season (check one): Spring Summer Fall Winter
		*Personal: Hay fever Eczema/Hives *Family Asthma Hay fever Eczema/Hives	(per day/week/month) ...[] times per [] ...[] times per [] ...[] times per [] ...[] times per [] ...[] times per []	Indications for referral: Aspirin Occupation

PEF: Predicted Measured (%predicted) After salbutamol (% change)
 FEV: Predicted Measured (%predicted) After salbutamol (% change)

Remarks:

Symptoms: Intermittent [] Mild Persistent [] Mod Persistent [] Severe Persistent [] Regular Treatment Prescribed:	Best PEF when stable: _____ (% predicted)
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Location of ongoing care person responsible

Appendix 2

Appendix 2.1

Establishing the severity grade of asthma on initial presentation

Category	Symptoms	Level of PEF (% predicted)
Severe	continuous	<60
Moderate	daily	60-80
Mild	weekly	>80
Intermittent	<weekly	>80

Appendix 2.2

Evaluation of severity of an asthma attack (from the International consensus)

Sign	Mild	Moderate	Severe	Imminent
Breathlessness	on walking, can lie down	on talking, prefers to sit up	on lying down	
Speaking	phrases	parts of phrases	words	cannot speak
Level of consciousness	may be agitated	usually agitated	always agitated	sleepy or confused
Breathing rate	increased	increased	often >30/min	
Muscle retraction	no	usually	usually	paradoxical movements
Wheezing	moderate end of expiration	strong	very strong	absent
Pulse/minute	<100	100-120	>120	bradycardia
PEF after treatment	over 70%	50-70%	<50% <100l/min	impossible to measure

Appendix 3 Cost of anti-asthmatics

a) Cost of anti-asthmatics in dollars US (from the International Drug Price Indicator Guide, 1996. Management Sciences for Health)

Item description	Average price per tablet or per dose
Prenisone 5 mg	0.0128/t
Hydrocortisone 100 mg vial (inj)	0.4886/vial
Beclomethasone 50µg/dose inhaler	0.0246/dose
Aminophylline 25mg/ml ampoule (inj)	0.0151/ml
Theophylline 200mg tablet	0.0483/t
Salbutamol 0.5 mg/ml ampoule (inj)	0.1049/ml
Salbutamol 4mg tablet	0.0044/t
Salbutamol 100µg/dose inhaler (inh)	0.0074/dose

inj = injectable; inh = inhaled

b) Cost of the principal anti-asthmatics commercially available in France, in dollars US (Price Vidal 1998)

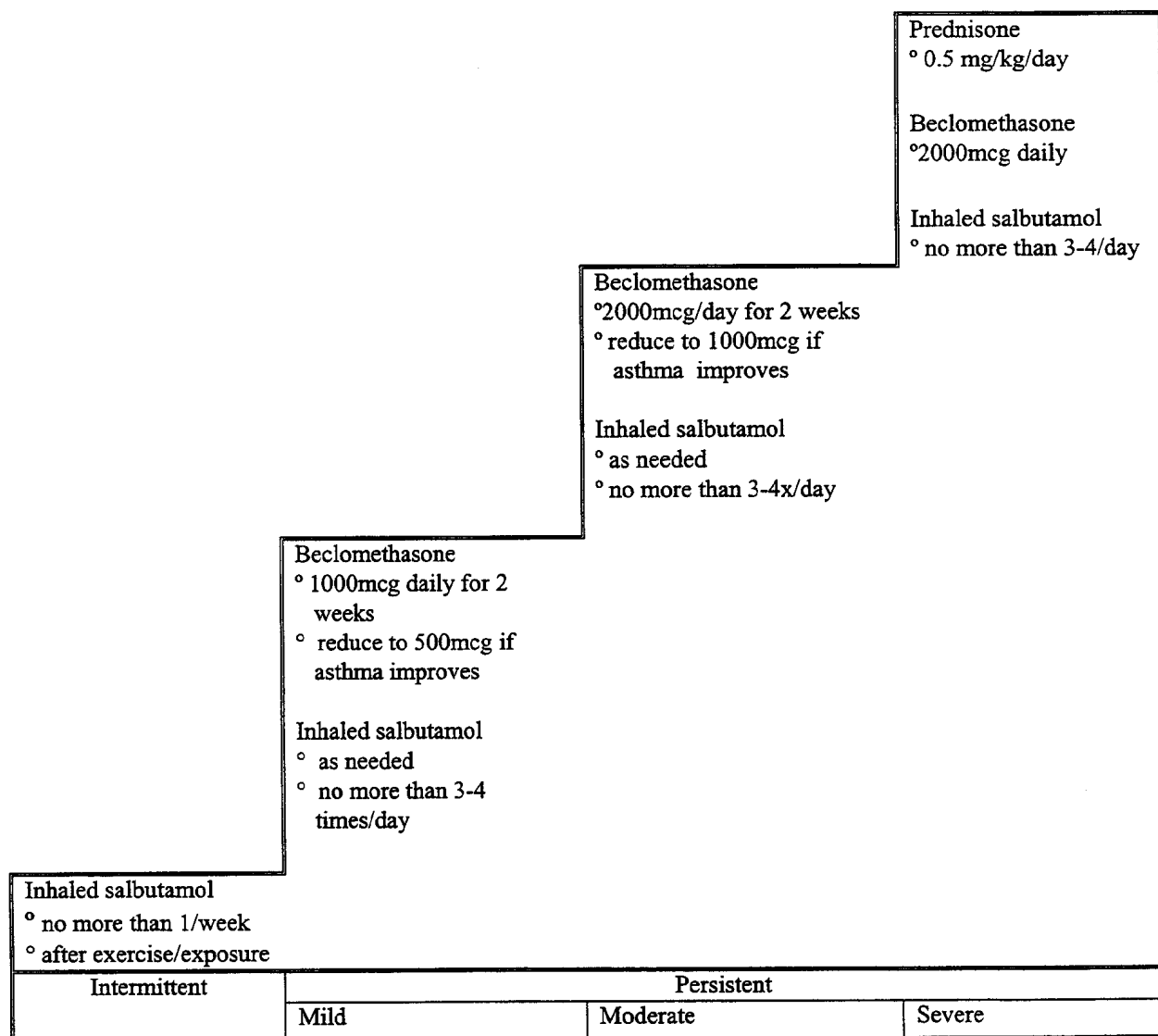
Item	Price	Price per dose
Salbutamol 100 µg/dose inhaler - 200 doses	5.0	0.025/dose
Beclomethasone 50 µg/dose inhaler - 100 doses	5.0	0.050/dose
Beclomethasone 250 µg/dose inhaler - 200 doses	33.6	0.15 /dose
Salmeterol 25µg/dose inhaler - 120 doses	35.9	0.30/dose
Salmeterol 50µg/dose inhaler - 60 doses	37.56	0.62/dose
Formoterol 12µg inhaler - 30 doses	20.63	0.66/dose
Sodium cromoglycate - 30 capsules of 20 mg	10.0	0.30/dose

c) Cost of the principal anti-asthmatics proposed by an independent laboratory, in dollars US (personal communication)

Item	Price	Price per dose
Salbutamol 100 µg/dose inhaler - 200 doses	1.37	0.0068/dose
Beclomethasone 250 µg/dose inhaler - 200 doses	3.50	0.018/dose

Appendix 4

**STAGED TREATMENT APPROACH FOR PATIENTS WITH ASTHMA
IUATLD GUIDE**



Increasing intensity

When asthma is not brought under control with current treatment even though treatment has been taken correctly ; medication dose is doubled with each step.

Decreasing intensity

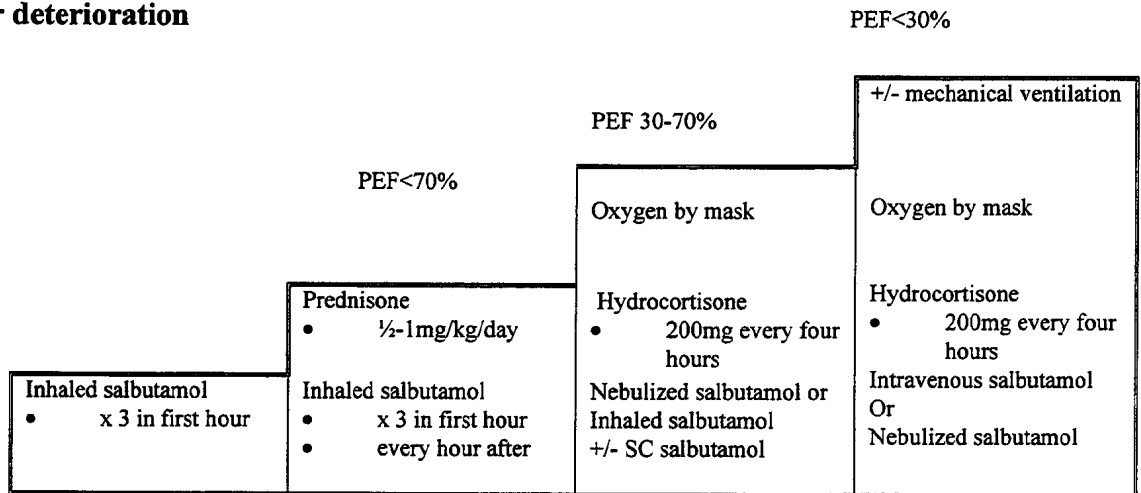
When the objectives of treatment have been reached and maintained over some weeks, medication does is halved at each step ; the minimum treatment needed must be determined.

Appendix 5

**STAGED TREATMENT APPROACH FOR PATIENTS WITH
ASTHMA ATTACKS
IUALTD GUIDE**

Hospitalisation Specialist Service General Service

**Increasing treatment for lack
of improvement or deterioration**



Immediate treatment

Initial Assessment	Mild	Moderate	Severe	Imminent Arrest
Minimum Follow up	1,5-2hrs	1,5-2 hrs	6-12 hrs	

Improvement leading to discharge and complete recovery

PEF ¹	>80%	>70%	>70%	
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Conditions for Discharge

- Instructions on use of short course prednisone
- Checking on proper prescriptions and inhalation technique
- Letter to the health service giving primary care

¹ The percentage refers to % predicted or personal best PEF

Appendix 6 Equipment, tools and drugs required by level of health facility

Level	Equipment	Tools	Drugs
DISTRICT			
Central district health facility	Peak flow meter Spacer Oxygen Nebulizer	Diagnostic algorithms Standardized questionnaire Standardized treatment card Asthma register	Salbutamol inhalation, nebulisation Beclomethasone inhalation Prednisone Hydrocortisone i.v.
District health facility with physician	Peak flow meter Spacer	Diagnostic algorithms Standardized questionnaire	Salbutamol inhalation Beclomethasone inhalation Prednisone
District health facility with nurse	Peak flow meter? Spacer	Diagnostic algorithms	Salbutamol inhalation
Health post with community health workers		Posters on clinical symptoms of asthma Diagnostic algorithms?	Salbutamol inhalation?
REGIONAL OR CENTRAL LEVEL	Peak flow meter Spacer Spirometer and hyperreresponsiveness test Arterial blood gas analysis Material for ventilation	Specific questionnaire for occupational asthma List of occupational asthmas (professions and sensitizers)	Salbutamol inhalation, nebulisation, i.v. Beclomethasone inhalation Prednisone Hydrocortisone i.v.

Additional tools need to be developed at the central level for the intervention:

- Guide for asthma management (integrated with management of TB, Asthma, COPD and ARI?)
- Training modules for physicians and nurses
- Training module for supervisors