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# Managing Bronchial Asthma in Underprivileged Communities

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## Abstract

The definition of a primary care facility is the site where the first patient contact occurs. In developing countries, primary healthcare (PHC) facilities are officially healthcare centers, hosting World Health Organization (WHO) programs for tuberculosis and chronic respiratory diseases. In addition, there are many other providers of PHC services, which include emergency departments, general outpatient clinics in public hospitals. Asthma patients may present for treatment in any of these primary care facilities. An international study achieved by the Union showed that 51% of asthma patients in Syria are treated in emergency departments only, many developing countries like Sudan, Algeria, and some African countries had the same use of ER. There are questions about the quality of care provided in these clinics with regard to their adherence to Global Initiatives for Asthma (GINA) guidelines. Evidence suggests that there may be over prescribing of oral corticosteroids and antibiotics and under-prescription of inhaled corticosteroids, so there is a need to improve practice bringing it more into alignment to international guidelines. It may be considered by many that it is not possible to follow guidelines in developing countries and those that have economic and political pressures. However, a pilot program to test the feasibility of a providing systematic follow-up of uncontrolled asthma patients in a general free of charge hospital in Syria showed that it is possible to achieve asthma control following to GINA guidelines even in very deprived community. The same was mentioned by the Union in an international survey for other developing African and Mediterranean countries. WHO launched programs for non-communicable disease including chronic respiratory disease: Practical Approach to lung Health (PAL) and Package of essential non-communicable (PEN) disease interventions for primary health care in low-resource settings. The IPCRG also worked on how to improve implementation of guidelines. We will provide the results and following evidence-based recommendations from our field surveys in developing countries, as well comment on international programs. Although much progress has been realized in the diagnosis and management of asthma in developed nations, progress in one variant of asthma, inner city asthma, has been slow. Inner city asthma is that variant of the disease which afflicts residents of urban environments with low socioeconomic conditions, poor housing, and rampant

environmental risks. This variant of asthma appears to be more severe, associated with increased psychological burden as well as morbidity and mortality, has a diverse array of predisposing factors, and poses significant challenges in management and treatment. One important aspect of treatment is education which leads to the participation of the patient and the families in the care resulting in a more favorable outcome.

**Keywords:** asthma, primary care, WHO, chronic respiratory diseases, essential drugs for asthma, inner city, developed nations

## Background

This chapter deals with asthma in developing nations and touches on one variant of asthma in the developed world which has significant resemblance to its counterpart in developing nations. The first section is derived from studies in Syria, while the second from the United States.

### 1. Introduction - Managing bronchial asthma in primary health care

According to the International Study for Asthma and Allergies in Childhood (ISAAC), comparing phase one in 1994 to three in 2000–2003, asthma prevalence expressed by wheezing the last 12 months in 13–14 years old is increasing in developing countries. Asthma prevalence is higher in developed countries, but asthma is more severe in developing countries [1].

The definition of a primary care facility is the site where the first patient contact occurs [2]. If we take Syria as an example of developing country, primary healthcare (PHC) facilities are officially healthcare centers under the control of the Ministry of Health, which among other services provided, host World Health Organization (WHO) programs for tuberculosis and chronic respiratory diseases [3, 4]. In addition, there are many other providers of PHC services which include emergency departments (ED), general outpatient clinics in public hospitals, school health clinics, clinics in workplace settings, and internal and general clinics within the private sector.

Asthma patients may present for treatment in any of these primary care facilities in Syria. A multicenter survey of primary care clinics revealed that 13% of patients aged over 6 years attended with asthma [5]. Another study showed that 51% of asthma patients are treated in ED only, and only 9% are treated in primary care centers [6]. Many developing countries like Sudan, Algeria and some African countries had the same use of ED [6]. The same under-utilization of community primary healthcare services has also been observed in China in 2014 [7].

There are questions about the quality of care provided in these clinics with regard to their adherence to Global Initiatives for Asthma (GINA) guidelines. Evidence suggests that there may be over prescribing of oral corticosteroids and antibiotics and under-prescription of

inhaled corticosteroids [5, 6], so there is a need to improve practice bringing it more into alignment to international guidelines.

It may be considered by many that it is not possible to follow guidelines in developing countries and those that have economic and political pressures. However, a pilot program to test the feasibility of a providing systematic follow-up of uncontrolled asthma patients in a general free of charge hospital in Syria showed that it is possible to achieve asthma control following to GINA guidelines even in very poor community [8]. The same was mentioned by the Union in an international survey for other developing African and Mediterranean countries [9], the same in a recent study in Sudan [10].

A Ministry of Health—WHO program for non-communicable diseases in Syria including an intensive courses for asthma and COPD for GPs in health centers has been launched since the beginning of 2015 in a pilot site from Syria. However, unlike developed countries, in Syria, presentations are very personalized, there are no established accredited modules or curriculum for continuing medical education for primary care physicians and nurses. In order to make optimum improvements in care across the country, we need to ensure that high-quality training interventions are made available for healthcare providers who are working in a primary care setting, aiming to increase both their competence and confidence in the essentials of asthma management. This program needs to incorporate accredited educational materials, a process for monitoring and continuous evaluation, and collaborative efforts with an international agency such as the Global Alliance against Chronic Respiratory Diseases (WHO—GARD [www.who.int/gard](http://www.who.int/gard)) [8]. A survey conducted by the International COPD Coalition gave the same conclusions about absence of curriculum for education for asthma and COPD [11].

Primary healthcare services are free of charge in Syria, and other developing countries hosting WHO programs, and are staffed by full-time qualified nurses who are supported by part-time physicians, who also provide services in the private sector. In addition, some patients who are able to pay for healthcare may refer themselves directly to private pulmonologists, without being referred from primary care. Since 2006, WHO launched programs for asthma and COPD at primary care level in Syria and other developing countries, and training was undertaken on site [3–5, 8].

In this paper, we share our experience in developing countries and will present first field surveys in developing countries. Second, we will comment on the international programs of WHO and International Primary Care Respiratory Group (IPCRG). And third, we will give our evidence-based recommendations.

## **2. Discussion**

### **2.1. Field surveys and what we learned**

Asthma is under-diagnosed in primary care [5, 6, 8, 12–14]. The Global Alliance against chronic respiratory disease (GARD—WHO: [www.who.int/gard](http://www.who.int/gard)) survey on chronic respiratory diseases prevalence and risk factors in Syria revealed that although 27% of the 1599 patients

surveyed had evidence of reactive airway disease and reversible obstruction by spirometry, but only 13% had been diagnosed as asthma by the primary care practitioners. Indicating that 50% were under-diagnosed [4]. This finding is not unique to Syria. Under-diagnosis has also been reported in the same GARD survey in Cape Verde [12]. There are several hypotheses for these high rates of under-diagnosis. The condition's variability of symptoms, misdiagnosis such as an infection, some may be mislabeling of patients as COPD when in fact, they may have uncontrolled asthma [5, 15], increasing workload, and demand on services and limited experienced doctors. It is important for practitioners to follow standard diagnostic procedures and good history taking such as recurrent symptoms (wheezing, cough, difficult breathing, and chest tightness) and the presence of triggers. In addition, practitioners should obtain objective tests and look for reversibility of peak expiratory flow rate (PEFR) expressed as increase of 20% and 60 l/min, or 12% increase in forced expiratory volume in one second (FEV1) and 200 ml after short-acting beta agonists (SABA), or a decrease in these measurements after exercise testing. Practitioners could also rely on variability of PEFR or FEV1 between two visits. In situations where spirometry or peak flow meter results are not available, or patients are under 5 years of age, practitioners should rely on clinical history and treatment trials [16]. WHO recommend peak flow meter to be available in the most remote healthcare centers, and referral for spirometry in healthcare centers or hospitals at central level is available [3, 4].

Asthma is under-treated and under-controlled: The GARD–WHO multicentre national survey 2010 for chronic respiratory diseases [5] revealed that only 25% of inhaled corticosteroid (ICS) prescriptions included adequate doses according to the GINA guidelines. In addition, 46% of patients received oral corticosteroids which could be avoided if ICS were prescribed in PHC according to the guidelines. Similarly, 56% of asthma patients received oral antibiotics without a clinical indication. Another important issue is that 56% of asthma patients surveyed have FEV1 < 80% after bronchodilators, which points to poor control [5, 16].

Despite asthma being poorly diagnosed and treated, it is possible to observe improvements in asthma control to the level of published guidelines in underserved areas. In a pilot study conducted on economically deprived patients in an underserved area, we systematically followed up patients with uncontrolled asthma in a general free of charge outpatient clinic in a public hospital 2006–2007 [8]. A trained postgraduate medical student asked every patient questions about the parameters of asthma control, measured PEFR, and ensured prescription of ICS at their first presentation. The student also taught patients proper inhaler technique and educated them about how to avoid risk factors. Weekly follow-up data were collected by the GP. After 3 months, 44 of 66 patients who had not been followed up previously were properly controlled. We conclude that GINA guidelines could be realistic even in underserved areas. In 2006, an international multicenter survey of the Union showed that implementation of asthma guidelines was possible in primary care in developing countries [13]. The same recently in Sudan (2014): In a new model specialized center for asthma, a survey aiming at describing the epidemiological and clinical characteristics of asthma patients concluded that most patients had abnormal spirometry with more than half having an FEV1 that is 60% or less of their predicted normal reading. The majority improved with combined treatment (Formoterol,

budesonide) with 60% normalizing their spirometry highlighting the feasibility and applicability of specialized asthma care centers in resource-poor countries [10].

The global initiative for asthma guidelines are based on the level of control [16] such that for each asthmatic presenting to a primary healthcare facility, the general practitioner (GP) should ask standard questions about the clinical control of asthma including:

- Frequency of symptoms
- Need for inhaled bronchodilators
- Frequency of night awakening
- Exercise limitation
- Number of exacerbations.
- values of PEFr or FEV1

To improve care, training should emphasize that: Patients with uncontrolled asthma need to be prescribed low-dose or medium-dose inhaled corticosteroids, educated on inhaler technique, and referred to higher level of care for further assessment if not controlled after follow-up visits [3–5, 16], and referred back to primary care for long-term follow-up and education.

#### *2.1.1. Review of international WHO programs and other programs*

*WHO–MOH programs:* Three programs have been introduced for chronic respiratory diseases (CRD) in Syria since 2006 [3, 4, 11, 16]:

1. Practical Approach to Lung Health (PAL) program, integrating asthma, and COPD care in the National Tuberculosis program, adopting for the first time a referral policy and initiating a respiratory disease dispensary at central level equipped with peak flow, oximetry, and spirometry.
2. The Package for the essential needs for non-communicable diseases (NCD) at primary care level in low resources settings: WHO–PEN program. Integrating all major NCD including CRD at primary care level.
3. GARD program [www.who.int/gard](http://www.who.int/gard) Survey on CRD risk factors and prevalence. And the resulting evidence based guidelines, and training. WHO country office is involved.

#### *2.1.2. Other programs*

1. The GINA world Asthma day program: Conferences in World Asthma Days are improving asthma care: Make health workers in PHC familiar with asthma symptoms, asthma control, peak flow meter, and corticoid inhalers.
2. Civil societies, in collaborating with the International COPD Coalition [www.internationalcopd.org](http://www.internationalcopd.org), are helping patients with CRD and allergy is wide-spreading patient education for asthma and COPD, and health education.



3. Educational Program for nurses about asthma and COPD: Two national workshops were run for this purpose in 2004 and 2007 by the Education for health center of Excellence—UK in Syria [www.educationforhealth.org](http://www.educationforhealth.org), but also in Bangladesh, and many other developing countries, aiming to introduce the role of nurses in national programs.
4. The new intensive course of WHO–MOH mentioned above for non-communicable diseases in Syria and other EMRO countries.

### 2.1.3. *International Primary Care Respiratory Group (IPCRG)*

The IPCRG tried to resolve the question on how to deal with asthma and COPD in primary care in developing countries, elaborating a symptomatic approach and algorithms, but they recommend providing primary care in developing countries with PEF and Inhalers [17]. While PAL–WHO went further (Spirometry and referral) [4].

Research priority to improve asthma management in primary care have been investigated by the IPCRG, 2009: Conclusion, primary care research should include awareness about local asthma triggers like biomass fuel, early diagnosis, and management in remote areas where there are no tools for diagnosis, the reliability of medication trial, how to overcome taboos about cultural misbelieves and inhalers, how to make essential drugs available, and how to adapt and evaluate guidelines implementation [18].

PEN–WHO opted for an integrated approach with other NCD; the approach was symptoms and PEAK flow measurements; primary care physician prescribes ICS if asthma; and treat acute attacks with oral corticosteroids and inhaled bronchodilators; referral rules to confirm diagnosis or help for better long-term treatment are stated if failure of control at follow-up visit. Necessary tools are PEF, oximetry, oxygen, and nebulisers or inhalers via spacer [3]

PAL–WHO, integrating CRD with tuberculosis program was very ambitious, referral and spirometry were recommended [4], but unfortunately, there were discontinuity and no evaluation process for the implementation of these programs, in conflict zones.

GARD–WHO was a success with the survey, and following publications and guidelines [5]

## 2.2. **The core messages from the field surveys and international national programs**

To empower the role of PHC in controlling asthma and lessen related mortality. Core messages are as follows:

1. The first consultation with the uncontrolled patient is crucial. It is vital that the correct diagnosis is made and good education is delivered. The correct treatment should be initiated at this time which will be an appropriate dose of inhaled corticosteroid and a short-acting reliever inhaler (Bronchodilator). Inhaler technique needs to be taught and the initiation of a self-management plan including what to do in an emergency and whom to contact. A follow-up appointment is important, and the PHC should consider a referral if not controlled during a follow-up visit [19]

2. Prescription of oral corticosteroids on discharge from emergency room, if not hospitalized, is recommended. By contrast, expectorants and antibiotics are often unnecessarily prescribed [5, 13, 19].
3. Methodical follow-up leads to control and is feasible even in poor settings by using standard guideline-based protocols and follow-up records. [8, 13]
4. The core equipment and medicines that health facilities should have include peak flow meter, pulse oximetry, bronchodilator inhalers, spacers (which could be built up in very poor settings/plastic bottle), [20–22], nebulizers and solution of short acting beta agonists (SABA) and if possible anticholinergics, oxygen extractor or oxygen bottle, and systemic corticosteroids.
5. Short-acting beta-agonists (via spacer, which can be built in poor settings using a plastic bottle) is as effective as nebulizer to relieve symptoms, except for very severe attacks [21–23]. The asthma-trained nurses or community healthcare workers key role is to educate patients, particularly in inhaler technique and self-management [23]. This is common practice in many developed countries and the UK and Australia have been leaders in developing nurses to fulfill this role. In the UK, much of the asthma management in primary care is provided by appropriately trained nurses [23].
6. Every uncontrolled asthma patient in spite prescription of ICS and regular follow-up in Primary care should be referred to a specialist or well-trained physician with an interest in asthma and placed in an asthma management plan and then referred back to the PHC for follow-up.
7. A toolbox for general practitioners and nurses should consist of the following:
  - Questions related to symptoms suggestive of asthma diagnosis to face under-diagnosis
  - Asthma control test for initial evaluation and follow up
  - Use of peak flow and table of values
  - Educational photos about inhaler and spacer use (Photos of all available inhalers to educate.)
  - What to do in an emergency
  - Education on how inhaled corticosteroids reverse inflammation
  - A patient self-management plan
8. Every follow-up visit should be the occasion to improve the partnership with patients according to their literacy level of education and cultural believes. A follow-up record to monitor clinical control, PEF, compliance, and trigger avoidance should be filled at every visit. Education for inhaler technique should be part of every follow-up visit.
9. Including these core elements on the role of primary care in curriculum of medical schools, nursing schools, and pharmacies is recommended.



10. WHO programs of NCD, PEN, and PAL have been introduced in PHC dispensaries in many developing countries including Syria, and training for those programs was done at pilot sites, but the humanitarian crisis in Syria and other conflict zones discontinued progress. Effort should be done to continue [3, 4].
11. Conferences and World Asthma Days as recommended by GINA are improving asthma care: Make health workers in PHC familiar with asthma control, peak flow meter, and corticoid inhalers, but there is a great need for more education, which can also be provided online.
12. Patient organizations are playing a role on patient education and providing free medications [11].
13. According to the GARD Survey results, training sessions for the essential on asthma and COPD are needed for health workers at primary care level. This needs to adapt educational materials.
14. The list of essential medications for asthma, especially inhaled corticosteroids [24], is not available in all countries; in Sudan, a survey pointed this issue [25]. In a general review, researchers reported [26]: Another issue is in some developing countries, the essential medication as listed by WHO is not available. Health services in low-resource countries are poorly adapted to treating chronic diseases. Designed to respond episodically to acute disease, almost all historical investment has focused on infectious diseases. Crucial to the successful management of chronic diseases is an infrastructure designed to support proactive management, providing not only an accurate diagnosis, but also a secure supply of cost-effective drugs at an affordable price. When in very poor health systems, ICS are not available, a variety or a phenotype of severe asthma prevails (defined by WHO as the non-treated severe asthma) [27], while the ATS/ERS definition for severe asthma is asthma refractory to ICS.
15. The WHO issued a guide on prevention and control of non-communicable diseases in: Guidelines for primary healthcare in low-resource settings: 2012, and urged developing countries to follow the directives for chronic respiratory disease as well [28].

### 3. Inner city asthma - Introduction

Inner city asthma is a variant of asthma that afflicts patients who reside in some of the poorest neighborhoods of some urban localities [29]. These patients frequently have economic and financial difficulties and reside in housing projects that are environmentally poor with increased likelihood of pollution [30]. Several studies have demonstrated that these factors coupled to barriers to appropriate asthma care, as well as reliance on emergency care, poor medication compliance, limited availability of primary and specialty asthma care and poor communication between patient and physicians are responsible for the unique nature of this entity [31–33]. Because of these factors, the character of inner city asthma may be different from

that observed in other localities. Different patterns of prevalence, predisposing factor, severity, morbidity, mortality, and management have been observed.

## 4. Prevalence

Over the past several decades, a gradual increase in the prevalence of asthma has been noted in several industrialized countries [29]. Although some of this increase may be related to changes in health insurance policies resulting in better coverage and increased access to care and improvements in diagnostic testing, other factors may be involved. Some of the increase is attributed, in part, to a gradual increase in prevalence of asthma in individuals of lower socioeconomic status who reside in inner cities [29, 34]. For example, statistical analysis shows that between the years 2001 and 2010, rates of asthma in adolescents in the United States of America have increased at a rate of around 1.4% reaching 9.5% in 2010 [34]. Careful analysis of this phenomenon indicates that this increase was most realized among various minority groups including African-Americans and Hispanics.

African-American children are reported to have a rate of asthma per population that is 1.6 times the level observed in white children [34, 35]. Some Hispanic groups, like children originally from Puerto Rico, have been reported to have asthma prevalence that is almost 2.4 times that of white children [35, 36]. The prevalence of asthma among children in some Chicago neighborhoods is estimated to be as high as 44%, with the highest rate observed and reported in neighborhoods with a higher proportion of residents of African-American and Hispanic ancestry [37]. In one district of New York City, asthma prevalence was reported 13.2% for Puerto Ricans [38]. Racial background is not the only factor responsible for this disparity. Asthma prevalence varies among various localities with those localities with low income levels manifesting an increase in prevalence irrespective of racial and ethnic mix [29, 33].

## 5. Severity

Numerous studies have shown that inner city asthma, especially among children, is characterized by increased intensity and poor response to therapy [39]. It is not clear why this population of asthmatics is more difficult to control. Some investigators speculate that a myriad of factors may be involved including environmental, socioeconomic, psychosocial, behavioral, or genetic ones [39, 40]. Other authorities believe that the poor control may be related to inappropriate asthma management practices, limited access to care, poor compliance with therapy, and limited communication between physicians and patients [41, 42]. The practical implications of these observations are that these children have a higher rate of hospital admissions [43] and their condition at the time admission is serious and is frequently described as near fatal [44] which refers to a group of individuals predisposed to acute respiratory failure from their disease state with acidosis and altered mental status.

The increased acuity of inner city asthma has several short-term and long-term implications. The collective cost resulting from loss of work and productivity as well as absenteeism from

school and work is hard to measure. The added cost of overutilization of healthcare facilities and emergency department adds to the financial implications of this phenomenon. Overconsumption of pharmaceutical agents and other supportive agents and procedures further increases the overall cost. Finally, the impact on the general health of the individuals, stunted growth, and development of long-term respiratory impairment adds to the overall societal impact.

## 6. Predisposing factors

The factors contributing to the high prevalence of asthma among inner city residents are varied. Cohen et al. [45] suggest that a key factor in this regard is the poor access to healthcare that patients in urban environments experience. This may be related to a limited number of physicians and healthcare facilities as well as limited availability of safe transportation. Limited access to care has a negative impact on most clinical conditions including the availability of effective prenatal care. Another major predisposing factor which increases the prevalence of asthma in residents of inner cities is exposure to tobacco smoke [45]. Tobacco smoke is known to affect the rate of lung growth, clearance of secretions, and defense mechanisms against particulate matter and infectious agents.

Studies have shown that children living in urban environments have a higher rate of emergency room visits and lower use of inhaled corticosteroids [46]. This may be related to lower rates of diagnosis as shown by the 1999 National Health Interview Study [34]. Specific factors that have been examined include poverty with reduced access to and quality of care [47]. The resultant additional health issues such as prematurity [48, 49] and obesity [29, 50] further confound the problem. In addition, poor housing [51] with exposure to indoor pollutants and environmental tobacco [52] plays a significant role in aggravating the condition. Finally, the psychological impact of the disease in the setting of poor resources worsens the perception among patients, impacts coping, and results in further deterioration in symptomatology [53, 54].

## 7. Morbidity and mortality

In general, inner city asthma has a higher index of severity, is associated with increased morbidity, and has a higher mortality rate than asthma outside the inner city milieu [29]. Several criteria may be used to evaluate the level of acuity. These include, among others, emergency room visits, hospitalizations, office visits, time lost from work, and absenteeism from school. Research shows that inner city asthma is associated with increased morbidity in each of these criteria. The national database report of 2006 indicated that around 3.5 million visits to physician offices, half a million visits to hospital outpatient departments, an equivalent number of visits to an emergency department, and over 150,000 hospitalizations were related to asthma in this population [55].

Inner city asthma is associated with increased mortality when adjusted for the level of acuity. As far as mortality is concerned, there were 167 deaths from asthma in 2005 among children and adolescents [29, 55]. Interestingly, African-Americans demonstrate a sevenfold increase in mortality, around threefold increase in emergency department visits, threefold increase in hospitalization, but 20% lower nonemergency ambulatory visits than white children. Data on Hispanic children show emergency department visits to be twice that of whites [55].

## 8. Management

Management of inner city asthma places additional demands on patients and healthcare providers alike. Patients need to be maintained on the usual asthma medications including short-acting and long-acting bronchodilators, inhaled corticosteroids, leukotriene antagonists, and possibly methyl xanthines. In addition, one has to focus on eliminating or minimizing the effect of the predisposing factors listed in the previous paragraphs. Specifically, dealing with poor housing, indoor pollutants, and environmental tobacco makes it necessary for patients and their families to invest in home improvement projects that are costly and demanding. Since this may be beyond the capabilities of several patients, this poses a significant burden on the public health and social safety networks in various cities. These services are already oversubscribed and have limited resources.

Several interventions have focused on the fact that patient and family education are critical to the process of managing and controlling inner city asthma. Patients and their families need to learn the components of quality care so that they can participate in their own care. An important component of this strategy is making sure patients, and their families have the requisite knowledge to reach healthcare providers in a timely and structured manner. Therefore, efforts should focus on educating patients to improve their ability to acquire the knowledge needed to navigate the healthcare system. A family-based intervention performed by a trained counselor has been shown to improve care and decrease morbidity [56]. School-based asthma education is also effective [57]. Emphasis should also be placed on reducing environmental triggers such as the use of pest control [58] services and reduction of exposure to tobacco smoke [59] and weatherizing homes to decrease mold and moisture [60, 61]. Good management of inner city asthma requires the same kind of proactive care that has been shown to be effective in other situations. These include guidelines-driven care and assured access to the appropriate controller medication [62] and the addition of a biologic such as omalizumab in selected cases [63].

## 9. Summary and conclusions

To the pulmonologist, inner city asthma is a complex and challenging entity that requires consolidated management efforts and a comprehensive approach that includes awareness of the unique predisposing factors, the increased acuity, and the need to focus on improved access

to care. A multifaceted approach that targets a wide array of risk factors including allergens, indoor pollution, housing quality, and external sources of pollution, such as neighborhood trash collection receptacles must be utilized. Guidelines-based management that is effective in other types of asthma may not be sufficient to provide adequate control. In addition, the structure of the healthcare system must change to allow the needed access and the recognition and management of social factors which impact on asthma management.

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