

Direct costs of asthma in Brazil: a comparison between controlled and uncontrolled asthmatic patients

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Abstract

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L.A. Santos is the recipient of a
CAPES scholarship. Research
partially supported by FAPESP.

Received August 28, 2006
Accepted April 10, 2007

Asthma is a common chronic illness that imposes a heavy burden on all aspects of the patient's life, including personal and health care cost expenditures. To analyze the direct cost associated to uncontrolled asthma patients, a cross-sectional study was conducted to determine costs related to patients with uncontrolled and controlled asthma. Uncontrolled patient was defined by daytime symptoms more than twice a week or nocturnal symptoms during two consecutive nights or any limitations of activities, or need for relief rescue medication more than twice a week, and an ACQ score less than 2 points. A questionnaire about direct cost stratification in health services, including emergency room visits, hospitalization, ambulatory visits, and asthma medications prescribed, was applied. Ninety asthma patients were enrolled (45 uncontrolled/45 controlled). Uncontrolled asthmatics accounted for higher health care expenditures than controlled patients, US\$125.45 and US\$15.58, respectively [emergency room visits (US\$39.15 vs US\$2.70) and hospitalization (US\$86.30 vs US\$12.88)], per patient over 6 months. The costs with medications in the last month for patients with mild, moderate and severe asthma were US\$1.60, 9.60, and 25.00 in the uncontrolled patients, respectively, and US\$6.50, 19.00 and 49.00 in the controlled patients. In view of the small proportion of uncontrolled subjects receiving regular maintenance medication (22.2%) and their lack of resources, providing free medication for uncontrolled patients might be a cost-effective strategy for the public health system.

Key words

- Asthma
- Health care costs
- Health economy
- Health care resources

Introduction

Asthma is one of the most common chronic diseases and affects a million people in the world (1). According to data of population-based surveys there is a gap between asthma management as stipulated by GINA and the achievement of asthma control around

the world (2-6). These studies have shown high levels of both emergency room visits and hospitalization despite the availability of effective therapies to achieve asthma control.

One of the most relevant socioeconomic impacts of this disease is the heavy burden of direct expenditures related to health care

costs due to uncontrolled asthma, causing unscheduled clinical visits, emergency room attendance and hospitalizations. Asthma is also a leading reason of lost school and working days, dysfunction and retirement. Improving asthma control reduces hospitalization costs, in contrast to an increase of expenditures with maintenance medications (7).

The costs associated with asthma management can be classified as direct, indirect and intangible. Direct costs include expenditures with health services: emergency department, hospitalization, ambulatory visits, and asthma medications prescribed. Indirect costs include costs resulting from missed work or school days and days with restricted activity at work, premature retirement and death. The adverse impact of asthma on the quality of life of the patients and on the families, as well as the limitation of physical, emotional and intellectual development is difficult to quantify, and therefore is referred to as intangible costs (8-12).

In Brazil, asthma was the third cause of hospitalization in 2001 (DATASUS-government database) and the total estimated cost was US\$35,000,000.00 spent every year with public health services related to asthma (13). However, the level of disease control, disease severity and medical resource utilization among Brazilian asthmatics is poorly documented and unknown.

Asthma control is hard to measure because the patients tend to underestimate the severity of their condition and to overestimate control (4). Analyses of direct cost distribution due to asthma in a population should help to estimate the achievement of good asthma control.

The objective of the present study was to measure the direct cost of health care for asthmatic patients, to identify the main expenditures according to asthma control, and to determine the burden of the disease for both the health care system and family income.

Patients and Methods

This is a cross-sectional study conducted at the Hospital of the Federal University of São Paulo. All consecutive patients attended in the Emergency room and outpatient department with a diagnosis of asthma by GINA criteria were invited to participate in the study (14). The study was continued until a number of 45 uncontrolled patients and 45 controlled patients from the outpatient clinic was reached. This equal number was defined in order to keep the same proportion of influence on costs. The study was approved by the Ethics Committee of the Institution and all subjects gave written informed consent to participate. Those who had other concomitant severe lung diseases or more than 5 pack-years of smoking were excluded from the study.

The subjects were classified as having mild, moderate and severe asthma based on the definitions given below (14).

Mild

Symptoms more than once a week but less than once a day, exacerbations possibly affecting activity and sleep, nocturnal symptoms more than twice a month, and forced expiratory volume in 1 s (FEV1) or peak expiratory flow (PEF) $\geq 80\%$ predicted.

Moderate

Daily symptoms, exacerbations possibly affecting activity and sleep, nocturnal symptoms more than once a week, daily use of an inhaled short-acting $\alpha 2$ -agonist, and FEV1 or PEF 60-80% predicted.

Severe

Daily symptoms, frequent exacerbations, frequent nocturnal asthma symptoms, limitation of physical activity, FEV1 or PEF $\leq 60\%$ predicted.

The patients were stratified into controlled and uncontrolled asthmatics based on the clinical features of the disease. The controlled asthmatics have daytime symptoms less than twice a week or nocturnal symptoms less than once a week, no limitations of activities, or need for relief rescue medication less than twice a week, and an Asthma Control Questionnaire (ACQ) score less than 2 points. The uncontrolled asthmatics have daytime symptoms more than twice a week or nocturnal symptoms during two consecutive nights or any limitations of activities, or need for relief rescue medication more than twice a week, and an ACQ score more than 2 points. The ACQ is a standardized questionnaire with seven simple questions about how often the patient was bothered by asthma symptoms in the past seven days. A zero point score means well-controlled asthma, and a six point score means uncontrolled asthma (15). For a reliable determination of the presence of inadequately controlled asthma, the optimal cut-off point is 1.50 (positive predictive value = 0.88) (16).

All patients enrolled in the study completed an assessment interview which included use of maintenance medication in the last month, number of emergency room visits, hospitalization, and admission to an intensive care unit because of asthma during the last 6 months, number of missed school and work days during the last 6 months.

Cost

Direct costs over a 6-month study period were related to asthma control, maintenance medication use, and health care expenditures. All costs were recorded in Brazilian currency (real, R\$) and converted to US\$ (American dollar) based on an exchange rate of 1US\$ = 2.41R\$ (17). The direct costs included: a) medications, whose price was taken from the Pharmaceutical Guide (18); b) emergency room visits, hospitalizations and admission to an intensive care unit be-

cause asthma was calculated based on reimbursement by the public health services for each type of care: emergency room visit = US\$1.32 and complete hospitalization = US\$128.80 (13).

Statistical analysis

Descriptive statistical methods were used to provide a general profile of the population studied. The chi-square test was used to compare proportions and the nonparametric Mann-Whitney U-test was used to compare continuous variables between groups. A P value of <0.05 was considered to be statistically significant. Statistical analyses were performed using the SPSS13 statistical software. Because the cost analyses do not recommend statistical comparisons, we decided to include at least 40 patients in each target group of controlled and uncontrolled asthma patients in order to describe the distribution of direct cost expenditure for each status.

Results

Ninety asthma patients were enrolled in the present study and their characteristics are reported in Table 1. There were significantly

Table 1. Subject characteristics.

	Controlled asthma group	Uncontrolled asthma group
Gender (female/male)	39/6	30/15*
Age	48.0 ± 15	43.0 ± 19
Caucasian	36	36
Non-caucasian	9	9
Family income (US\$)	329.5 ± 305	281.5 ± 187
Years of schooling	5.0 ± 3.8	6.5 ± 3.4**
<5 years/school (%)	66.7%	51.1%
>5 years/school (%)	33.3%	48.9%
Severity		
Mild	14	17
Moderate	21	20
Severe	10	8
Use of inhaled corticoids (%)	82.2%	22.2%*

Data are reported as means ± SD, number or percent of 45 patients in each group. P < 0.05 compared to controlled group (*chi-square test, **t-test).

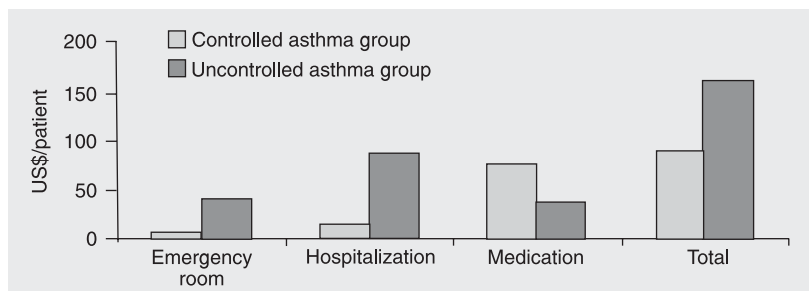


Figure 1. Distribution of direct costs among controlled and uncontrolled asthma patients.

Table 2. Emergency room (ER) visits and hospitalization costs according to asthma severity (US\$/per patient).

	Controlled asthma group		Uncontrolled asthma group	
	Visits to ER (US\$)	Hospital cost (US\$)	Visits to ER (US\$)	Hospital cost (US\$)
Mild	1.12	0.00	2.57	0.00
Moderate	0.93	0.00	10.69	54.10
Severe	0.65	12.88	25.89	32.20
Sub-total	2.70	12.88	39.15	86.30
Total	15.58		125.45	

Hospital cost is reported as average cost per patient in US\$, over 6 months.

Table 3. Impact of medication cost on family income.

Severity	Controlled asthma group			Uncontrolled asthma group		
	Medication	Income	% of impact	Medication	Income	% of impact
Mild	6.50	310.40	2.1	1.60	334.60	0.5
Moderate	19.00	408.60	4.6	9.60	193.70	5.0
Severe	49.00	269.30	18.2	25.00	242.74	10.3
Total	74.50	988.35	7.5	36.20	771.09	4.7

Medication cost and income are reported for last month in US\$.

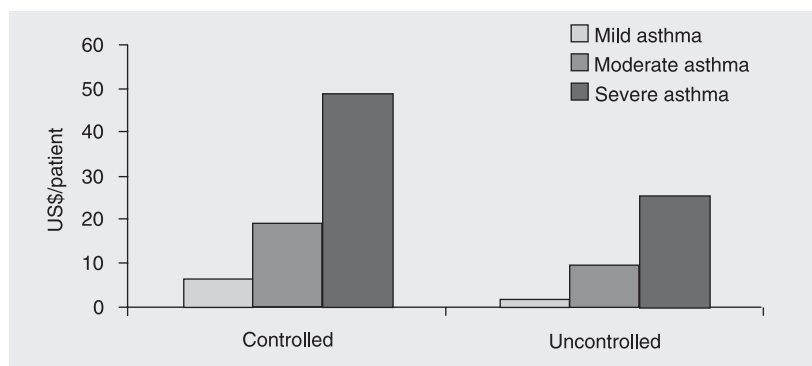


Figure 2. Cost of medication in the last month according to disease severity.

more males in the uncontrolled group and also a higher educational level in this group. The controlled asthma group showed an average PEF of 72.3% of the predicted value and the average ACQ score was 1.34. These values are compatible with controlled disease.

The severity of asthma was similar in both groups. The majority of patients with controlled asthma (82.2%) were users of inhaled corticoids, as opposed to 22.2% of uncontrolled patients.

The average direct costs per patient in the uncontrolled asthma group were US\$39.15 for emergency room visits, US\$86.30 for hospitalization and US\$36.20 for maintenance medication, while the average costs of the controlled group were US\$2.70 for emergency room visits, US\$12.88 for hospitalization and US\$74.50 for maintenance medication (Figure 1).

Comparison of direct costs among severe, moderate and mild asthmatics showed that the highest expenditures for moderate uncontrolled asthmatics were related to hospitalization and emergency room visits (US\$10,69 and US\$54,10; Table 2), while the highest expenditures for the controlled group were related to the medication consumed by patients with severe asthma (US\$49,00; Table 3). The proportional distribution of medicine costs regarding severity is presented in Figure 2.

The maintenance medication for asthma used up to 6.3% of the family's monthly income. The level of impact increased with the severity of asthma. The controlled group with severe asthma spent 18.2% of the family income while the uncontrolled group spent 10.3% (Table 3).

The number of school and working days lost was higher among the uncontrolled patients, 54 versus 30 days and 48 versus 12 days, respectively.

Discussion

The present study demonstrates that un-

controlled asthmatic patients have higher direct costs compared with uncontrolled ones. The major proportion of these direct costs in uncontrolled patients was related to emergency room visits and hospitalizations, whose total expenditure was US\$125.45, while for the controlled patients it was US\$15.58. It is suggested that there is a gain area for significant health care cost reduction by improving the disease control.

The reduction in asthma mortality and morbidity with the regular use of maintenance medication has been well documented (19-23). In our study, we observed that only 22% of the uncontrolled patients used inhaled corticoids daily while 82% of the controlled patients did so. The reduction of exacerbations in the controlled asthma patients as well as the lower direct cost with health care assistance was a consequence of the use of maintenance medication.

Among the controlled patients, the direct cost was skewed toward more severe disease, while the uncontrolled patients with a moderate level of asthma used more health care attendance and spent more resources compared with mild and severe patients. This indicates that the total direct cost is closely related to uncontrolled disease.

In our health system the drugs are not free for patients, and therefore it is imperative to estimate how medicine costs influence family resources. There is little information regarding the financial impact of asthma costs on family income. One of the few published studies found that asthma care expenditures accounted for an average of 6.4% of the family's yearly income (24). In our study we observed a similar impact, with the cost of maintenance treatment representing 6.3% of the family income (23).

The cost of medicines might be a barrier

to asthma care in our poor population. Based on this cost results, the Brazilian public health system has been targeted to provide free drug distribution to uncontrolled asthma patients. Although there would be an increase in cost with the acquisition of medicines, the total direct cost would be reduced by decreasing unscheduled visits, emergency attendance and hospitalization. Moreover, this recommended management of the disease avoids dangerous consequences for under treated asthma patients (24,25).

One of the limitations of the present study is the difficulty to compare the amount of money spent due to differences in economic systems. The expenditures in Brazil are lower compared to other studies; however, observing the direct cost oscillation between controlled and uncontrolled patients it is possible to estimate the effect of asthma control.

The present study demonstrated that the costs with controlled asthma affected the total costs mainly by reducing health care expenditures. On the other hand, the lack of free distribution of medicines imposes a burden on family income which might be a barrier to asthma care.

The analysis of the direct cost due to asthma may help to plan better strategies for asthma management and prevention. Providing regular structured health care for asthma patients would aid in obtaining good control, reducing health care costs and improving the quality of life, and would promote well-being and reduce the disease burden on both the health care system and society.

Acknowledgments

The authors thank Ana Paula Godoy Fernandes for correcting the text.

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