

Level of bronchial asthma control and direct medical care costs among adult asthma club members: longitudinal cost of illness study

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ABSTRACT

Background. Uncontrolled bronchial asthma (BA) creates financial burden, which is expected to rise as symptom severity increases.

Objective. To quantify the direct medical care costs incurred by adult patients with BA in relation to the level of asthma control.

Design. Longitudinal cost of illness study.

Setting. Outpatient Department of Southern Philippines Medical Center (SPMC) in Davao City, Philippines.

Participants. 35 male and female patients above 18 years old, diagnosed to have BA and members of the Davao Asthma Club.

Main outcome measures. Level of asthma control and direct medical care costs based on patient diaries.

Main results. There were 10 males and 25 females who participated in the study, with an overall mean age of 56.86 ± 12.93 years. For the duration of the study, 24 (69%) participants had controlled asthma and 11 (31%) had uncontrolled asthma. Over a 2-month period, the overall mean direct medical care cost was PHP $3,264.66 \pm 3,076.39$. Cost of medications, admissions, outpatient consultations, emergency room consultations, and diagnostics account for 75.96%, 17.59%, 3.19%, 1.75%, and 1.51% of the total medical care costs, respectively. The mean direct medical care costs incurred by participants with controlled asthma was PHP $2,365.96 \pm 265.43$, while that of participants with uncontrolled asthma was PHP $5,225.45 \pm 4,885.37$ ($p=0.0085$).

Conclusion. Cost of medications accounted for three-fourths of the total direct medical care costs of patients with BA. The direct medical care costs incurred by patients with uncontrolled BA are significantly higher, compared to those of patients with controlled BA.

Keywords. financial burden of disease, asthma symptom severity, source of funds, health insurance, out-of-pocket expenses

INTRODUCTION

The worldwide incidence of bronchial asthma (BA) has been increasing in recent years.¹ BA accounts for 180,000 preventable deaths per year, becoming the second major cause of adult death and disability worldwide in 2004, according to the Asia Asthma Development Board.² An estimate of 10.7 million Filipinos have BA.³

There is an increasing trend in the costs of asthma care.⁴⁻⁵ The average cost per hospital admission related to asthma was USD 6,600 in 2010, compared to only USD 5,200 in 2000.⁶ The increasing efforts in controlling asthma complications and the rising range of environmental factors that affect asthma symptoms can possibly explain this trend. Financial burden in asthma among different Western countries range from USD 300 to USD 1,300 per patient each year.⁷ In one study in Canada on the cost of asthma care among children, the

societal total costs of the disease were comprised of hospital admission expenses (43%), medication expenses (31%), and parent productivity losses (12%).⁸

IN ESSENCE

Taking maintenance medications is crucial in symptom control for patients with asthma.

In this study, cost of asthma medications constituted most of the total expenses of patients with asthma for medical care. Compared to patients with controlled asthma, those with uncontrolled asthma spent more than twice in direct medical care costs.

A health insurance benefit package for asthma should include coverage of maintenance medications, and outpatient diagnostics and consultations aimed at controlling the symptoms of asthma, on top of coverage of hospitalization costs.



In an Asian study done in diverse urban regions in China, Hong Kong, Korea, Malaysia, Philippines, Singapore, Taiwan, and Vietnam, the mean total direct annual cost for asthma per patient was USD 320. Drug costs comprised about 9% (Hong Kong) to 75% (Philippines) of the total per-patient direct costs. Filipinos with asthma spent 573% of the nation's mean per capita health care spending on asthma medical care.⁹

The goal of periodic assessment and monitoring of patients with BA is to determine whether the goals of therapy are achieved and the asthma is controlled. If asthma is uncontrolled, there is significant asthma burden, decreased quality of life, and increased health care utilization.¹⁰⁻¹²

We did this study in order to quantify the direct medical care costs incurred by adult patients with BA in relation to the level of asthma control. We also wanted to determine the sources of funds for medical care and how each of the sources contributes to the total direct medical care costs.

METHODS

Study design and setting

In 2014, we did a 2-month longitudinal cost of illness study among members of the Davao Asthma Club (DAC) in Southern Philippines Medical Center (SPMC), a 1,200-bed capacity tertiary government hospital in Davao City, Philippines. The DAC was founded in November 2000 by patients diagnosed with BA. The club is supervised by residents of the Department of Family and Community Medicine, but it has its own set of officers, duly elected by the members from among their fellow patients with BA. Club activities, including regular monthly meetings and consultations, lectures, and celebrations, are geared towards education about BA, disease monitoring, efficient means of drug procurement, and social support. At present, the club has 57 registered members. An average of 30 members are usually present during a meeting.

Participants

Male and female members of the DAC who were at least 18 years old and who had been with the club for at least six months were eligible to participate in the study. We wanted for the study to detect a difference of PHP 1,000 in direct medical care costs between two comparison groups (i.e., controlled asthma group versus uncontrolled asthma group)

as statistically significant. Assuming a PHP 1,000 standard deviation of direct medical care costs and an equal number of patients between two comparison groups, a total sample size of at least 34 patients will have 80% power of rejecting the null hypothesis in a test for comparison of means carried at a <0.05 level of significance. We eventually recruited 35 patients into the study.

Data collection

The primary outcome measures we were interested in were the level of asthma control among the participants of the study and asthma-related direct medical care costs. We used two data collection tools for this study: a self-administered questionnaire and a structured diary.

The self-administered questionnaire was constructed in order to collect the demographic profile of patients, as well as their asthma control scores. Upon enrolment into the study, we collected a patient's age, sex, civil status, occupation, and educational attainment. We also took the baseline BA control score of a patient using the Filipino version of the Asthma Control Test™ (ACT™).¹³ ACT™ is a 5-question test designed for self-administration by 12-year-old or older patients with BA, in order to measure the degree to which their symptoms are controlled for the past four weeks.^{14 15} This questionnaire, which includes an item about the patient's view of control, has been widely used, translated in many languages, validated, and found to correlate well with doctors' rating of patients' asthma control.¹⁶ For each of the 5 items in the questionnaire, patients would choose a score from 1 to 5, with 1 reflecting the worst and 5 reflecting the best control of asthma symptoms. The individual scores are then added to come up with the total ACT™ score. A total score of 25 indicates totally controlled asthma, a score of 20-24 indicates partially controlled asthma, while a score of 19 or lower indicates uncontrolled asthma. All the participants accomplished the self-administered questionnaires during scheduled monthly meetings, and one of us (MAMF) was always present when the patients answered the questionnaires. We measured the ACT™ scores of participants twice: at the end of their first month and at the end of their second month into the study. We considered participants to have controlled

asthma if their ACT™ scores were consistently between 20 and 25 within the two-month study. Participants who had at least one ACT™ score below 20 during the study were considered to have uncontrolled asthma.

We designed a structured diary, which was used by participants to record asthma-related expenses that they have incurred throughout the two-month duration of the study. The participants classified each entry in the list of expenses into one of the following direct cost categories reflected in the diary: diagnostics (e.g., cost of chest x-ray, spirometry, and arterial blood gases), asthma medications, outpatient consultation, emergency care consultation, and hospital admission. For this study, only these direct costs of asthma-related medical care were considered. We did not account for the indirect costs of asthma, such as the equivalent costs of lost wages and productivity¹⁷ during asthmatic exacerbation or recuperation from illness. We did not factor in other direct medical care costs of non-asthma diseases, such as those of hypertension or diabetes comorbidities, in the list of expenses, either. We instructed the participants to reflect the actual costs of the products and services in their diaries, even if they did not have to pay the entire or a portion of the costs (i.e., after discounts, fund assistance, etc.). We also asked them to, whenever feasible, turn in a copy of the official receipt of payment for each item reflected in the diary. The corresponding sources of funds for the items in the list of expenses were also indicated by the participants. Costs were covered by one or a combination of the following fund sources: health insurance, out-of-pocket (from the patient's personal funds, or assistance from family or friends), external assistance (from one or more of several medical assistance programs or social services available in the

Table 1 Demographic characteristics of patients with bronchial asthma

Characteristics	Values (n=35)
Mean age \pm SD, years	56.86 \pm 12.93
Sex, frequency (%)	
Female	25 (71.43)
Male	10 (28.57)
Civil status, frequency (%)	
Single	2 (5.71)
Married	24 (68.57)
Widowed	7 (20.00)
Separated	2 (5.71)
Occupation, frequency (%)	
Employee	3 (8.57)
Self-employed	7 (20.00)
None	25 (71.43)
Educational attainment, frequency (%)	
Elementary level	4 (11.43)
High school level	17 (48.57)
College or vocational course level	14 (40.00)

locality), and senior citizen discount.

Statistical analysis

We summarized categorical variables using frequencies and percentages. We summarized continuous variables using means and standard deviations, and compared them using t-test. A two-sided alpha error of <0.05 was considered statistically significant. We did all statistical analyses in Epi Info version 7.1.4.0.

RESULTS

Data on demographic characteristics, asthma control and asthma-related medical care expenses were complete for all 35 patients who participated in the study. Table 1 shows the demographic characteristics of the participants. The mean age of the participants was 56.86 ± 12.93 years. Majority were females (25/35, 71.43% versus 10/35,

Table 2 Direct medical care cost of bronchial asthma in a 2-month period, according to cost category

Cost category	Average cost†	SD†	Minimum†	Maximum†	% of total
Diagnostics	49.29	224.75	0.00	1,320.00	1.51
Medications	2,479.80	949.30	1,000.00	4,754.00	75.96
Outpatient consultations	104.29	73.14	50.00	500.00	3.19
Emergency consultations	57.00	262.93	0.00	1,547.00	1.75
Hospital admissions	574.29	2,518.56	0.00	13,600.00	17.59
Total	3,264.66	3,076.39	1,050.00	18,791.00	100.00

†All values are in Philippine pesos (PHP).

Table 3 Direct medical care cost of bronchial asthma in a 2-month period, according to source of funds

Source of funds	Average cost†	SD†	Minimum†	Maximum†	% of total
Out-of-pocket	912.90	2,770.16	0.00	16,594.00	1.51
External assistance*	2,131.14	1,044.17	50.00	4,560.00	65.28
Senior citizen discount	34.90	107.69	0.00	444.00	1.07
Health insurance	185.71	1,098.70	0.00	6,500.00	5.69
Total	3,264.66	3,076.39	1,050.00	18,791.00	100.00

†All values are in Philippine pesos (PHP); *external assistance includes *Lingap para sa Mahirap*, Congressional Medical Assistance Program (CMAP), and hospital social services.

28.57% males). Most of the participants were married, (24/35, 68%), had no employment (25/35, 71.43%), and had either high school (17/35, 48.57%) or college/vocational course education (14/35, 40%).

The direct costs of asthma-related medical care are summarized in Table 2. The average total direct medical cost was PHP 3,264.66 ± 3,076.39. Cost of medications comprised the largest proportion (75.96%), while cost of diagnostics comprised the smallest proportion (1.51%) of the total direct medical cost.

The sources of funds for asthma-related expenses are shown in Table 3. Most of the funds for medical care were sourced externally (65.28%). The mean external assistance amount (PHP 2,131.14 ± 1,044.17) was more than twice the mean amount of out-of-pocket expenses (PHP 912.90 ± 2,770.16).

For the duration of the study, 24 (69%) participants had controlled asthma and 11 (31%) had uncontrolled asthma. Table 4 shows the comparative costs of medical care between patients with controlled asthma and those with uncontrolled asthma. The total direct medical care costs of uncontrolled asthma was more than twice as much as that

of controlled asthma (PHP 5,225.45 ± 4,885.37 versus PHP 2,365.96 ± 265.43, $p=0.0085$). Specifically, uncontrolled asthma entailed significantly higher costs compared to controlled asthma in medications (PHP 3,189.27 ± 1,018.57 versus PHP 2,154.62 ± 728.01, $p=0.0016$), outpatient consultations (PHP 140.91 ± 122.10 versus PHP 87.50 ± 22.12, $p=0.0430$), and hospital admissions (PHP 1,827.27 ± 4,364.42 versus PHP 0.00, $p=0.0445$). Among patients with controlled asthma, the cost of medications comprised 91.07% of the total direct medical care costs. Among those with uncontrolled asthma, the cost of medications was only 61.03% of the total direct medical care costs, but the absolute average cost of the medications was higher compared to that among patients with controlled asthma.

DISCUSSION

Key results

In this two-month study among patients with asthma, we found out that cost of asthma medications constituted three-fourths of the total direct medical care cost of the disease. Our findings also revealed that the total direct cost of medical care for uncontrolled asthma was more than twice the total direct

Table 4 Direct medical care cost of bronchial asthma in a 2-month period, according to cost category and asthma control

Cost category	Controlled asthma (n=24)			Uncontrolled asthma (n=11)			p-value
	Average cost†	SD†	% of total	Average cost†	SD†	% of total	
Diagnostics	59.38	269.36	2.51	27.27	63.93	0.52	0.7010
Medications	2,154.62	728.01	91.07	3,189.27	1,018.57	61.03	0.0016*
Outpatient consultations	87.50	22.12	3.70	140.91	122.10	2.70	0.0430*
Emergency consultations	64.46	315.78	2.72	40.73	72.59	0.78	0.8084
Hospital admissions	0.00	0.00	0.00	1,827.27	4,364.42	34.97	0.0445*
Total	2,365.96	265.43	100.00	5,225.45	4,885.37	100.00	0.0085*

†All values are in Philippine pesos (PHP); *statistically significant.

cost of care for controlled asthma.

Strengths and limitations

We were able to successfully quantify the costs of medical care of asthma in our locality from the patients' perspective. This study was also able to demonstrate the huge gap in costs of medical care between controlled and uncontrolled asthma, thereby highlighting the importance of symptom control in the management of the disease.

Our study has several limitations. We did not include the indirect medical care costs of asthma, such as lost wages, and equivalent cost of lost productivity during acute exacerbations and recuperation from asthma. If we considered indirect costs of asthma, the disparity in costs between controlled and uncontrolled asthma or the comparative costs of the individual cost categories could possibly be different.⁸ In addition, our study focused only on patients' perspective about direct costs of medical care. Looking at the issue from the perspective of the government, the hospital, or the health insurance companies could possibly generate different findings and insights. Finally, we measured BA control using the Asthma Control Test™.¹³ Many other asthma-specific and patient-based measures are available with varying nature, validity, and ease of use, such as the Rule of Two™,¹⁸ the 30-second test used in Canada,¹⁹ and the Royal College of Physicians Three Questions utilized in the United Kingdom.²⁰ The use of other BA control tools could have produced different control classifications among our patients.

Interpretation

Medical care costs of asthma increase when the condition becomes poorly controlled.⁸ When BA is uncontrolled, there is an increase in the need to seek emergency medical attention, and spend for diagnostics and therapeutics. Asthma control is achieved by avoidance of factors that trigger symptoms and exacerbations and by maintaining prescribed medications. Improved asthma control will reduce the number of asthma-related hospitalizations and can ultimately reduce direct health care costs.

Procurement of asthma medications is crucial to asthma control. In our study, asthma medication cost took up most of the total medical care costs incurred by patients with asthma. It was lower in terms of percentage of total direct medical care costs

among patients with uncontrolled asthma, but the absolute cost was still higher compared to the asthma medication cost among patients with controlled asthma. Patients with uncontrolled asthma spent relatively less for medications because they had to allot a third of their expenses to the cost of hospital admissions. Medications and hospitalization for asthma-related causes are significant parts of health care expenditure, especially among patients with uncontrolled asthma.⁶⁻⁸ Health care resources are burdened when the prevalence and severity of asthma increase.^{4,5} Majority of the costs of illness comes from managing the effects of poorly controlled asthma. Hence, improving asthma control is clinically and economically desirable.⁸

Generalizability

Patients with BA need adequate funds for their maintenance medications. Maintenance medications control asthma symptoms and prevent hospitalizations. Health insurance can potentially protect patients with asthma from financial risk.²¹ At present, most health insurance benefit packages only cover the cost of hospital admissions related to asthma. This means that patients are only protected from financial risk when their asthma symptoms become uncontrolled or when they develop complications of the disease. It also means that, despite having health insurance, patients with asthma bear the financial burden of controlling their disease and keeping themselves from getting hospitalized for asthma-related symptoms.

The results of our study can help patients and health care practitioners in making decisions around the medical care for patients with BA. The results of this study can also guide health insurance policy makers in designing cost-efficient benefit packages for patients with BA. A benefit package that includes not only coverage of hospitalization costs, but also coverage of maintenance medications, as well as outpatient diagnostic tests and consultations intended to keep patients from experiencing symptoms of uncontrolled asthma, can help control asthma morbidity and potentially reduce the overall costs of medical care for the disease.

CONCLUSION

Cost of medications comprised three-fourths of the direct medical care costs of asthma. Compared to patients with controlled

asthma, those with uncontrolled asthma spent more than twice for medical care.

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Ethics approval

This study was reviewed and approved by the Department of Health XI Cluster Ethics Review Committee (DOH XI CERC reference 14082203).

Reporting guideline used

STROBE Checklist (http://www.strobe-statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_combined.pdf)

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