Costs of drugs used for the treatment of asthma in relation to disease severity

Yoshiro Tanizaki, Fumihiro Mitsunobu, Yasuhiro Hosaki, Kozo Ashida, Masanori Hamada, Naofumi Iwagaki, Makoto Fujii, Shingo Takata

Division of Medicine, Division of Rehabilitation, Misasa Medical Center, Okayama University Medical and Dental School

Abstract: Costs of drugs used for the treatment for 1 year were examined in 32 patients with asthma in relation to disease severity. Asthma severity was classified as: 1) intermittent; 2) mild persistent; 3) moderate persistent; 4) severe persistent. 1. The total cost of drugs used for each patient for 1 year was the highest (¥263,710) in patients of stage 4 (severe persistent) and the lowest (¥74,670) in those of stage 1 (intermittent). The costs of bronchodilators and antiallergics were predominant at all stages, and their cost increased significantly with increasing severity. 2. The costs of drugs such as antiallergics and bronchodilators were predominant, and the costs of drugs such as inhaled corticosteroids and mucolytics were considerably high in patients of all stages. 3. The costs of bronchodilators, inhaled corticosteroids, and antiallergics were the largest in patients of stage 4. The results suggested that the costs of drugs used for the asthma treatment tended to increase as the disease severity became stronger from stage 1 to stage 4, and the main drugs related to the increase in total costs were bronchodilators, antiallergics, and inhaled corticosteroids.

Key words: asthma, disease severity, costs, bronchodilators, corticosteroids, antiallergics

Introduction

Asthma is one of the most popular respiratory diseases. In the onset mechanisms of asthma, IgE-mediated allergy plays an important role, in which an increase in the generation of leukotriene C4 (LTC4) related to bronchospasm\(^1\-\(^3\)\), and leukotriene B4 (LTB4) related to bronchial hyperresponsiveness\(^4-\(^6\)\), is observed. The leukocytes of the asthmatics generated significantly more LTB4 and LTC4 than those of controls. The leukocytes of patients with atopic asthma generated significantly more LTC4 than those of patients with nonatopic asthma. In addition, it has been reported that there is a significant
correlation between LTB4 generation by leukocytes and the degree of bronchial hyperresponsiveness to methacholine. However, the pathogenesis of asthma becomes somewhat complex with aging. Our previous studies have shown that bronchial hyperresponsiveness decreases significantly as age at onset increases in patients without a family history, suggesting that the hyperresponsiveness shows a tendency to decrease with aging.

The process of development of drugs for the treatment of asthma has shown that asthma symptoms could be improved more easily with newly developed drugs such as inhaled corticosteroids and bronchodilators. However, the costs of drugs newly developed are considerably high, and the number of patients with asthma has been increasing in recent years. Because of high cost of newly developed drugs and an increase in number of patients with asthma, it has been suggested that the costs of medication for the treatment of asthma has been increasing.

In recent years, several pharmacoeconomic studies in asthma have been conducted in the USA and Europe. In the present study, the costs of drugs used for the treatment of asthma was studied in relation to disease severity.

Subjects and Methods

The subjects of this study were 32 patients (18 females and 14 males) with asthma. Their mean age was 66.2 years (range 48-76 years). All patients were treated with antiasthmatic drugs such as bronchodilators, corticosteroids, antiallergics, mucolytics, antibiotics, and others (physiological saline, drugs for common cold, etc) at Misasa Medical Center for 1 year. The costs of drugs used for the treatment of asthma per patient for 1 year (from January to December in 2000) were calculated. The total costs of all drugs and the cost of each drug were expressed throughout in ¥.

Asthma severity was evaluated according to international guidelines. Assessments of severity were classified as: 1) intermittent; 2) mild persistent; 3) moderate persistent; 4) severe persistent. The costs of drugs used per patient for 1 year were compared among four stages.

Statistically significant differences of the mean were estimated using unpaired Student's t test. A p value of <0.05 was regarded as significant.

Results

The total costs of drugs used for patients of stage 1 and 2 were significantly lower than in those of stage 3 and stage 4. The costs of drugs such as bronchodilators, corticosteroids, antiallergics, mucolytics, antibiotics, and others tended to increase as stage of asthma went up, as shown in Table 1. Of all drugs used for asthma treatment, the costs of antiallergics and bronchodilators were markedly large, and the costs of corticosteroids and mucolytics were considerably high in patients of all stages (Table 2).

Table 1. Costs of drugs used for treatment per patient for 1 year in relation to asthma severity

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Asthma stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Bronchodilators</td>
<td>20,200</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>9,950</td>
</tr>
<tr>
<td>Antiallergics</td>
<td>30,570</td>
</tr>
<tr>
<td>Mucolytics</td>
<td>12,700</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>820</td>
</tr>
<tr>
<td>Others</td>
<td>440</td>
</tr>
<tr>
<td>Total</td>
<td>74,670</td>
</tr>
</tbody>
</table>

Data are presented as mean ¥. a,b and d: p<0.001, c:p<0.01.
Table 2. Total costs of each drug used for the treatment per patient for 1 year in all stages

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Costs (¥)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bronchodilators</td>
<td>38,946</td>
<td>23.2</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>20,712</td>
<td>12.4</td>
</tr>
<tr>
<td>Antiallergics</td>
<td>81,708</td>
<td>48.8</td>
</tr>
<tr>
<td>Mucolytics</td>
<td>17,251</td>
<td>10.3</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>7,094</td>
<td>4.2</td>
</tr>
<tr>
<td>Others</td>
<td>1,765</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>167,476</strong></td>
<td>100.0</td>
</tr>
</tbody>
</table>

The proportion of the cost of bronchodilators in total drugs in each asthma stage was the largest in patient with stage 1 and the lowest in those of stage 4 (Fig. 1 a). However, the proportion of the cost of bronchodilators used in patient of all stages was the largest in those of stage 4 (Fig. 1 b). The proportion of the cost of corticosteroids in total drugs in each asthma stage was not different among patients of four stages (Fig. 2 a). In contrast, the proportion of the cost of corticosteroids used in patients of all stages was the largest in those of stage 4, and showed a tendency to decrease as the asthma stages went down (Fig. 3 b).
Discussion

Many antiasthmatic drugs such as inhaled sympathomimetics, inhaled corticosteroids and leukotriene C4 receptor antagonists have been developed in recent years. However, the costs of these newly developed drugs are in general considerably high. Particularly, the use of prescribed inhaled sympathomimetics and corticosteroids has been increase with severity of illness. In addition, the number of patients with asthma, particularly, of elderly asthmatics, has been increasing in recent years in Japan. It has been also reported that pharmacotherapy for asthma is underused or inadequate. In particular, treatment with inhaled corticosteroids is insufficient. In contrast, short-term sympathomimetics are excessively prescribed. Only one-third of asthma patients were treated according to asthma guidelines.

A relationship between total costs for asthma treatment and disease severity has been discussed in recent years. The most empirical data, for 1995-1996, clearly showed an increased costs depending upon illness severity, and other reports have also shown an enormous increase as total costs as asthma severity increases.

In this study, the costs of drugs used for the treatment of asthma were examined in 32 patients with asthma. The results obtained here demonstrated that the total costs of drugs for asthma increased as disease severity increased from stage 1 to stage 4. Regarding the proportion of the costs of each drug against total drugs in each asthma stage, the proportion of costs of antiallergics and antibiotics increased. In contrast, the proportion of costs of bronchodilators and mucolytics decreased, and the proportion of the costs of corticosteroids did not change, as asthma severity increased from...
stage 1 to stage 4. This suggests that the proportion of the costs of antiallergics and antibodies against total drugs was the largest, and the proportion of bronchodilators and mucolytics against total drugs was smallest in patients of stage 4 (severe persistent). The proportion of the costs of each drug used in patients of all stages tended to increase as asthma stage went up from stage 1 to 4. The results reveal that the costs of bronchodilators, corticosteroids, and antiallergics increased as asthma severity became stronger.

References


一方, stage 1 (平均¥74, 670) で最も低い値を示した。2. 個々の薬剤費の検討では、抗アレルギー薬、気管支拡張薬などの薬剤費が高く、次いで副腎皮質ホルモン（主として吸入薬）、去痰薬の順であった。3. 気管支拡張薬、副腎皮質ホルモン、抗アレルギー薬などの薬剤費は、いずれも stage 4 で最も高い値を示した。

気管支喘息に対する薬剤費は、疾患が重症になるにつれて高くなる傾向を示した。また、その主たる薬剤は気管支拡張薬、抗アレルギー薬、吸入用副腎皮質ホルモンなどであった。