

because the concentration of contaminants is higher in fatty fish and shellfish than in lean fish. Further research is needed to explore if the observed results could be replicated.

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Cost analysis of asthma maintenance medications in a veteran population



Asthma is a disease that is characterized by hyperresponsiveness of bronchi due to various stimuli. An estimated 22.9 million Americans have asthma. Asthma accounts for 17 million ambulatory care visits and 456,000 hospitalizations per year.¹ It affects 7.7% of US adults and 9.4% of US children.² In the United States, in 2007, the annual total economic burden of asthma-related cost is estimated to be \$56 billion.³ Previous reports have found that economic burden of asthma increases with severity of the disease, and poorly controlled disease results in even higher costs.

Both the Global Initiative for Asthma and the National Asthma Education Prevention Program (NAEPP) guidelines emphasize stepwise management of asthma based on disease severity.^{4,5} The current asthma guidelines recommend daily use of asthma controller medications to achieve and maintain control of persistent asthma. The preferred initial treatment is inhaled corticosteroids (ICSs), with leukotriene modifiers listed as an alternative controller. The recommendations are based on data from controlled trials in which ICSs, when compared with long-acting β -agonists (LABAs) alone, have produced significantly greater clinical improvement, such as peak expiratory flow, percentage of symptom-free days, and percentage of rescue-free days.⁶

However, estimates of efficiency from tightly controlled clinical trials may not translate to clinical practice, particularly when real-world asthma medication adherence plays an important role. One of the most important factors influencing adherence is the cost of controller medications. Controller medications are expensive and can be a barrier to optimal control. Poor baseline asthma control often results in higher total health care cost due to exacerbations.⁷

A retrospective clinical database analysis was performed using a computerized clinical database at the Veterans Affairs (VA) West Los Angeles Hospital, Allergy/Immunology Clinic. Patients who

presented to the clinic between July and August 2009 were identified. Inclusion criteria was defined by (1) diagnosis of persistent and well-controlled asthma as defined by NAEPP criteria and (2) use of ICSs or combination ICSs and LABAs. Exclusion criteria included patients receiving omalizumab and/or allergen immunotherapy. The number of asthma maintenance medications, such as montelukast, ICSs, LABAs, and ICS-LABA combination, were collected. Patients were divided into 3 groups of disease severity based on type of controller medication used. The groups were use of low- to medium-dose ICSs, use of high-dose ICSs, and use of ICS-LABA combination. Cost of asthma medications were calculated based on VA West Los Angeles Pharmacy pricing. Costs of emergency department visits, office visits, and hospitalizations were not included. SAS statistical software (SAS Institute Inc, Cary, North Carolina) was used for data analysis.

A total of 112 patients were recruited, of whom 99 patients met the inclusion criteria. The mean age of the patients was 65 years. Twenty-two patients used low- to medium-dose ICSs, 6 patients used high-dose ICSs, and 71 patients used the LABA-ICS combination. The total medication cost per month ranged from \$1.73 to \$279.84. For patients using low- to medium-dose ICSs, the mean total medication cost per month was \$46.19. For patients who were using high-dose ICSs, the mean total medication cost per month was \$132.45. For patients who were using the LABA-ICS combination, the total mean medication cost per month was \$156.28 (Fig 1). In addition, patients who were atopic, defined by skin or blood test positivity to at least one aeroallergen, have higher medication cost per month. Cost for patients with atopic vs nonatopic asthma was \$134.69 vs \$113.30.

The expense of medications in chronic disease, such as asthma, affects the growing burden of medical care in the United States. Drug prices have increased in the troubled economy, and patients often cannot afford their medications, further compounding this crisis.

B= low to medium dose ICS
C= high dose ICS
D= ICS/LABA

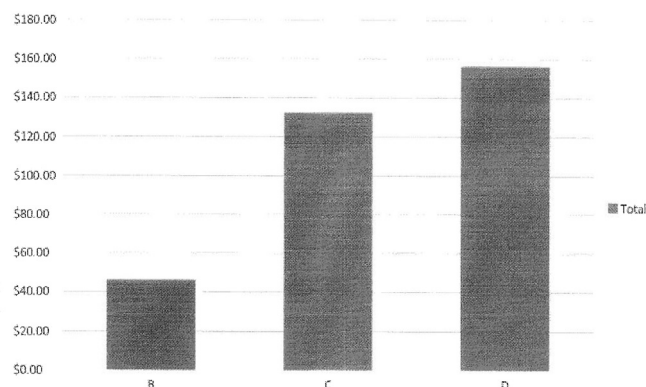


Figure 1. Cost of medication for patients with low to medium dose ICS versus high dose ICS or ICS/LABA per month.

One study found that when the copayment doubles, patients with asthma reduce the use of medications by 32%.⁷ The reduction in use of controller medications eventually leads to greater long-term costs in the form of emergency department visits and hospitalizations. Identifying patients early who may require a higher cost to treat is important because these patients can be targeted more aggressively. Patient education, omalizumab, allergen immunotherapy, treatment of concomitant allergic rhinitis, and management of comorbid conditions are all important in controlling baseline asthma in addition to traditional controller medications.⁸

The aim of this study is to quantify the cost of asthma maintenance medication use in the VA system. In accordance with previous studies, our study found that cost of asthma maintenance medication correlated with severity of disease. Patients who used the ICS-LABA combination have a higher direct cost of medication than those who used ICSs alone. In addition, patients with atopic asthma also required a higher cost compared with those with nonatopic asthma.

The annual total cost for VA patients in this cohort was \$1564.46 in 2009. Mean costs were \$554.32 for patients using low- to medium-dose ICSs, \$1589.36 for those using high-dose ICSs, and

\$1875.36 for those using the for ICS-LABA combination. Compared with other chronic conditions, such as hypertension or diabetes mellitus, the cost of asthma treatment is high. The mean annual cost of treating a patient with diabetes is \$18.18 for metformin, \$31.03 for hydrochlorothiazide, and \$4.87 for lisinopril for hypertension.

In conclusion, asthma treatment is associated with high health care expenditures. Glucocorticoids remain the most successful anti-inflammatory treatment used for asthma maintenance therapy. They are effective in treating symptoms, reducing exacerbations, and improving lung function and have greatly improved asthma control and quality of life. It is concerning that the annual cost of asthma medication is substantial for the VA pharmacy. This high cost has implications for non-VA asthma populations.

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Experience with epinephrine delivery in immunotherapy-associated systemic reactions



The administration of subcutaneous immunotherapy (SCIT) is associated with a 0.06% to 0.67% risk of systemic reactions (SRs).^{1,2} Injectable epinephrine is first-line treatment for SRs specified in anaphylaxis and allergy immunotherapy practice parameters.³ Historically, the deltoid muscle has been used to deliver epinephrine for asthma and anaphylaxis. Two pharmacokinetic studies performed in 17 children and 13 adults reported faster peak plasma epinephrine levels with intramuscular epinephrine delivered to the vastus lateralis compared with the deltoid muscle.^{4,5} Nevertheless, the deltoid remains an injection site used in

many institutions, and no clinical evidence suggests epinephrine is ineffective in the deltoid. These observations highlight the need for clinically relevant studies on epinephrine delivery practices in SCIT-associated SRs.

This 7-year study (2005–2012) approved by an institutional review board examined epinephrine administration at a single institutional allergy clinic. All SCIT-associated SRs identified and treated with at least 1 dose of epinephrine were included. SRs that were not treated with epinephrine and reactions attributable to non-SCIT triggers were excluded. In our clinic, 2 epinephrine modalities were used: epinephrine prefilled syringes (EPFSs) and auto-injectors. EPFSs were drawn up daily in 3 doses (0.15, 0.3, and 0.5 mg). EPFSs were injected intramuscularly using 2.5-cm-long 25-gauge hypodermic safety needles injected in the deltoid or vastus lateralis. Adult and pediatric epinephrine auto-injectors (EpiPen,

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