Chapter 4
Outcomes Research in the Treatment of Asthma

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ABSTRACT
Asthma is a common chronic disease in the United States, with increasing prevalence. Many patients do not realize therapeutic goals because of poor disease management. The purpose of this study is to examine the costs of the commonly used drugs used to treat asthma. We examined the contribution of individual, government and private agencies for medication payment. We next compared the prescription cost to the cost of emergency room visits. The data are taken from the Medical Expenditure Panel Survey. SAS Enterprise Guide was used for preprocessing and data visualization. It was found that prednisone is the cheapest drug and the drug, albuterol, is the most common, even if it is more expensive. The contribution of the government is higher than the amount paid by individuals and other agencies. We examined data from the National Inpatient Sample to investigate trends in asthma as well.

BACKGROUND
Asthma is a chronic disease that affects the human respiratory system. Because of asthma, the airways in the lungs become narrower. Consequently, there is less airflow through the lungs. Its main symptoms are trouble in breathing, coughing and chest tightness. Asthma cannot be cured, but most people with asthma can control it so that they have few symptoms and can live a normal and active life. When the symptoms of asthma become worse than usual, this is called an asthma attack. In a severe case, the airways might narrow so much that oxygen cannot circulate to the vital organs of the body. As a result, people may die from severe asthma attacks.

Asthma is a worldwide public health problem affecting approximately 300 million people. Most of them are living in the developing countries. Despite the existence of effective medications and international medical guidelines, the continuous high cost of asthma medications becomes a major problem for most of the developing countries. (Ait-Khaled,
According to the National Center for Health Statistics, there are at least 21 million patients with asthma in the United States. Among them are about 6 million children under 18 years of age. In 2000, there were 1.9 million emergency department visits for asthma leading to 465,000 hospital admissions overall, with 214,000 for children 1 to 17 years of age. (Conboy-Ellis, 2006)

According to the American Lung Association, in the year 2007, there were 22.2 million Americans suffering from asthma, including 6.5 million children of 5 to 17 years of age. Also, in 2005, there were 488,594 asthma related hospitalizations, 1.8 million emergency department visits and 3,780 deaths in 2004. The annual cost in 2007 was $19.7 billion. (Anonymous-asthma, 2007)

The main causes of asthma are allergens such as skin, hair and feathers of animals, pollen from trees, cockroaches, dust mites, irritants such as air pollution, cigarette smoke, strong odors, cold air and strong emotional expressions, and viral infections. Working closely with a doctor, avoiding things that create asthma symptoms, using asthma medicines, monitoring asthma symptoms and responding quickly to prevent an asthma attack are the main procedures used to treat asthma. (Anonymous-NIH asthma, 2008)

There are many factors that influence the level of asthma control. Mainly, they are classified as physiologic, environmental and behavioral. Physiologic factors include circadian fluctuations, hormonal status, pregnancy, obesity, airway remodeling, and airway hyper responsiveness. Environmental factors include viral infections, allergens, air pollution, seasonal variation, tobacco and behavioral factors that include patient understanding of asthma, adherence to asthma therapy regimen, knowledge and/or avoidance of asthma triggers, and recognition of worsening symptoms. One physiologic factor is gender. The number of males with asthma is more than the number of females in childhood, while we get the opposite result in adulthood. Air pollution such as ozone sulfuric oxide creates the problem in lung function. Behavioral factors are related to the perception of asthma severity and the proper response to escape symptoms. (Chipps & Spahn, 2006)

Because of different causes and different levels of severity of asthma, the treatment of asthma varies from person to person. There are three basic types of medications to control asthma, long-term control medications, quick relief medications and medications for allergy-induced asthma. The drugs, fluticasone, budesonide, triamcinolone, flunisolide, qvar, montelukast, and beta-2 agonists such as salmeteral and formoterol are used to treat persistent asthma. These medications reduce bronchial inflammation and open the airways. The drugs, cromolyn and nedocromil, are used to decrease the allergic reaction, and Theophylline is a daily pill that opens airways and relaxes the muscles around them. Quick-relief medications are used during an asthma attack. A short-acting, beta-2 agonist such as albuterol is given for easy breathing by temporarily relaxing airway muscles. The drug, ipropirium, is also given for immediate relief to allow breathing. Moreover, the drugs, prednisone and methylprednisolone, are given to treat acute asthma attacks, but those drugs may cause serious side effects if they are used in the long term. Anti-igE monoclonal antibodies such as xolair reduce the patient’s immune system’s reactions to allergens. It is given by injections every two to four weeks. (Anonymous-Mayoasthma, 2008)

Besides drug treatment, behavioral modification is another most important aspect for asthma management. The National Institutes of Health (NIH) established five general goals for asthma management. They include no missed school or work days, no sleep disruptions, and maintenance of normal activity levels. A minimal or absent need for emergency department visits or hospitalizations and maintenance of normal lung functions are also goals for treatment.

However, achieving these goals remains incomplete. Low rates of patient adherence to treatment, or failure to follow a prescribed treatment...