

# Asthma: Putting What We Know into Action

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## Summary

Asthma is a costly disease that is more costly when patients have frequent exacerbations. Several strategies can help decrease the number of exacerbations and subsequent costs.

## Key Points

- Exacerbations are common in patients with asthma and result in significant costs.
- A small percentage of patients with frequent exacerbations account for a large portion of the costs of managing asthma.
- Identifying and managing exacerbations at home can avoid emergency department visits or hospitalizations.
- Ensuring patients are on appropriate long-term control medications, and that patients know how to use their medications, will help reduce exacerbations.
- Patients who are frequent users of the emergency department should be referred to asthma specialists.

ASTHMA IS A DISEASE THAT INVOLVES many people, and accounts for a large portion of our health care spending. Twelve percent of children and 11 percent of adults have asthma at some time during their lives. Asthma was the reason for 1.1 million hospital days in 2000 and \$2.9 billion in charges in 2000. The direct and indirect costs of asthma doubled between 1990 and 1998 from \$6.2 billion to \$12.7 billion. Like other diseases, about 20 percent of asthma patients account for about 80 percent of the cost.

Much of the direct costs are related to the management of exacerbations. Patients with asthma are frequent visitors to the emergency department. There are about 38.7 exacerbations per 1,000 patients yearly. There were almost 2 million emergency department visits for asthma in 2002. This was a 30 percent increase from the decade before. Of those patients treated in an emergency department, 12 to 16 percent will need further treatment within two weeks.

One study examining admission for acute asthma in adults in 83 emergency departments in 26 states found that 21 percent of the patients had six or more emergency department visits.<sup>1</sup> More than 90 percent of the visits were attributed to less than half of the total patients who visited the emergency department. Generally, older age and nonwhite patients were associated with an increased number of emergency department visits. Socioeconomic status was inversely

related to emergency department visits. One of the interesting findings of this study was that it did not matter whether these patients had a primary care provider. Further, gender was not related. In this study, males and females had equal frequency of emergency department visits. A higher number of puffs of beta-agonist within six hours before the visit and a short duration of symptoms were associated with more frequent visits. Either the frequent users did not recognize their symptoms or they rapidly got worse.

One study, which examined outcomes of patients hospitalized for asthma in the United States, found that patients hospitalized for asthma exacerbations were more likely to be white, female, and admitted from the emergency department.<sup>2</sup> One of the conclusions that the authors reached was that many people who die from asthma never make it into the hospital. Mortality from asthma in this particular study was about 0.5 percent. Overall, the hospital length of stay was 2.7 days and the hospital charges were over \$9,000. The majority of deaths occurred in the older group as opposed to the younger asthmatics.

The asthma treatment guidelines from the National Asthma Education Program are under revision and should be published later this year. Under the revised guidelines, asthma severity, disease control, and goals of therapy are all defined around two domains - impairment and risk. Impairment is what is going on with the patient currently. Risk is what

### Exhibit 1: Example Causes of Exacerbations

- **Outdoor air pollution**
  - Castor bean dust, grain dust, soy bean dust
  - Wood smoke
  - Ambient air pollution- ozone, nitrogen dioxide
- **Indoor air pollution**
  - House dust mite
  - Environmental tobacco smoke
  - Cockroach
  - Cat
- **78% of acute exacerbations are viral associated**
  - 83% rhinovirus

### Exhibit 2: Tools to Assess Control

- **Clinical Parameters**
  - Nocturnal awakenings
  - Bronchodilator use
  - Symptom scores
- **Lung Functions**
  - Peak flows
  - Forced expiratory volume (FEV1)
- **Subjective Measures**
  - Asthma control test
  - Asthma control questionnaire
  - Quality of life
- **Hypersensitivity Measures**
  - Sputum Eosinophilia
  - Effective but difficult
  - Exhaled Nitric Oxide
    - Probably effective, needs more study
    - Expensive with current equipment

are the risks in the future for this patient.

The goals of asthma management in 2007 are to reduce impairment by preventing chronic troublesome symptoms, reducing use of short acting inhaled beta agonists for symptoms, maintaining “normal” pulmonary function, and maintaining normal activity levels. An additional goal is to meet patients’ and families’ expectations of and satisfaction with asthma care. Health care providers need to get the patients and families more involved to make them active participants in achieving appropriate outcomes of treatment.

In terms of long-term risk from the disease, the goals are to prevent recurrent exacerbations, minimize the need for emergency department visits or hospitalizations, prevent progressive loss of lung function, and provide optimal pharmacotherapy with minimal or no adverse effects. In children, prevention of reduced lung growth is an additional goal.

Because exacerbations frequently lead to emergency department visits, the causes of exacerbation are important (Exhibit 1). Educating patients to avoid exposures that result in exacerbations and how to recognize and manage these exacerbations at home may reduce emergency department visits. Interestingly, viruses, especially rhinovirus, cause most asthma exacerbations. Even with good environmental control measures, this overriding cause of asthma exacerbations is still present.

Early recognition and treatment of exacerbations is important. Patient and family education can accomplish this. The patient needs a written action plan that tells them which medications to take daily, what to monitor to detect an exacerbation, and what to do with the monitoring results. Patients also need to be educated to recognize the early indicators of an exacerbation such as a change in symptoms or peak flow. Within the written action plan, there should be instructions for the patient to intensify therapy at the first sign of an exacerbation. There also needs to be

prompt communication between the patient and the clinician about deterioration so that something can be done. If symptoms get worse or peak flows decrease, action should be taken.

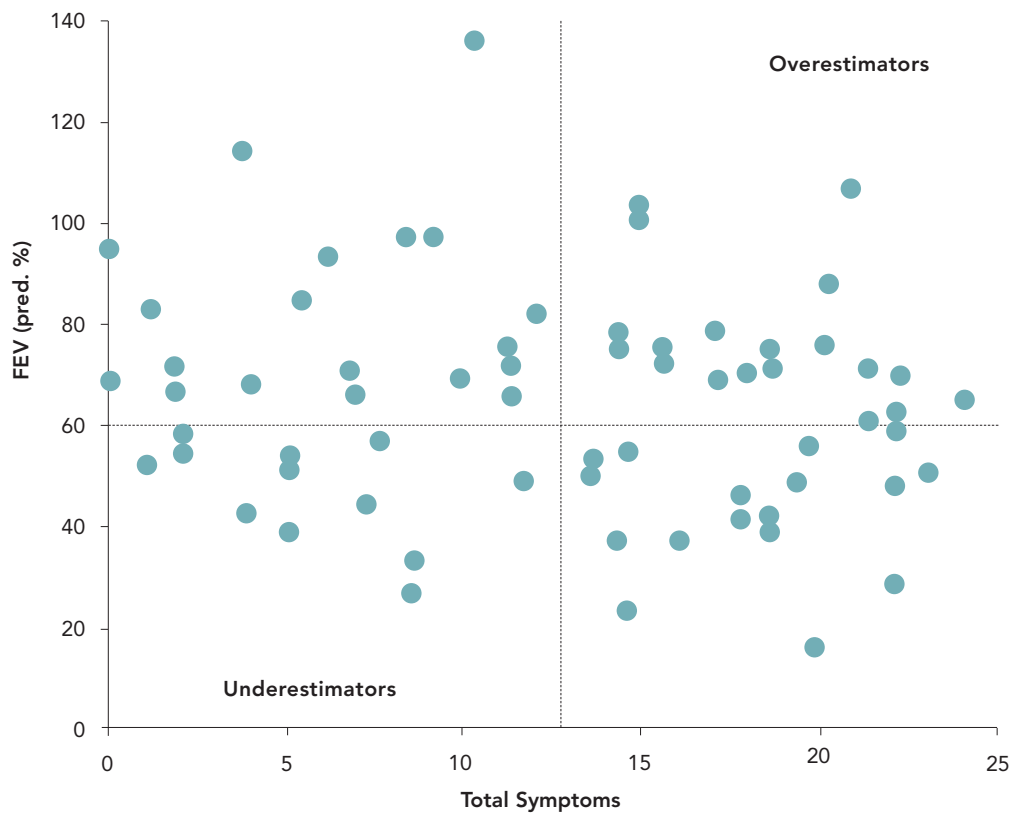
Peak flows and symptoms can be used for monitoring exacerbations (Exhibit 2). In adults, one study found that peak flow monitoring has no advantage over symptom monitoring as an asthma management strategy for adults.<sup>3</sup> To some extent, the method chosen depends on patient preference. Certain patients prefer peak flow monitoring because they can chart each day’s results. Monitoring can be adjusted to each patient.

Methods under study to monitor asthma control include two hypersensitivity measures, sputum eosinophils and exhaled nitric oxide (Exhibit 2). Hypersensitivity measures are objective measures of airway irritability. As the airway becomes more irritable, the patient is much more likely to have an asthma exacerbation.

Patients’ symptoms cannot always be used to predict whether an exacerbation is occurring. Symptoms correlate poorly with the level of airway obstruction as determined by the forced expiratory volume in one second (FEV1) and peak expiratory flow (PEF). In one study, asthma symptom score determined by patient-reported severity was compared with objective measures of airway obstruction. The maximum possible asthma symptom score was 24. The relationship between total asthma symptoms and FEV1 is demonstrated in Exhibit 3.<sup>4</sup> Following treatment, subjective improvement in asthma symptoms may occur without improvement in the level of airway obstruction. These results support the recommendation to measure airway obstruction objectively when assessing adult patients with chronic asthma.<sup>3</sup>

The factors reported to be associated with increased risk of exacerbation are listed in Exhibit 4. These factors are determined retrospectively by

Exhibit 3: Asthma Symptoms Correlate Poorly with FEV1



Teeter JG, et al. *Chest*. 1998;113:272-277.

examining the history of patients who have severe asthma attacks or die from asthma. Some of these factors may be valuable in identifying patients at risk so they can be targeted with strategies to avoid exacerbations.

The patient or family can manage many exacerbations at home thus avoiding an emergency department visit. For home management of exacerbations, doubling the dose of the inhaled corticosteroid is no longer recommended. There are a number of studies that have clearly shown that just doubling the dose of inhaled corticosteroid for an asthmatic is not sufficient to quell an exacerbation.

Oral corticosteroids are effective for at-home management of asthma exacerbations but are underused. Studies show that high-dose oral corticosteroids for a week are effective and do not need tapering. There also are studies that show a single dose of an oral corticosteroid at the time of a viral exacerbation can prevent an exacerbation. Either of these strategies can be incorporated into the patient's written action plan to improve home management of exacerbations.

Another strategy to help more patients achieve dis-

ease control and avoid exacerbations is to ensure all patients understand how to use their prescribed inhaler devices. Insufficient education on how to use the many inhaler devices is one of the significant problems with current asthma management. Most patients need recurrent education to attain and maintain their inhalation technique. This cannot be a one-time event.

Another strategy to reduce the number of exacerbations is to ensure patients are on appropriate long-term control medications, if indicated. The emergency department is one place where this can be accomplished. If a patient admitted for an asthma exacerbation was not already on a long-term control medication such as inhaled corticosteroids, treatment should be initiated upon discharge. Many times patients leave the emergency department breathing better, but the underlying problem of airway inflammation has not been corrected. As discussed earlier, 12 to 16 percent of patients return to the emergency department within two weeks. Using guidelines or protocols to check for long-term control medications will prevent repeat visits by helping the patient gain better asthma control.

#### Exhibit 4: Factors Associated with Increased Risk of Asthma Related Exacerbations or Death

- Severe airflow obstruction (as detected by spirometry)
- Persistent severe airflow obstruction
- Two or more emergency department visits or hospitalizations for asthma in the past year
- Any history of intubation or intensive care unit admission, especially if in the past 5 years
- Feeling in danger or frightened by one's asthma
- Certain demographic or patient characteristics: female, nonwhite, nonuse of inhaled corticosteroid therapy, and current smoking
- Psychosocial factors: depression, increased stress, socioeconomic factors
- Attitudes and beliefs about taking medications

There are additional agents for the management of asthma on the horizon. One is a combination of budesonide, a corticosteroid, and formoterol, a long acting beta agonist. In Europe, this combination is being used as both an acute symptom reliever and as a long-term controller. Formoterol has a unique property in that it provides bronchodilatation very quickly like short acting beta agonists but also has a long duration of activity. The patient uses this combination both on a twice-a-day scheduled basis and as needed for acute symptoms. By doing this, the patient is intensifying their inhaled corticosteroid dose very early during an exacerbation. With this type of regimen, the patient is managing his or her own asthma. This combination product will not be approved for use in the United States for as-needed use. Managed care plans can have an impact on reducing exacerbations and reducing asthma emergency department visits by encouraging the FDA or the manufacturer that this dosing strategy may be something that would actually help asthmatic patients.

Another way to help reduce the rate of exacerbations and emergency department visits associated with asthma is to refer appropriate patients to an asthma specialist. As discussed earlier, a small number of patients account for a large proportion of expenditure of health dollars. They visit the emergency department and are hospitalized frequently. These are patients who are not going to be well controlled with a short 15-minute visit to a general practitioner. There is a better chance of actually following the asthma management guide-

lines in centers of excellence or when the patient is under a specialist's care.

One managed care specific strategy is to partner with emergency rooms and be notified when a patient comes in for an exacerbation to activate the case management process earlier than waiting for claims data. Another strategy is to provide prescription refill information to physicians so they can determine objectively if their patients are being compliant with medications.

In general, two ways the rate of asthma could be improved is by reducing the rate of smoking and obesity. Both of these increase the incidence of asthma dramatically. Children who reported smoking 300 or more cigarettes per year had a relative risk of 3.9 for a new onset asthma compared with non-smokers.<sup>5</sup> Regular smokers who were exposed to maternal smoking during gestation had the largest risk, 8.8 percent.<sup>5</sup> Overweight and obesity are associated with a dose dependent increase in the odds of asthma in men and women.<sup>6</sup>

#### Conclusion

Exacerbations with asthma are common and costly. Educating patients to understand their disease better, looking for environmental triggers, teaching inhaler use, written action plans, early use of oral corticosteroids, referral to an asthma specialist, appropriate medications, and specific managed care programs are all strategies to reduce exacerbations and health care costs related to asthma. **JMCM**

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