A retrospective study of risk factors for repeated admissions for asthma in a rural/suburban university hospital

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In the study reported, the authors examined risk factors for repeated hospital admissions for asthma in a rural/suburban setting. Charts of patients who were hospitalized two or more times with the diagnosis of asthma between June 1991 and January 1998 were reviewed. A questionnaire was completed for each admission for 65 patients. The results demonstrated an equal male-to-female ratio, with a mean age of 27 years. Hispanics represented 12% of the patients although they accounted for only 2.5% of the general population in the area under study. The mean number of hospital admissions was 3.2. A history of depression existed in 25% of the patients. Noncompliance was admitted in 38%. Twenty-five percent were active tobacco smokers. Acknowledged triggers of asthma included viral infections (74%), exercise (50%), weather conditions (43%), dust (38%), cats (36%), sinusitis (32%), pollen (32%), gastroesophageal reflux disease (31%), dogs (30%), smoke (28%), and emotional stress (15%). Medications at time of admission included albuterol (98%), salmeterol xinafoate (26%), theophylline (38%), ipratropium bromide (55%), nedocromil sodium (20%), cromolyn sodium (35%), prednisone (49%), and inhaled corticosteroids (69%). Ninety-five percent had access to a primary care physician. Fifty-seven percent had a pulmonary and 11% had an allergy consult. These data suggest that patients in rural/suburban areas with repeated hospitalizations for asthma have a high probability of noncompliance, depression, and allergenic triggers. Gastroesophageal reflux was a common recognized trigger. Inhaled steroids were underused, whereas ipratropium and theophylline were overused. Bilingual education on asthma and triggers and social support are necessary even in rural healthcare settings without a large minority population.

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In the past two decades, hospital admissions for asthma have been increasing despite improved knowledge about the disease and the availability of better treatment modalities. About 14 million to 15 million people in the United States are affected by asthma, including an estimated 4.8 million children.[1,2] Asthma is a serious cost to society, annually costing more than 100 million days of restricted activity, 470,000 hospitalizations, and more than 5000 deaths.[3] In 1990, the estimated direct cost for emergency department and hospital care was $1.9 billion.[4] Up to half of all hospital admissions for asthma are readmissions.[5] This problem is especially apparent in children, as asthma is the most common chronic disease in children and hospitalization rates for childhood asthma have increased during the past 20 years.[6] From 1980 to 1993, the annual hospitalization rate for asthma in patients aged 0 to 24 years increased 28% (from 16.8 to 21.4 per 10,000 population).[2]

Asthma is defined as a chronic inflammatory disorder of the airways which, in susceptible individuals, can cause episodic coughing, wheezing, shortness of breath, and chest tightness. It can be exacerbated by many different triggers, including dust mites, animal dander, pollen, exercise, emotional stress, weather changes, tobacco smoke, gastroesophageal reflux disease, and viral infections.[3] Because the disease is complex and involves multiple factors, it has been acknowledged that many aspects of diagnosis and treatment remain educated guesses and therapeutic regimens must be highly individualized.[7]

Understanding the risk factors for hospitalizations for asthma is important for treating and reducing their effects on society. Most of the data accumulated about repeated hospitalizations have been collected from urban centers. Asthmatic patients who are admitted to the hospital and those who die appear to come from a similar portion of the population. They tend to have troublesome disease, previous respiratory arrest or life-threatening attack, poor compliance, poor medical management, and use of emergency departments for the treatment of acute attacks.[8] One of the most reliable and valid markers of risk of death is the number of hospital admissions for asthma in the previous 12 months.[9] Although recognition of a high-risk profile is useful as a warning to physicians and patients, patients with moderate and even mild asthma are also at risk of a life-threatening exacerbation.[10]

In our study, risk factors for patients living in a rural/suburban setting were

Table 1
Demographics (n=65)

Variable	No.	%
Gender		
Male	31	48
Female	34	52
Race		
White	50	77
Black	4	6
Hispanic	8	12
Asian	2	3
Multiracial	1	1
Age, y		
<5		
— female	2	6
— male	5	16
5 to 14		
— female	8	24
— male	15	48
15 to 24		
— female	3	9
— male	4	13
25 to 34		
— female	6	18
— male	1	3
35 to 44		
— female	9	26
— male	1	3
45 to 54		
— female	0	0
— male	1	3
55 to 64		
— female	1	3
— male	2	6
>65		
— female	5	15
— male	2	6

Table 2
Asthma Triggers (n=65)

Trigger	No.	%
Viral infection	48	74
Exercise	33	50
Weather changes	28	43
Dust mites	25	38
Cat hair	24	37
Pollen	21	32
Sinusitis	21	32
Dog hair	20	31
Gastroesophageal reflux	20	31
Tobacco smoke	18	28
Emotional stress	10	15

examined to see if variables are similar to data obtained mainly from urban areas. It is the intent that this information may help in management of patients by identifying factors that may lead to more appropriate intervention and reduce the need for readmissions.

Methods

A retrospective chart review was done for repeated hospital admissions to the Milton S. Hershey Medical Center, the Pennsylvania State University, for the treatment of asthma between June 1, 1991, and January 7, 1998. This medical center is a healthcare center in suburban/rural Pennsylvania. The study focused on patients who had two or more admissions to the Hershey Medical Center with the primary diagnosis of asthma. Patients younger than 2 years were excluded because bronchiolitis, an acute wheezing illness occurring mainly in children younger than 2 years, closely resembles asthma and may affect our data. Patients admitted to the hospital whose diagnosis code changed to nonasthma during hospitalization also were excluded.

A questionnaire was filled out for every admission for each patient after approval by the institutional review board. The following information was recorded for each patient when available: gender, age at first admission, race, triggers of asthma, family history of asthma and allergies, medications before admission, compliance with medications, history of smoking, presence of pets in the home, history of depression, and number of admissions to Hershey Medical Center between 1991 and 1998 for asthma. Data from the questionnaires were entered into the Minitab statistics program.

Results

Eighty-four patients were identified as having multiple admissions for asthma between 1991 and 1998. Of these, 15 were younger than 2 years and excluded from our study. Charts were unavailable for four patients. A total of 65 patient records were included in this study.

The demographic profile demonstrated an equal male-to-female ratio. The age of the subjects ranged from 2 years to 85 years, with a mean age of 27 years. A specific breakdown by age and gender appears in *Table 1*. The mean number of hospital admissions was 3.2. The number of admissions ranged from 2 to 6 for all but one patient who had 25 admissions.

Acknowledged triggers of asthma (*Table 2*) included viral infections (74%), exercise (50%), weather conditions (43%), dust (38%), cats (36%), sinusitis (32%), pollen (32%), gastroesophageal reflux disease (31%), dogs (30%), smoke (28%), and emotional stress (15%).

Table 3 shows family and social history risk factors. A history of depression existed in 25% of the patients. Thirty-eight percent admitted that they were noncompliant with medications, and 22% were active tobacco smokers. Sixty-five percent had a family history of asthma or allergies or both.

Table 4 lists the medications patients had been treated with before their hospital admissions. Nearly all patients had been placed on β-agonist therapy. Thirty-

eight percent had been treated with theophylline. Sixty-nine percent were using inhaled corticosteroids (triamcinolone acetonide, beclomethasone dipropionate, flunisolide, fluticasone propionate, or budesonide). The majority of patients had access to a primary care physician.

Discussion

Asthma can affect patients regardless of gender, race, or age, though hospitalization rates have been highest for minorities and children.[2,11] Although our results show an equal ratio overall between male and female patients, there were differences within age groups. Between ages 2 years and 15 years, there was a 2:1 male-to-female ratio, whereas among those older than 15 years, the ratio was reversed. This finding is consistent with several studies that have noted higher readmission rates for girls, despite the increased prevalence of asthma in male children.[12,13] It should be noted, however, that among those older than 35 years, there is a higher rate of misdiagnosis of asthma.[14] Because we did not directly assess the patients in this study, we cannot assume that diseases such as vocal cord dysfunction were not inappropriately diagnosed as asthma.

In this study, Hispanics represented 12% of the patients even though they accounted for only 2.5% of the general population. Asthma rates among Puerto Ricans are higher than those of the general US population.[15] Previous studies in urban areas have noted that minorities have higher rates of asthma, which may be more reflective of socioeconomic difficulties than of ethnicity.[11,16-18]

In a study of risk factors for multiple visits to the emergency department, Dale and colleagues[19] noted that patients usually had moderate to severe asthma chronically under poor control, with exposure to any trigger probably becoming the "last straw." It is important to identify potential triggers and enforce control measures to reduce the amount of exposure that patients have with these irritants. Common triggers include animal dander, dust mites, pollen, tobacco smoke, molds, perfumes and strong odors, cockroaches, and occupational irritants and allergens. Gastroesophageal reflux is frequently asymptomatic; however, 31% of patients noted gastroesophageal reflux as a trigger of their asthma attacks.

Twenty-five percent of the patients in our study had a history of depression. Because psychological problems may increase the risk for life-threatening episodes of asthma, physicians should assess the psychosocial and emotional aspects of the patient's life. Such variables include wheezing with stress, poor self-care, disregard of perceived asthma symptoms, family dysfunction, reaction to separation or loss, emotional disturbance, manipulative use of asthma, depression, and conflict among the physician, patient, and caregivers.[20]

The use of three or more categories of asthma drugs in past years was associated with an increased risk of death from asthma or readmission for asthma.[8,9] Independently, the recent need for oral corticosteroids is a marker of increased risk of hospitalization and mortality.[9] Inhaled corticosteroid prophylaxis is effective in controlling symptoms and reducing hospitalizations and death.[13,21,22] Because our patients all had previous hospitalization, we anticipated that all, if not the vast majority, would be on inhaled corticosteroid therapy. Inhaled anti-inflammatory therapy was underutilized in urban settings,[16] and in our cohort, only two thirds were using inhaled corticosteroids.

Ninety-five percent of our study patients had access to a primary care physician. Fifty-seven percent had a pulmonary consult, and 11% had an allergy consult. This situation is different from that in urban populations where

Table 3
Family and Psychosocial History (n=65)

Factor	No.	%
Family history of asthma	42	65
Pets in the home	26	40
History of noncompliance	25	38
History of depression	16	25
Passive tobacco exposure	15	23
Active smokers	14	22

Table 4
Medical Care and Management (n=65)

Variable	No.	(%)
Treatment		
Albuterol	64	(98)
Salmeterol xinafoate	17	(26)
Theophylline	25	(38)
Ipratropium bromide	36	(55)
Nedocromil sodium	13	(20)
Cromolyn sodium	23	(35)
Prednisone	32	(49)
Inhaled corticosteroids	45	(69)
Asthma managment		
Primary care physician	62	(95)
Pulmonary consult/referral	37	(57)
Allergy consult/referral	7	(11)

few patients had primary care physicians, and patients used the emergency room for their primary care.[23,24]

Comment

Patients in rural/suburban areas with repeated hospitalizations for asthma appear to have a high probability of noncompliance, depression, underuse of inhaled corticosteroids, and communication barriers. Risk factors in rural settings are similar to those in urban environments. Unlike patients in urban settings, however, most of the patients in this study had access to a primary care physician. Hispanic-speaking minorities accounted for a large percentage of readmissions, demonstrating a need for patient education in Spanish even when the population at large has few Hispanics. More frequent follow-up visits and explicit written instructions in the appropriate language are needed if the patient has poor compliance with medications or has a serious psychological problem.[25]

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