

Slide 15

... PATIENT OUTCOMES ...

Treatment Outcome in an Outpatient Asthma Center: Retrospective Questionnaire Data

Stephen J. Gaioni, PhD; Melissa Korenblat-Hanin, MSW; Edwin B. Fisher, PhD; and Phillip Korenblat, MD

Abstract

Questionnaires were mailed to all individuals with asthma who had completed treatment at the Barnes-Jewish Hospital Asthma Center at least 1 year before the start of this study, in order to assess medical system use, symptoms, medications, physical functioning, psychologic functioning, social functioning, education, and satisfaction with asthma care for the 12 months preceding treatment and for the 12 most recent months after questionnaire receipt. Of 401 patients who had been treated and had been sent questionnaires, 207 (52%) responded. Respondents reported significant improvements in each domain, including reductions of 78%, 73%, and 48% in hospitalizations, emergency department visits, and unscheduled visits to physicians, respectively. Other improvements included decreases in the percentage of patients reporting severe shortness of breath (from 48% to 15%), substantial interference with daily activities (from 31% to 11%), and frequent depressed mood (from 32% to 13%). After treatment, significantly more patients had knowledge of asthma care, and significantly more were very satisfied with the quality of care (from 48% to 96% and from 21% to 78%, respectively). Additional analyses suggested that the improvements in all domains were maintained for a period of 3 years. Important limitations of the present retrospective study are discussed.

(*Am J Man Care* 1996;2:999-1008)

Asthma in the United States costs \$6.2 billion annually, accounting for almost 1% of all healthcare expenditures and 8% of all expenditures for respiratory diseases.^{1,2} Emergency department use, hospitalization, and death from asthma account for 43% of these expenditures. Each year, asthma is

responsible for almost a half million hospitalizations, amounting to 2 to 3 million days; more than 1.8 million emergency department visits; and 1.5 million hospital outpatient visits. Despite these vast amounts of medical care and money, however, the incidence of asthma continues to increase at an alarming rate. Between 1980 and 1987, the prevalence of asthma rose 29% and mortality increased 31%.³

The burden from asthma is psychosocial, as well as medical and financial. Many people with asthma experience a significantly reduced quality of life, with more missed school or work days, more highly constricted physical activities, and fewer social interactions than their counterparts without asthma.⁴ As in the case of other chronic diseases, growing evidence suggests that the incidence of both affective disorders, particularly depression, and anxiety disorders is much higher among people with asthma than among the general population.⁵⁻⁹ In addition, psychosocial factors are extremely important in poorly controlled asthma and in deaths from asthma.¹⁰⁻¹³ Indeed, these factors are as highly predictive of death from asthma as are medical or physiologic factors.¹³

Recent evidence suggests that a comprehensive treatment program, including detailed assessment, medical treatment, and patient education, can have a beneficial effect on asthma outcome.¹⁴⁻¹⁷ Given the increasing costs of asthma in terms of expenditures of medical resources and money and reductions in the quality of life, the healthcare system has expressed mounting interest in developing treatment programs that address the complex biopsychosocial factors affecting asthma.

The Barnes-Jewish West County Asthma Center (referred to here as "the center") is a community-based, university-affiliated facility that began operations during October 1989 and is committed to such a comprehensive treatment program. Patients enter treatment at the center as a result of private physician referral or self-referral. Treatment comprises three phases: (1) assessment; (2) design and implementation of a comprehensive treatment plan; and (3) out-

From the Center for Health Behavior Research (S.J.G. and E.B.F.), Department of Internal Medicine (P.K.), Washington University School of Medicine; and Barnes-Jewish West County Hospital, St. Louis, MO (M.K.-H. and P.K.).

Address correspondence to: Phillip Korenblat, MD, The Asthma Center, 1040 North Mason Road, Suite 115, St. Louis, MO 63141.

... PATIENT OUTCOMES ...

come measurement. The assessment phase involves confirmation of the diagnosis, determination of causative and exacerbating factors, and establishment of a prognosis, with particular emphasis on identifying patients who are at risk for asthma that could result in a poor outcome. During this phase, center staff also pay close attention to psychosocial factors.

Development and establishment of a treatment plan includes a comprehensive step-wise approach to medication use; use of peak flow meters to measure air flow objectively; control of the environment and symptom triggers; exercise; counseling, if necessary; and education. Patient education is the cornerstone of the treatment plan. Asthma education is taught to adults and parents of asthmatic children in four sessions, each lasting 1 1/2 hours, and to similarly aged, small groups of 3 to 10 children in five sessions. People who must travel long distances to reach the center are offered a single, 5-hour session. Components of the sessions, which are taught by a clinical nurse specialist or a social worker, include education on pulmonary function, medications, and environmental controls; development of an action plan; and education and practice in coping techniques.

The third phase of the program consists of outcome measurement. For several years, this phase has been accomplished informally, by making frequent follow-up telephone calls to patients and by analyzing patient-satisfaction surveys. This paper reports on the first stage of a more systematic method of outcome measurement. The data reported here are based on a retrospective questionnaire that was sent to all people who had completed asthma treatment at the center at least 1 year before receiving the questionnaire.

The questionnaire addressed the following eight domains: (1) medical system use; (2) symptoms; (3) medications; (4) physical functioning; (5) social functioning; (6) psychological functioning; (7) education; and (8) satisfaction with asthma care. This multi-domain approach is important given the biopsychosocial nature of asthma and is similar to the approach used in the MOS 36-Item Short Form Health Survey (Appendix A).¹⁶ All respondents were asked to evaluate each of these domains for the 12 months immediately preceding their initial treatment at the center and for the most recent 12-month period preceding questionnaire receipt.

... SUBJECTS AND METHODS ...

Subjects

This research was approved by the Institutional Review Board of Barnes-Jewish Hospital. All people

with asthma who had undergone treatment at the center before August 31, 1992, were mailed questionnaires. Typically, patients were referred by their private physicians or were self-referred. Of these, 15% were children (younger than 19 years of age), 63% were adults aged 19 to 64 years, and 22% were older than age 64. Sixty-three percent had some form of private insurance, 13% were covered by Medicaid, and 24% by Medicare.

Of the 401 people with asthma who had received treatment within the 1-year time frame, 180 responded. A second mailing yielded an additional 27 patients, for a total of 207, or 52% of all those who had received treatment. The respondent sample was 41% male and 59% female. Of these, 15% were children, 60% were between the ages of 19 and 64 years of age, and 25% were older than 65 years of age. In addition, 37% had received treatment 1 to 2 years before receiving a questionnaire, 36% had received treatment 2 to 3 years before, and 27% had received treatment more than 3 years before.

Procedure

The questionnaires were mailed to each patient's last known address. The patients were asked to complete the questionnaire, and to mail it back to the center in the self-addressed, stamped envelope that was part of the mailing. Primary caretakers were asked to complete questionnaires in conjunction with all patients who were younger than 12 years of age at the time of the survey.

The questionnaire consisted of 38 questions in the following eight domains: (1) medical system use; (2) symptoms; (3) medications; (4) physical functioning; (5) psychological functioning; (6) social functioning; (7) education; and (8) satisfaction with asthma care (Appendix A). Each respondent was asked to complete the same set of questions twice—once for the 12 months immediately preceding treatment, and once for the 12 months preceding receipt of the questionnaire (ie, September 1, 1993, to August 31, 1994). Under this design, respondents varied with respect to the time interval between treatment and follow-up measurement of outcome.

Several questions asked the respondents how frequently they used the medical system during the 12-month period. Possible answers were zero, one, two, three, four, or more than four times. For purposes of data analysis, we coded a response of more than four times as five times during the 12-month period. As described in the next section, this coding method produces an underestimate of treatment effectiveness.

... TREATMENT OUTCOME IN AN OUTPATIENT ASTHMA CENTER ...

Statistical Tests

Because most of our data was ordinal in nature, we used nonparametric statistics in the analyses. Most comparisons of the pre- and posttreatment results were based on Wilcoxon matched-pairs, signed-ranks tests. We used the Mann-Whitney *U* statistic to compare the results of the 180 subjects who responded to the first mailing with those of the 27 who responded to the second mailing. For comparison of respondents who were treated 1 to 2 years, 2 to 3 years, and more than 3 years before questionnaire administration, we used Kruskal-Wallis tests. Finally, we used chi-squared tests to determine whether overall pre- and posttreatment patterns of response differed. The alpha level was always set at 0.05. For the comparisons of respondents (first mailing versus second mailing and years between treatment and questionnaire response), two-tailed tests were used. For comparison of pre-post responses, one-tailed tests were used. Unless otherwise noted, all reported results were statistically significant according to these criteria.

... RESULTS ...

We began our analysis by comparing the responses, to each of the 38 questions, of the 180 subjects who returned the first mailing with the responses of the 27 who returned the second one. We had a total of 76 comparisons (38 pretreatment and 38 posttreatment questions for each respondent). Only one comparison yielded a statistically significant difference. The 27 subjects who responded to the second mailing had significantly more unscheduled physicians' visits (1.63 visits per person, compared with 1.09 visits per person for the initial respondents). Given the large number of comparisons, one would expect three or four significant differences to have arisen by chance ($0.05 \times 76 = 3.8$).

Respondents also varied in terms of the time since receipt of treatment at the center. This difference had the potential to introduce systematic variability into the data in two ways. First, respondents' recall about their condition during the year preceding treatment could have varied systematically as a function of the amount of time since treatment. Second, their actual condition during the 12 months preceding receipt of the questionnaire could have varied as a function of the time since their treatment at the center.

To test for such variability, we divided the respondents into three time cohorts: (1) all patients treated 1 to 2 years before receiving questionnaires (between September 1, 1991, and August 31, 1992); (2) all patients treated 2 to 3 years before (between September

1, 1990, and August 31, 1991); and (3) all patients treated more than 3 years before (before September 1, 1990). We then compared the cohorts' responses to each question on the pretreatment and posttreatment questionnaires. On the pretreatment questionnaire, the cohorts differed significantly on only two questions, one involving the extent to which asthma interfered with normal social activities (question 9; see Appendix A), and the other on the frequency of oral bronchodilator use (question 12). The cohorts also gave significantly different responses to only two questions on the posttreatment questionnaire, on how often they were nervous (question 5), and on whether their difficulties doing their daily work because of their asthma were mostly physical or mostly emotional in origin (question 8a). Given the large number of tests conducted, the number of significant differences is within the range of number of differences that would be expected to be significant as a result of chance.

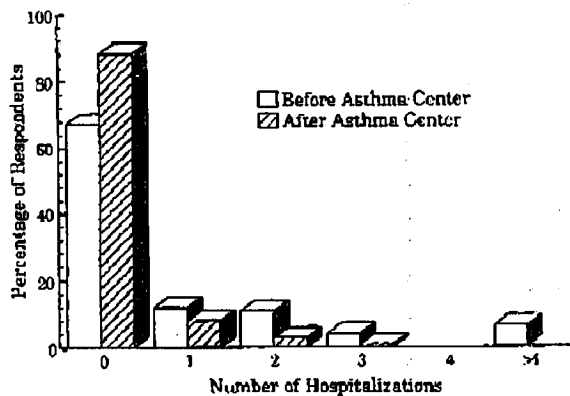
Because the respondents to the two mailings provided similar responses on both the pretreatment and posttreatment questionnaires, we combined their results for subsequent data analyses. For the same reason, we combined the data from the three time cohorts. In each domain, large, statistically significant improvements in the respondents' condition subsequent to treatment at the center were observed. We consider each domain in turn.

Medical System Use. Patients receiving treatment at the center experienced significant decreases in the number of hospitalizations (from 157 to 35), emergency department visits (from 233 to 63), and unscheduled physicians' appointments (from 458 to 237).^{*} These decreases represent reductions of 78%, 73%, and 48% in hospitalizations, emergency department visits, and unscheduled physicians' visits, respectively (Figure 1).

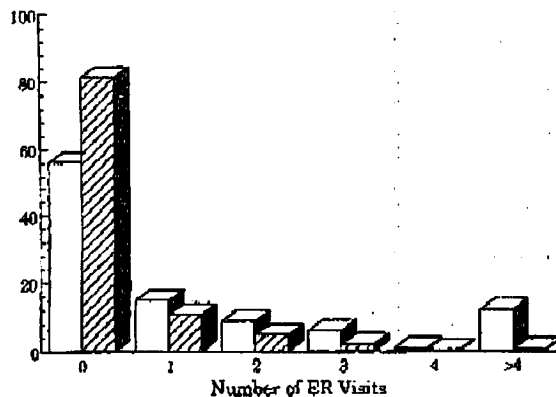
Symptoms. The percentage of respondents whose asthma symptoms occurred either many times daily or continually dropped substantially. The following reductions were reported: shortness of breath, 48% to

*Note that whenever a respondent reported more than four hospitalizations, ER visits, or unscheduled doctor's visits, five visits were coded. Responses of greater than four visits were much more common prior to treatment at the Asthma Center. Twelve respondents reported more than four hospitalizations before treatment at the Asthma Center and none reported more than four hospitalizations after treatment. Twenty-four respondents reported more than four ER visits before treatment and only one reported more than four ER visits after treatment. Forty-nine respondents reported more than four unscheduled doctor's visits before treatment and only 11 reported more than four unscheduled doctor's visits after treatment. Thus, it is almost certain that the reductions reported for hospitalizations, ER visits, and unscheduled doctor's visits following treatment at the Asthma Center are underestimates.

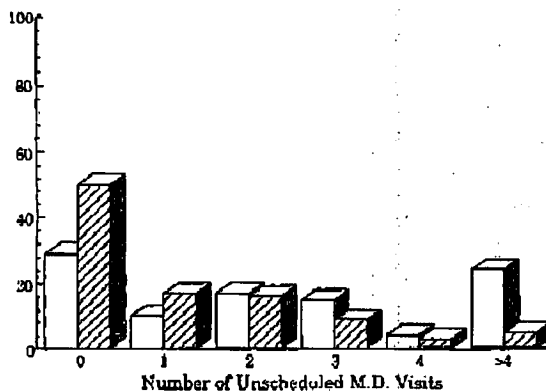
... PATIENT OUTCOMES ...



(a)



(b)



(c)

Figure 1. Percentage of respondents requiring 1, 2, 3, 4, or more hospitalizations (a), emergency department visits (b), and unscheduled physicians' visits (c) during the pretreatment and the most recent year.

15%; wheezing, 40% to 10% (Figure 2a); chest tightness, 41% to 12%; and coughing, 50% to 19%. The percentage of respondents who reported nocturnal awakening more than four times weekly fell substantially, from 27% to 11%; the percentage reporting waking up less frequently than once weekly increased correspondingly (from 24% to 53%). Finally, 23% of the respondents reported having very mild or mild symptoms before treatment, and 37% reported having severe or very severe asthma. After treatment, 51% reported that their asthma was very mild or mild, and only 14% reported that it was severe or very severe.

Medications. Respondents reported systematic changes in posttreatment medication use characterized by less frequent use of oral and inhaled bronchodilators; lower dosages of oral steroids, and with fewer increases in or tapering of dosage; and greater reliance on anti-inflammatory medications (cromolyn sodium, nedocromil sodium). Daily use of oral bronchodilators decreased from 45% to 41% of respondents, and the percentage reporting no use increased from 41% to 49%. Before treatment, 28% of respondents had used inhaled bronchodilators more than five times daily; this percentage decreased to 18% posttreatment. The use of inhaled bronchodilators two or fewer times per day increased from 33% to 38%.

Although the percentage of respondents who reported taking oral steroids during the year did not change significantly, the dosage, number of increases in dosage, and number of tapers significantly decreased after treatment. For example, before treatment at the center, 31% of respondents were taking less than 20 mg of oral steroids every other day; this percentage increased to 36% after treatment. Before treatment, 30% took more than 20 mg of these drugs daily, compared with 25% after treatment. The percentage of respondents who reported only one or two increases or tapers per year increased from 32% to 48%.

The percentage of respondents who reported taking anti-inflammatory medication three or four times per day increased from 17% to 27%. Finally, there was no significant difference in the percentage of respondents receiving allergy shots before and after treatment.

Physical Functioning. Respondents reported significant improvement in all measures of physical functioning after treatment. The percentage reporting no interference with moderate activities, such as household chores or bowling, increased from 34% to 54% (Figure 2b), and the percentage reporting no interference with vigorous activities, such as running or participating in strenuous sports, increased from 7% to 20%.

... TREATMENT OUTCOME IN AN OUTPATIENT ASTHMA CENTER ...

The ability of the respondents to perform specific physical activities also improved. For example, before treatment, asthma interfered substantially with the ability of 45% of respondents to climb several flights of stairs, compared with the ability of only 23% after treatment. The ability of the respondents to walk one block, several blocks, and more than 1 mile improved significantly; for example, before treatment, only 23% reported that asthma did not interfere with their ability to walk more than 1 mile, compared with 40% reported after treatment. After treatment, fewer patients were limited substantially in their ability to lift groceries (9%, versus 16% before treatment), and the percentage reporting at least a little interference with bathing and dressing decreased from 27% to 19%.

Psychological Functioning. Before and after treatment, 32% and 13% of respondents, respectively, reported feeling "downhearted and blue a good bit of the time or more." Before treatment, 34% were nervous a good bit of the time or more, compared with 18% after treatment (Figure 3a).

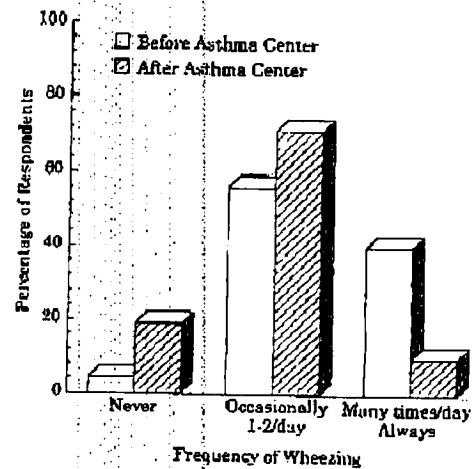
Social Functioning. After treatment, fewer respondents reported at least moderate disruption of their social activities (24%, compared with 47% before treatment). When asked the extent to which asthma interfered with daily work, school, or play, 31% responded either that it interfered quite a bit or that they could not perform the activity before treatment; only 11% responded in this way after treatment (Figure 3b).

Asthma Knowledge. The percentage of respondents who knew how to recognize asthma increased from 79% to 97%. The percentage who knew how to care for their disease increased from 48% to 96% (Figure 4a).

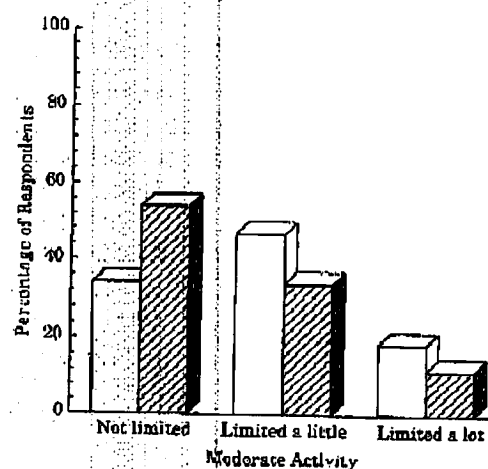
Evaluation of Asthma Care. Before treatment at the center, only 21% of all respondents were very satisfied with their asthma care, and 27% were very dissatisfied. After treatment, 78% were very satisfied, whereas only 2% were very dissatisfied (Figure 4b).

Individuals with Poorly Controlled Asthma. We were interested in the effects of treatment at the center on the subset of respondents whose asthma was most poorly controlled. We arbitrarily selected for this analysis all people who reported requiring three or more hospitalizations for their asthma during the year preceding treatment. There were 21 such people, representing 10% of all respondents. Not surprisingly, compared with the overall sample, a greater percentage of these individuals viewed their asthma as severe or very severe before treatment (86%, versus 37% of the overall sample). After treatment, only 24%

of this subset viewed their asthma as very severe or severe. Before treatment, 63% of this subset but only 29% of the overall sample reported having asthma that interfered quite a bit or completely with their ability to perform their daily work. After treatment, only 21% of respondents with severe asthma were affected to this degree. Similarly large improvements were observed in all other domains.



(a)



(b)

Figure 2. Percentage of respondents reporting different frequencies of wheezing (a) and different limitations on moderate physical activities (b) during the pretreatment year and the most recent year.

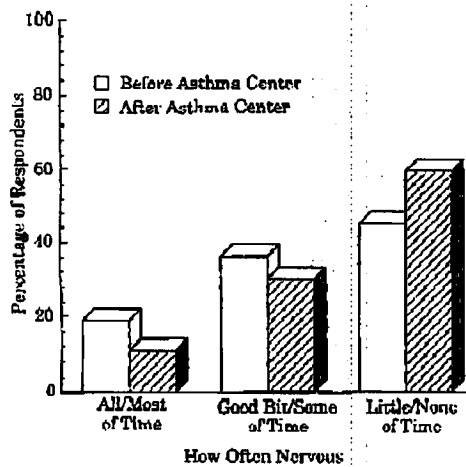
... PATIENT OUTCOMES ...

Perhaps most important, this subset of respondents accounted for 88 hospitalizations during the pretreatment period, or 56% of all hospitalizations reported. After treatment, they required only 12 hospital visits, a decrease of 86%. They also had 70 emergency department visits during that year—30% of all such visits. In contrast, they required 17 visits during the posttreatment year, a reduction of 76%. These reductions of 86% and 76% for hospitalizations and emer-

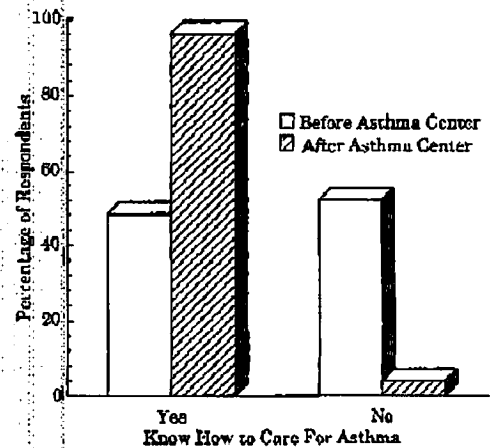
gency department visits, respectively, are similar to the reductions reported by the full sample (78% and 73%, respectively).

... DISCUSSION ...

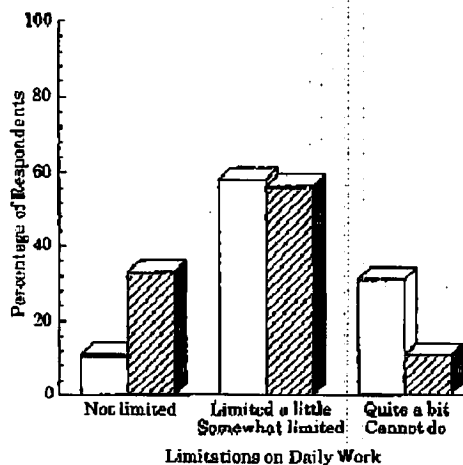
Before considering the possible significance of this study, it is important to discuss some of the major limitations of our results. First, the retrospective de-



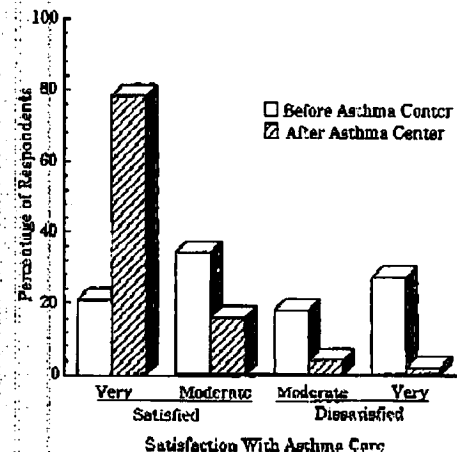
(a)



(a)



(b)



(b)

Figure 3. Percentage of respondents reporting different amounts of time feeling nervous (a) and different amounts of interference with ability to perform daily work or school work or to play (b) during the pretreatment year and the most recent year.

Figure 4. Percentage of respondents reporting knowing how to care for their asthma (a) and different levels of satisfaction or dissatisfaction with their asthma care (b) during the pretreatment year and the most recent year.

... TREATMENT OUTCOME IN AN OUTPATIENT ASTHMA CENTER ...

sign imposed a large memory burden on the respondents. In describing their condition during the year before treatment, some respondents had to report on physical and psychological conditions and medical treatments occurring more than 4 years previously. Clearly, the extent to which respondents were able to recall accurately after these long intervals is questionable, particularly in the case of judgments related to quality of life. We doubtless could have increased the accuracy of the posttreatment data by specifying a much shorter time interval (eg, 1 to 4 weeks for symptoms and medication use). However, this time frame would not have improved the accuracy of the pretreatment data. Given the major memory burden imposed on respondents, it is noteworthy that the responses of people treated 3 or more years previously and 1 year previously were quite similar with respect to both the pretreatment questionnaire and the posttreatment questionnaire.

A second limitation is the possibility that the respondents were a biased sample of all patients with asthma who received treatment at the center. We obtained completed questionnaires from 52% of all possible respondents. Low response rates are a problem commonly encountered when conducting mail-questionnaire studies.

A third important limitation is the absence of a control group to which people were randomly assigned (ie, those who did not receive the center's intensive treatment program). In the absence of data from such a group, we cannot rule out the possibility that the observed improvements were the result of chance or of statistical regression to the mean. The latter concern is important, as people seeking specialized treatment and those who are referred for such treatment are most likely to do so when their medical condition is particularly poor. Because asthma is a disease that often increases and decreases in severity, it is likely that the condition of many of the respondents in our sample would have improved even in the absence of the intervention.

To address the limitations of a biased sample and the large memory burden, we currently are collecting and analyzing data from a prospective sample of patients who are newly enrolled for treatment at the center. These patients will report on their condition at the time of enrollment, immediately after treatment, and at 6-month intervals thereafter.

Even with these limitations, however, it appears that the patients with asthma who received intensive treatment in a multidisciplinary outpatient setting showed significant improvements in biological, psychological, and social functioning. Indeed, respon-

dents reported significant improvements in each of the eight domains assessed. These results are consistent with recent literature indicating that such a biopsychosocial model of asthma care is highly effective. For example, the 78% reductions in hospitalizations and 73% reductions in emergency department visits reported in the present study are of the same order of magnitude as the 67% reduction in hospitalizations reported by Mayo et al¹⁴ and the 83% reduction in hospitalizations and 45% reduction in emergency department visits reported by Mason et al.¹⁶

From a different perspective, the pervasive negative impact of poorly controlled asthma on the respondents' lives is striking. Before treatment, about half of this group reported frequent symptoms every day. Ninety-three percent reported interference with vigorous activities. Roughly one third were depressed most of the time, and a similar fraction felt nervous most of the time. Asthma disrupted the social activities of 47% of the sample at least moderately and interfered significantly with the daily work of 31%. Physically, psychologically, and socially, asthma severely affected the quality of these individuals' lives. From this perspective, it is apparent that a multidisciplinary approach to treating severe asthma is important.

In light of increasing evidence that this type of intensive treatment program is highly effective in treating severe asthma, it is important to determine whether the treatment is economically viable. Weiss et al¹ calculated that asthma costs the United States \$6.2 billion per year (in 1990 dollars). Importantly, they estimated that 43% of the economic impact of asthma is associated with emergency department use, hospitalizations, and death.

Recently collected data from Barnes Hospital indicate that the average cost of a hospitalization for asthma is \$5,935, and that the average cost of an emergency department visit is \$800. The 207 patients in the present study reported 157 hospitalizations for asthma during the year preceding treatment and 35 hospitalizations during the most recent posttreatment year, for a reduction of 122 hospitalizations per year. This reduction amounts to a total cost savings of \$724,070 over 1 year, or an average cost savings of \$3,498 per patient. Similarly, the reduction in emergency department visits by 170 visits (from 233 to 63) amounted to a 1-year cost savings of \$136,000, or an average savings of \$657 per patient. Combining the savings from reduced hospitalizations and emergency department visits produces a total 1-year cost savings per person of \$4,155.

Examining only patients who were hospitalized frequently before treatment reveals even more dra-

... PATIENT OUTCOMES ...

matic economic benefits of the treatment program. Recall that, before treatment, 10% of respondents accounted for 56% (88/157) of all hospitalizations and 30% (70/233) of all emergency department visits. After treatment, they required only 12 hospitalizations and 17 emergency department visits. The estimated 1-year savings from reductions in the number of hospitalizations and emergency department visits combined is \$493,460, or \$23,498 per person. The savings for these most severely ill patients account for 68% of the total savings for the entire sample.

We reviewed the records of a random sample of 19 of the respondents to determine the total number of visits that each respondent made to the center and the total cost of all treatments received. We also reviewed the records of all respondents who reported having three or more hospitalizations during the year preceding treatment. Patients in the random sample had a mean of 5.1 visits (standard deviation, 3.2; range, 1 to 12 visits). The mean cost of all services provided was \$1,441 ± \$642 (range, \$426 to \$2,810).

For those reporting three or more pretreatment hospitalizations, the mean number of visits was 5.8 ± 4.3 (range, 1 to 14 visits). The mean cost of all services provided was \$1,552 ± \$1,056, with a range from \$142 to \$3,830. Interestingly, these respondents did not differ significantly from the sample as a whole in terms of either the number of visits to the center or in the total cost of treatment.

We can estimate the 1-year net savings in medical system use by subtracting the center treatment costs from the savings from lower hospitalization and emergency department visit costs. These savings amount to \$2,714 per person. For respondents with three or more pretreatment hospitalizations, the net savings is \$21,946 per person. These estimates do not include savings from reductions in the number of unscheduled physicians' visits.

Our data and those of Mason¹⁵ suggest that the savings from a comprehensive treatment program of this type are likely to continue for years after treatment. In a recent report on a group of people with severe asthma enrolled in a health maintenance organization and treated in the National Jewish Center for Immunology and Respiratory Medicine program, Meyer and Rohl¹⁶ projected that the cost of treating the patients would decrease from \$18,000 per patient before treatment to \$9,000 during the first year after treatment, and to only \$3,600 during the second year after treatment.

In conclusion, this study represents an initial step in determining whether an intensive, multidisciplinary approach to the treatment of asthma in an outpa-

tient setting can cost-effectively produce significant improvements in the biological, psychological, and social aspects of asthma. Although this retrospective study is subject to significant limitations, the data are consistent with recent reports suggesting the utility of this approach. Additional research clearly is warranted.

Acknowledgments

This research was supported by funding from VHA Great Rivers, Inc., Springfield, IL. The authors thank Ms. Lori Grigsby of VHA for her time and effort in data collection and analysis. We also thank the Barnes-Jewish West County Hospital Asthma Center staff for help in data collection. In particular, we thank JoAnn Bonsiglio, RN, MSN; Vivien Gardner, BSN; Kristine Wehmeier, BSN; and Mr. Jerry Lewin.

... REFERENCES ...

1. Weiss KB, Gergen PJ, Hodgson TA. An economic evaluation of asthma in the United States. *N Engl J Med* 1992; 326:862-866.
2. Bone RC. The bottom line in asthma management is patient education. *Am J Med* 1993;94:561-563.
3. National Asthma Education Program Expert Panel. *National Asthma Education Program Expert Report. Guidelines for the Diagnosis and Management of Asthma*. Bethesda, MD: National Heart, Lung, and Blood Institute, National Institutes of Health; 1991. Publication no. 91-3042.
4. Gaioni SJ, Fisher EB, Strunk RC. Identification and management of psychosocial factors. In: Bierman CW, Pearlman DS, Shapiro GC, Busse WW, eds. *Allergy, Asthma, and Immunology from Infancy to Adulthood*. 3rd ed. Philadelphia: WB Saunders Co; 1996:256-267.
5. Shavitt RG, Gentil V, Mandella R. The association of panic/agoraphobia and asthma. Contributing factors and clinical implications. *Gen Hosp Psychiatry* 1992;14:420-423.
6. Yellowlees PM, Haynes S, Potts N, Ruffin RE. Psychiatric morbidity in patients with life-threatening asthma: Initial report of a controlled study. *Med J Aust* 1988;149: 246-249.
7. Yellowlees PM, Kalucy RS. Psychobiological aspects of asthma and the consequent research implications. *Chest* 1990;97:628-634.
8. Yellowlees PM, Ruffin RE. Psychological defenses and coping styles in patients following a life-threatening attack of asthma. *Chest* 1989;95:1298-1303.
9. Miller BD. Depression and asthma: A potentially lethal mixture. *J Allergy Clin Immunol* 1987;80(3 part 2):481-486.
10. Kravis LP. An analysis of fifteen childhood asthma fatalities. *J Allergy Clin Immunol* 1987;80(3 part 2):467-472.
11. Rea HH, Scragg R, Jackson R, et al. A case control study of deaths from asthma. *Thorax* 1986;41:833-839.

... TREATMENT OUTCOME IN AN OUTPATIENT ASTHMA CENTER ...

12. Detjen PF, Greenberger PA, Grammer LC, Patterson R. Malignant potentially fatal asthma: A management strategy. *Allergy Proc* 1992;13:27-33.
13. Strunk RC, Mrazek DA, Fuhrmann GSW, LaBrecque J. Physiological and psychological characteristics associated with deaths from asthma in childhood: A case-controlled study. *JAMA* 1985;254:1193-1198.
14. Mayo PH, Richman J, Harris HW. Results of a program to reduce admissions for adult asthma. *Ann Intern Med* 1990;112:864-871.
15. Mason RJ. Time out for asthma. *Ann Allergy* 1989;63:366-368.
16. Mason RJ, Datz JL, Bethel RA. Time out for asthma: Rationale for a comprehensive evaluation. *Sem Respir Crit Care Med* 1994;15:97-105.
17. Korenblat PE. Asthma management. In: Korenblat PE, Wedner J. *Allergy: Theory and Practice*. 2nd ed. Philadelphia: WB Saunders Co; 1992:397-411.
18. Ware JE, Sherbourne CD. The MOS 36-Item Short Form Health Survey (SF-36): I conceptual framework and item selection. *Med Care* 1992;30:473-483.
19. Meyer L, Röhl BJ. An innovative approach to treating chronic disabling asthma. *TOM* 1993;60-69.

Appendix A

Medical System Use

1. How many times were you hospitalized for asthma?
2. How many times did you have to go to your doctor's office for an unscheduled appointment for treatment of asthma?
3. How many times did you have to go to a hospital emergency room for treatment of asthma?

Symptoms

4. Did you wake up at night with cough, wheeze, shortness of breath, or chest tightness? If yes, how often?
16. How frequently did you have the following symptoms?
 - a. How often did you cough?
 - b. Did you have chest tightness (difficulty moving air)?
 - c. Did you have wheezing?
 - d. Did you have shortness of breath?
17. How bad did you think your asthma was overall?

Medications

10. Did you take oral prednisone, Medrol, or another "steroid" by mouth or by injection to control your asthma?
 - a. If yes, how much did you take?
11. Did you have to suddenly increase and then taper the dose of prednisone, Medrol, or other "steroid" to control your asthma?
 - a. If yes, how many times?
12. How many times a day did you use an inhaled bronchodilator (an inhaled medication) to open your airways?
13. How many times a day did you use an inhaled cromolyn sodium (Intal) or inhaled nedocromil sodium (Tilade)?
14. How often did you take an oral theophylline bronchodilator (ie, Slobid, Theodur, or Uniphyll)?
15. Did you receive allergy shots (immunotherapy)?
 - a. If yes, how many times a month?

(Appendix A continued on next page)

... PATIENT OUTCOMES ...

Appendix A (continued from previous page)

Physical Functioning

*7. The following questions are about activities you might do during a typical day. Did your asthma limit you in these activities? If so, how much?

- a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports
- b. Moderate activities, such as pushing a vacuum cleaner, doing other household chores, bowling, or playing golf
- c. Lifting or carrying groceries
- d. Climbing several flights of stairs
- e. Climbing one flight of stairs
- f. Bending, kneeling, or stooping
- g. Walking more than a mile
- h. Walking several blocks
- i. Walking one block
- j. Bathing and dressing yourself

Social Functioning

*8. How much difficulty did you have doing your daily work, school activities, or play, both inside and outside of the house because of your asthma?

- a. if you had difficulty, what was the cause? (Mostly or entirely physical. Mostly or entirely emotional. About equally physical and emotional.)

*9. To what extent did your asthma interfere with your normal social activities with family, friends, neighbors, or groups?

Psychological Functioning

*5. How much of the time were you a nervous person?

*6. How much of the time did you feel downhearted and blue?

Education

18. Did you feel you knew how to care for your asthma or your child's asthma?

- a. Did you feel that you could usually recognize when your asthma or your child's asthma was getting bad?
- b. Did you feel that you usually knew what to do when your asthma or your child's asthma got bad?

Satisfaction with Asthma Care

19. How satisfied were you with the medical care of your asthma?

Each of the questions listed was asked once with the stem "in the 12 months prior to your first visit to the Asthma Center" and once with the stem "during the past 12 months." Questions preceded with an asterisk were derived from the SF-36 Health Survey. (Questions are listed according to the domain involved [eg. social functioning, physical functioning] rather than the order presented in the questionnaire.)