

Relationship Between Disease and Psychological Adaptation in Children in the Childhood Asthma Management Program and Their Families

Bruce G. Bender, PhD; Robert D. Annett, PhD; David Iklé, PhD; Thomas R. DuHamel, PhD; Cynthia Rand, PhD; Robert C. Strunk, MD; for the CAMP Research Group

Objective: To test the hypotheses that the burden of childhood asthma compromises psychological adaptation and that the degree of compromise increases with disease severity.

Design: The Childhood Asthma Management Program (CAMP) is a multicenter randomized clinical trial initiated and funded by the National Heart, Lung, and Blood Institute.

Setting: Study sites were located in Albuquerque, NM, Baltimore, Md, Boston, Mass, Denver, Colo, St Louis, Mo, San Diego, Calif, Seattle, Wash, and Toronto, Ontario.

Participants: A total of 1041 children aged 5 to 12 years were randomized to the trial after confirming their mild to moderate asthma.

Main Outcome Measures: Psychological questionnaires administered at baseline to parents and partici-

pants assessed anxiety, depression, behavioral competence, social support, and family functioning.

Results: Psychological difficulty was not increased in this group of asthmatic children and their families. Psychological adaptation in the children was associated with the psychological adaptation of the family but not with disease-related variables. Scores from the Impact on Family Scale, a measure of family quality of life related to the child's illness, were associated more strongly with the overall psychological characteristics of the family and child and very little with disease characteristics or severity.

Conclusions: Mild to moderate asthma has imposed modest effects on the daily life but not the psychological health of this group of children. Variation in the psychological characteristics of these children was, as is the case for most children, traceable to the overall psychological adaptation of their families.

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From the National Jewish Medical and Research Center, Denver, Colo (Drs Bender and Iklé); University of New Mexico Medical School, Albuquerque (Dr Annett); ABCD, Inc, Seattle, Wash (Dr DuHamel); Johns Hopkins School of Medicine, Baltimore, Md (Dr Rand); and Washington University School of Medicine, St Louis, Mo (Dr Strunk). A complete list of the members of the Childhood Asthma Management Program (CAMP) Research Group appears on pages 712 and 713.

PSYCHOLOGICAL disorder has been repeatedly associated with childhood asthma.¹⁻¹¹ Anxiety and depressive affect in the asthmatic child and distress in the family have been most frequently documented.^{4,12,13} This collective literature implies that a large group of asthmatic children have been psychologically compromised by their illness and may be in need of mental health services.⁷ However, inconsistencies in the findings from these investigations obscure the conclusions that can be drawn from them. For example, although some investigators reported a relationship between disease severity and psychological severity,^{1,6,7,10,11,14} others did not.²⁻⁵ Variation in sampling and methods likely contributed to these inconsistencies and the consequent confusion about the relationship between asthma and psychological adaptation in children. Two methodological shortcomings characterize many of

these studies.^{15,16} First, most relied on parental report of asthma diagnosis, severity, medication use, and symptom control without documentation by pulmonary function test results, medical chart review, or physician verification of findings. In the weakest scenario, questionnaires were mailed to parents with no face-to-face contact with patients or their parents.^{1,8} Second, many of the patient groups recruited were "samples of convenience,"² single-site cohorts whose demographic and illness characteristics may produce different outcomes from other small samples.

Some of the discrepancies in findings about the relationship between disease severity and psychological adaptation can be traced to differences in definitions of asthma severity. In some instances, inclusion in a study was based only on a diagnosis of asthma reported by the parent, with no severity-related assessment.^{2,3} When illness severity was assessed by pulmonary function, frequency of asthma attacks, or

PARTICIPANTS AND METHODS

The Childhood Asthma Management Program (CAMP) is a multicenter randomized clinical trial initiated and funded by the National Heart, Lung, and Blood Institute, Bethesda, Md, to assess the long-term effects of 3 asthma treatments on lung growth. The treatment arms included 2 anti-inflammatory medication groups and a control group. Secondary outcome measures consisted of long-term effects on bronchial responsiveness to methacholine, patient-reported asthma symptoms and peak flowmeter readings, health care utilization, physical growth, and safety and adverse effects. Recognizing that chronic childhood asthma can significantly affect the psychological well-being of the child and family, an extensive protocol of psychological measures was also included.

PATIENTS

A total of 1041 children, aged 5 to 12 years, were enrolled at the 8 clinical centers (Albuquerque, NM, Baltimore, Md, Boston, Mass, Denver, Colo, St Louis, Mo, San Diego, Calif, Seattle, Wash, and Toronto, Ontario) after confirming their mild to moderate asthma with criteria that included asthma symptoms or daily medication use for at least 6 months in the previous year; current asthma symptoms (by diary card report or AM or PM peak expiratory flow rate <80% of personal best measurement; at least 8 days of significant asthma symptoms within the 28-day screening period); bronchial hypersensitivity as demonstrated by 12.5 mg/mL or less of methacholine chloride required to cause a 20% decrease in forced expiratory volume in 1 second (FEV₁) (PC₂₀); and ability of the family to comply with the study protocol. Exclusion criteria included other significant illness, other pulmonary disease, severe chronic sinusitis, treatment for gastroesophageal reflux, introduction of or change in allergen immunotherapy within 30 days, pregnancy, inability to complete FEV₁ maneuvers or methacholine challenge, or severe

asthma (demonstrated by FEV₁ <65% predicted when not using inhaled β -agonists for >4 hours and theophylline for >24 hours, history of intubation for asthma, more than 1 hospitalization for asthma in the past year, more than 5 courses of oral glucocorticoids in the past year, or high β -agonist use during the 28-day screening period). All data contained in this report were collected during the screening period before randomization to a treatment group.

PROCEDURES

Patients at each center were recruited from a variety of sources, including clinics, hospitals, pediatricians, general practitioners, family practitioners, managed care groups, schools, and the general public (through radio, television, and newspaper advertising). A brief telephone screening was conducted with patients and families who expressed an interest in participation. If the child qualified for further screening, an initial appointment was scheduled at which time informed consent was obtained and asthma patient education information was provided. A minimum of 5 screening visits occurred during 5 weeks to 4 months that included a 28-day period when the patient did not use any asthma medications except bronchodilator as needed, during which symptoms and peak flows were recorded by the patients. During the screening period, various measurements were obtained (eg, bone density, blood values, pulmonary function, methacholine challenge) and procedures performed (skin testing and physical examination), and the child and family participated in an asthma education program that reinforced protocol-specific procedures and general guidelines for appropriate asthma care. Results from the screening evaluations were used to determine eligibility and to assess each family's ability to adhere to the protocol. The psychological evaluation occurred at the fourth screening visit, just before randomization into the trial. Further information is available elsewhere regarding CAMP study design¹⁹ and recruitment.²⁰

Continued on next page

medication use, no direct relationship between illness and psychopathological adaptation was found.^{4,8,9} In contrast, days of asthma-related school absence^{11,17,18} or activity restriction⁷ were frequently associated with the child's psychological adaptation as measured by standardized parent-report questionnaires. In these cases, however, the relationship between illness-related events and psychological adaptation remained relatively weak, and all variables were less significant determinants of psychological adaptation than characteristics of the family, such as parental psychiatric disorder,⁹ exposure to stressful life events,⁸ family conflict,¹ and maternal social support.⁵

The present investigation examined the illness-adaptation relationship in children with mild to moderate asthma participating in a large, multicenter clinical trial. Based on previous investigations, it was hypothesized that this population of asthmatic children would demonstrate significant compromise in psychological adaptation and that the degree of compromise would be most strongly associated with family functioning but also associated with functional control and measures of disease severity.

RESULTS

Table 1 lists summary statistics for demographic, pulmonary function, functional control, and physiological parameters. The study group included 32% minorities. Most of the caretakers answering screening questionnaires were mothers. Households predominantly had at least 1 parent with some college education. Inclusion criteria were designed to recruit patients with mild to moderate asthma. At presentation, mean FEV₁ before bronchodilator use was 93.8% of predicted and improved significantly with bronchodilator to 103.0% of predicted. For most children in this study, child psychosocial and family psychosocial variables were within the expected range and not indicative of clinical problems based on published normative data for the Children's Depression Inventory,²² Revised Children's Manifest Anxiety Scale,²³ Social Anxiety Scale for Children-Revised,²⁴ CBCL,²¹ Family Environment Scale,²⁵ Impact on Family Scale,²⁶ and Medical Outcomes Study Social Support Survey.²⁷ Mean Internalizing, Total Problem, and School Com-

CHILD AND FAMILY PSYCHOSOCIAL MEASURES

A committee composed of behavioral scientists from the 8 centers was responsible for selecting psychological measures to be included in the study protocol. The selected psychological questionnaires were standardized, published instruments that could evaluate constructs identified through previous investigations to be important to the psychological adaptation and quality of life of asthmatic children and their families. The following is a list of the questionnaires selected: Child Behavior Checklist (CBCL),²¹ which measured parent-reported evaluation of behavioral and emotional problems, social competence, and school competence; Children's Depression Inventory,²² which measured child-reported depressive symptoms; Revised Children's Manifest Anxiety Scale,²³ which measured child-reported anxiety symptoms; Social Anxiety Scale for Children-Revised,²⁴ which measured child-reported anxiety in peer interactions; Family Environment Scale,²⁵ which measured parent-reported family functioning; Impact on Family Scale,²⁶ which measured parent-reported impact of the child's illness on the family; and Medical Outcomes Study Social Support Survey,²⁷ which measured parent-reported relationships outside the immediate family that provide the family social support.

DISEASE-RELATED MEASURES

Measures of disease severity were chosen to reflect functional control and direct measurement of pulmonary function and airway reactivity.

PHYSIOLOGICAL MEASURES

Physiological measures included pulmonary function (percent of predicted FEV₁ before administration of bronchodilator after administration of bronchodilator), airway responsiveness (prebronchodilator to postbronchodilator percentage change in FEV₁), PC₂₀ (methacholine dose, administered incrementally for 2 minutes by inhalation, at

which a 20% decrease in FEV₁ occurs), and functional control measures (days of oral steroid use for asthma treatment in past 6 months and days of school missed because of asthma in past year by parent report).

DATA COLLECTION AND QUALITY ASSURANCE

Procedures were instituted to ensure correct and consistent collection of psychological data at all 8 centers. A policy was established that data collection would be conducted by a qualified psychometrist supervised by an on-site psychologist. Additional steps included the development of a psychometric data collection and scoring manual for use at all centers; a general certification test for all CAMP staff and a specific test for certification of psychometrists; and a standardized policy for data entry at each center into a desktop computer followed with checks for outliers, collection during appropriate time windows, and completeness.

STATISTICS

The mean (SD) and median (interquartile range) are listed as summary statistics for the continuous variables. Categorical data were summarized using percentage of total population. One-sample *t* tests were used to determine if, on average, observed values on the CBCL differed from the expected values based on age and sex in a normal population.²¹ Spearman correlations were chosen to describe the strength of a monotonic relationship between 2 variables. Plots of all correlations were examined for nonmonotonic relationship between pairs of variables. Stepwise regression was used to determine which combination of variables predicted the CBCL total score and Impact on Family scores. No formal statistical adjustments were made for the number of correlations examined. Thus, the reader should exercise caution in interpreting small correlation coefficients. All statistical tests were 2-sided and conducted at the .05 significance level using SAS statistical software, version 6.12 (SAS Institute Inc, Cary, NC).

petence scores from the CBCL were significantly different from the well-standardized population norms established for this instrument.²¹ However, these mean differences were small (2.75, 1.50, and -1.57 for Internalizing, Total Problem, and School Competence scores, respectively), indicating only a slight tendency for more problems. None of the mean scores approached the range of 60 and higher, which indicates clinically significant behavioral problems. Mean Externalizing and Social Competence scores did not differ significantly from population norms. Also consistent with the presence of significant asthma was methacholine PC₂₀ reactivity in the range of 0.5 to 2.8 mg/mL.

CORRELATIONS BETWEEN DISEASE-RELATED AND PSYCHOSOCIAL VARIABLES

Table 2 lists Spearman correlation coefficients between disease-related variables and psychosocial variables. Correlations of psychosocial variables with PC₂₀, prebronchodilator and postbronchodilator percent predicted FEV₁, and FEV₁ percentage change following bronchodilator use were small and for the most part not sig-

nificant. Postbronchodilator percent predicted FEV₁ was slightly correlated with the Impact on Family Scale and, negatively, with the Children's Depression Inventory. FEV₁ percentage change was very slightly correlated with the School Competence score from the CBCL. The Impact on Family Scale correlated very slightly and positively with days of oral steroid use in past year and days of school missed. Days of school missed in past year was also positively correlated with the CBCL Internalizing and Total Problem scores and the Impact on Family Scale score but negatively correlated with Social Competence and School Competence scores. All these associations are in the direction expected, where the number of school days missed negatively affects child and family.

FACTORS PREDICTING EMOTIONAL AND BEHAVIORAL DYSFUNCTION IN THE ASTHMATIC CHILD

Stepwise regression was used to determine what combination of factors predicted the child's psychological adjustment as measured by the CBCL total score. All disease-

related and psychological variables were available for inclusion in the model with the exception of the Revised Children's Manifest Anxiety Scale, Children's Depression Inventory, the Social Anxiety Scale scores, and the CBCL problem scores, which like the CBCL total score are measures of child psychopathological dysfunction. Results indicated that the measure of the family's network of social support outside the immediate family was the strongest contributor to the model, with a partial R^2 of 0.116 (**Table 3**). Thus, 11.6% of the variability in CBCL total score can be explained by social support after accounting for all other variables selected in the model. Other factors that explain the variability in CBCL total score included measures of general family functioning (conflict, expressiveness, and cohesion), perceived impact of the illness, and missed school days. School absence days was the only disease-related variable included in the model. Adjustment for clinical site did not appreciably alter the regression coefficients in the final model.

FACTORS ASSOCIATED WITH THE PARENTS' PERCEPTION THAT THEIR CHILD'S ILLNESS NEGATIVELY AFFECTS THE FAMILY

A stepwise regression was conducted to determine what combination of pulmonary function, functional control, and child and family psychosocial variables is associated with parental report that the illness affects the family (**Table 4**). Results show that perceived social support, absence from school, and child behavioral problems contribute most to the Impact on Family score. The few disease-related variables that emerge in the model (FEV_1 change, oral steroid days, prebronchodilator FEV_1) account for only a small amount of the variance in the Impact on Family Scale score. Both CBCL Social and School Competence scores also contributed slightly to the model. Adjustment for clinical site did not appreciably alter the regression coefficients in the final model.

COMMENT

In this study of 1041 children with mild to moderate asthma participating in CAMP, little evidence was found for increased psychological difficulty in the children or their families. Furthermore, there is minimal documentation regarding the relationship between physiological parameters of their illness and the psychological characteristics of these children and their families. The 4 measures of pulmonary function and airway reactivity (PC_{20} , prebronchodilator percent predicted FEV_1 , postbronchodilator percent predicted FEV_1 , and FEV_1 percentage change following bronchodilator use) correlated with few of the 9 measures of child or family psychological adaptation (CBCL Internalizing, Externalizing, or Total Problem scores; Children's Manifest Anxiety Scale; Children's Depression Inventory; Family Environment Scale Cohesion, Expressiveness, or Conflict scores; Medical Outcomes Study Social Support Survey). A small but significant correlation was found between the Impact on Family Scale and postbronchodilator percent predicted

Table 1. Summary of Demographic, Pulmonary Function, Functional Control, and Psychosocial Variables for 1041 Children in the Childhood Asthma Management Program*

Variables	%	Mean (SD)	Median (Interquartile Range)
Demographics			
Minority participation			
White	68.3	...	...
Black	13.2	...	...
Hispanic	9.4	...	...
Other	9.1†	...	...
Child sex			
Male	59.7	...	...
Female	40.3	...	...
Questionnaire respondent			
Father	12.9	...	...
Mother	85.3	...	...
Other guardian	2.7	...	...
Parental education (maximum of respondent and partner)			
≤8th grade	0.5	...	...
Some high school	1.3	...	...
Completed high school	9.8	...	...
Some college or secondary	37.3	...	...
Completed college	51.2	...	...
Age of child, y		8.2 (2.1)	8 (7-10)
Pulmonary Function			
PC_{20} , mg/mL	...	2.2 (2.5)	1.2 (0.5-2.8)
Prebronchodilator % predicted FEV_1	...	93.8 (14.4)	94.1 (84.2-103.6)
Postbronchodilator % predicted FEV_1	...	103.0 (12.8)	102.8 (94.3-111.1)
Functional Control			
Oral corticosteroid days in 6 mo	...	2.8 (5.1)	0 (0-5)
Days of school missed because of asthma in 1 y	...	5.3 (7.0)	3 (0-8)
Child Psychosocial			
Child Behavior Checklist scores			
Internalizing	...	52.9 (10.2)	52 (46-60)
Externalizing	...	50.2 (9.5)	50 (43-56)
Total Problem	...	51.6 (10.2)	51 (45-57)
Social Competence	...	48.1 (7.1)	50 (43-55‡)
School Competence	...	46.8 (7.6)	48 (43-53‡)
Children's Manifest Anxiety Scale score	...	47.2 (11.4)	47 (39-54)
Children's Depression Inventory score	...	6.7 (6.2)	5 (2-10)
Family Psychosocial			
Family Environment Scale scores			
Cohesion	...	7.7 (1.6)	8 (7-9)
Expressiveness	...	6.4 (1.7)	7 (5-8)
Conflict	...	3.1 (2.0)	3 (1-4)
Medical Outcomes Study Social Support Survey score	...	77.6 (14.8)	80 (69-90)
Impact on Family Scale score	...	32.8 (10.5)	32 (24-40)

* PC_{20} indicates methacholine chloride dose at which a 20% decrease in forced expiratory volume in 1 second (FEV_1) occurs; ellipses, data not applicable.

†The category of "other" includes primarily self-reported mixed racial heritage.

‡These scales were only included for school-aged children ($n = 921$).

Table 2. Spearman Correlations of Disease-Related and Psychosocial Variables for 1041 Children in the Childhood Asthma Management Program*

Variables	PC ₂₀	Prebronchodilator % Predicted FEV ₁	Postbronchodilator % Predicted FEV ₁	Change From Prebronchodilator to Postbronchodilator FEV ₁	Days of Oral Steroid Use in Past 6 mo	Days of School Missed in Past Year
Child Psychosocial						
Child Behavior Checklist Problem scores						
Internalizing	-0.004	0.044	0.040	-0.018	0.017	0.100‡
Externalizing	-0.001	0.031	0.040	0.010	0.114	0.029
Total	0.006	0.034	0.029	-0.010	0.074	0.078‡
Competence scores						
Social Competence	-0.014	0.017	-0.003	-0.038	0.039	0.070†
School Competence	0.024	0.024	0.009	0.071†	0.031	-0.069†
Children's Manifest Anxiety Scale	-0.010	-0.046	-0.046	0.006	0.010	-0.002
Children's Depression Inventory	0.011	0.044	-0.071†	-0.021	0.014	-0.008
Social Anxiety Scale						
Fear of negative evaluation	-0.020	-0.009	-0.049	0.036	-0.008	-0.038
Distress to new situations	0.004	0.060	0.019	-0.049	0.007	-0.023
Generalized social avoidance	-0.033	0.013	-0.032	-0.049	0.012	-0.025
Family Psychosocial						
Family Environment Scale						
Cohesion	-0.002	0.007	-0.006	-0.049	-0.039	-0.007
Expressiveness	0.005	0.009	0.016	-0.015	0.004	0.000
Conflict	-0.036	0.013	0.019	0.019	0.018	-0.026
Medical Outcomes Study Social Support Survey	0.012	-0.032	-0.046	-0.008	0.047	-0.003
Impact on Family Scale	0.009	0.059	0.103‡	0.041	0.070*	0.172‡

*PC₂₀ indicates methacholine chloride dose at which a 20% decrease in forced expiratory volume in 1 second (FEV₁) occurs.

†Significant (P<.05).

‡Significant (P<.01).

Table 3. Stepwise Regression of Child Psychological Adjustment (Child Behavior Checklist Total Problem Score)*

Variable	No. In	Partial R ² †	P	Coefficient‡
Intercept	...	...	<.001	59.97
Medical Outcomes Study Social Support Survey	1	0.116	<.001	0.09
Family Environment Scale-Conflict	2	0.060	<.001	-0.40
Impact on Family Scale	3	0.020	<.001	-0.52
Family Environment Scale-Expressiveness	4	0.010	<.001	1.15
School absence days	5	0.004	.03	-0.13
Family Environment Scale-Cohesion	6	0.003	.06	0.13

*Variables included in the stepwise regression were Family Environment Scale (Cohesion, Expressiveness, Conflict), Impact on Family Scale, Medical Outcomes Study Social Support Survey, methacholine chloride dose at which a 20% decrease in forced expiratory volume in 1 second (FEV₁) occurs, prebronchodilator percent predicted FEV₁, postbronchodilator percent predicted FEV₁, oral steroid days, and school absence days.

†Total R² = 0.212.

‡Coefficients are from the final model.

FEV₁ but not with any additional lung function measures.

School and Social Competence scores, as reported by parents on the CBCL, were slightly decreased and negatively correlated with school absence. A small correlation was also found between School Competence and change in FEV₁ following bronchodilator use. These re-

sults suggest that, although emotional and behavioral problems are not increased, school adaptation and peer interactions may be somewhat inhibited, particularly in children who demonstrate greater airway obstruction and school absence related to their asthma. However, the size of mean score differences and correlations was in most cases so small that it was clinically irrelevant. In short, mild to moderate asthma has imposed modest effects on the daily life but not the psychological health of this group. Because the children participating in this study had volunteered and were screened for enrollment, conclusions drawn herein may not apply to all children with asthma. Nonetheless, this study includes a broad spectrum of children across North America and should provide greater generalization than most previous studies of pediatric asthma.

Other investigations have also reported no increase in psychological dysfunction in children with mild to moderate asthma.^{10,28} The presumption that chronic illness will bring compromised psychological adaptation must be tempered by the realization that even some children who have experienced extreme stress from poverty, war, natural disasters, physical disability, and illness emerge as reasonably happy and psychologically well-adjusted individuals.²⁹ The capacity to survive such stress has been traced to "protective" factors, which include the child's own temperament, strengths of the family, and external sources of support.³⁰ In the present study, the absence of significant psychological dysfunction in children with chronic asthma may also reflect the fact that their illness, although uncomfortable and inconvenient,

is not of sufficient magnitude to alter their psychological adaptation.

Because participation in CAMP is limited to children with mild to moderate asthma, these findings cannot be generalized to children with severe asthma. Indeed, there is evidence that psychological disorder is increased in children only when their asthma is severe.^{10,11,31} Others have reported no severity-mediated relationship between the disease and psychological adaptation.^{8,9,18} Inaccuracy in the assessment of asthma severity, however, may occur in studies that rely on parent-report measures, include no objective disease measures, and fail to represent severe asthma. When this occurs, absence of an observed severity-psychopathology relationship may reflect the absence of patients with severe asthma.

The psychological adaptation of a child with asthma is determined most strongly by the emotional climate of the family. The impact of the child's illness appears to be secondary to parental adaptation. Hence, the regression of numerous variables on the CBCL Total Problem score revealed that secure family relationships, external social support, and the perception of minimal illness impact were together most strongly associated with the child's emotional and behavioral strength, whereas disease-related measures were not (Table 3). Others have reported that severe asthma has a detrimental impact on the child's psychological adaptation only when the illness co-occurs with other adverse circumstances in the family.^{5,8,9}

Parental responses to questionnaires evaluating child psychosocial adaptation are largely influenced by the psychological well-being and personal outlook of the parent completing the questionnaire. Thus, a depressed parent may describe his or her child as less psychologically adapted than a nondepressed parent viewing the same child.³¹ Any attempt to evaluate the relationship between illness and psychological adaptation must be based on a theoretical model that takes sufficiently into account the complex set of relationships between illness severity, illness control, family characteristics, and parental mental health.³² Failure to do so will result in simplistic and inaccurate conclusions. For example, inclusion of only the Impact on Family Scale in an investigation of childhood asthma may appear to indicate that correlations between this scale and symptom control measures reflect the degree to which the illness burdens the family, as is implied by the name of the questionnaire. The regression of psychological and disease-related variables onto the Impact on Family Scale score (Table 4), however, clearly reveals that parents' perceptions of the effect of their child's illness on the entire family are significantly influenced by other family characteristics and only minimally by illness severity. For instance, families that are challenged by such factors as economic instability or few social resources may perceive the child's asthma as an enormously disruptive influence, whereas families with relative stability and support may have considerable resilience and report little adverse impact even in the presence of severe illness. The requirement of sufficient psychosocial measurement is equally applied to investigations that use quality-of-life instruments. Inad-

Table 4. Stepwise Regression of Impact on Family Scale Total Score*

Variable	No. In	Partial R ² †	P	Coefficient‡
Intercept	...	...	<.001	36.37
Medical Outcomes Study Social Support Survey	1	0.095	<.001	-0.18
School absence days	2	0.023	<.001	0.16
CBCL Total Problem	3	0.015	<.001	0.10
Oral steroid days	4	0.006	.01	0.18
CBCL Social Competence	5	0.005	.02	-0.09
Postbronchodilator % predicted FEV ₁	6	0.004	.04	-0.40
% Change in FEV ₁	7	0.006	.02	0.44
Prebronchodilator % predicted FEV ₁	8	0.006	.01	0.52
CBCL School Competence	9	0.003	.07	-0.09

*Variables included in the stepwise regression were Child Behavior Checklist (CBCL) (Internalizing, Externalizing, Total, Social Competence, School Competence), Children's Manifest Anxiety Scale, Children's Depression Inventory, Social Anxiety Scale (Negative Evaluation, New Situations, Generalized Avoidance), Family Environment Scale (Cohesion, Expressiveness, Conflict), Medical Outcomes Study Social Support, methacholine chloride dose at which a 20% decrease in forced expiratory volume in 1 second (FEV₁) occurs, prebronchodilator percent predicted FEV₁, postbronchodilator percent predicted FEV₁, oral steroid days, and school absence days.

†Total R² = 0.163.

‡Coefficients are from the final model.

equating measurement of important correlates may lead to simplistic conclusions about the impact of asthma on the child and family's life without sufficient understanding of the complex variables that influence patient or parent subjective perception of the effects of the illness.

Results from this investigation are consistent with the psychosocial model of children's health status outcomes proposed by Bonner and Finney.³² In the model, the child's and family's responses to the chronic illness are mediated by a variety of factors, including the family's level of adaptability, previous patterns of health care utilization, existing psychological disorder, and the degree to which parents perceive that they have control of the illness. Relatively mild illness places little additional burden on the family. More severe illness requires greater adaptive resources from the family; when such adaptability cannot be achieved, both the child and family may experience disabling levels of distress and consequent decreased health quality for the child. The psychological health of the parents, particularly the mother, is an additional potent factor influencing the child's response to the illness and risk of psychopathological dysfunction.

Pediatricians must judge when to refer a child for psychological intervention. For children with asthma, numerous factors work collectively to determine psychological health. Relatively mild or even moderate illness is unlikely to result in psychological disturbance, but emotional and behavioral problems may emerge when the illness occurs in a distressed family. Increased illness severity, impaired physical and social activity, and frequent interaction with the health care system may additionally alert the physician to a need for consultation with a mental health practitioner.

The members of the Childhood Asthma Management Program (CAMP) Research Group as of February 1998 are as follows:

Clinical Centers

ASTHMA, Inc, Seattle, Wash: Gail G. Shapiro, MD (director); Thomas R. DuHamel, PhD (codirector); Timothy G. Wighton, PhD (codirector); Tamara Chinn, RN (coordinator); C. Warren Bierman, MD; Clifton T. Furukawa, MD; Leonard C. Altman, MD; Frank S. Virant, MD; Paul V. Williams, MD; Dominick A. Minotti, MD; Michael S. Kennedy, MD; Jonathan W. Becker, MD; Chris Reagan; Heather Eliassen; Dan Crawford, RN; Babi Hammond; Grace Strodbeck; Marian Sharpe, RN (1992-1994).

Brigham & Women's Hospital, Boston, Mass: Scott Weiss, MD, MS (director); Dirk Greineder, MD (codirector); Walter Torda, MD (codirector); Martha Tata, RN (coordinator); Peter Barrant, MD; Anthony DeFilippo; Mary Grace, RN (1993-1996); Stephanie Haynes; Margaret Higham, MD; Susan Kelleher (1993-1997); Jay Koslof, PhD (1993-1995); Nancy Madden, RN; Dana Mandel; Agnes Martinez (1994-1997); Jean McAuliffe (1994-1995); Paola Pacella; Paula Parks (1993-1995); Anne Plunkett, RN; Kay Seligsohn, PhD; June Traylor, MSN, RN; Melissa Van Horn, PhD; Janice Ware, PhD; Carolyn Wells, RN (1993-1995); Ann Whitman, RN (1994-1996).

The Hospital for Sick Children, Toronto, Ontario: Joe Reisman, MD, FRCPC (director); Ian MacLusky, MD, FRCPC (codirector); Henry Levison, MD, FRCPC (former director); Anita Hall, RN (coordinator); Yola Benedet; Jennifer Chay; Michelle Collinson, RN; Jane Finlayson-Kulchin, RN; Kenneth Gore, MA; Melody Miki, RN; Renée Sananes, PhD.

Johns Hopkins Asthma & Allergy Center, Baltimore, Md: N. Franklin Adkinson, Jr, MD (director); Peyton Eggleston, MD (codirector); Karen Huss, DNSc (coinvestigator); Leslie Plotnick, MD (coinvestigator); Margaret Pulsifer, PhD (coinvestigator); Cynthia Rand, PhD (coinvestigator); Barbara Wheeler, RN, BSN (coordinator); Nancy Bollers, RN; Kimberly Hyatt; Betsy Leritz; Mildred Pessaro; Stephanie Philips, RN.

National Jewish Medical and Research Center, Denver, Colo: Stanley Szeffler, MD (director); Harold S. Nelson, MD (codirector); D Sundström (coordinator); Bruce Bender, PhD; Kristin Brelsford; Melanie Gleason, PA-C; Joseph Hassell; Caroline Hendrickson, RN (coordinator, 1995-1997); Charles G. Irvin, PhD; Tara Junk; Andrew Liu, MD; Joseph Spahn, MD; Michael P. White; Jeryl Feeley, MA (coordinator, 1992-1995); Jessyca Bridges (1995-1997); Jody Ciacco (1993-1996); Michael Eltz (1994-1995); Michael Flynn (1995-1996); Marcia Hefner (1992-1994); Daniel Hettelman (1995-1996); Jeffrey Jacobs, MD (1996-1997); Alan Kamada, PharmD (1994-1997); Sai Nimmagadda, MD (1993-1996); Kendra Sandoval (1995-1997); Jessica Sheridan (1994-1995); Trella Washington (1993-1997); Eric Willcutt (1996-1997).

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University of New Mexico, Albuquerque: Bennie McWilliams, MD (director); Robert D. Annett, PhD (coinvestigator); H. William Kelly, PharmD (coinvestigator); Mary Spicher, RN (coordinator); Diane Becker; Selda Bereket; Marisa Braun; Shannon Bush; David Hunt; Margaret Moreshead; Barbara Ortega.

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Dermatology, Allergy and Clinical Immunology (DACI) Reference Laboratory, Johns Hopkins University School of Medicine, Asthma and Allergy Center, Baltimore, Md: Robert G. Hamilton, PhD, D ABMLI (director); Carol Schatz (business office manager); Jack Wisenauer, MT (laboratory supervisor).

Immunology and Complement Laboratory, National Jewish Medical and Research Center: Ronald Harbeck, PhD (director); Rhonda Emerick; Brian Watson.

Patient Education Center, National Jewish Medical and Research Center: Stanley Szeffler, MD (director); Bruce Bender, PhD; Harold Nelson, MD; Cindi Culkin, MEd (coordinator, 1996-1997); Jeryl Feeley, MA (coordinator, 1992-1995); Sarah Oliver, MPH (co-coordinator, 1992-1996); Colleen Lum Lung, RN (1992-1994); Ann Mullen, RN (1994-1996).

Project Office, National Heart, Lung, and Blood Institute, Bethesda, Md: Virginia Taggart, MPH (project officer); Pamela Randall (contracting officer); Paul Albert, PhD; Suzanne Hurd, PhD; James Kiley, PhD; Margaret Wu, PhD; Sydney Parker, PhD (1991-1994).

S&M Instrument Company, Doylestown, Pa: William Letvenko (president); William Repko.
 Serum Repository, DACI Reference Laboratory, Johns Hopkins Asthma & Allergy Center: Robert Hamilton, PhD (director);
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Reprints: Bruce G. Bender, PhD, National Jewish Medical and Research Center, Denver, CO 80206.

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