

Subjective symptoms of acute asthma within a heterogeneous sample of asthmatics

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A heterogeneous group of 175 severe asthma inpatients with perennial symptoms were asked to rate the frequency with which 77 symptoms occurred during their asthma attacks. The reported frequency of occurrence for individual symptoms and symptom categories of panic-fear, irritability, fatigue, hyperventilation-hypocapnia, and airway obstruction are presented. As expected, airway obstruction symptoms were the most frequently reported during acute asthmatic episodes. In decreasing order, the airway obstruction symptoms were followed by fatigue, panic-fear, irritability, and hyperventilation-hypocapnia. A separation of the patient sample into subgroups revealed no differences in reported occurrence of the symptom categories associated with age, age at onset, or length of illness. Females reported experiencing panic-fear and fatigue symptoms more frequently than males. Patients who subsequently had higher steroid regimens prescribed at discharge reported more frequent panic-fear symptoms. Those patients with an infectious component in their asthma reported symptoms of panic-fear, fatigue, and airway obstruction somewhat more frequently than those classified as having no infectious component in their asthma. The results suggest that subjective symptomatology may provide important clues concerning the nature of emotional factors in asthma and response to treatment.

As part of the medical history, the patient's subjective symptomatology not only presents clues as to the organic problem but also provides important information about the patient's emotional response to his illness. In intermittent reversible obstructive lung disease, i.e., asthma, subjective symptoms are of special interest for several reasons. Because of its intermittent nature, objective indices of pulmonary status during acute asthma attacks are not always available. Thus, the patient's subjective description of his attack may be the only source of information available to a physician, who must then decide the proper approach and management. The character of the patient's subjective response to acute episodes may color the clinical picture, thereby influencing decisions related to hospitalization, prescribed drug regimens, and prognosis. The patient's

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subjective complaints not only may provide an indication of severity of the attack, but also may reveal the patient's emotional response to asthma attacks. It may prove useful to derive a subjective assessment of the patient's emotional response during an acute asthma episode since strong emotions have been found to affect airway caliber of some patients.¹⁻³

Descriptions of the subjective complaints of asthmatics are seldom seen in the literature, although recently we have presented a systematic analysis of the subjective symptomatology of asthma.⁴ Using a large heterogeneous group of inpatients with asthma, we derived an Asthma Symptom Checklist (ASC) measuring 5 categories of symptoms of acute asthma.

The 5 categories of the ASC are composed of items that describe unique aspects of asthma subjective symptomatology. The 2 *mood* categories, labeled *panic-fear* and *irritability*, describe affective states concomitant with asthma; a *fatigue* category describes the subjective state of tiredness associated with the attack; and 2 *somatic* categories, labeled *airway obstruction* and *hyper-ventilation-hypocapnia*, describe physical symptoms associated with asthma attacks. Labels for the categories were made entirely on a conceptual basis according to the symptoms comprising each category. A detailed description of the derivation of the ASC and its component symptom categories can be found in the earlier report.⁴ This report also presents detailed information about the reliability and reproducibility of each of the 5 symptom categories.

Our purpose in this paper is to present detailed information of the reported frequency with which a still larger group of adult asthma inpatients experienced specific individual symptoms during acute asthmatic episodes, and to evaluate differences in symptomatology among various subgroups of asthmatics defined according to sex, age, age at onset, duration of illness, medication requirements, and pathogenic basis of the disease. Such information has not been made available previously.

METHOD

Checklist development

The original checklist included 77 symptom items describing the subjective responses of patients during asthma attacks. The symptom items were originally derived from individual interviews with 29 adult asthma inpatients asked to describe their "asthma attacks" and to cite as many descriptive subjective symptoms as possible. Each of these 77 symptom items were then placed in random order next to a 5 point scale of frequency of occurrence (1 = never; 5 = always). This arrangement permitted each patient to rate the frequency with which he experienced each symptom during his "asthma attacks" by marking the appropriate point on the 5 point scale. Within this group of patients, the asthma was of such severity that there was little doubt about when "attacks" occurred. For example, the first second forced expiratory volume (FEV₁) commonly dropped to 50 per cent of the *best* FEV₁ during acute asthma episodes for many of these patients. Additionally, all patients within this group experienced periods of relative freedom from symptoms interrupted by incapacitating episodes of severe obstruction requiring emergency treatment with vigorous medical intervention. The symptom checklist used in this study will be provided upon request.

Subjects and procedure

The checklist was administered to 175 asthma inpatients admitted consecutively to National Jewish Hospital and Research Center (NJHRC) over a period of 20 months. The first

100 of these patients were used in the earlier report.⁴ Patients ranged in age from 14 to 67 (mean age $\pm$ S.D., 27.60 ± 14.49) years of age. Ninety-two patients were females (mean age $\pm$ S.D., 29.46 ± 15.32) and 83 were males (mean age $\pm$ S.D., 25.54 ± 13.30). Age at onset ranged from 6 months to 54 years (mean age at onset $\pm$ S.D., 13.67 ± 15.54). Pathogenic basis of the asthma, as will be described below, varied considerably. For the 119 patients for whom this information was available, allergic (i.e., reaginic) factors were judged to be importantly involved in the asthma of 40 per cent of these patients, infection in 83 per cent, both infection and reagin in 30 per cent, and for 7 per cent neither of these two factors was judged to be of major significance. Seventy-five per cent of these patients were prescribed maintenance steroids at the time of discharge from the hospital. They were all methacholine- and histamine-sensitive in that increased airway obstruction developed in varying degrees upon inhalation of small, measured quantities of one or both of these substances. Some were responders and others nonresponders to various medical regimens used at NJHRC. Thus, the patients involved in this study represented a very heterogeneous group of severe, perennial asthmatics.

Each patient was administered an individual checklist containing all of the 77 symptom items. Instructions, given verbally and in writing at the top of the checklist, were to rate on the 5 point scale how often each symptom was experienced during asthma attacks. Patients were permitted to take as much time as necessary to complete the checklist.

RESULTS

A listing of each of the 77 individual symptom items within each of the 5 symptom categories of the Asthma Symptom Checklist (ASC) and a *unique symptom set* are presented in Table I. The ASC includes 2 *somatic* symptom categories, labeled *airway obstruction* and *hyperventilation-hypocapnia*, a *fatigue* symptom category, and 2 *mood* symptom categories, labeled *panic-fear* and *irritability*.* The symptom items included within each symptom category of the original ASC were only those satisfying the statistical properties characterizing clusters identified by key cluster analysis.⁵ For the present study, the number of symptoms within each category was increased by adding any highly related, conceptually consistent symptom items. For example, in Table I the item *wheezing*, although not originally a defining item of airway obstruction, was added because it correlated highly with the other symptoms of this category and was conceptually consistent with these symptoms. Thirty-two of the 77 symptoms are not members of any of the 5 ASC symptom categories, and are therefore listed separately within a *unique symptom set*. The percentage of patients responding to each of the 5 scale points (1 = never; 5 = always) is shown, along with the means and standard deviations for each symptom item. Over-all mean percentages, means, and standard deviations are also listed for each symptom category as a whole. The symptom categories are arranged within the table in descending order of reported frequency. In the previous report,⁴ statistical tests performed on the first 100 of these patients revealed that symptoms of hyperventilation-hypocapnia (C4) were reported to occur significantly less frequently than the symptoms of all other categories. The mood symptom categories, panic-fear (C1) and irritability (C2), were reported to occur significantly less frequently than fatigue (C3) or airway obstruction (C5).

*The airway obstruction symptom category was previously labeled *bronchoconstriction*. The name has been changed to reflect the more general origins of the symptoms composing this category, i.e., due to edema, mucus congestion, bronchospasm, and so on.

TABLE 1. Distributions for 77 subjective symptoms within 5 symptom categories and the unique symptom set*

		Scale point					$\bar{X}$	S.D.
		1 Never (%)	2 Almost never (%)	3 Some- times (%)	4 Almost always (%)	5 Always (%)		
Item No.	Symptom category							
<i>Airway obstruction symptom category</i>								
1.	D12 Hard to breathe	2	0	10	15	74	4.59	0.81
2.	D21 Short of breath	1	2	11	20	67	4.51	0.80
3.	42 Wheezing	1	2	16	26	55	4.32	0.89
4.	D47 Chest tight	2	1	15	33	49	4.25	0.91
5.	D22 Chest congestion	4	3	28	23	41	3.94	1.09
6.	D32 Rapid breathing	6	5	24	32	33	3.82	1.13
7.	D52 Shallow breathing	7	6	28	29	31	3.71	1.16
8.	D69 Coughing	4	0	32	32	24	3.63	1.07
9.	D8 Mucus congestion	11	4	29	28	29	3.61	1.23
10.	D57 Chest filling up	10	11	34	25	19	3.31	1.21
11.	3 Panting	13	9	34	23	21	3.28	1.27
12.	D54 Choking	11	18	42	17	13	3.02	1.13
Mean values		6.00	5.83	25.25	25.25	38.00	3.83	1.06
<i>Fatigue symptom category</i>								
1.	D33 Worn out	4	4	25	29	38	3.92	1.08
2.	48 Tired	5	4	28	29	34	3.83	1.11
3.	64 Exhausted	6	3	32	29	31	3.75	1.10
4.	D35 Weak	6	6	30	29	28	3.65	1.14
5.	D70 No energy	9	6	32	30	24	3.55	1.17
6.	D55 Fatigued	12	8	32	26	21	3.36	1.25
Mean values		7.00	5.17	29.83	28.67	29.33	3.68	1.14
<i>Panic-fear symptom category</i>								
1.	53 Nervous	7	11	47	21	14	3.23	1.07
2.	D43 Worried about the attack	15	11	43	16	15	3.06	1.22
3.	71 Jittery	18	13	40	21	9	2.91	1.19
4.	D62 Worried	16	16	40	18	9	2.89	1.16
5.	D15 Frightened	22	16	35	10	17	2.84	1.34
6.	D73 Worried about myself	21	15	35	18	11	2.82	1.26
7.	D34 Panicky	17	21	38	12	12	2.80	1.20
8.	D49 Scared	21	21	38	8	12	2.70	1.24
9.	D28 Afraid of dying	45	18	28	4	5	2.07	1.17
Mean values		20.22	15.78	38.22	14.22	11.56	2.81	1.21
<i>Irritability symptom category</i>								
1.	D11 Irritable	13	13	49	16	8	2.93	1.07
2.	D14 Edgy	18	13	44	13	12	2.89	1.21
3.	D60 Short-tempered	18	18	43	12	9	2.77	1.16
4.	39 Want to be left alone	26	13	39	14	9	2.67	1.24
5.	D10 Cranky	20	17	45	12	6	2.66	1.10
6.	D29 Frustrated with things	26	13	46	10	6	2.56	1.15
7.	D66 Anxious	29	16	34	13	8	2.55	1.26
Mean values		21.43	14.71	42.86	12.86	8.29	2.72	1.17
<i>Hyperventilation-hypocapnia symptom category</i>								
1.	D13 Headache	25	15	34	19	7	2.70	1.24
2.	D31 Dizzy	22	25	38	11	4	2.49	1.08
3.	D41 Itchy throat	37	14	33	9	7	2.34	1.25
4.	51 Feel hazy	32	15	43	8	2	2.34	1.07

*Items are labeled in the second column of the table according to their position in the original checklist. Those items additionally labeled with a *D* were the original *defining* items of the symptom category identified by the empirical analysis described in the previous report.⁴ The nondefining, but highly related items, within each category do not have the *D* label. The items not associated with the 5 symptom categories are included within a *unique symptom set*. All data in this table are based on the full sample of 175 patients.

TABLE I. Cont'd

Item No.	Symptom category	Scale point					$\bar{X}$	S.D.
		1 Never (%)	2 Almost never (%)	3 Some- times (%)	4 Almost always (%)	5 Always (%)		
5.	D68 Nauseated	36	20	36	5	3	2.18	1.07
6.	D36 Pins and needles feelings	52	17	22	6	2	1.90	1.10
7.	D27 Itchy lungs	58	12	22	6	2	1.81	1.08
8.	D46 Tingly in spots	56	16	22	5	2	1.80	1.04
9.	D67 Itchy skin	57	16	22	3	2	1.79	1.04
10.	D7 Numb	64	16	15	3	2	1.61	0.96
Mean values		43.90	16.60	28.70	7.50	3.30	2.10	1.09
<i>Unique symptom category</i>								
1.	16 Uncomfortable	6	2	18	24	50	4.10	1.14
2.	23 Slept poorly	5	2	28	26	40	3.95	1.08
3.	59 Sweating	6	9	33	26	26	3.57	1.15
4.	74 Concerned about asthma	11	9	35	22	23	3.36	1.24
5.	30 Heart pounding	10	11	33	30	16	3.30	1.17
6.	76 Tense	14	6	42	24	14	3.18	1.19
7.	58 Tense muscles	16	11	36	21	17	3.11	1.27
8.	19 Upset	13	13	43	15	16	3.08	1.20
9.	63 Chest pain	17	18	35	20	11	2.91	1.21
10.	75 Concerned in general	19	16	33	19	13	2.90	1.27
11.	56 Feel helpless	16	20	39	14	12	2.86	1.19
12.	72 Unhappy	21	15	37	16	11	2.82	1.25
13.	4 Jumpy	21	15	36	20	8	2.79	1.21
14.	17 Stuffy nose	18	17	43	14	8	2.77	1.15
15.	9 Sleepy	25	15	37	16	7	2.66	1.21
16.	5 Feel pressured	26	15	38	12	9	2.63	1.24
17.	1 Feel dull	30	13	34	13	11	2.61	1.33
18.	38 Don't care about things	32	14	35	13	6	2.47	1.24
19.	44 Angry	29	17	39	9	6	2.44	1.17
20.	25 Excited	26	24	37	10	3	2.40	1.07
21.	45 Limp	40	12	30	13	5	2.32	1.27
22.	24 Afraid of being left alone	35	22	29	6	8	2.31	1.23
23.	18 Withdrawn	33	25	29	7	6	2.30	1.18
24.	61 Lonely	30	26	33	6	5	2.30	1.10
25.	20 Sneezing	31	30	31	4	4	2.19	1.04
26.	40 Feel isolated	41	21	26	10	2	2.11	1.12
27.	50 Furious	42	23	30	2	2	1.99	1.01
28.	65 Mad at the world	51	23	21	5	2	1.84	1.01
29.	77 Feel ignored	52	23	20	1	4	1.82	1.05
30.	26 Heavy legs	59	14	18	8	1	1.78	1.07
31.	37 Vigorous	63	15	16	2	3	1.66	1.02
32.	2 Cramps	62	20	14	5	0	1.62	0.89

No other statistically significant differences were found. Within symptom categories, the individual symptoms are arranged in descending order of reported frequency.

A rapid scan of Table I shows that the individual symptoms of each symptom category and the *unique* set varied widely in their reported frequency of occurrence. During acute asthmatic episodes, the symptoms of airway obstruction were most frequently reported. The mean scale points for the symptoms ranged from 4.59 for hard to breathe to 3.02 for choking, with an over-all symptom category mean of 3.83. Hard to breath, short of breath, chest tight, and wheezing were the most frequently reported symptoms of this category. The

TABLE II. Means and standard deviations of symptom categories for male and female subgroups

Symptom category	Males	Females	p Value*
C1 Panic fear	2.53 ± 0.92†	2.95 ± 0.97	< 0.003
C2 Irritability	2.70 ± 0.90	2.77 ± 0.86	N.S.
C3 Fatigue	3.44 ± 0.96	3.80 ± 0.88	< 0.02
C4 Hyperventilation-hypocapnia	1.96 ± 0.62	2.17 ± 0.71	N.S.
C5 Airway obstruction	3.74 ± 0.66	3.93 ± 0.66	N.S.

*Based on the Mann-Whitney U tests.

†Mean ± standard deviation.

fatigue symptom category contained the second most frequently reported symptoms, with mean scale points ranging from 3.92 for worn out to 3.36 for fatigue. The symptoms of fatigue were most generally reported to occur "sometimes" to "almost always" during acute asthma. Panic-fear symptoms were third in frequency of reported occurrence. These symptoms ranged from a mean scale point of 3.23 for nervous to 2.07 for afraid of dying. Nervous, worried about the attack, jittery, and frightened were the most frequently reported symptoms of panic-fear. With an over-all mean scale point value of 2.81, panic-fear symptoms were most generally reported to occur "sometimes" during acute asthmatic episodes. The irritability symptom category contains symptoms that were only slightly less often reported than those of panic-fear. Mean scale points ranged from 2.89 for edgy to 2.56 for frustrated with things, with an over-all mean scale point of 2.72. The most frequently reported symptoms of the irritability category were edgy, irritable, and short-tempered. Finally, hyperventilation-hypocapnia contained the symptoms least frequently reported to occur during acute asthmatic episodes, with an over-all mean scale point of only 2.10. The range in mean scale points was from 2.70 for headache to 1.61 for numb, with headache, dizzy, itchy throat, and feel hazy as the most frequently reported symptoms.* Although lowest in reported frequency, most patients reported at least the occasional occurrence of hyperventilation-hypocapnia symptoms.

For the *unique* symptoms, which did not clearly group empirically or conceptually with any of the ASC symptom categories, uncomfortable, slept poorly, sweating, and heart pounding were reported to occur most frequently.

Comparative symptomatology among subgroups of asthma patients

As we have described, the patient population was heterogeneous in regard to sex, age, age at onset, duration of illness, drugs prescribed at discharge, and known pathogenic factors involved in their asthma. Most of the information necessary to establish subgroups based on these factors was available from the patient's clinical chart. An opportunity was thereby provided to evaluate dif-

*The composition of the hyperventilation-hypocapnia symptom category has been discussed in more detail in the earlier report.⁴ In brief, it contains subjective symptoms that have been associated both with hyperventilation and hypoxic conditions.⁶ The items *itchy skin*, *itchy throat*, and *itchy lungs* are included since they consistently group with this symptom category on an empirical basis.

TABLE III. Discharge drug regimen subgroups

Discharge drug regimen subgroup	Description	Number/subgroup
1	No steroids	35
2	Alternate-day steroids	83
3	Daily steroids	19
Total number of patients		137

TABLE IVA. Means and standard deviations of symptom categories for discharge drug subgroups

Symptom category	No steroids (1)	Alternate-day steroids (2)	Daily steroids (3)	p Value*
C1 Panic-fear	2.50 ± 0.98†	2.78 ± 1.03	3.12 ± 0.91	0.08
C2 Irritability	2.56 ± 0.97	2.78 ± 0.89	2.81 ± 0.65	N.S.
C3 Fatigue	3.54 ± 0.95	3.75 ± 0.95	3.49 ± 0.75	N.S.
C4 Hyperventilation-hypocapnia	2.09 ± 0.74	2.01 ± 0.68	2.22 ± 0.69	N.S.
C5 Airway obstruction	3.82 ± 0.69	3.85 ± 0.69	4.10 ± 0.50	N.S.

*Based on the Kruskal-Wallis one-way analysis of variance.

†Mean ± standard deviation.

TABLE IVB. Summary table of individual comparisons for panic-fear category (C1)*

	No steroids (1)	Alternate-day steroids (2)	Daily steroids (3)
No steroids (1)	—	N.S.	p < 0.04
Alternate-day steroids (2)		—	N.S.

*Based on Mann-Whitney U tests.

ferences in reported symptomatology during acute asthma within various subgroups of the population. For these comparisons, only the items occurring within the 5 symptom categories (airway obstruction, fatigue, panic-fear, irritability, and hyperventilation-hypocapnia) were used. All of the following comparisons were based on the overall mean values for each symptom category. Following recommended statistical procedure for data of this kind, an over-all analysis was first performed using the Kruskal-Wallis one-way analysis of variance when more than one comparison was possible. If the over-all analysis approached statistical significance, individual comparisons were then made to locate the specific differences using Mann-Whitney U tests.⁷

Sex

The sample included 92 female and 83 male patients. Table II presents the means and standard deviations for each symptom category for male and female patients. Statistical comparisons indicated that females reported more panic-fear ($\bar{Z} = 2.99$; $p < 0.003$, 2 tailed) and fatigue ($\bar{Z} = 2.42$; $p < 0.02$, 2 tailed) symptoms than males. No statistically significant differences occurred for sex on any other symptom category, although there was a general tendency for females to acknowledge the more frequent occurrence of symptoms within each category.

TABLE V. Subgroups according to reaginic factors and infection

Subgroups according to pathogenic factors	Number/subgroup
Reagin and infection ($R + I$)	36
Reagin and not infection ($R + \bar{I}$)	12
Infection and not reagin ($\bar{R} + I$)	63
Not reagin and not infection ($\bar{R} + \bar{I}$)	8
Total	119

TABLE VIA. Means and standard deviations for symptom categories for subgroups according to pathogenic basis

Symptom category	Reagin + infection ($R + I$)	Reagin and not infection ($R + \bar{I}$)	Infection and not reagin ($\bar{R} + I$)	Not reagin and not infection ($\bar{R} + \bar{I}$)	p Value*
C1 Panic-fear	$2.87 \pm 1.08^\dagger$	2.09 ± 0.92	2.89 ± 0.92	2.57 ± 1.02	0.08
C2 Irritability	2.90 ± 0.92	2.45 ± 0.97	2.74 ± 0.79	2.34 ± 1.06	N.S.
C3 Fatigue	3.90 ± 0.94	3.06 ± 0.87	3.69 ± 0.94	3.63 ± 0.82	0.03
C4 Hyperventilation-hypocapnia	2.17 ± 0.79	1.69 ± 0.45	2.06 ± 0.69	1.88 ± 0.27	N.S.
C5 Airway obstruction	3.96 ± 0.72	3.24 ± 0.50	3.99 ± 0.60	3.76 ± 0.44	0.004

*Based on the Kruskal-Wallis one-way analysis of variance.

†Mean $\pm$ standard deviation.

Age

The patients ranged in age from 14 to 67 years. On an arbitrary basis, patients were separated into 3 age groups: adolescence (14 to 20 years), young adults (21 to 35), and older adults (36 and older). The available sample ($N = 168$) included 86 adolescents, 41 young adults, and 41 older adults. No differences in the patterns of symptomatology occurred between the age groups.

Age at onset

Information specifying age at onset of asthma was available in the medical history for 148 patients. Age at onset ranged from 6 months to 54 years. For the purposes of comparison, patients were separated into 4 subgroups according to age at onset: birth to 5 years (69 patients), 6 to 12 years (25 patients), 13 to 20 years (18 patients), and 21 years and older (36 patients). These categories roughly represent early childhood, late childhood, adolescence, and adulthood. Comparisons of the symptom category means for the age at onset subgroups revealed no differences for any symptom category.

Duration of illness

Length of illness ranged from less than one year to 62 years for the 148 patients for which this information was available. For the purposes of comparison, patients were separated into 4 groups including those having asthma for 2 years or less (15 patients), 3 to 5 years (23 patients), 6 to 10 years (20 patients), and more than 11 years (90 patients). Comparisons of symptom category means between these groups revealed no statistically significant differences.

TABLE VIB. Summary tables for individual comparisons*

	Panic-fear (C1)				Fatigue	
	R+I	R+Ī	R̄+I	R̄+Ī	R+I	R+Ī
R+I	—	p < 0.02	N.S.	N.S.	—	p < 0.006
R+Ī		—	p < 0.007	N.S.		—
R̄+I			—	N.S.		

*Based on Mann-Whitney U tests.

Drug regimen at discharge

During each patient's stay at NJHRC, which typically was for 2 to 6 months, a goal of treatment was to obtain a medication regimen providing maximal control of the asthma with minimal risk due to side effects. Such a medication regimen, which may or may not include steroids, was recommended upon discharge. Steroids represent those drugs with the highest risk of side effects and were, therefore, prescribed according to the following philosophy: (1) if adequate control of asthma could be achieved without steroids, steroids were not prescribed, (2) if steroids proved necessary, alternate-day steroids were prescribed first; and (3) only if control of the asthma proved more difficult were daily steroids prescribed.^{8,9} Thus, since more intensive steroid regimens at discharge were associated with greater difficulty in control of the asthma, drug regimens at discharge could represent an estimate of the severity or intractability of the asthma. The comparisons described here were to ascertain whether differences in subjective symptomatology are associated with subsequently prescribed drug regimens at discharge.

One hundred thirty-seven patients were available for these comparisons. Based on the medication philosophy, the discharge drug regimen subgroups shown in Table III were used. Table IV presents the means and standard deviations of each symptom category for these subgroups of patients along with summary information of the over-all statistical analyses and appropriate individual comparison tests. Over-all Kruskal-Wallis one-way analyses of variance indicated that the differences for panic-fear approached significance for the 3 subgroups ($p = 0.08$). Individual comparisons indicated no statistically significant differences in reported subjective symptomatology for panic-fear between patients discharged on no steroids and alternate-day steroids (Subgroups 1 and 2). However, patients discharged on daily steroids reported more panic-fear symptoms than those having no steroids prescribed at discharge ($Z = 2.14$, $p < 0.04$, 2 tailed). No marked differences for subgroups according to discharge drug regimen occurred for any other symptom category.

Pathogenic basis of the asthma

Prior to discharge, all patients received skin tests using the puncture method with undiluted antigens as well as with intracutaneous serially diluted antigens from 10^{-5} to 10^{-3} w/v keyed to history and the geographic area of residence. In most instances, direct inhalation challenge was performed to ascertain the relationship between skin reactivity and bronchial reactivity to the same

(C3)		Airway obstruction (C5)			
$\bar{R}+I$	$\bar{R}+\bar{I}$	$R+I$	$R+\bar{I}$	$\bar{R}+I$	$\bar{R}+\bar{I}$
N.S.	N.S.	—	$p < 0.002$	N.S.	N.S.
$p < 0.03$	N.S.		—	$p < 0.0002$	$p < 0.04$
—	N.S.			—	N.S.

antigens.¹⁰ Thereby, the role of reagenic factors in the patient's asthma was evaluated. The role of *infection* was also evaluated on the basis of history and longitudinal observation during the 2 to 6 month hospital stay. Patients were classified as having infection involved in their asthma only if there was clear and consistent indication that infection contributed to or aggravated wheezing episodes. For 20 patients, longitudinal observation within the hospital, together with careful histories taken upon admission, indicated that infection did not play a significant role in aggravating the asthma. These patients for whom sufficient data were available ($N = 119$) were separated into 4 mutually exclusive subgroups according to the role of reagenic factors and infection in their asthma (Table V). Means and standard deviations for each symptom category are presented for each of the subgroups in Table VI along with summary information of the over-all statistical analyses and appropriate individual comparison tests. By Kruskal-Wallis one-way analyses of variance, no differences were found for the symptom categories *irritability* and *hyperventilation-hypocapnia*. However, there were differences between these subgroups for *panic-fear* ($p = 0.08$, 2 tailed), *fatigue* ($p = 0.03$, 2 tailed), and *airway obstruction* ($p = 0.004$, 2 tailed). Individual comparisons indicated that patients classified as having reagin but not infection involved in their asthma reported significantly less fatigue, panic-fear, and airway obstruction symptoms than patients having *both* reagin and infection or infection alone (all p 's < 0.04 , 2 tailed). In addition, those patients having reagin but not infection reported significantly less frequent airway obstruction symptoms than patients classified as having neither reagin nor infection involved in their asthma ($p < 0.04$, 2 tailed).

DISCUSSION

The meaning and derivation of each of the 5 symptom categories has been discussed in detail in our earlier report.⁴ As expected, the data for the individual symptoms shown in Table I indicate that the symptoms of airway obstruction are the most frequently reported during acute asthmatic attacks. Since these involve the target somatic symptoms of the asthmatic, this result is not surprising. However, it is striking that not all patients report that these symptoms always occur during the acute attack. In fact, an examination of Table I indicates that substantial percentages of patients report that these symptoms occur only "sometimes" or even less often. This is in keeping with clinical observation showing that a small, but significant number of patients may state

that they "feel fine" while the observer notes evidence of labored breathing or even hears obvious wheezing. The item *wheezing* of the airway obstruction symptom category has been a particularly prominent sign used by physicians. The fact that it is not a defining item of airway obstruction on a statistical basis⁵ suggests that wheezing should not be used to the exclusion of other symptoms of airway obstruction in assessing patient status. Patients themselves use other symptoms more frequently than wheezing in their own self-assessment of their condition.

Other important symptom categories are also reported to occur during an acute asthmatic attack. In descending order of reported frequency, these include the symptoms of fatigue, panic-fear, irritability, and hyperventilation-hypocapnia. On the basis of this information, it is clear that severe wheezing episodes may be accompanied by a wide range of subjective symptoms. The point is simply that airway obstruction affects the whole person, evoking an attending range or pattern of subjective symptomatology. For any particular asthmatic, the subjective responses may be quite unique, although unrelated either to his age, age at onset, or duration of illness. Nevertheless, differences in subjective responses reported to occur during the acute attack do appear to be associated with sex, the prescribed drug regimens at discharge, and subgroups of asthmatics according to pathogenic factors.

Across all symptom categories, female patients tended to report the more frequent occurrence of all symptoms during acute asthma attacks, and significantly more often the symptoms related to panic-fear and fatigue. We have no definite way of knowing if these are "real" differences between males and females. However, it may be suggested that males are more disinclined to acknowledge symptoms of panic-fear and fatigue. These differences may be real to the extent that the clinical picture may be differentially affected by sex differences in subjective report. The importance of such differences is more clearly indicated in the next comparison.

The symptom checklist was administered shortly after hospital admission. Approximately 2 to 6 months later, at the time of hospital discharge, the final recommended discharge drug regimen was prescribed. Patients with discharge drug regimens requiring daily administration of steroids tended to report more frequent occurrence of panic-fear symptoms during their acute asthma episodes. It should be noted that the checklist was administered shortly after admission; therefore, this relationship cannot be explained on the basis of concurrence between discharge steroid administration and response to the symptom checklist. At least 3 possible explanations may account for the relationship. First, discharge drug regimen may, as suggested earlier, index the severity of the asthma. Thus, the asthma patient with the more severe attacks may tend to panic more and become more upset by the greater degree of obstruction experienced. However, we have no data at present to indicate that severity of individual episodes revealed by medical history is related to drug therapy prescribed at discharge. Presumably, patients with more severe acute episodes should also have reported the more frequent occurrence of these target somatic symptoms. However, no differences were found for the reported frequency of

the airway obstruction symptoms for subgroups according to discharge drug regimen. Second, the characteristic response of the patient to an acute asthmatic episode may alter the clinical picture and influence treatment decisions. For example, when a patient becomes extremely upset during an attack, the attending physician may bring to bear more intensive treatment involving somewhat greater risk. The converse may also be true: If the patient maintains a more stable equilibrium, treatment may be more modest. In asthma, it is difficult to separate the influence of such subjective factors upon the clinical picture from the "real" aspects of the acute asthma episode. Third, a strong emotional response accompanying the acute attack may render the asthma more difficult to treat by the addition of another factor. Others have shown that airway caliber in asthmatics can be influenced by stress or strong emotions.¹⁻³ If such strong emotional responses occur during the progression of an acute asthmatic episode, they may aggravate the degree of obstruction or render it less amenable to treatment. This possibility differs importantly from the first explanation noted above in that it suggests that the emotional response contributes to and intensifies the acute episode, rather than being only a product of antecedent airway obstruction.

These potential explanations for the relationship between discharge drug regimens and the subjective symptoms of panic-fear contain intriguing questions. Adequate answers will depend upon our ability to unravel the relative influence of the subjective responses in asthma as (1) deriving from preceding airway obstruction, (2) influencing clinical judgment and decision making, and (3) contributing to airway obstruction.

Reports of panic-fear, fatigue, and airway obstruction symptoms also differed somewhat across subgroups according to pathogenic factors. Patients in whom infection played a prominent role in the asthmatic attacks tended to report that these symptoms accompanied attacks more frequently than those classified as having only reagenic factors involved in their illness. It may be suggested that the influence of infection as a contributing factor in asthma attacks results in differences in symptomatology in 2 possible ways. First, individuals with infection-mediated asthma may have more severe and/or prolonged episodes of airway obstruction than those with more specific reagenic asthma. If the asthma is more severe during infection, this alone may lead to more frequent reports of panic-fear, fatigue, and airway obstruction symptoms. The occurrence of fatigue symptoms, for example, has been commonly observed to antedate or accompany a wide range of infection and illness.¹⁰ Second, infection-mediated asthma may have a somewhat more unpredictable quality since it is less easy to avoid infection than specific environmental substances associated with reagenic asthma. While this may tend to increase the frequency of panic-fear symptoms, it is probably less likely to influence reports of fatigue and airway obstruction. However, it may be suggested that the constant apprehensive focus involved in attempting to avoid infection may be quite fatiguing to the patient. While we have no conclusive data that such a phenomenon occurs, a number of patients interviewed on a clinical basis have expressed these fears.

The information presented in this paper describes the over-all frequency

of reported occurrence of symptoms for subgroups of severe asthma patients. It is becoming increasingly clear that individual patients may have a unique style of subjective response to the acute asthmatic episode. Using the symptom categories described in this report, we are now in a position to identify and describe these individual coping styles to the asthmatic attack and to relate coping styles to response to various treatment modalities.

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