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ORIGINAL ARTICLE

Do Asthma Patients Prefer to Monitor Symptoms or Peak Flow?

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We administered a 65-item survey to patients to assess preference of symptoms and peak flow to detect worsening asthma and to collect information about asthma triggers, asthma knowledge sources, and barriers to peak flow meter use. It was completed by 139 asthma patients. Survey responses were comparable for adult and pediatric patients and for those who owned peak flow meters and those who did not. But patients who owned a peak flow meter reported more severe asthma than others. On average, the patients preferred symptoms to peak flow for assessing worsening asthma. It is likely that the preference for symptom over peak flow monitoring was effort related: Patients preferred symptom monitoring because it was the easier of the two to conduct.

Keywords asthma; symptoms; peak flow; symptom monitoring; peak flow monitoring

INTRODUCTION

Home monitoring of asthma is an essential component of asthma self-management. To manage asthma effectively, a patient must be capable of matching the severity of an exacerbation with a commensurate asthma control measure. Obviously, this requires the ability to identify degree of asthma severity, a skill that derives from home monitoring. Two forms of home monitoring are practiced: symptom and peak flow. Each has its strengths and weaknesses. Symptom monitoring benefits from uncomplicated implementation and low cost but suffers from a lack of objectivity, a serious deficiency that hinders comparison of symptoms experienced at different times. Peak flow monitoring, conversely, may be cumbersome or impractical at times and can involve financial cost for the patient but provides an objective index of severity. Deciding which of the two to use in asthma self-management is an important question.

Symptom and peak flow monitoring have been compared for effectiveness in reducing asthma symptoms (1–6), but the findings of experiments were inconclusive. The two could not be distinguished in the majority of tests for effectiveness, although a few findings concerning frequency of emergency visits (2, 3) favored peak flow. Despite the latter outcomes, most workers have concluded that peak flow monitoring adds little, if anything, to the effectiveness of asthma management beyond that provided by symptom monitoring (7, 8).

Considerations of usage and attitudes also bear on the utility of distinct forms of monitoring. First, the percentage of patients who use a meter regularly is low, reportedly 10% in one study (9) and 16% in another (10). Second, patients who described a scenario of a slowly evolving asthma attack mentioned a peak flow meter only 25% of the time (10). Third, only 20% of the parents of pediatric patients described

a peak flow meter as useful for detecting of respiratory problems when the child was not exhibiting signs of respiratory distress (11). Clearly, peak flow monitoring is not highly endorsed by patients, but the question of monitoring preference has not been answered directly. In this study, we asked asthma patients specifically about their preference for using symptoms or peak flow for detecting worsening asthma.

METHOD

Participants

The study participants were recruited from an outpatient clinic in Charlotte, North Carolina, specializing in the care of asthma. To be included in the study, a patient had to have a confirmed diagnosis asthma, had to have visited the clinic at least once in the past 12 months, had to be over the age of 8 years, and had to be willing to complete a survey questionnaire.

Survey Questionnaire

A 65-item asthma survey was developed in a preliminary study of 10 patients with asthma. The survey consisted of items related to asthma knowledge, asthma self-management practices including decision-making, utilization of health care facilities, and medication usage. It required 10–15 minutes to complete. After patients completed the survey, we asked them if they understood each item and if they had suggestions for improving the survey. Several items were subsequently modified. We did not include responses obtained in the development of the survey in this report.

Procedure

Patients were recruited for this study either in person or by mail. Patients who were recruited in person were given the asthma survey to be completed either during their clinic visit or at home. Each patient (or, in the case of children, the attending adult) gave informed verbal consent after reading a brief statement that described the purpose of the study. One hundred consecutive surveys were distributed during a

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TABLE 1.—Most common responses relating to source of asthma knowledge, asthma triggers, and barriers to peak flow use (n = 139).

Asthma knowledge		Asthma triggers		Barriers to peak flow use	
Source	Number (percent) of patients who selected source	Trigger	Number (percent) of patients who selected trigger	Barrier	Number (percent) of patients who selected barrier
Magazines	83 (60%)	Allergies	106 (76%)	Don't have one	31 (30%)
Brochures	68 (49%)	Upper airway infection	93 (67%)	My asthma isn't that bad	30 (29%)
Newspaper	54 (39%)	Exercise	83 (60%)	Doesn't help me	13 (13%)
Television (news shows)	52 (37%)	Dust	81 (58%)	Not worth the effort	12 (12%)
Family and friends	44 (32%)	Cigarette smoke	77 (55%)	Takes too much time	11 (11%)
Books	33 (24%)	Humidity	65 (47%)	Never told about peak flow	7 (7%)
Pharmacist	26 (19%)	Pets	62 (45%)	Lost my meter	3 (3%)
World Wide Web	25 (18%)	Smog/pollution	61 (44%)	Broke my meter	1 (1%)
Television (other)	22 (16%)	Vapors	59 (42%)		
Videos	9 (7%)	Strong emotion	41 (30%)		

4-month period. Patients who were recruited by mail were selected at random from the clinic patient population. They were each sent the survey, a brief description of its purpose, a consent form, and a return envelope. Letters inviting patients to participate in the study were mailed to 340 patients. The Institutional Review Board of the University of North Carolina at Charlotte approved the procedures.

Analytic Approach

We summarized the responses to three of the survey questions that called on patients to select from (or add to) a list of (1) the ways in which they learned about asthma during the past year; (2) their relevant asthma triggers; and (3) the barriers they encountered to frequent peak flow use. To ensure equivalency of groups, we compared responses: (1) of patients who completed the survey at the clinic and those who completed the survey at home; (2) of adult and pediatric patients; and (3) of patients who owned peak flow meters and those who did not on each of 12 dependent variables. The variables were age, age at diagnosis of asthma, years since diagnosis, self-rated asthma severity (range 1–5), self-rated asthma control (range 1–4), self-rated asthma impact (range 1–3), number of asthma attacks the previous 12 months, number of lifetime visits to the emergency room because of asthma, number of lifetime hospitalizations because of asthma, personal best peak flow score, the perceived value of symptoms to detect worsening asthma (range 1–10), and the perceived value of peak flow scores to detect worsening asthma (range 1–10).

Our primary analyses compared patient responses to two questions: “Please rate how much you depend on *symptoms*,

or on *how you feel*, to decide if your asthma is worsening from 1 (not at all) to 10 (very much)” and “Please rate how much you depend on *your peak flow score* to decide if your asthma is worsening from 1 (not at all) to 10 (very much).”

RESULTS

A total of 139 patients completed the questionnaire including 63 surveys completed at the clinic and 76 surveys completed at home. Patients who completed the survey were between 8 and 63 years of age ($M = 26.3 \pm 17.3$). There were more males (56%) than females (44%) in the sample. On average, patients had been diagnosed with asthma at an early age ($M = 13.8 \pm 16.4$ years) and for more than a decade before completing the survey ($M = 12.3 \pm 10.4$ years).

ANALYSES

Descriptive Analyses

Responses relating to source of asthma knowledge, asthma triggers, and barriers to peak flow use are summarized in Table 1. Most patients learned about asthma through either magazines or brochures distributed by various healthcare providers. On a related survey item, 60% of respondents answered “yes” to the question, “Do you wish you knew more about asthma?” The most common asthma triggers reported by participants included allergies, colds/upper airway infections, exercise, and dust. The most frequently reported barriers to using peak flow meters included “don’t have one” and “my asthma isn’t that bad.”

Tests examining group equivalency are shown in Table 2. Reliable differences did not emerge between patients who

TABLE 2.—Comparisons for 12 dependent variables between children (n = 82) and adults (n = 57); between patients interviewed at the clinic (n = 63) or at home (n = 76); and between patients who owned peak flow meters (n = 91) or did not own meters (n = 48). Values are M $\pm$ SD.

	Age		Interview location		Owned a peak flow meter	
	8–20 years	> 21 years	Clinic	Home	Yes	No
Age (years)			25.1 $\pm$ 17.7	27.2 $\pm$ 17.1	24.2 $\pm$ 16.9	29.9 $\pm$ 17.7
Age at diagnosis (years)	4.1 $\pm$ 3.2	28.1 $\pm$ 17.6*	14.7 $\pm$ 16.7	13.1 $\pm$ 16.3	11.9 $\pm$ 15.8	17.3 $\pm$ 17.2
Years since diagnosis (years)	9.3 $\pm$ 4.5	16.7 $\pm$ 14.4*	10.6 $\pm$ 12.2	13.7 $\pm$ 8.5	11.8 $\pm$ 9.4	13.2 $\pm$ 12.0
Self-rated asthma severity (1–5) (“mild” to “severe”)	2.5 $\pm$ 1.2	2.7 $\pm$ 1.2	2.6 $\pm$ 1.2	2.6 $\pm$ 1.2	2.8 $\pm$ 1.3	2.4 $\pm$ 1.0
Self-rated asthma control (1–4) (“well managed” to “not managed at all”)	1.7 $\pm$ 0.8	1.9 $\pm$ 0.8	1.9 $\pm$ 0.9	1.7 $\pm$ 0.7	1.8 $\pm$ 0.8	1.7 $\pm$ 0.8
Self-rated asthma impact (1–3) (“hardly noticeable” to “troublesome”)	1.9 $\pm$ 0.8	2.1 $\pm$ 0.7	2.0 $\pm$ 0.7	2.0 $\pm$ 0.7	2.1 $\pm$ 0.8	1.9 $\pm$ 0.7*
Asthma attacks (past 12 months)	10.3 $\pm$ 40.0	8.5 $\pm$ 15.6	6.4 $\pm$ 8.5	12.1 $\pm$ 43.1	10.9 $\pm$ 39.6	7.3 $\pm$ 15.7
Emergency room visits for asthma	6.8 $\pm$ 10.2	5.1 $\pm$ 1.1	3.4 $\pm$ 2.9	7.3 $\pm$ 9.9	7.4 $\pm$ 9.7	2.9 $\pm$ 2.4*
Hospitalizations for asthma	6.1 $\pm$ 5.3	5.1 $\pm$ 8.5	4.0 $\pm$ 2.9	6.5 $\pm$ 7.5	6.1 $\pm$ 6.8	3.2 $\pm$ 3.1
Personal best peak flow score	356 $\pm$ 125	433 $\pm$ 36	395 $\pm$ 87	378 $\pm$ 164		
Perceived value of symptoms to detect worsening asthma (1–10)	7.5 $\pm$ 2.6	8.5 $\pm$ 2.4*	8.0 $\pm$ 2.6	7.8 $\pm$ 2.6	8.2 $\pm$ 2.3	7.4 $\pm$ 3.1
Perceived value of peak flow to detect worsening asthma (1–10)	4.7 $\pm$ 3.5	4.2 $\pm$ 3.5	4.6 $\pm$ 3.3	4.7 $\pm$ 3.7		

* $p < .05$.

completed the survey at the clinic ($n = 63$) and at home ($n = 76$). But differences did appear between adult and pediatric patients. Omitting the comparison for age, adult and pediatric patients differed in age at diagnosis, years since diagnosis, and value of symptoms for detecting worsening asthma. Value of symptoms was rated more highly by adults ($\bar{M} = 8.5$) than by children ($\bar{M} = 7.5$; $t(133) = -2.2, p < 0.05$). Differences also were observed between patients who owned a meter ($n = 91$) and those who did not ($n = 48$). Patients who owned peak flow meters were slightly younger ($p = 0.07$); reported that their asthma was more severe ($p = 0.057$) and more troublesome ($p < 0.05$) than those who did not own meters; and reported, on average, more lifetime visits to the emergency department ($\bar{M} = 7.4$) than those who did not own meters ($\bar{M} = 2.9$; $p < 0.05$).

A priori Comparisons

Patients reported that they depended more on symptoms than on PEFR to evaluate worsening asthma. This was borne out by all our analyses. For the entire sample, preference for symptoms ($\bar{M} = 8.2$) was greater than for peak flow for detecting worsening asthma ($\bar{M} = 4.5$; $t(85) = 8.3, p < 0.001$). For those completing the survey in the clinic, the ratings were $\bar{M} = 8.0$ for symptoms and $\bar{M} = 4.6$ for PEFR, and for those completing the survey at home the ratings were $\bar{M} = 8.4$ and $\bar{M} = 4.8$, respectively. The preference for symptoms over peak flow was consistent also in comparisons between adult and pediatric patients groups. In children and in adults, the preference for symptoms ($\bar{M} = 7.6$ and 9.4 , respectively) was significantly greater than the self-reported preference for peak flow ($\bar{M} = 4.7$ and 3.9 , respectively).

We performed an additional set of subgroup comparisons based on peak flow ownership and peak flow use. Specifically, we conducted within-group comparisons of symptom and peak flow value: in those who reported a personal best peak flow score ($n = 41$); in those who used a peak flow meter at least once in the previous month ($n = 35$); and in those who reported using a “traffic light” system to assess changes in asthma ($n = 25$). In each case, the preference for symptom monitoring was judged to be greater than that for peak flow. The results from the within-group comparisons are summarized in Table 3.

TABLE 3.—Mean ($\pm$ SD) values and results of within-group comparisons in patient subgroups for depending on symptoms (0–10) and peak flow (0–10) to decide if asthma is worsening.

	Depend on symptoms	Depend on peak flow	t	Significance level
Owned a peak flow meter ($n = 86$)	8.2 ± 2.3	4.5 ± 3.4	8.31	< 0.001
Reported a personal best peak flow score ($n = 41$)	8.0 ± 2.4	6.3 ± 3.2	2.80	< 0.01
Used a peak flow meter at least once in previous month ($n = 35$)	8.0 ± 2.3	6.7 ± 3.1	2.03	< 0.05
Used a “traffic light” system to assess changes in asthma ($n = 25$)	7.8 ± 2.4	5.7 ± 3.6	2.80	< 0.01

DISCUSSION

The preference we observed for symptom over peak flow monitoring was fairly robust. It was present in both children and adults and was unaffected by interview setting. In addition, it appeared to be unrelated to asthma severity, at least on the basis of the following indirect evidence: Preference for symptom over peak flow monitoring was fairly similar for a series of graded self-management practices whose use typically varies by severity. In short, preference for symptom monitoring was generally apparent.

The preference for symptom monitoring among patients may be related to monitoring practices. A vast difference in recording procedure exists between monitoring symptoms and monitoring peak flow. Monitoring symptoms is nearly an effortless task, consisting mostly of directing attention to breathing and necessitating little interruption of other activities. Monitoring peak flow, conversely, is more difficult. It requires the availability of both a meter and a suitable place in which to execute an expiratory maneuver, and it may interfere with other activities. Aspects of peak flow monitoring may be unwieldy, inconvenient, or distracting for both pediatric and adult patients. Whereas the practice of symptom monitoring makes minimal demands on the time and effort of patients, the practice of peak flow monitoring is challenging. The preference of patients for symptom over peak flow monitoring may be due to the difference in demands placed on them by the two forms of tracking.

Patient preference for symptom monitoring extends the idea that peak flow makes little or no unique contribution to asthma self-management. This idea is supported by evidence relating not only to effectiveness, usage, and preference, as discussed earlier, but also to accuracy of measurement. It is well known that peak flow (12–14) does not accurately reflect other indices of obstruction consistently, an observation that may, in part, be due to the effort-dependency of obstruction measures including peak flow (15). Questionable accuracy of peak flow suggests that, at best, its monitoring may benefit some, but not all patients, and possibly not even the majority. In view of accumulating evidence unfavorable to peak flow relating to a variety of issues, it may be counterproductive to regard its use highly as a necessary component of asthma self-management.

The problems of peak flow do not necessarily strengthen the case for symptom monitoring in asthma control. Like peak flow, the accuracy of symptoms has been questioned. Symptoms and measures of obstruction do not exhibit a high degree of interrelatedness in many patients (16–18), and some patients with asthma seem more aware of symptoms than others despite a similar degree of airway obstruction (9, 16, 17, 19). Perceptual error of this sort may be rooted either in individual variability or in external influences. Illustrating the former are groups of patients who exhibit a greater degree of perceptual error than others. These include patients grown accustomed to obstruction (20), those with low $FEV_{25-75\%}$ (21), and those with life-threatening asthma (22). Examples of external factors that increase perceptual error are listening to wheezing (23) and watching affective video (24). Another category of external factors contributing to perceptual error includes symptoms that are minimized or magnified by the patient in the service of obtaining a reward or avoiding an unpleasant event (25, p. 84). Symptoms also

may be cued by an event that normally does not cause obstruction but was at some time associated with obstruction. Striking examples of the latter phenomenon are described in both anecdotal (26, 27) and experimental (28) studies of the role of emotion in asthma. Perceptual error of asthma symptoms brought about by these and possibly other factors precludes the exclusive use of symptoms for monitoring severity in asthma.

The adverse properties of both peak flow and symptom monitoring make it difficult to choose between them. Although an argument for symptom monitoring is simply that it spares patients the expense and inconvenience associated with peak flow recording, the potential benefits of objective assessment of asthma severity are promising and difficult to dismiss. This is probably why the National Institutes of Health continues to recommend the use of peak flow meters (29) and why the number of patients who own peak flow meters is probably increasing. In a study in New Zealand in 2000 (10), 54% of patients had meters, whereas 65% of our patient population owned a meter. It is likely that peak flow monitoring will continue to be recommended and that peak flow meter ownership will increase. This may encourage inquiry into neglected areas of peak flow monitoring such as determining who is likely to benefit from its use and when it should be used.

DECLARATION OF INTEREST

The authors report no conflict of interest. The authors alone are responsible for the content and writing of this paper.

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