

Disparities in Assessments of Asthma Control Between Children, Parents, and Physicians

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Summary. Objective: Assessment of asthma control in children by physicians, patients and their parents was compared, assuming parents may underestimate symptoms in asthmatic children and exploring whether physicians tend to agree with them. Design: Asthma control perception was assessed in 4- to 11-year-old asthmatic children and their parents, using C-ACT, during 2011–2012. Pediatric pulmonologists used GINA guidelines for their assessment; pediatricians, not having spirometry, used the information given in addition to physical examination. The C-ACT scores given by the children and their parents were further analyzed separately, and compared with their physicians' assessment. Statistical methods, which also measured possible influence of different variables, included kappa, Chi-square, linear-by-linear association, McNemar test and logistic regression. Patient Selection: The study comprised 354 parents and children aged 4–11 years with moderate-severe asthma; 129 (36.4%) were treated by 23 pediatricians; 225 (63.6%) by 11 pediatric pulmonologists. Results: The C-ACT was generally found valid in assessing asthma control ($P < 0.001$; κ 0.529; CI 0.441, 0.617) and showed that in 229/354 (53%) of children the asthma was uncontrolled. Nevertheless, of the 229 children who indicated their asthma was uncontrolled, 124 (54.1%) of their parents (κ 0.245; CI 0.15, 0.34) and 96 (41.9%) of their physicians believed it to be controlled (κ 0.331; 0.24, 0.43). Comparing the physician-child discordance vis-à-vis the parents, the significant difference was when 96/229 children (41.9%) and 34/126 parents (27.0%) indicated the asthma was uncontrolled while the physician determined it controlled (OR 1.95; 1.19, 3.24). There were no significant differences between pediatric pulmonologists and pediatricians. Conclusions: In addition to increasing awareness of parents to symptoms in their asthmatic children, physicians should question the child appropriately, as well as using the children's responses to C-ACT as an information source for properly assessing asthma control. **Pediatr Pulmonol.** © 2013 Wiley Periodicals, Inc.

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INTRODUCTION

Asthma is one of the most common chronic illnesses in children.¹ Appropriately managing children with moderate-to-severe asthma is an increasing challenge. Inappropriate asthma management has major impact on the child's physical, social and emotional health,^{2,3} with a significant economic effect on the family's finances and the nation's health-care budget, as reported in the USA.⁴⁻⁶ Concerns about side-effects from inhaled steroids, such as the effect on the child's height,⁷ deters many parents from administering this important treatment. Proper assessment of asthma control and identification of children who require long-term inhaled steroids are therefore crucial.

Several tools are useful in detecting uncontrolled asthma in children. The Global Initiative for Asthma (GINA) and the National Asthma Education and Prevention Program (NAEPP) recommend using the Childhood Asthma Control Test (C-ACT), developed as a complete questionnaire, to assess asthma control in children aged 4 years and older.^{8,9} It is used in this age group worldwide.¹⁰⁻¹⁷

Discordance between parents and children in assessing asthma control has been previously reported.^{2,18-27} A comparison of this discordance using separately the C-ACT scores of parents and their children has recently been suggested.²⁷ In our study, we compared assessment of asthma control by physicians versus children and their parents, using their C-ACT scores, as part of ongoing research concerning the major factors influencing parental adherence to administration of inhaled corticosteroids.

MATERIALS AND METHODS

Research Population

Our study comprised 354 Hebrew-speaking parents of children aged 4–11 years with asthma diagnosed by a physician, and for whom the physician determined that inhaled steroids were necessary. All the inhaled corticosteroids are included in the basket of essential services provided to Israeli citizens virtually free of charge. Children with lung diseases other than asthma were excluded from the study. The study was undertaken in the

health clinics of the physicians who participated in the study. Physicians were selected and recruited by the HMO representative, after which all patients who met the inclusion criteria were approached. Only parents who agreed to complete the long questionnaire participated.

Data Collection

The Physician's Role. Physicians reported their area of specialization (pediatric pulmonology or pediatrics), their assessment of the asthma severity (intermittent; mild persistent; moderate persistent; severe persistent), their subjective assessment of adherence to inhaled corticosteroid treatment (using a scale of 0–100%), the level of asthma control (controlled or partially controlled; uncontrolled) and the recommended treatment. Spirometry was done routinely only by pediatric pulmonologists. The children were seen by the pediatrician or pediatric pulmonologists every 3 months, or more frequently in cases of worsening of asthma symptoms. They were also seen by their pediatrician more frequently when they had other illnesses.

Roles of Parent and Child. Both child and parent (one parent per child) were asked by their physician to fill in the C-ACT form. The children filled in this form first, and parents saw and heard the child's responses. The parent also answered a self-administered questionnaire, described below.

Childhood Asthma Control Test (C-ACT). Prior to the study, the C-ACT had not been used in the participating clinics. The English version of the C-ACT form¹⁰ (Table 1) was translated into Hebrew and back into English to validate the translation. Experts in pediatric pulmonology agreed on the validity of the measurement and content of the Hebrew version. In addition, the comprehension of 65 parents and their 4- to 11-year-old asthmatic children was realized in a prior pilot study. A written agreement to use the C-ACT questionnaire translated into Hebrew for the study was obtained from Elsevier's Copyright Clearance. The C-ACT included four items to be answered by the children (including Likert scale that used a child's facial expressions), and three by their caregivers.

Interpretation of the C-ACT Scoring. Interpretation of the scoring was as follows: a score of 20–27 was considered to indicate controlled asthma, 19 or less as uncontrolled asthma.^{10,28} We also analyzed separately the scores given by children and their parents. We dichotomized the responses of children and their parents, and analyzed them separately. As our aim was evaluating agreement regarding the level of asthma control between three pairs of raters (children–parents, children–physicians, parents–physicians) and as the physicians' evaluation was conducted categorically, we had to categorize the evaluation of both children and parents, as well. We therefore indicated a separate cut-off value rather than

ABBREVIATIONS:

ACT	Asthma control test
BMQ	Beliefs about medication questionnaires
C-ACT	Childhood asthma control test
CI	Confidence interval
GINA	Global initiative for asthma
HMO	Health Maintenance Organization
IRB	Institutional Review Board
NAEPP	National Asthma Education and Prevention Program
OR	Odds ratio

TABLE 1—Childhood Asthma Control Test (C-ACT) for Children 4–11 Years Old¹⁰

		Possible answers					
Scoring		0	1	2	3		
a: Questions for the child							
1. How is your asthma today?		Very bad	Bad	Good	Very good		
2. How much of a problem is your asthma when you run, exercise or play sports?		It is a big problem, I cannot do what I want to do	It is a problem and I do not like it	It is a minor problem but it is okay	It is not a problem		
3. Do you cough because of your asthma?		Yes, all of the time	Yes, most of the time	Yes, some of the time	No, none of the time		
4. Do you wake up during the night because of your asthma?		Yes, all of the time	Yes, most of the time	Yes, some of the time	No, none of the time		
		Possible answers					
Scoring		0	1	2	3	4	5
b: Questions for the parent							
5. During the past 4 weeks, how many days did your child have any daytime asthma symptoms?	Every day	19–24 days/month	11–18 days/month	4–10 days/month	1–3 days/month	Not at all	
6. During the past 4 weeks, how many days did your child wheeze during the day because of asthma?	Every day	19–24 days/month	11–18 days/month	4–10 days/month	1–3 days/month	Not at all	
7. During the past 4 weeks, how many days did your child wake up during the night because of asthma?	Every day	19–24 days/month	11–18 days/month	4–10 days/month	1–3 days/month	Not at all	

using percentage of the maximal score that was used recently by others.²⁷ The cut-off score was determined in proportion to the general score (74%). The parent could achieve a maximum score of 15; 11 and above was considered controlled; 10 or less uncontrolled. The child's maximum score of 12; 9 and above was considered controlled; 8 or less uncontrolled.

Agreement Between Children, Parents, and Physicians. We compared the physician's assessment of asthma control (controlled asthma vs. uncontrolled and partially controlled) with the total C-ACT scores. We also separately compared the physician's asthma control assessment with the C-ACT scoring of the parent or child, and compared the C-ACT scores of parents with those of their children.

Parents' Questionnaires. The questionnaire for parents included questions that measured socio-demographic characteristics and their perception of the disease, their concern regarding inhaled corticosteroids, beliefs about medication questionnaires (BMQ), and knowledge of asthma.^{29–39} To assess the effect of the variables on the rate of disagreement, we first looked at the distributions and found they were approximately normal with mean and median close to one another. Mean values were selected. Then, the continuous variables were dichotomized into two levels: below (including the mean value) and above (low vs. high) the mean values.

The physician's assessment regarding adherence to inhaled corticosteroid treatment was evaluated after dichotomization according to the median: >80% versus ≤80%.

Data Analysis

Data were analyzed with SPSS software (version 19.0). Descriptive statistics are given for all variables. The internal consistency of each scale in the questionnaire was estimated by calculating Cronbach's α .

All responses by parents, children and physicians were compared using the kappa statistic to measure the strength of agreement between parent and child. The following interpretation of the range of kappa was used: 0 = poor; 0–0.2 = slight; 0.21–0.4 = fair; 0.41–0.6 = moderate; 0.61–0.8 = substantial; 0.81–1 = almost perfect.⁴⁰

Statistical analysis examined the level of agreement and disagreement between each pair of the three respondents, namely physician–parent, physician–child, and parent–child. First a Chi-square test was used to assess whether the ratings of each pair were independent of one another. Then the McNemar test compared, within

each pair of respondents, the two proportions of disagreement. Finally, logistic regression models examined the associations between covariates and the likelihood of disagreement (focusing on the cell that indicates disagreement when the child or parent claims the asthma is uncontrolled). At a first stage, our models examined univariate relationships, followed by the inclusion of all potentially explanatory variables, using multivariable logistic regression. The potential explanatory variables that were examined were: the demographic characteristics of parents and children; the physicians' assessment; the parents' perception of the disease; their beliefs about medications; parental self-efficacy; parental functioning; knowledge of asthma; and self-management of the asthma. Odds ratios (ORs) were calculated with 95% CIs for the likelihood of disagreements.

To validate our results we adopted an alternative method for examining the difference in assessment of control between children and parents. First, we transformed children's and parents' scores to z-scores. We then subtracted the children's z-scores from those of their parents and divided the differences into tertiles. The upper tertile represents those instances in which parents assessed asthma as controlled while their children assessed it as uncontrolled (mean 0.69). We ran a logistic regression on this group versus the others. The results were similar to the original ones and are therefore not represented here.

Ethical Issues

Our study was approved by the institutional review board (IRB) of the Hadassah Medical Center and the HMOs. All the IRBs approved the study determining only that participation be voluntary. No consent form was required. All but one of the IRBs approved giving participants a modest gift voucher to purchase a book or educational material. The study was not supported by any pharmaceutical concern.

RESULTS

The study included 354 asthmatic children aged 4–11 years and their parents who were treated in community clinics belonging to one of the three major Health Maintenance Organizations (HMOs) ($n = 318$, 89.8%) or in ambulatory care at Hadassah Hospital in Jerusalem ($n = 36$, 10.2%), during April 2011–May 2012. Twenty-three additional cases, originally part of the study, were later excluded because the children had not received inhaled steroids (12), the questionnaires were not completed (six), or the children were ≥ 12 years old (five cases). The 354 children in the study were treated by 34 physicians; 23 of these physicians were pediatricians treating 129 (36.4%) children, and 11 were pediatric pulmonologists who treated 225 (63.6%) children.

The distribution of patients recruited by HMO reflects the distribution of Israel's general population. A range of socio-demographic characteristics of the participating parents—among them, level of education, economic status, smoking—were compared with Israel's Central Bureau of Statistics data and were found to be similar.

The characteristics of patients and their parents are shown in Table 2. A comparison of the demographic parameters of those treated by pediatric pulmonologists and pediatricians showed only that more children in the Jerusalem area ($P < 0.001$) were treated by pulmonologists. There were no significant differences in other demographic variables.

The pediatric pulmonologists reported using GINA guidelines to assess asthma control: daytime symptoms, limitation of activities, nocturnal symptoms/awakening, need for relief/rescue treatment, and lung function measured by spirometry. The pediatricians had no spirometry, and based their assessment solely on physical examination and the information they received. Home peak flow meter was used in a single case. The severity of the asthma was determined by frequency of symptoms and airflow obstruction by spirometry (pediatric pulmonologists only) and on the basis of intensity of treatment required to achieve good asthma control.

The median C-ACT score of the 354 children and their parents was 19.0 (range 4–27; mean 18.76 ± 4.68 SD). According to the C-ACT scoring, the asthma was uncontrolled in 53.4% of the children (C-ACT ≤ 19) (Table 3). There was a statistically significant association between the C-ACT score and the physician's assessment of control ($P < 0.001$), with moderate agreement (κ 0.529; CI 0.441, 0.617; results not shown). There was no significant difference regarding whether the physician was pediatrician or pediatric pulmonologist.

Table 3 shows the physicians' determination of the severity, adherence and control of the asthma, and the assessments according to the C-ACT total score, as well as the separate scores of parents and children. Again, there was no significant difference regarding whether the physician was pediatrician or pediatric pulmonologist.

Disagreement Between Children and Parents

When we compared the C-ACT assessment of the children and their parents, we found that the agreement was fair (κ 0.245; CI 0.15, 0.34). Of the 229 children who indicated in the C-ACT that their asthma was uncontrolled, 124 (54.1%) of their parents described it as controlled. Conversely, of the 125 children who indicated their asthma was controlled, only 21 (16.8%) parents described it as uncontrolled ($P < 0.001$). Focusing on the 124 children who indicated their asthma was uncontrolled in contradiction to their parents, logistic regression

TABLE 2—Characteristics of 354 Asthmatic Children and Their Parents

Variable	N	%	Range; median; mean (SD)
Children			
Age (years)	354		4–11; 7.50; 7.81 (2.73)
Gender			
Male	231	65.3	
Female	123	34.7	
Order in the family			
First	131	37.0	
Second	92	26.0	
3–13	131	37.0	
Place of residence in Israel			
Jerusalem area	232	65.5	
Tel Aviv area and south	122	34.5	
Parents			
Mother's age (years)	349		24–58; 37; 37.62 (6.39)
Father's age (years)	344		27–74; 40.0; 40.92 (7.44)
Number of cars			
None	85	24.0	
One	164	46.3	
Two or more	105	29.7	
Mother's employment			
Working	264	74.6	
Unemployed	90	25.4	
Father's employment			
Working	294	83.1	
Unemployed	60	16.9	
Number of children in the family ¹			1–14; 3; 3.42 (1.85)
Parent who brought the child to the clinic			
Mother	241	68.1	
Father	88	24.9	
Both	25	7.0	
Level of education			
Up to high school	96	27.3	
Higher education	256	72.7	
Place of birth			
Israel	266	75.1	
Other	88	24.9	
Religious observance			
Secular	137	38.7	
Traditional, religious, orthodox	217	61.3	
Marital status			
Married	315	89.0	
Not married	39	11.0	

¹There were a number of missing cases.

revealed that this disagreement was significantly more likely when parents' knowledge of asthma was scanty, when parents indicated that the reason for not using the steroid inhaler daily was that their child felt fine, and when parents had little faith in the need for inhaled steroids (Table 4a). Other characteristics of the children, parents or physicians were not found to have a significant effect on the discordance between parents and children,

TABLE 3—Physician's Determination of the Severity, Adherence and Control of Asthma, Assessment According to the Overall C-ACT Score; Separate C-ACT Score of Parent and Child and Additional Information

	N (%)	Range; median; mean (SD)
Physician determination		
Age of onset	354	0–11; 1.00; 2.19 (2.55)
History of ED visits		
No	168 (47.5)	
Yes	186 (52.5)	
History of admissions		
No	218 (61.6)	
Yes	136 (38.4)	
Severity		
Intermittent/mild	185 (52.4)	
Moderate/severe	168 (47.6)	
Adherence	345	0–100; 80.0; 75.77 (23.9)
Asthma control		
Controlled	195 (55.1)	
Uncontrolled	159 (44.9)	
Inhaled corticosteroids medications		
Fluticasone	108 (33.5)	
Budesonide	103 (32.0)	
Budesonide + formoterol	69 (21.4)	
Beclometasone	32 (9.9)	
Seretide	10 (3.1)	
Parent/child C-ACT		
Parent and child (7 items)		4–27; 19.0; 18.76 (4.68)
Controlled	165 (46.6)	
Uncontrolled	189 (53.4)	
Child only (4 items)		1–12; 8.0; 7.65 (2.10)
Controlled	125 (35.5)	
Uncontrolled	229 (64.7)	
Parent only (3 items)		0–15; 12.0; 11.12 (3.28)
Controlled	228 (64.4)	
Uncontrolled	126 (35.6)	

¹There were a number of missing cases.

including the age of the child, age of the parents and their educational level.

Disagreement Between Children and Physicians

Looking at the C-ACT scores of the children alone, there was a fair agreement between the assessment of the children and that of their physicians (κ 0.331; 0.24, 0.43). Of the 229 children whose C-ACT indicated their asthma was uncontrolled, 96 (41.9%) were described by their physicians as controlled. Notably, 70 (72.9%) of the parents of these children indicated the asthma was controlled. Conversely, of the 125 children who indicated their asthma was controlled, only 26 (20.8%) were described by their physicians as uncontrolled ($P < 0.001$; Table 5). Focusing on the 96 children who indicated their asthma was uncontrolled when their physicians determined the disease was under control, logistic regression

TABLE 4— Variables Found by Logistic Regression Analysis to be Significantly Associated With the Likelihood of Disagreement Between Children, Their Parents, and the Physicians

Variables	OR	95% CI
a: Disagreement between children and parents Parent: controlled; child: uncontrolled		
Low knowledge of asthma	1.80	1.13–2.87
Reported not using inhaled steroid daily because “child feels fine”	1.73	1.12–2.69
Low belief in medication as a necessity	1.68	1.06–2.68
b: Disagreement between children and physicians Physician: controlled; child: uncontrolled		
Physician judged adherence to be >80% ¹	2.43	1.49–3.95
Parent respondent education no greater than high school	1.89	1.07–3.38
c: Disagreement between parents and physicians Parent: uncontrolled; physician: controlled		
Physician judged adherence to be >80% ¹	2.11	1.02–4.35

¹We used the median split method for turning a continuous variable into a categorical one that has two levels.

revealed that disagreement was significantly more likely when the physician assessed the adherence of the parents as more than 80% and when the parents' level of education was beyond high school (Table 4b). No other variables of the children, parents or physicians were found to have a significant effect on the assessment differences between physicians and children, including the physicians' specialization (pediatric pulmonology or pediatrics), their determination of the severity of the asthma and the child's age.

Disagreement Between Parents and Physicians

Looking at the C-ACT scores of solely the parents, there was moderate agreement between their assessment and that of the physicians (κ 0.412; 0.32, 0.51). Of the 126 parents who assessed the asthma as uncontrolled, in only 34 (27.0%) cases did the physicians differ, determining that the asthma was under control. Conversely, of the 228 parents who assessed the asthma as controlled, in 67 (29.4%) cases the physicians determined the asthma was uncontrolled ($P = 0.001$). Focusing on parents who

indicated that their child's asthma was uncontrolled when the treating physician assessed the disease as controlled, logistic regression revealed that disagreement was significantly more likely when the physician assessed the adherence of the parents as high (Table 4c). No other variables of the children, parents, or physicians were found to have a significant effect on the differences between physicians and parents.

Comparing Discordance Between Physicians and Children vis-à-vis Parents

Comparing the discordance between physicians and children vis-à-vis parents, the significant difference was when 96 of the 229 children (41.9%) and 34 of the 126 parents (27.0%) indicated that the asthma was uncontrolled while the physician determined it was under control (OR 1.95; 1.19, 3.24). When children or parents indicated the asthma was controlled and physicians determined it uncontrolled, the discordance between them was not significant—26/125 (20.8%) versus 67/228 (29.4%) (OR 1.58; 0.92, 2.78), respectively.

DISCUSSION

The discordance between the physicians' assessment and the children's description in the C-ACT is very striking: while 229 children indicated that their asthma was not controlled, the physicians of 96 of them (41.9%) assessed the asthma as controlled, as did 70/96 (72.9%) of their parents. Listening solely to the parents' description may therefore give a false impression of the child's complaints. This discordance may have led physicians to underestimate the asthma's control and hence prescribe suboptimal treatment, and could be a reason why in so many children (about half of those studied) asthma was uncontrolled.

Our observation that physicians listen to parents in preference to the child is supported by studies that analyze videos of doctor–parent–child interactions for different diseases. A study from the Netherlands examined 105 videos of children aged 4–12 years who visited general practitioners for temporary illness and minor complaints, and found that the children's voices were scarcely heard.⁴¹ A US study that examined 50 videos and 241 audio records of acute pediatric encounters in both community- and university-based practices, showed that the child's problem was most likely to be presented by the parents.⁴² One group which used audio-tape recently reported that both children (8–16 years old) and parents were asked for their input into asthma treatment plans during only 7.8% and 9%, respectively, of visits,⁴³ and that one third of providers did not ask these children any treatment-related questions.⁴⁴

Our finding that disagreement between the physician, whether pediatrician or pediatric pulmonologist, and the

TABLE 5— Comparison of the Children's Assessment of Asthma Control and That of Their Physicians

	Physicians		Total (%)
	Asthma controlled (%)	Uncontrolled asthma (%)	
Children			
Asthma controlled	99 (79.2)	26 (20.8)	125 (100.0)
Uncontrolled asthma	96 (41.9)	133 (58.1)	229 (100.0)
Total	195 (55.1)	159 (44.9)	354 (100.0)

child is significantly greater when the parents have a higher level of education or when the physician believes there is good adherence to the inhaled steroids treatment is of interest. It suggests that physicians may be biased by impression. They may assume that a higher level of education means the parent is more knowledgeable about asthma, as there is an association between such knowledge and asthma control.^{45–48}

The finding of parent/child discordance is borne out by several other reports.^{2,18–27} It can be argued that separately comparing the C-ACT sections answered by children and their parents may be flawed because the questions posed to the children and parents in our study were not identical. Of the seven C-ACT questions, the four put to children differ from the three to their parents. Parents are asked about daytime complaints, daytime wheezing and awakenings at night, and relate to the preceding 4 weeks. The children's questions are about perception of asthma control, limitations of activities, coughing and nocturnal awakenings, taking into account their level of comprehension and that the common recall period for children younger than 8 years is no more than a few days. These are the original C-ACT questions for 4- to 11-year-old asthmatic children and their parents, that measure their ability to predict asthma control.²⁸ Using separate C-ACT scores for children and parents in the recent study,²⁷ supports our approach.

The discordance we found in our study between parents and children (parent: controlled; child: uncontrolled) is striking and of great interest, especially since parents answered the C-ACT questions after their children had done so, were able to hear and see the child's answers, and even had an opportunity to talk to the child about complaints of which they had been unaware. This can be explained by their lack of knowledge about asthma symptoms and the need for inhaled corticosteroids, resulting in their failure to realize what their child's answers indicate—namely, that the asthma is inadequately controlled. Indeed, the logistic regression of our data show that such disagreement was significantly more likely when parents' knowledge of asthma was scanty, when they believed their child was feeling fine, and when parents had little faith in inhaled steroids—all of these findings that, to the best of our knowledge, have not been previously demonstrated. These findings are supported by the recent PACMAN cohort study which suggests that better adherence and thereby better asthma control can be achieved by improving parental knowledge and stimulating positive parental perception of the nature of the disease, the characteristics of prescribed drugs and use of medications.⁴⁸ An additional factor, suggested by others, may be the emotional state of parents, which may influence their reporting of the impact of asthma; likewise, caregiver-reported asthma morbidity and actual morbidity may be discrepant.⁴⁹

Our finding that the asthma of 53% of the children was not under control, as based on C-ACT, is unsurprising and compatible with reports by others.^{2,16,50} In fact, the number of children with uncontrolled asthma may be still higher. A recent study has shown that a cut-off point of 19 for C-ACT and ACT resulted in sensitivity of 33% and 66%, respectively, in predicting uncontrolled asthma. C-ACT correlates well with GINA criteria in predicting uncontrolled asthma, but commonly used cut-off points for C-ACT seem to underestimate the proportion of children with uncontrolled asthma as defined by GINA.⁵¹

There was no significant difference between the assessment of asthma control and its severity between the pediatricians and the pediatric pulmonologists. This was an important finding, as a limitation of our study was that the pediatricians had no objective measure while the pulmonologists used spirometry. As is well known, no assessment can be based mainly on lung-function tests, such as spirometry or exhaled nitric oxide test, or on a general impression during a follow-up visit. For both GINA and NAEPP, impairments during the previous 4 weeks must be known, as it is in parents' C-ACT questions.^{8,9} Using peak flow meter at home may serve as an objective indicator of asthma control.

Other limitations of our study include a possibility of volunteer bias, as only physicians and parents who agreed to participate in the study were included; assessment of adherence as a subjective judgment of the physician and not based on objective measures; and other characteristics of parents and children that could influence the agreement/disagreement (such as psychological and mental issues, temperament of the child and income of parents)—variables that were not evaluated in the study.

Splitting the questionnaire and the separate cut-off points for the C-ACT, validated in our study by comparing the separate scores by z-score, need further validation using objective parameters.

In conclusion, many parents of asthmatic children must be taught to recognize symptoms in their children, to be aware of and attuned to these symptoms, and to understand the importance of inhaled corticosteroid treatment. We also advocate that C-ACT questionnaires are completed jointly by parent and child, from age 4, in the same way suggested for asthmatic adolescents.¹⁹ It is also very important for pediatricians and pediatric pulmonologists, as well as asthma educators, to ask appropriate questions, whose answers are essential for properly assessing the degree of control. Physicians and asthma educators should specifically ask for details of symptoms during both day and night, interference with activity, sleep, missed school, bronchodilator use for acute symptoms and unscheduled medical care. They should ask the children all these questions, as parents are often unaware of their children's symptoms and may consequently underestimate them. Looking at the

discrepancy in the C-ACT between parent and child, as well as discussion and consultation with parents and children about the disagreement between them may also be a good strategy for the treating physician.

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