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CONTROL

Perceptions of Parents and Physicians Concerning the Childhood Asthma Control Test

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Background. The Childhood Asthma Control Test (C-ACT) has been proposed to be a simple, patient-based test that is able to reflect the multidimensional nature of asthma control. In this analysis, the aim was to evaluate the perceptions of physicians and caregivers concerning C-ACT and its predictive value for future asthma-related events. *Method.* In a multicenter prospective design, 368 children aged 4–11 years with asthma who were either well- or not well-controlled were included in the study. The study participants were evaluated during three visits made at 2-month intervals and the Turkish version of C-ACT was completed each month. Parents completed questionnaires concerning their perception of asthma (before and after the study) and the C-ACT (after the study). Physicians completed a survey about their perception of a control-based approach and the C-ACT. *Results.* The C-ACT scores increased from visit 1 to visit 3, with improvement seen in all domains of the test. At the end of the study period, the parents more strongly agreed that asthma could be controlled completely and that asthma attacks and nocturnal awakenings due to asthma were preventable ($p < .05$). Most of the parents reported that the C-ACT helped them to determine asthma treatment goals for their children and also that the C-ACT improved communication with their physicians. The physicians indicated that a control-centered approach was more convenient (95%) and simpler (94.5%) than a severity-centered approach and provided better disease control (93.4%). A higher C-ACT score was associated with a decreased risk of asthma attack and emergency department admittance in the 2 months following the administration of C-ACT. *Conclusion.* Our findings indicated that the C-ACT improved both parental outlook on asthma control and the communication between the physician and parents. There was a good correlation between the C-ACT score and the level of asthma control achieved, as described by the physician. Additionally the C-ACT score was predictive of future asthma-related events. These findings suggest that the C-ACT may have an important role in asthma management in the future.

Keywords asthma, asthma attack, child, Childhood Asthma Control Test, pulmonary function test

INTRODUCTION

Since the recent guidelines published by the Global Initiative for Asthma (GINA) (1) and the National Asthma Education and Prevention Program (NAEPP) (2) on the control-centered approach for asthma management, there has been a surge of research interest in establishing reliable tools to assess asthma in the context of routine clinical care. It was shown that patients are undertreated and that the goals of asthma management are not achieved even in specialist centers (3–5), perhaps due, at least in

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part, to differences in the criteria physicians use to assess asthma control levels.

The perceptions of asthma control levels may differ between patients and clinicians. In the case of pediatric patients, one barrier to receiving adequate asthma care is an inaccurate perception of symptom severity by the patients and parents. The ideal assessment tool to measure asthma control should be practical in both clinical practice and research and reflect the asthma status according to the patient and clinician perspectives (6). The Childhood Asthma Control Test (C-ACT) was designed to assess the asthma control levels among children aged 4–11 years in a simple manner, to reflect the multidimensional nature of asthma control and to have predictive value (7). No previous studies have sufficiently analyzed the use of the C-ACT in clinical practice or the views of physicians and parents who use it.

In 2008, we performed a 4-month prospective, noncontrolled, multicenter trial to validate the Turkish version of the C-ACT, the results of which were published elsewhere (8). Using the same data, this article focuses on the opinions of parents and caregivers concerning C-ACT and asthma. It also analyzes the predictive value of the C-ACT score for future asthma-related events.

METHODS

The study protocol has been detailed elsewhere (8). In summary, the study was performed at multiple nationwide centers concurrently. The subjects included in the study were children aged 4–11 years, who had a history of intermittent wheezing and/or reversible airway obstruction that supported the diagnosis of asthma as defined by at least a 12% improvement in FEV1% following bronchodilator administration. An asthma attack was defined as an episode of progressive increase in asthma symptoms such as shortness of breath, cough, wheezing, and expiratory airflow limitation associated with at least twice as much short-acting bronchodilator use (1). The clinics where the study was performed were referral centers for their specific regions, and also functioned as primary and tertiary healthcare centers, since patients were admitted without an appointment. Patients with severe chronic illnesses other than asthma and those in the dose increment phase of immunotherapy were excluded from the study. A written informed consent form, which was approved by the Medical Ethics Committee of Hacettepe University, was signed by all parents and by patients 10 years of age and older.

C-ACT Survey

The C-ACT is a 7-item, self-administered questionnaire that assesses daytime and nighttime asthma symptoms, the effects of asthma on daily life, and the use of rescue medications in the preceding 4 weeks (7). The first four questions were answered by the children and the last three by the parents, and all questions included a Likert scale. The patients with C-ACT scores of >19 were considered "well-controlled", whereas those with C-ACT scores $\leq$19 were classified as "not well-controlled".

Study Design

Close to an equal number of asthmatic children with well- and not well-controlled asthma were enrolled and evaluated in three visits at 2-month intervals. The parents and patients completed the C-ACT every month during the study (the first, third, and fifth responses were in clinical settings and the second and fourth were at home). At every visit, after assessing the level of control, physicians chose a treatment plan according to the 2006 GINA guidelines, and categorized the treatment plan in their documentation as increased, decreased, or no change. Furthermore, asthma attacks, unscheduled health-care resource usage, and admittance to an emergency unit because of asthma in the previous 2 months were noted at each visit. At visits 1 and 3, parents completed a 9-item questionnaire concerning their perception of asthma. Additionally, at visit 3, the parents completed a 10-item questionnaire concerning their perception of the C-ACT. At visit 3, the physicians were also asked to complete a questionnaire concerning their perception of the control-based approach and of the C-ACT (the key elements of the questionnaire are shown in the Addendum).

Survey Instruments

The questionnaires consisted of statements, and parents/physicians rated their agreement with the statement on a Likert-type rating scale (1: disagree; 2: mostly disagree, 3: neither agree nor disagree, 4: mostly agree, 5: agree, F: have no idea). The percentage of "agreement" was calculated using responses having a Likert score of 4 or 5.

The surveys for parents were designed to evaluate the following items:

- The perception of asthma by parents (visit 1 and visit 3: asthma control, accessibility of asthma treatment goals, and change in the perception of asthma before and after the study period using C-ACT)
- The opinion of parents about the C-ACT (visit 3) (effect of the C-ACT on expectations of asthma management and communication with the physician, usefulness of the C-ACT to produce changes in asthma control, evaluation of the C-ACT in terms of ease of use and convenience, and willingness to use the C-ACT in the future)

Surveys for physicians were designed to evaluate the following items:

- The opinions of physicians about the control-based asthma treatment approach (visit 3)
- The opinions of physicians about the C-ACT (the ability of the C-ACT to objectively examine control parameters and to report patient and parent perceptions of asthma control; the usefulness of the C-ACT in predicting changes in asthma control over time, an evaluation of the C-ACT in terms of ease of use and convenience, the compatibility of the C-ACT with pulmonary function

tests, physician willingness to use the C-ACT in the future or plans to find another tool to assess asthma control). The physicians did not influence patient responses to questionnaires.

Statistical Analysis

Statistical analyses were performed using the SPSS 15 program (SPSS, Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test was utilized to determine if the data were normally distributed. The results were expressed as proportions or mean and standard deviation. The differences between the groups were compared using the Student's *t*-test or chi-square, whichever was more appropriate for the data. Variables that were associated with a particular outcome in the univariate analysis at a *p*-value of <.25 were examined using multivariate logistic regression models. A backward likelihood ratio modeling strategy was used. The size of the effect of each of the risk factors was measured using the odds ratios (ORs) and 95% confidence intervals (CIs). In the logistic regression analysis for the risk of asthma attack and the risk of emergency department admittance due to asthma between visits 1 and 2 and between visits 2 and 3, forced vital capacity (FVC), forced expiratory volume in 1 s (FEV1), FEV1/FVC, forced expiratory flow (FEF) 25–75, and the recommended treatment in the preceding visit were included in the models. A value of $p \leq .05$ was considered statistically significant.

RESULTS

A total of 368 patients (57% male) with a mean age of 8.3 ± 2.3 years (206 well- and 162 not well-controlled patients) were included. Additional characteristics of the parents and children are summarized in Table 1.

Childhood ACT

The C-ACT score increased from visit 1 to visit 3, with consistent improvement in all domains, as shown in Figure 1.

Parents' Perspective: Perception of Asthma

As the asthma control level of the child increased, as reported by the parents, the C-ACT score increased (r_s = 0.566, $p < .001$). During the study period, the parents' responses to some statements concerning the disease changed from visit 1 to visit 3 in some including "Asthma can be completely controlled" (69.8% vs 79.5%, $p < .001$), "Asthma attacks are preventable" (76.1% vs 88.9%, $p < .001$), and "Night-time awakenings due to asthma are preventable" (72.9% vs 80.4%, $p < .001$) (Figure 2). The level of agreement with the statements "Despite asthma, one can lead a normal life" (71.5% vs 71.7%), "If asthma is treated well, bronchodilator drug requirement may decrease" (93.1% vs 92.3%), and "If asthma is treated well, there will be no need for emergency department admittance" (90.5% vs 86.3%) did not significantly differ between visit 1 and visit 3. The last three items including "If asthma is not treated well, exercise capacity will be affected" (91.6% vs 78.8%, $p < .001$), "If asthma is not treated well, school or daycare attendance will be affected" (95.1% vs 85.9%, $p < .001$), and "If asthma is treated well, pulmonary function tests will be maintained within normal limits" (86.7% vs 79.6%, $p = .002$) had lower scores at visit 3 compared with visit 1.

Parents' Perspective: C-ACT

The parents also gave positive feedback concerning the use of the C-ACT. Most (85%) stated that the C-ACT helped to determine treatment goals for their children and stated that it "increased our expectations from asthma management." More than 90% of parents agreed with the statement "C-ACT increased our communication with the physician" and also that "C-ACT helped me and my child to describe the status of asthma." Most of the caregivers thought that the C-ACT could be completed easily (94.5%) and quickly (88.4%), and specified that the C-ACT was a convenient tool (90.2%). Finally, most parents agreed that "In the future, I want C-ACT to be used in the asthma follow-up of my child" (91.7%).

Physicians' Perspective: Control-Based Asthma Management

In this study, 49 physicians used the C-ACT as a supplementary tool to aid in their decisions for asthma control levels and treatment plans. The majority of them (79.6%) were females, and the mean age was 32.1 ± 5.1 years. On average, they had worked as a physician for 7.6 ± 4.8 years. When the physicians compared the control- and severity-centered approaches at the end of the study

TABLE 1.—Demographic characteristics.

	Well-controlled group ($n = 206$)	Not well-controlled group ($n = 162$)	*p*-Value
Gender (male/female)	126/80	84/78	.073[a]
Age (mean ± SD)	8.1 ± 2.3	8.5 ± 2.2	.038[b]
Follow-up period (month)	25.3 ± 24.2	20.5 ± 22.0	.02[b]
At least one school day absenteeism of the child within last year (%)	59.7	70.4	.001[a]
Total number of health-care resource use within last year (mean ± SD)	5.5 ± 4.3	6.8 ± 6.4	.081[b]
Total unscheduled health-care resource use within last year (mean ± SD)	1.8 ± 3.0	3.1 ± 5.4	.001[b]
Admission to an ER within last year (%)	43.4	62	.001[a]
Perception of asthma by parents			
Asthma did not affect the child's quality of life within last year (%)	52	27.3	<.001[a]

Note: [a]Chi-square, [b]Student *t*-test. $p < 0.05$.

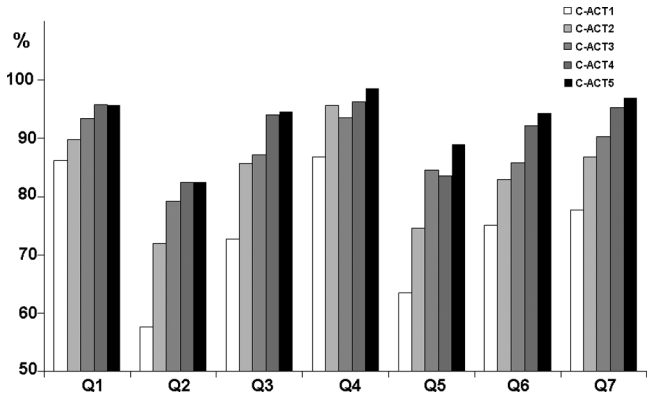

FIGURE 1.—The overall C-ACT score and the individual scores for each question. (Q1. How is your asthma today? Q2. How much of a problem is your asthma when you run, exercise or play sports? Q3. Do you cough because of your asthma? Q4. Do you wake up during the night because of your asthma? Q5. During the last 4 weeks, how many days did your child have any daytime asthma symptoms? Q6. During the last 4 weeks, how many days did your child wheeze during the day because of asthma? Q7. During the last 4 weeks, how many days did your child wake up during the night because of asthma?

period, most of them agreed that the control-centered approach was more convenient for practical applications (93.9%), provided better disease control (93.5%), better met the patient's expectations (88.5%), and was simpler than the disease-severity centered approach (94.6%). Eighty-seven percent of physicians stated that they would use the control-centered approach in the future for asthma management.

Physicians' Perspective: C-ACT

There was a positive correlation between physicians' decisions regarding asthma control and C-ACT scores at visit 1 ($r_s = 0.663$, $p < .001$), visit 2 ($r_s = 0.611$, $p < .001$), and visit 3 ($r_s = 0.580$, $p < .001$). Physicians agreed that the C-ACT helped the patient to express himself/herself (85.4%) and increased patients' expectations of the asthma treatment (85%). They thought that the C-ACT was quick and easy to use for parents and children (94%). The physicians agreed with the statements that the "C-ACT projects changes in asthma control over time" (83.5%) and "C-ACT is parallel to my evaluation of asthma control" (76.2%). However, a lower percentage of physicians stated that "C-ACT is parallel to results of the pulmonary function tests" (58.9%). Nearly 75% of them wanted to use C-ACT in asthma management in their future practice. However, only one-fourth of physicians indicated that they would use the C-ACT exclusively to evaluate the level of disease control in the future (Figure 3).

The Relationship between the C-ACT Score and Future Asthma-Related Events

In a multivariate logistic (linear) regression analysis, we found that higher C-ACT scores at visit 1 were associated with a decreased risk of having an asthma attack between visits 1 and 2, and between visits 2 and 3 [OR: 0.86, 95% CI: 0.81–0.92 ($p = .001$), and OR: 0.65, 95% CI: 0.56–0.75 ($p < .001$), respectively]. Furthermore, a higher C-ACT score at visit 1 was associated with a decreased risk of asthma-related emergency department admittance between visits 1 and 2 and between visits 2 and 3 [OR: 0.88, 95% CI: 0.81–0.96 ($p = .001$), and OR: 0.65, 95% CI: 0.46–0.91 ($p = .011$), respectively] (Table 2A and B).

DISCUSSION

In many chronic diseases, physicians aim to achieve a predefined target level of symptom improvement that indicates good control. However, there is no simple, clear, and accepted target measurement for asthma that can be used as a reliable indicator of treatment effectiveness by both

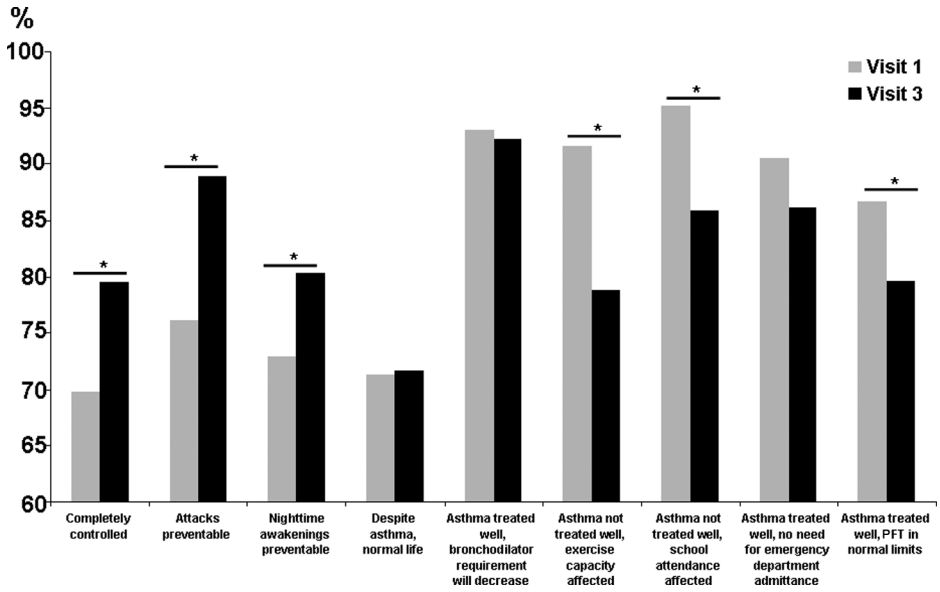

FIGURE 2.—Parents' perception of asthma at visit 1 and visit 3 (*$p < .05$).

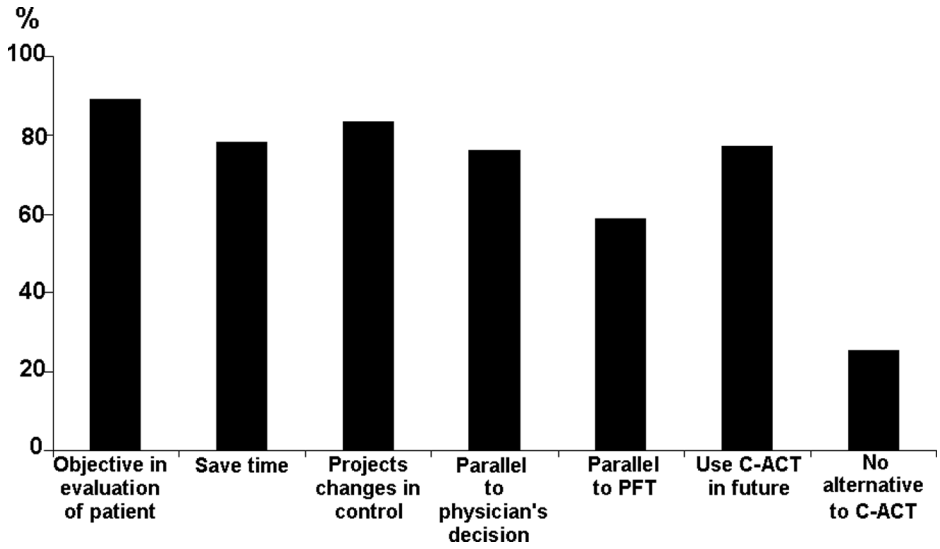

FIGURE 3.—Opinions of physicians about the C-ACT.

TABLE 2.—Logistic regression analysis for emergency department admittance due to asthma between visit 1 and visit 2 (A) and between visit 2 and visit 3 (B).

	p-Value	OR	95% CI	
(A)				
Constant	.155	0.121		
C-ACT 1	.003	0.878	0.807	0.957
(B)				
Constant	.467	0.046		
C-ACT 1	.011	0.647	0.462	0.907

patients and physicians (9). The aim of our study was to conduct a comprehensive assessment of C-ACT, which is a potential tool for evaluating control in asthma management. To our knowledge, this is the first study documenting the opinions of parents and physicians regarding the use of C-ACT.

The C-ACT score is the sum of the scores of seven questions. In our study, the increase seen in the C-ACT score was the result of increases in the scores of the individual questions. Re-administration of C-ACT at each follow-up visit may provide an opportunity to monitor control levels over time and also allow changes in all control parameters to be documented. One of the main impairments due to asthma as stated by asthmatic children is the limitation in activity (9), and the Asthma Control Test (ACT) is appropriate for identifying adult patients with activity limitations (10). Our study is in agreement with this finding because, with the use of C-ACT over the study period, we showed that the main improvement among children was in the domain of exercise limitation.

Asthma Intervention Research (AIR) studies from different parts of the world consistently showed that low expectations observed among patients and parents may be one of the contributing factors for the low asthma control seen worldwide. Therefore, there is always a need to increase parents'/patients' expectations by improving their awareness of the quality of life that can be attained. At the conclusion of this study, parents more strongly agreed that asthma could be controlled completely and that asthma attacks and nighttime awakenings could be prevented. Parents were able to set goals for asthma control. The C-ACT enables patients and parents to actively participate in their asthma management and may improve adherence to the treatment plan. Janson et al. reported that the participation of asthmatic patients in a self-management program attenuates the usual decrease in medication adherence and improves clinical markers of asthma control (11).

Poor communication between health-care professionals and patients may impair optimal asthma care (12). Furthermore, there is always a discrepancy in the perceptions and use of medical terminology regarding asthma control of asthmatic children, their parents, and physicians (13). The C-ACT seemed to increase the communication between patients and physicians and improved the parents' ability to describe the state of their child's asthma. The ease and convenience of the C-ACT may contribute to this finding.

Although control-centered asthma management is the preferred treatment modality, and classification of asthma by severity is recommended only for research purposes according to recent guidelines (1,2), little is known concerning the opinions of physicians about control-based treatment. After the study period with the C-ACT, many physicians agreed that a control-centered approach was convenient and simpler and provided better disease control. This finding is not surprising since severity classification is complicated, and in one of our previous studies concerning the knowledge and attitudes of Turkish physicians, assessment of asthma severity was the least understood part of asthma care (14). As expected, most physicians indicated that they intended to utilize this approach in their clinical practice in the future.

The busy environment of clinical practice necessitates that tools be both easy to use and easy to interpret (15). Physicians agreed that the C-ACT was easy to administer

and saved time. They also agreed that the C-ACT seemed to correlate with decisions regarding asthma control at each visit. However, some studies compared the use of the GINA criteria and the C-ACT to evaluate asthma control, and suggested that higher C-ACT scores should be used to determine if a patient is well controlled (16,17). Erkocoglu et al. reported there was inconsistency between the GINA criteria and the C-ACT in one-fourth of the children with asthma (18). Though most physicians wanted to use C-ACT in the future, interestingly, only one-fourth of them planned to use the C-ACT exclusively in the evaluation of asthma control. Since physicians did not think that the C-ACT was correlated with pulmonary function tests, there may be a need for new assessment items. In addition, the limited experience of physicians with a control-centered approach may lead to a search for novel instruments to evaluate asthma control.

Sato et al. demonstrated that in adults, the combination of the ACT and lung function test was the most useful for predicting future exacerbations of asthma, in comparison to either of the measurements used alone during a single assessment (19). In our study, even when the FEV1% was included in the logistic regression analysis, the C-ACT alone was useful for predicting asthma attacks and asthma-related emergency department admittance in the future. Identifying at-risk patients is important so that special efforts may be made to improve their asthma control.

A limitation of our study is that while the study conditions reflect a real-life setting, the parents consented to participate and the frequent monitoring visits are not typical of routine care. These factors alone might increase the level of asthma control and make parents feel confident about asthma management programs. Even though the Turkish version of the C-ACT was validated, we used nonvalidated questionnaires to assess perception of parents and physicians. The surveys consisted of statements that generally suggested that the C-ACT would be beneficial, which might potentially lead to bias. However, options for disagreement with these positive statements were included with the hopes of reducing the potential bias.

To conclude, our results show that the C-ACT can be used in the routine, daily practice of physicians treating children with asthma. The multicenter and prospective nature of our study provided the opportunity to evaluate the contribution of C-ACT to asthma follow-up and management in a detailed manner. The C-ACT improved communication and led to a more effective physician–patient partnership, improved the parent expectations for asthma management, and assisted physicians in their decision-making. Finally, the C-ACT may be an appropriate tool for predicting future asthma-related events.

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- *Soyer O.U.* participated in the development of the protocol and analytic framework of the study, prepared the article, and had the primary responsibility for patient screening in her study centers.
- *Sekerel B.E.* had the primary responsibility for protocol development, outcome assessment and data analysis, and prepared the article with *Soyer O.U.*
- *Kilic M., Keskin O., Asilsoy S., Altinel N., Karaman O., Yazicioglu M., Sapan N., Zeyrek D., Kotan C., Ozmen S., Reisli I., Aydogan M., Altintas D.U., Orhan F., Yuksel H., Boz A.B., Gurkan F., Tahan F.,* and *Cevit O.* supervised the design and execution of the study, contributed to preparation of the article, and had the primary responsibility for patient screening in their study centers.
- This study was presented as a poster presentation in London at the EAACI 2010 annual congress.

DECLARATION OF INTEREST

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

ADDENDUM

The Questionnaire

- Perception of asthma by parents (visit 1 and visit 3)
  - Asthma can be completely controlled.
  - Asthma attacks are preventable.
  - Nighttime awakenings due to asthma are preventable.
  - Despite asthma, one can lead a normal life.
  - If asthma is treated well, bronchodilator drug requirement may decrease.
  - If asthma is not treated well, exercise capacity will be affected.
  - If asthma is not treated well, school or daycare attendance will be affected.
  - If asthma is treated well, there will be no need for emergency department admittance.
  - If asthma is treated well, lung function tests will be maintained within normal limits.
- Opinion of parents about C-ACT (visit 3)
  - C-ACT helped me to determine my child's treatment goals.
  - C-ACT helped me and my child to describe the asthma.
  - C-ACT increased our communication with the physician.
  - C-ACT increased our expectations from asthma treatment.
  - Questions directed to my child in C-ACT helped us to describe our asthma better.
  - C-ACT helped to project changes in my child's asthma control.
  - C-ACT can be completed easily.
  - C-ACT can be completed quickly.
  - C–ACT is a convenient tool.
  - In the future, I want my child to use C-ACT in his/her asthma follow-up.

- Opinions of physicians about control–based asthma treatment approach (visit 3)
  - The control-centered approach is more convenient than the disease severity-centered approach for practical applications.
  - The control-centered approach provides better disease control than the disease severity-centered approach.
  - The control-centered approach meets the patient's expectations more than the disease severity-centered approach.
  - The control-centered approach is simpler than the disease-severity centered approach.
  - I can use the control-centered approach in the future in asthma treatment practice.
- Opinion of physicians about C-ACT (visit 3)
  - C-ACT provides an objective contribution in the evaluation of the patient.
  - C-ACT provides an objective contribution in determining my treatment goals.
  - C-ACT helped the patient to express her/his condition in my evaluation.
  - C-ACT was time-saving when evaluating the patient.
  - C-ACT increased the patients' expectations.
  - C-ACT can be completed easily by the patient.
  - C-ACT can be completed quickly by the patient.
  - C-ACT is a convenient tool.
  - It is appropriate to have questions for the parents in the C-ACT.
  - It is appropriate to have questions for the child in the C-ACT.
  - C-ACT projects the changes in asthma control.
  - C-ACT is parallel to my evaluation of asthma control.
  - C-ACT is parallel to the results of lung function tests.
  - I plan to use C-ACT in the future for my practice.
  - I do not plan to use any tool other than the C-ACT in evaluating disease control level.

REFERENCES

1. Global Initiative for Asthma. Global strategy for asthma management and prevention. National Institutes of Health. National Heart Lung and Blood Institute. Revised 2006. Available at: http://www.ginasthma.org. Accessed November 11, 2011.
2. Expert Panel Report 3 (EPR 3). Guidelines for the Diagnosis and Management of Asthma. National Asthma Education and Prevention Program (NAEPP). National Heart Lung and Blood Institute. Revised 2007. Available at: http://nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf. Accessed November 11, 2011.
3. Sekerel BE, Gemicioglu B, Soriano JB. Asthma insights and reality in Turkey (AIRET) study. Respir Med 2006; 100:1850–1854.
4. Gaga M, Papageorgiou N, Zervas E, Gioulekas D, Konstantopoulos S. Control of asthma under specialist care: is it achieved? Chest 2005; 128:78–84.
5. Soyer OU, Beyhun NE, Demir E, Yildirim S, Boz AB, Altinel N, Cevit O, Karakaş T, Anlar Y, Söğüt A, Altintaş D, Canitez Y, Büyükdereli Z, Sekerel BE. A multicenter survey of childhood asthma in Turkey-II: utilization of asthma drugs, control levels and their determinants. Pediatr Allergy Immunol 2009; 20:172–179.
6. Revicki DWeiss KB. Clinical assessment of asthma symptom control: review of current assessment instruments. J Asthma 2006; 43:481–487.
7. Liu AH, Zeiger R, Sorkness C, Mahr T, Ostrom N, Burgess S, Rosenzweig JC, Manjunath R. Development and cross-sectional validation of the Childhood Asthma Control Test. J Allergy Clin Immunol 2007; 119:817–825.
8. Sekerel BE, Soyer OU, Keskin O, Uzuner N, Yazicioglu M, Kiliç M, Artaç H, Ozmen S, Can D, Zeyrek D, Cokugras H, Canitez Y, Aydogan M, Kuyucu S, Inal A, Gurkan F, Orhan F, Yilmaz O, Boz AB, Tahan F, Cevit O. The reliability and validity of Turkish version of Childhood Asthma Control Test. Qual Life Res 2012; 21:685–690.
9. Horne R, Price D, Cleland J, Costa R, Covey D, Gruffydd-Jones K, Haughney J, Henrichsen SH, Kaplan A, Langhammer A, Østrem A, Thomas M, van der Molen T, Virchow JC, Williams S. Can asthma control be improved by understanding the patient's perspective? BMC Pulm Med 2007; 7:8.
10. Schatz M, Mosen DM, Kosinski M, Vollmer WM, Magid DJ, O'Connor E, Zeiger RS. The relationship between asthma-specific quality of life and asthma control. J Asthma 2007; 44:391–395.
11. Janson SL, McGrath KW, Covington JK, Cheng SC, Boushey HA. Individualized asthma self-management improves medication adherence and markers of asthma control. J Allergy Clin Immunol 2009; 123: 840–846.
12. Moffat M, Cleland J, van der Molen T, Price D. Poor communication may impair optimal asthma care: a qualitative study. Fam Prac 2007; 24:65–70.
13. Hyland ME, Stahl E. Asthma treatment needs: a comparison of patients' and health care professionals' perceptions. Clin Ther 2004; 26: 2141–2152.
14. Civelek E, Sekerel BE. Management of childhood asthma: physicians' perspective in Turkey. Pediatr Allergy Immunol 2004; 15:372–375.
15. Halbert RJ, Tinkelman DG, Globe DR, Lin SL. Measuring asthma control is the first step to patient management: a literature review. J Asthma 2009; 46:659–664.
16. Ito Y, Adachi Y, Itazawa T, Okabe Y, Adachi YS, Higuchi O, Katsunuma T, Miyawaki T. Association between the results of the childhood asthma control test and objective parameters in asthmatic children. J Asthma 2011; 48:1076–1080.
17. Koolen BB, Pijnenburg MW, Brackel HJ, Landstra AM, van den Berg NJ, Merkus PJ, Hop WC, Vaessen-Verberne AA. Comparing Global Initiative for Asthma (GINA) criteria with the Childhood Asthma Control Test (C-ACT) and Asthma Control Test (ACT). Eur Respir J 2011; 38:561–566.
18. Erkoçoğlu M, Akan A, Civelek E, Kan R, Azkur D, Kocabaş CN. Consistency of GINA criteria and childhood asthma control test on the determination of asthma control. Pediatr Allergy Immunol 2012; 23: 34–39.
19. Sato R, Tomita K, Sano H, Ichihashi H, Yamagata S, Sano A, Yamagata T, Miyara T, Iwanaga T, Muraki M, Tohda Y. The strategy for predicting future exacerbations of asthma using a combination of the Asthma Control Test and lung function test. J Asthma 2009; 46: 677–682.