

Development of a quality-of-life assessment for the allergic child or teenager with multisystem allergic disease

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Background: Health-related quality of life (HRQOL) questionnaires currently being used to evaluate allergic disease are organ-specific. They therefore fail to take account of the systemic aspects of allergic disease.

Objective: To develop and validate a pediatric HRQOL questionnaire for allergic disease (Pediatric Allergic Disease Quality of Life Questionnaire, PADQLQ) that encapsulates problems related to the eyes, ears, nose, lungs, skin, emotions, and everyday activities.

Methods: In the development phase, 77 subjects (6 to 16 years of age), with seasonal or perennial allergic problems, were asked how much they were bothered by each different area of HRQOL impairment. The highest scoring areas were used to construct the PADQLQ. In the validation phase of the study, 36 subjects (8 to 16 years of age) with seasonal allergic rhinoconjunctivitis, seasonal allergic asthma, and/or cutaneous manifestations of grass pollen allergy were assessed before and during the pollen season.

Results: The PADQLQ contains 26 questions. In addition to standard symptoms (eg, rhinitis), it incorporates multiorgan symptoms that are usually overlooked (eg, hearing problems). The PADQLQ demonstrated good cross-sectional and longitudinal validity, showing a high degree of correlation with symptom scores and quality of life as measured by a visual analogue scale and two-organ specific questionnaires. The PADQLQ showed good within-subject reliability and a small minimal important difference (0.33; 95% CI, 0.11 to 0.54 on a 7-point scale).

Conclusions: The PADQLQ has good cross-sectional and longitudinal validity, making it a potentially useful outcome measure in the evaluation of systemic treatments such as antihistamine medications and immunotherapy in children with multisystem allergic disease. (*J Allergy Clin Immunol* 2003;111:491-7.)

Key words: Quality of life, multisystem allergic disease, asthma, rhinoconjunctivitis, eczema, children, teenagers

Abbreviations used

ARQLQ:	Adolescent rhinitis quality of life questionnaire
HRQOL:	Health-related quality of life
MID:	Minimal important difference
PADQLQ:	Pediatric allergic disease quality of life questionnaire
PAQLQ:	Pediatric asthma quality of life questionnaire
PRQLQ:	Pediatric rhinitis quality of life questionnaire
VAS:	Visual analogue scale

Clinical practice and clinical research depend on the ability to accurately assess the severity of a patient's disease. Outcome measures such as symptoms, medication usage, and spirometry are all important indicators of disease, but it has been found that they do not provide an accurate assessment of a subject's health-related quality of life (HRQOL).¹⁻⁶ HRQOL is now believed to be an important outcome measure because different patients are affected in different ways despite having similar disease severity. Many generic quality-of-life questionnaires exist, and some have been applied to populations with allergic disease.⁷ More recently, several organ-specific quality-of-life questionnaires have been developed to assess allergic diseases such as hay fever and asthma.^{3,8,9} They represent a substantial improvement over generic questionnaires because they are more sensitive tools. Unfortunately, they may not take account of the systemic aspects of allergic disease and are therefore unlikely to provide a valid global measure of health-related quality of life in multisystem allergic disease. In this article, HRQOL has been defined as the functional effects of an illness and its consequent therapy on a patient as perceived by the patient.¹⁰

We have developed and validated a health-related quality-of-life assessment for allergic disease that encompasses its effects on a child's or teenager's eyes, ears, nose, lungs, skin, emotions, and everyday activities. We named this the Pediatric Allergic Disease Quality of Life Questionnaire (PADQLQ). We used well-established questionnaire development principles to identify the areas of impairment.¹¹ The initial development work involved children and teenagers with both perennial and seasonal allergic rhinoconjunctivitis. A group of children and teenagers with seasonal grass pollen allergy was subsequently used to validate the questionnaire.

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METHODS

Questionnaire development

A list of 72 areas of HRQOL impairment was developed from unstructured personal consultations with pediatric subjects with allergic asthma, rhinoconjunctivitis, and/or eczema. For each of these items, subjects (6 to 16 years of age) affected by one or more of seasonal or perennial allergic asthma, seasonal or perennial rhinoconjunctivitis, or dermatologic problems were asked "How much were you bothered by the following?" They responded on a 6-point scale from "not bothered" to "extremely bothered." The items scoring highest were then used to construct the pediatric allergic disease quality of life questionnaire.

Questionnaire validation

Study design. Questionnaire validation was undertaken by assessing subjects before the season and 3 times during the grass pollen season of 2000 at 4-week intervals. At the start of each visit, subjects completed the PADQLQ and a visual analogue scale (VAS) measuring perceived bother due to all their allergic problems. At the end of the visit, they completed the previously validated pediatric rhinitis (ARQLQ or PRQLQ) and asthma (PAQLQ) quality-of-life questionnaires^{3,8,9} and separate VAS assessments for asthma-related and hay fever-related problems. Before each visit, subjects filled in a 7-day symptom diary.

Subjects

Validation was undertaken in a group of children with systemic manifestations of grass pollen allergy: seasonal allergic rhinoconjunctivitis, asthma, and/or eczema. All subjects had to have symptoms that developed during the pollen season and positive results for a skin prick test to grass pollens (>3 mm, ALK, Horsholm, Denmark). The diagnosis of seasonal allergic asthma was based on clinical history, examination, and reversibility with inhaled bronchodilators.¹² A diagnosis of seasonal allergic rhinoconjunctivitis was made if there were typical symptoms during the pollen season.¹³ Cutaneous symptoms were defined as the presence of urticaria, pruritis, or eczema during the pollen season.¹⁴ Other illnesses that might affect HRQOL were specific exclusion criteria. Subjects were recruited from the pediatric chest and allergy clinic at St Mary's Hospital. Informed consent was obtained from all subjects and their parents and the study was approved by the local research ethics committee.

Outcome measures

The pediatric allergic disease quality of life questionnaire (see Appendix) has 26 questions grouped into 3 domains: (1) practical problems (8 questions); (2) symptoms; and (3) emotional problems.³ Responses to each question were rated on a 0- to 6-point scale from not troubled to extremely troubled. Individual items were equally weighted. The PADQLQ is intended to be self-administered. Subjects were asked to answer each question, without parental help, by thinking about the previous week. The results are presented as an average score.

Visual analogue scales

Subjects completed three visual analogue scales to describe how troubled they were by their asthma, hay fever, and all their allergies. The VAS consisted of 7 faces ranging from very happy to very sad. These have been previously validated at St Mary's Hospital (data not shown). The VAS was taken as the gold standard measurement of HRQOL.

Symptom diary

Subjects were asked to rate ocular (itchy, swollen, runny), nasal (itchy, blocked, sneezing, runny), and chest symptoms (wheezy,

coughing, short of breath/chest tight, breathing problems while running/walking, any night time cough/wheeze/chest tightness). Severity was rated from 0 (no symptoms, a happy face) to 3 (severe symptoms, a very sad face) without parental help. The symptom diary was adapted from a validated weekly diary and has itself been validated at St Mary's (data not shown).¹⁵

Pollen count

Daily pollen counts for the North West London area were measured during the pollen season with a Burkard volumetric spore trap (data supplied by National Pollen Centre, University of Worcester, UK). The 2000 pollen season commenced at the start of May and extended until mid August.

Evaluation of the measurement properties of the PADQLQ

Internal validity. Cronbach α coefficient was used to assess the consistency of the PADQLQ, looking at all the items and then the items in each domain. It was expected that there should be excellent overall agreement ($\alpha \geq 0.9$), with good agreement for each individual domain ($\alpha \geq 0.7$).

Cross-sectional validity. The ability of the PADQLQ to distinguish between subjects with different degrees of impairment of HRQOL was assessed by comparing it with the VAS and the validated organ-specific HRQOL assessments (PAQLQ, PRQLQ, and ARQLQ). We expected a close relation between these ($r > 0.6$). A comparison was also made between the PADQLQ and symptom scores; only a moderate degree of association was expected ($0.6 > r > 0.4$).

Reliability and responsiveness to change

The absolute change in VAS for all allergic problems was classified into the following groups: 0 (no change), 1 (minimal important difference, MID), 2, and 3 or 4. For each group, the change in PADQLQ is presented graphically with the overall relation being assessed by analysis of variance (ANOVA). The intraclass correlation coefficient for the repeated PADQLQ measurements where there was no change in the VAS is presented as a measure of repeatability. The change in PADQLQ was also correlated with the change in the average symptom scores and disease-specific HRQOL assessments. A high degree of association was expected between the change in VAS or organ-specific HRQLQ ($R > 0.6$), with a moderate association with the change in symptoms ($R > 0.4$).

All statistical tests were undertaken with Stata 6. A *P* value of $< .05$ was taken to be significant.

RESULTS

Questionnaire development

One hundred twenty-two children, 6 to 16 years of age from the pediatric chest and allergy clinic, were sent the list of 72 possible items. Seventy-seven subjects (63.1%) participated (Table I). They had a wide range of allergic problems and represented a wide range of ages and diverse socioeconomic and ethnic groups. Results of the problem area questionnaire are shown in Table II. Items are arranged in order of their bother score. Analyses of these responses (Table II) allowed us to select 25 question areas. One additional question on all the activities undertaken in the past week was added (see Appendix, question 26) to ensure that important areas of impairment for individual children were not missed. The resulting questionnaire is presented in the Appendix. The questionnaire could be completed in under ten minutes.

Questionnaire validation

Subjects. Validation was undertaken in a group of 36 children (7 to 16 years of age; mean, 12.3 years) with seasonal allergic rhinoconjunctivitis, asthma, and/or eczema (Table I).

Internal validity

The Cronbach α coefficient for the PADQLQ was 0.95, indicating excellent agreement between the individual items in the tool. For the practical problems, symptoms, and emotions domain, the Cronbach α coefficients were 0.88, 0.92, and 0.73 respectively.

Cross-sectional validity

Cross-sectional validity was assessed by comparing the total and domain scores in the PADQLQ with the children's VAS results, the disease-specific quality-of-life questionnaires, and symptom scores (see Table III and Fig 1). There was excellent correlation between the PADQLQ and both the VAS and other HRQOL questionnaires, with a moderate correlation with symptoms. There was also a significant correlation ($0.591 < R < 0.735$, $P < .001$) between each PADQLQ domain and the equivalent domain in the organ-specific HRQOL questionnaires. Similar results were seen when children (≤ 12 years of age) and teenagers were analyzed separately. The average PADQLQ scores from before and during the pollen season were 0.65 and 1.70, respectively ($P < .001$, unpaired t test).

Responsiveness to change and reliability

Longitudinal validity and responsiveness to change was addressed by comparing the change in the PADQLQ score between two visits with the change in VAS, symptom scores, and validated asthma and rhinoconjunctivitis HRQOL. A significant relation was found with VAS (ANOVA, $P < .0001$; Fig 1), the total symptom score ($P < .001$), and the HRQOL questionnaires ($P < .001$; Table IV). Similar results were found when the children (≤ 12 years of age) and teenagers were analyzed separately. With the exception of the emotions domain, a significant relation was also seen between the individual PADQLQ domains and VAS (data not shown), the total symptom score (Table V), and the HRQOL questionnaires (Table IV). The PADQLQ emotions domain significantly correlated with the emotions domain of the asthma ($R = 0.691$, $P < .01$) and rhinitis ($R = 0.685$, $P < .05$) HRQOL questionnaires.

To determine the reliability of the PADQLQ, subjects with no change in their overall VAS were examined. Their change in PADQLQ was -0.21 (95% CI, -0.60 to 0.18 , $n = 17$), with an intraclass correlation coefficient for these repeated PADQLQ measurements of 0.67. For the practical problems, symptoms, and emotions domains, it was 0.63, 0.64, and 0.41, respectively. To determine the sensitivity of the PADQLQ, subjects with a change of 1 in their overall VAS were examined. Their change in PADQLQ was 0.33 (95% CI, 0.11 to 0.54, $n =$

TABLE I. Questionnaire development phase: subject characteristics

	Development phase	Validation phase
No.	77	36
Age (y)	10.6 (6-16)	12.3 (8.5-16.5)
Female	30 (40.3)	11 (30.6)
Ethnicity		
White	60 (77.9)	27 (77.8)
Black	6 (7.8)	2 (5.6)
Indian subcontinent	6 (7.8)	4 (11.1)
Other	5 (6.5)	2 (5.6)
Seasonal allergic asthma	39 (50.6)	33 (91.7)
Perennial allergic asthma	36 (46.8)	0 (0.0)
Seasonal allergic rhinoconjunctivitis	63 (81.8)	36 (100)
Perennial allergic rhinoconjunctivitis	19 (24.7)	7 (19.4)
Eczema	28 (36.4)	5 (13.9)
Food allergy	37 (48.1)	4 (11.1)

The table presents data describing the subjects involved in the questionnaire development and validation phases. Data presented as mean (range) or number (%) of subjects.

31), the MID for the PADQLQ (Fig 2). The MID was significantly different from subjects showing no change in their HRQOL (unpaired t test, $n = 57$, $P < .01$).

DISCUSSION

We have developed and validated a novel quality-of-life questionnaire (PADQLQ) to evaluate children and teenagers with multisystem allergic disorders. This questionnaire is designed to assess how such allergic diseases impinge on their lives. It was validated in a group of children with grass pollen allergy. We have shown that it is able to discriminate between children with different degrees of impairment as measured by the VAS, organ-specific HRQOL questionnaires, or a total symptom score. This questionnaire therefore has the potential to be a valuable instrument for delineating the effect of systemic allergic diseases in cross-sectional studies. The PADQLQ is also valid longitudinally as it correlated with changes in the VAS, disease-specific HRQOL questionnaires, and total symptoms. The PADQLQ correlates better with the VAS and HRQOL questionnaires than the symptom score emphasizing that it is assessing HRQOL and not merely symptoms. Additionally, the PADQLQ shows good reliability and a small MID. With such sensitivity and longitudinal validity, the PADQLQ may be useful when looking at change in HRQOL prospectively within a population.

The quality-of-life questionnaires currently used for allergic disease (eg, PAQLQ,³ PRQLQ,⁸ ARQLQ⁹) are organ-specific. They have proved to be more sensitive than the older generic questionnaires because they focus on the problem areas seen with each organ.¹⁶⁻¹⁸ Such questionnaires are rightly seen as the definitive HRQOL measures for organ-specific diseases. Allergic disease, however, frequently affects more than one system. More than half of children with allergic asthma have coexistent allergic rhinitis, and a third of children

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TABLE II. Areas of impairment associated with multisystem allergic disease

Item number in PADQLQ	Question area	Score (rank) in each subject group		
		Seasonal allergy (n = 63)	Perennial allergy (n = 38)	All subjects (n = 77)
1	Being unable to concentrate	3.56 (1)	1.62 (58)	2.00 (43)
2	Needing to rub eyes	3.16 (2)	2.62 (4)	2.89 (2)
3	Rashes on your skin	3.14 (3)	2.30 (22)	2.43 (17)
4	Itchy nose	3.13 (4)	2.32 (19)	2.73 (5)
5	Being unable to remember things learned at school	3.00 (5)	1.65 (56)	1.89 (51)
	Sneezing	2.92 (6)	2.31 (21)	2.64 (7)
6	Blocked nose	2.90 (7)	2.95 (3)	2.92 (1)
	Stuffy nose	2.87 (8)	2.72 (4)	2.80 (4)
7	Needing to rub your nose	2.85 (8)	2.22 (26)	2.54 (9)
8	Needing to blow your nose	2.82 (10)	2.14 (29)	2.49 (13)
	Your parents complaining that you don't listen	2.80 (11)	1.50 (62)	1.78 (54)
	Runny nose	2.77 (12)	2.47 (12)	2.63 (8)
9	Being unable to get to sleep	2.77 (13)	2.09 (31)	2.45 (15)
	Itchy eyes	2.72 (7)	2.62 (14)	2.67 (6)
	The lack of a good night sleep	2.70 (15)	1.86 (45)	2.29 (22)
10	Not hearing well	2.67 (16)	0.78 (79)	1.15 (79)
	Red eyes	2.63 (19)	1.90 (41)	2.26 (25)
11	Swollen eyes	2.63 (17)	2.34 (16)	2.49 (12)
12	Coughing at night	2.63 (18)	2.08 (33)	2.36 (18)
	Coughing while running	2.60 (20)	1.84 (47)	2.12 (27)
	Being unable to pay attention during lessons	2.56 (21)	1.68 (39)	1.85 (52)
	Itchy skin	2.51 (22)	3.24 (1)	2.88 (3)
13	Being worn out	2.49 (23)	1.83 (48)	2.17 (30)
14	Coughing	2.47 (24)	2.55 (10)	2.51 (10)
15	Feeling out of breath	2.47 (25)	2.53 (11)	2.50 (11)
	Watery eyes	2.40 (26)	2.11 (30)	2.26 (26)
16	Needing to use medicines and inhalers	2.36 (27)	2.60 (8)	2.47 (14)
17	Coughing while playing a game	2.34 (28)	2.26 (24)	2.30 (21)
18	How your skin looks	2.33 (29)	2.08 (32)	2.13 (35)
	Wheezing while running	2.32 (30)	2.34 (17)	2.33 (20)
19	Feeling irritable	2.32 (31)	1.68 (54)	2.00 (44)
	Tightness in your chest	2.29 (32)	2.41 (14)	2.35 (19)
	Feeling tired	2.28 (33)	1.73 (51)	2.01 (42)
	Being tired	2.26 (34)	1.92 (37)	2.09 (36)
	Wheezing	2.24 (35)	2.32 (18)	2.28 (23)
20	Feeling thirsty	2.22 (36)	1.76 (50)	1.99 (46)
	Feeling short of breath	2.21 (37)	2.19 (27)	2.20 (28)
	Puffy eyes	2.21 (39)	1.89 (42)	2.05 (39)
	Pain in your chest	2.21 (38)	1.83 (49)	2.03 (40)
21	Being unable to play sport outside	2.18 (41)	1.94 (35)	2.07 (37)
	Sore eyes	2.15 (42)	1.70 (52)	1.93 (48)
	Being unable to play sport	2.13 (45)	1.69 (53)	1.92 (50)
	Wheezing while playing a game	2.13 (44)	2.19 (28)	2.16 (33)
	Needing to use inhalers	2.11 (47)	2.24 (25)	2.17 (31)
	Feeling frustrated	2.11 (48)	1.89 (43)	2.00 (45)
	Being unable to do school work as well as usual	2.05 (52)	1.61 (59)	1.84 (53)
	Being unable to catch your breath	2.05 (50)	2.27 (23)	2.16 (34)
22	Sore throat	2.05 (49)	1.24 (69)	1.65 (57)
	Dry throat	2.05 (51)	1.20 (71)	1.64 (59)
23	Having a headache	2.00 (53)	1.47 (63)	1.75 (56)
	Having to carry medicines and inhalers	1.97 (54)	2.38 (15)	2.17 (32)
	Being unable to breathe	1.92 (55)	2.65 (5)	2.28 (24)
24	Being different from your friends	1.92 (56)	1.92 (38)	1.92 (49)
	Problems taking a deep breath?	1.87 (57)	1.65 (57)	1.76 (55)
	Itchy throat	1.87 (58)	1.31 (68)	1.60 (60)
25	Feeling frightened by the thought of an asthma attack	1.84 (60)	2.06 (34)	1.95 (47)

The table shows the problem areas identified during the questionnaire development phase of the study. Subjects were asked "How much were you bothered by the following?" and responded with "not bothered," "hardly bothered," "somewhat bothered," "moderately bothered," "very bothered," or "extremely bothered"; these were scored from 0 (not bothered) to 5 (extremely bothered). The score was assumed to be zero in the case of the few questions that were left blank. Items are ranked in order of importance according to their mean bother score for subjects with seasonal allergic problems. Items with the highest bother scores were used to form the PADQLQ. Where the response to two items were highly correlated ($r > 0.6$), the two items were, if possible, combined to form one question, otherwise the one with the smaller mean bother score was dropped from the PADQLQ. The numbered items were then used to construct the PADQLQ.

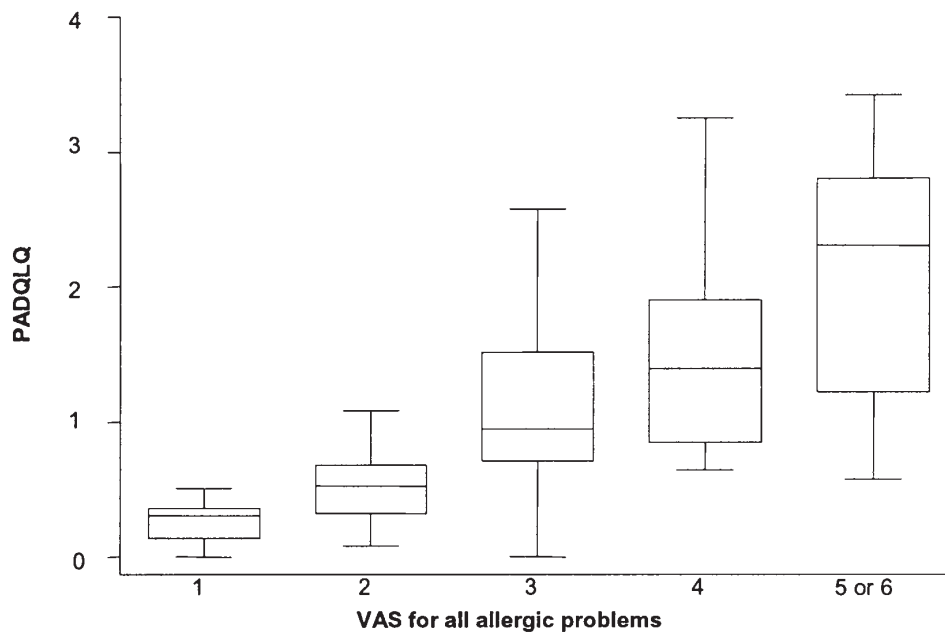


FIG 1. Relation between VAS and PADQLQ scores.

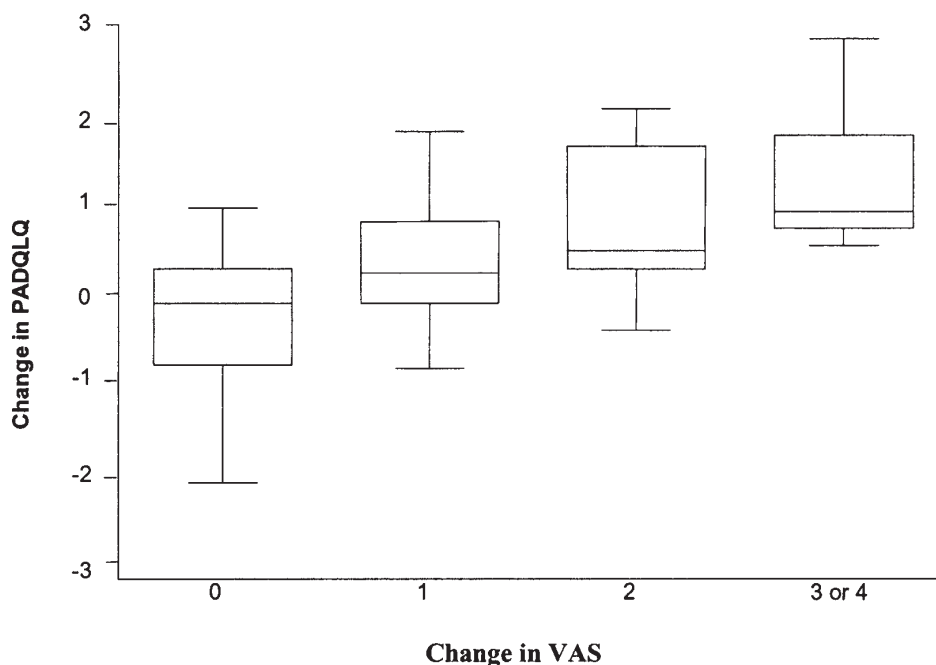


FIG 2. Relation between change in PADQLQ and VAS scores.

with allergic rhinitis have asthma.¹⁹ By using the PADQLQ, the contribution of disease affecting different organs can be measured without resorting to the use of multiple organ-specific questionnaires. The single questionnaire also addresses the issue of the relative weighting of the different areas. In common with other groups, we found that the bother scores for hay fever-related areas are much higher than for asthma areas.^{7,20} This is reflected by the better correlation

between the PADQLQ and hay fever than asthma symptoms. Both these points suggest that problems related to rhinoconjunctivitis have the larger impact on the child's life. The high correlation seen between the PADQLQ and the organ-specific questionnaires, cross-sectionally (Table III) and longitudinally (Table IV), suggests, however, that they are measuring similar things and that the multisystem questionnaire is no less sensitive than the organ-specific ones.

TABLE III. Correlation between PADQLQ and symptoms and other quality-of-life questionnaires

	PADQLQ			
	Total	Activities domains	Symptoms domains	Emotions domains
Eye/nose symptoms	0.421***	0.374**	0.293**	0.217
Chest symptoms	0.266	0.133	0.343*	0.153
All symptoms	0.429***	0.341*	0.433***	0.225
PAQLQ	-0.711***	-0.623***	-0.685***	-0.675***
PRQLQ or ARQLQ	0.892***	0.864***	0.801***	0.710***

This table presents the correlation coefficients for the association between the PADQLQ and the symptoms or other HRQLQ. Level of significance: * $P < .05$; ** $P < .01$; *** $P < .001$; P values modified using Bonferroni transformation to allow for multiple comparisons.

TABLE IV. Change in PADQLQ versus change in symptoms and other quality-of-life questionnaires

Change in: (number)	PADQLQ			
	All domains	Practical	Symptoms	Emotions
Eyes and nose symptoms (57)	0.410*	0.455**	0.345	0.163
Chest symptoms (57)	0.284	0.157	0.321	0.083
All symptoms (57)	0.417*	0.405*	0.381	0.155
PRQLQ or ARQLQ (68)	-0.612***	-0.675***	-0.391*	0.171
PAQLQ (65)	-0.452**	-0.377**	0.420**	-0.269

This table presents the correlation coefficients for the association between the change in PADQLQ and the change in symptoms or other HRQLQ. Level of significance: * $P < .05$; ** $P < .01$; *** $P < .001$; P values modified using Bonferroni transformation to allow for multiple comparisons.

The development of the PADQLQ provided intriguing insights into the problems faced by children with grass pollen allergy during the summer months. Many of the predictable features of the allergic history are featured in the list (Table II). However, many less well-known manifestations of allergic disease had high bother scores. Some of these related to other recognized manifestations of rhinoconjunctivitis, such as thirst, sore throat, and headache. Others involved the skin and ears. "Rashes on your skin" was the third most important item, "itchy skin" also featuring in the top 20 items. Other less well-appreciated problems that appeared high in the list were complaints about hearing and "being worn out." Many of these areas are not well covered by the other well-validated questionnaires.^{3,8,9} These items all represent distinct symptoms. Multisystem manifestations of grass pollen allergy have a more pervasive effect on children, impeding many of their daily activities. These performance issues were also captured in the development of the PADQLQ. For example, the chief complaint in this group was "being unable to concentrate," presumably because of a combination of ocular, nasal, pulmonary, and dermatologic symptoms. "Your parents complaining that you don't listen" was ranked 11th, 5 places above complaints about being unable to hear well. Problems with sleep were also ranked highly. All of these performance issues have important implications for the education of this group of children. They recognize this by placing the items "unable to remember things learned at school" and "unable to pay attention during lessons" high on their bother list. These academic problems may have their basis in both the allergic disease process and the therapies used for it.²¹

Within the population selected for validation, the PADQLQ has good cross-sectional validity correlating well with quality-of-life assessments that focus on one organ system. It also has good longitudinal validity and reliability, making it a potentially useful means of assessing the effect of new systemic treatments, for example anti-IgE, leukotriene receptor antagonists, antihistamine, and immunotherapy. A sample size analysis demonstrates that 83 subjects would be required in each group to detect a statistically significant ($P < .05$) difference of 0.5 between the groups (SD, 0.99; power 90%).

This study has a number of limitations. First, the questionnaire was validated in a small group of 36 children and teenagers. However, a much larger number of subjects was used to develop the questionnaire, and the results obtained during the validation exercise are consistent suggesting that the PADQLQ is a valid questionnaire for subjects with seasonal allergic disease. As with any new questionnaire, though, it is critical that it be tested in other larger populations. Second, we have not completely evaluated the extended validity of the questionnaire. As the validation population was ethnically diverse and represented a wide range of socioeconomic groups, the PADQLQ is likely to be useful in other UK populations, but further validation work would be required before it is used in other countries. Last, we have only validated the questionnaire in a group of children and teenagers with seasonal allergic disease. Subjects with perennial problems were included in the development stage, but it is important that the validity of the PADQLQ be tested in this group.

We have developed a health-related quality-of-life questionnaire to assess the multisystem manifestations of

allergic diseases such as grass pollen allergy. It highlights the importance of problems that are often neglected in allergic children as well as the significant impact this disease has on the emotional and educational areas of a child's life. After further validation, this single questionnaire could be used instead of a battery of organ-specific tools in children with systemic allergic disease. This multisystem approach may prove to be a more sensitive approach for evaluating multisystem allergic diseases and their response to systemic treatments.

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APPENDIX

Pediatric allergic disease quality-of-life questionnaire

Think about how much of a problem your allergies have caused you in the past week. Think about all your breathing, eyes, nose, and skin symptoms. Please complete all the following questions by circling the number that best describes how troubled you have been during the last week as a result of your allergies. There are no correct or wrong answers; this is not a test.

HOW MUCH HAVE YOU BEEN TROUBLED BY THE FOLLOWING AS A RESULT OF YOUR ALLERGIES IN THE PAST WEEK?

(1) Being unable to concentrate. (2) Being unable to remember things learnt at school. (3) Being unable to get to sleep or have a good night sleep. (4) Not hearing well. (5) Needing to carry or use medicines, inhalers, or creams. (6) Coughing or wheezing while running or playing a game. (7) Unable to play sport outside. (8) Coughing at night. (9) Coughing or wheezing. (10) Feeling out of breath or tightness in your chest. (11) Needing to rub your eyes. (12) Swollen or puffy eyes. (13) Itchy nose. (14) Blocked or stuffy nose. (15) Needing to rub your nose. (16) Needing to blow your nose. (17) Rashes on your skin. (18) How your skin looks. (19) Being tired or worn out. (20) Feeling thirsty. (21) Dry, itchy, or sore throat. (22) Having a headache. (23) Feeling irritable or frustrated. (24) Being different from your friends. (25) Feeling frightened by the thought of an asthma attack. (26) Think about all the activities that you have done in the past week. How much have you been troubled by your allergies when you were been doing those activities?

Questions are all answered using the following scale: not troubled (0), hardly troubled at all (1), somewhat troubled (2), moderately troubled (3), troubled quite a bit (4), very troubled (5), extremely troubled (6).