

Health-related quality of life in adult rhinitis: The role of perceived control of disease

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Background: Factors affecting health-related quality of life (HRQOL) in adult rhinitis have not been well described.

Objective: To understand how symptom severity, physical functioning, psychological distress, and perceived control of disease relate to HRQOL in a population-based sample of adults with rhinitis.

Methods: We conducted telephone interviews in 109 adults with rhinitis recruited via random digit dialing. We assessed HRQOL by using the Rhinosinusitis Disability Index, physical functioning by using the physical component score of the Short Form-12, and psychological distress by using the Center for Epidemiologic Studies Depression Scale. To evaluate the role of patient-perceived control of disease in rhinitis, we developed a new 8-item instrument, the Perceived Control of Rhinitis Questionnaire.

Results: Lower HRQOL correlated with greater symptom severity ($r = 0.57$), poorer physical functioning ($r = -0.41$), greater psychological distress ($r = 0.44$), and less perceived control ($r = -0.53$). In a multivariate model, symptom severity ($P < .001$), psychological distress ($P < .001$), and perceived control ($P < .001$) were all independent predictors of HRQOL. Adding functional and psychosocial measures to a base model with demographics and disease severity explained an additional 26% of variance in HRQOL.

Conclusions: Although disease severity is an important factor in HRQOL, psychosocial factors, such as perceived control of disease, explain a substantial amount of the variability in HRQOL among adults with rhinitis (J Allergy Clin Immunol 2004;114:845-50.)

Key words: Rhinitis, rhinosinusitis, quality of life, symptom score, perceived control, measurement, questionnaire, validation

Itchy eyes, runny nose, and sinus congestion are a few of the many symptoms reported by persons with rhinitis. Although such symptoms may seem bearable, the effect they have on daily activities may compare to that of more serious medical conditions.¹ As with other airway diseases, clinical research in rhinitis has begun placing a

Abbreviations used

CES-D: Center for Epidemiologic Studies Depression Scale
HRQOL: Health-related quality of life
PCAQ: Perceived Control of Asthma Questionnaire
PCRQ: Perceived Control of Rhinitis Questionnaire
PCS: Physical component score of the Medical Outcomes Study Short Form-12
RSDI: Rhinosinusitis Disability Index
RSS: Rhinitis Symptom Score
SF-12: Medical Outcomes Study Short Form-12

greater emphasis on assessing health-related quality of life (HRQOL).

The Rhinosinusitis Disability Index (RSDI) is one such measure of HRQOL in rhinitis.² Since its introduction, the RSDI has demonstrated reliability in a variety of rhinologic diagnoses.³ The RSDI has shown modest correlation with self-rated symptoms but little to no correlation with disease severity as determined by allergy testing, nasal endoscopy, or computed tomographic imaging.⁴ These findings are consistent with research with other HRQOL measures, such as the Rhinoconjunctivitis Quality of Life Questionnaire.⁵

The lack of strict concordance between clinical measures of disease severity and HRQOL is not surprising. As observed in other chronic health conditions, there are likely to be a number of factors that affect HRQOL in rhinitis. Because HRQOL represents the patient's perspective, the contribution of psychological factors, such as depressed mood, may be substantial. Other factors may also come into play. Studies among subjects with asthma and arthritis have shown that the perception of one's ability to deal with illness, referred to as *perceived control*, influences the way individuals manage their own condition and predicts health outcomes.⁶⁻⁸ Given the degree to which persons with rhinitis often participate in the management of their own symptoms, we hypothesized that perceived control may play a particularly important role in determining rhinitis-specific HRQOL.

In this study, we examine a range of factors likely to explain HRQOL in rhinitis, including disease-specific severity, general health status, depressed mood, and perceived control of disease. We tested the latter by using a new disease-specific instrument, the Perceived Control of Rhinitis Questionnaire (PCRQ), that we developed for this study.

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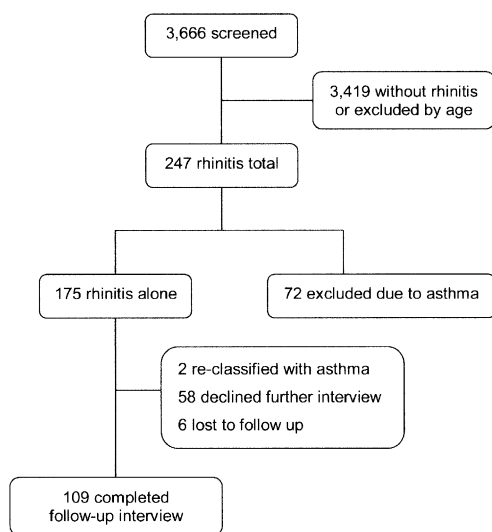


FIG 1. Subject recruitment flow.

METHODS

Subjects

Subjects were drawn from a larger prospective study of persons with asthma, rhinitis, or both. Details of the baseline study design and methods have been previously reported.¹ Briefly, subjects were originally recruited in northern California via random digit dialing during an 8-week period (May to July 1999). Only English- and Spanish-speaking respondents aged 18 to 50 years were enrolled. Approval for the study of human subjects was obtained from the University of California, San Francisco Committee on Human Research.

Subjects were included in our analysis if they reported a physician's diagnosis of allergic rhinitis, sinusitis, hay fever, or chronic postnasal drip, a method consistent with the approach used in the National Health Interview Survey.⁹ Of 3666 individuals screened in the original study, there were 247 adults with a self-reported diagnosis of rhinitis. Seventy-two persons were excluded from this analysis because of concomitant asthma. Of 175 persons with rhinitis alone, 109 (62%) completed a follow-up telephone interview during the summer and fall of the following year (a mean of 17.4 months later), from which our study data were obtained. During the follow-up interview, the same conditions were reascertained to correct any initial misclassification (ie, underreporting of asthma), but this was not the basis of further exclusions (Fig 1).

Interview content

Subjects responded to an interview including general demographic information, history of smoking, self-rated disease severity (mild, moderate, or severe), medication use, and 5 health status measures.

Rhinosinusitis Disability Index. The RSDI is a 30-item disease-specific HRQOL instrument with 3 subscales (emotional, functional, and physical) designed for persons with nasal or sinus disease. Its reliability and validity have been demonstrated in patients with various rhinologic conditions.^{2,3} Higher scores on the RSDI represent worse quality of life (possible range, 0-120).

Rhinitis Symptom Score. The Rhinitis Symptom Score (RSS) was adapted from a 31-item symptom scale validated in patients with asthma and rhinoconjunctivitis.¹⁰ Only 11 items from the original instrument pertaining to eye, nose, and sinus symptoms were in-

cluded in our modified scale. For ease of telephone administration, the number of response options was reduced from 6 to 5 ("no symptoms" to "severe symptoms"), with a higher total score reflecting more severe disease (possible range, 0-44).

Perceived Control of Rhinitis Questionnaire. The 8 items for the PCRQ were adapted from a previously validated 11-item Perceived Control of Asthma Questionnaire (PCAQ).⁶ Questions assess individuals' perceptions of their ability to deal with asthma. Each item was reworded by replacing *asthma* with *nasal condition* (see Appendix). Of the 11 items in the PCAQ, 4 were excluded from the rhinitis version because of poor item-total correlations (<0.2). One new item drawn from the Arthritis Helplessness Index (on which the PCAQ was based) was added.^{7,8} The PCRQ items use a 5-point Likert scale, with higher scores reflecting greater perceived control of rhinitis (possible range, 8-40).

Medical Outcomes Study Short Form-12. The Medical Outcomes Study Short Form-12 (SF-12) is a 12-item version of the SF-36, a generic measure of health status. The reliability, validity, and responsiveness of the SF-12 have been demonstrated in various disease states and are comparable to those of the SF-36.¹¹ Two summary scores, a physical component score (PCS) and a mental component score, can be calculated. Scores range from 0 to 100, with a population mean of 50. Higher scores represent better health status. This study used the PCS as a measure of general physical functioning.

Center for Epidemiologic Studies Depression Scale. The psychometric properties of the Center for Epidemiologic Studies Depression Scale (CES-D) have been demonstrated in a wide variety of clinical groups.^{12,13} The questionnaire consists of 20 items intended to assess depressive symptoms. Because evidence suggests that the CES-D reflects psychological factors in addition to depression,¹⁴ we used the CES-D as a general measure of psychological distress (possible range, 0-60).

Statistical analyses

To compare the baseline characteristics of subjects who completed the follow-up interview with the characteristics of those who did not, we used the Student *t* test for continuous variables and χ^2 tests or χ^2 tests for trend for categorical data. We evaluated the internal consistency of each health status measure by using the Cronbach α and by examining their item-total correlations. For the disease-specific scales (RSDI, RSS, and PCRQ), we also performed factor analysis to determine whether we could identify latent constructs similar to those defined during their initial development. Interrelationships among the health status measures were assessed with Spearman rank-order correlations, because not all scores were normally distributed. To test the independent association of each health status measure with HRQOL while controlling for the other factors, we performed multiple linear regression, treating RSDI as the dependent variable. Demographic data used in these analyses were obtained at the time of the follow-up interview. To further evaluate our findings, we also performed stepwise regression, calculating changes in the model R^2 by using a restricted F test to compare the explanatory power of consecutive models.

RESULTS

Subject characteristics

Table I shows the baseline characteristics of the 175 persons interviewed during the initial recruitment phase. Subjects who completed the follow-up interview ($n = 109$) were similar demographically to those who did not ($n = 66$), with the exception of income. Overall, the study population included in this analysis ($n = 109$) was young

(mean age, 37 years), with a large component of college-educated white women ($n = 46$; 42%). Nearly half the subjects (49%) reported moderate disease, with the remainder almost equally divided between mild (27%) and severe (24%) disease. Although we did not specifically determine recent use of health-care services for rhinitis, the frequency of prescription and nonprescription medication use in the 2 weeks before the interview is consistent with active disease (Table I). In addition, 26 (24%) of subjects reported receiving allergy-desensitization injections.

Performance characteristics of the health status measures analyzed

Descriptive statistics for all 5 scales are summarized in Table II. The PCS and PCRQ scores were both normally distributed, whereas scores of the RSDI, RSS, and CES-D were all skewed toward lower values.

All scales demonstrated good internal consistency. The 30-item RSDI yielded a Cronbach α of 0.97. Factor analysis revealed that the RSDI weighted predominately on a single factor with an eigenvalue of 15.6, which sharply declined to 2.1 for the next factor. Intercorrelation among the RSDI subscales (physical, functional, and emotional) was high, ranging from 0.80 to 0.84 ($P < .001$).

The 8-item PCRQ developed for our study (see the Methods section) demonstrated adequate internal consistency (Cronbach $\alpha = 0.71$). When factor analysis was performed, the eigenvalue of the first factor predominated, accounting for 98% of the variance. Accordingly, all items weighted heavily on the first factor, with loads ranging from 0.38 to 0.62, suggesting that the PCRQ represents primarily a single construct as conceptualized.

Applying factor analysis to the modified 11-item RSS used in our study, we found that all the items weighted on 1 of 3 factors after an orthogonal varimax rotation was performed. These 3 constructs corresponded closely to those defined during the original development of the scale (eye, nose, and sinus).

Performance characteristics of the SF-12 and CES-D have been well described by others. Our findings were consistent with the established validity of these scales.

Interrelationship among disease-specific and generic health status measures

Symptom severity, physical functioning, psychological distress, and perceived control of disease all correlated significantly with the HRQOL measured by the RSDI (Table III). Poorer HRQOL (higher RSDI scores) was associated with greater symptom severity (higher RSS scores), poorer physical functioning (lower PCS scores), and greater psychological distress (higher CES-D scores). When we re-examined these correlations stratifying by type of rhinitis (allergic rhinitis, sinusitis, hay fever, and postnasal drip), we found similar relationships within each stratum.

To assess the concurrent validity of the PCRQ, we examined whether it correlated with the other health status

TABLE I. Baseline characteristics

Characteristic	Completed follow-up interview	
	Yes (n = 109)	No (n = 66)
Age, y, mean (range)	37 (18-50)	36 (18-50)
Female, n (%)	76 (70)	50 (76)
White (non-Hispanic), n (%)*	78 (85)	50 (91)
Education, n (%)		
High school or less	20 (18)	14 (21)
Some college	79 (72)	41 (62)
Graduate degree	10 (9)	11 (17)
Married, n (%)	68 (62)	39 (59)
Income <\$40,000/y, n (%)†‡	29 (28)	26 (43)
Smoking status, n (%)		
Current	16 (15)	11 (17)
Former	28 (26)	20 (30)
Self-rated severity of rhinitis, n (%)		
Mild	29 (27)	22 (33)
Moderate	53 (49)	32 (48)
Severe	26 (24)	12 (18)
Medication use in <2 wk, n (%)		
Nasal steroids	21 (19)	12 (18)
Nonsedating antihistamines	48 (44)	24 (36)
Over-the-counter antihistamines or decongestant	43 (39)	33 (50)

All $P > .05$ unless otherwise indicated.

*There were 17 of 109 and 11 of 66 missing responses to this variable.

†There were 5 of 109 and 6 of 66 missing responses to this variable.

‡ $P = .04$.

measures in the anticipated manner. As shown in Table III, PCRQ scores correlated significantly with all 4 other measures. Lower perceived control was associated with greater symptom severity, poorer physical functioning, greater psychological distress, and worse HRQOL. Among these, the association between perceived control and rhinitis-specific HRQOL was the strongest ($r = 0.53$).

To control for the effects of demographics and smoking on HRQOL, we used multiple linear regression, including age, sex, marital status, income, and smoking status as independent variables. We first considered each health status measure separately as a predictor of HRQOL in a simple model that included demographic covariates. As shown in Table IV, all 4 health status measures were significant predictors of HRQOL. We then retested the strength of these associations by using a multivariate model in which all 4 health measures, plus demographics and smoking status, were added simultaneously. Symptom severity, perceived control of disease, and psychological distress were each independent predictors of HRQOL ($P \leq .0001$), whereas general physical functioning was no longer statistically significant ($P = .27$).

To ascertain the relative contribution of each health status measure to HRQOL, we performed linear regression by adding each measure to the model sequentially (Table V). Symptom severity, perceived control, and psychological distress all contributed significantly to the explanatory power of the model; physical functioning did

TABLE II. HRQOL and health status in 109 adults with rhinitis

Measure	No. items	Cronbach α	Mean (SD)	Median (25% to 75%)	Observed range
Rhinosinusitis Disability Index*					
Total score	30	0.97	24.0 (25.1)	15 (3-41)	0-99
Physical subscale	11	0.92	11.4 (11.0)	9 (2-17)	0-39
Functional subscale	9	0.92	6.0 (7.6)	3 (0-9)	0-34
Emotional subscale	10	0.93	6.6 (8.4)	3 (0-10)	0-36
Disease-specific health status					
Rhinitis Symptom Score*	11	0.90	14.4 (10.3)	14 (5-22)	0-38
Perceived Control of Rhinitis Questionnaire	8	0.71	27.5 (4.6)	28 (25-30)	16-38
Generic health status					
Physical Component Score of SF-12	12	NA	48.5 (8.5)	50.6 (42-56)	22.2-65.0
Center for Epidemiologic Studies Depression Scale*	20	0.92	12.3 (11.3)	9 (5-16)	0-46

NA, Not applicable.

*Not normally distributed.

TABLE III. Correlations among Rhinosinusitis Disability Index and other health status measures

Variable	RSDI	RSS	PCRQ	PCS	CES-D
Rhinosinusitis Disability Index (RSDI)	1.0	—	—	—	—
Rhinitis Symptom Score (RSS)	0.57 (0.43, 0.68)	1.0	—	—	—
Perceived Control of Rhinitis Questionnaire (PCRQ)	−0.53 (−0.65, −0.38)	−0.37 (−0.52, −0.20)	1.0	—	—
SF-12 physical component score (PCS)	−0.41 (−0.56, −0.24)	−0.32 (−0.48, −0.14)	0.23 (0.04, 0.40)	1.0	—
Center for Epidemiologic Studies Depression Scale (CES-D)	0.44 (0.27, 0.58)	0.13* (−0.06, 0.31)	−0.31 (−0.47, −0.13)	−0.18* (−0.35, 0.01)	1.0

Values are Spearman correlation coefficients (95% confidence interval). A higher score on the RSDI represents worse quality of life.

*Nonsignificant correlation ($P > .05$).

not. Our final model explained 62% of the variance in HRQOL, of which psychological factors (PCRQ and CES-D) accounted for 26%.

In separate analyses, we re-evaluated these models, controlling for the potential confounding effects of comorbid conditions: high blood pressure, heart disease, diabetes, peptic ulcer disease, and arthritis. None of these substantially affected the observed relationships (data not shown). Although medication use correlated with symptom severity, it was not an independent predictor of health status or HRQOL and therefore was not included in the models tested.

DISCUSSION

In this study we confirmed the utility of 2 disease-specific measures, the RSDI (measuring HRQOL) and the RSS (measuring symptom severity), while introducing a new disease-specific instrument, the PCRQ, which assesses perceived control of disease in rhinitis. To identify predictors of rhinitis-specific HRQOL, we simultaneously evaluated all 3 disease-specific instruments, along with 2 generic health status measures: one for physical health and the other for depressed mood. These results support

the multidimensional nature of HRQOL in rhinitis while emphasizing the relative importance of perceived control of disease compared with other more traditional measures of health.

Our findings strengthen the validity of the RSDI as a whole. Although the reliability of the RSDI has been investigated in selected patient populations,³ ours is the first assessment of its validity in a population-based sample. The high internal consistency of the RSDI observed in our study was comparable to or greater than that which has been previously reported. Results of our factor analysis, however, did not support a distinct delineation among its purported domains. This was further substantiated by the high degree of intercorrelation among its 3 subscales. When compared with the other health status measures, the RSDI performed in the expected ways: poorer quality of life correlated with greater symptom severity, poorer physical functioning, greater psychological distress, and less perceived control.

As part of this study, we also validated use of the RSS, an 11-item symptom score that can be quickly administered and is specific to rhinitis. Although symptom severity was statistically correlated with rhinitis-specific HRQOL, it explained only a portion of the variability in multivariate modeling. Our findings agree with the results of other

TABLE IV. Effect of health status on HRQOL as measured by the Rhinosinusitis Disability Index

Health status measure	Simple model*		Multivariate model†	
	β (SE)	P value	β (SE)	P value
Rhinitis Symptom Score (RSS)	1.11 (0.21)	<.0001	0.74 (0.18)	<.0001
Perceived Control of Rhinitis Questionnaire (PCRQ)	−2.63 (0.43)	<.0001	−.55 (0.38)	.0001
SF-12 physical component score (PCS)	−0.82 (0.27)	.003	−0.22 (0.20)	.27
Center for Epidemiologic Studies Depression Scale (CES-D)	1.09 (0.18)	<.0001	0.89 (0.15)	<.0001

*Simple model indicates single health status measure plus demographic and smoking covariates.

†Multivariate model indicates all 4 health status measures plus demographic and smoking covariates (as defined in Table I; also see the Methods section).

investigations showing that clinical measures of disease severity correlate poorly with quality of life. In a study by Birch et al⁴ of 53 patients with chronic rhinosinusitis, the RSDI correlated modestly with self-rated symptom scores ($r = 0.4$), but not with endoscopic scores. Another study by Krouse¹⁵ in 48 patients with rhinosinusitis observed a weak correlation between the RSDI and allergy skin testing and showed no correlation with computed tomographic staging. Evidence obtained with other HRQOL measures developed for rhinitis have shown similar results.¹⁶

Although previous investigators have focused solely on correlations between clinical measures and HRQOL, we used multivariate analysis to simultaneously evaluate multiple dimensions of health status and their effect on rhinitis-specific HRQOL. To specifically investigate the role of perceived control in adult rhinitis, we designed the 8-item PCRQ, adapted from an 11-item PCAQ. Our analyses, including the factor analysis, support the PCRQ as a single construct with fair internal consistency. Responses to individual items varied throughout the potential range, and total scores demonstrated a normal distribution, thus providing evidence of the instrument's ability to detect differences among groups. Moreover, the construct validity of the PCRQ was supported by its pattern of relationships with the other health status measures: less perceived control was associated with greater symptoms, worse functioning, greater psychological distress, and worse HRQOL.

Together, disease severity and psychosocial factors account for the bulk of the variability observed in HRQOL. Multivariate analysis indicates that perceived control of disease remains significantly associated with HRQOL, even when the other measures of health status we included were taken into account. On the basis of the comparative strength of association and explanatory power, perceived control of disease seems to be as important as psychological distress and of greater importance than general functional status as measured by the SF-12.

Our study is limited by the relatively small cohort studied, although it was larger than most other studies that have examined HRQOL in rhinitis. Because of the modest sample size, our study had the power to detect only substantial differences in HRQOL. Despite this limitation, we were still able to demonstrate significant associations among the health status measures considered. The fact that

TABLE V. Stepwise regression showing the relative contribution of different health status measures to variance in HRQOL.*

Model	Model R^2	ΔR^2	P value
DEM	0.17	—	—
DEM + RSS	0.36	0.19	<.001
DEM + RSS + PCS	0.38	0.02	.06
DEM + RSS + PCRQ	0.48	0.12	<.001
DEM + RSS + PCRQ + CES-D	0.62	0.14	<.001

DEM, Age, sex, race, marital status, income, and smoking status; RSS, Rhinitis Symptom Score; PCS, physical component score of the SF-12; PCRQ, Perceived Control of Rhinitis Questionnaire; CES-D, Center for Epidemiologic Studies Depression Scale.

*The dependent variable was the Rhinosinusitis Disability Index. Change in R^2 and P values compared models with and without the last added variable.

we found little to no difference in HRQOL among the demographic categories analyzed may be a reflection of our limited sample size.

Another potential limitation of this study is its inability to resolve heterogeneity among the different subtypes of rhinitis included. Subjects were recruited during the spring and early summer but were not asked to classify their symptoms as seasonal or perennial, and therefore we could not draw any conclusions about these specific subgroups. Also of note, HRQOL and health status were not assessed until the summer and fall of the following year. Nevertheless, to the extent that some subjects may report only seasonal symptoms, this would have tended to attenuate our results by biasing toward the null.

Rhinitis-specific quality of life was not assessed in subjects with concomitant asthma, thereby limiting the generalizability of our study to persons with rhinitis alone. Given that perceived control is a known predictor of HRQOL in asthma, we believed that including subjects with concomitant asthma could have confounded the relationship between perceived control and HRQOL in rhinitis. Therefore, we chose to focus our analysis on adult rhinitis without asthma.

We also considered the role of other potential confounders in our analysis. Previous research has suggested that demographic characteristics and disease severity can be associated with both perceived control and HRQOL.^{6,7} To control for these factors, we included them in our final regression model, recognizing that the study was not

designed to have sufficient power to detect the effect of every covariate on the outcome of interest. Although residual confounding is possible, this would be unlikely to change our conclusions substantially, given the strength of the associations observed.

Finally, although these results suggest that perceived control may be an important predictor of HRQOL in adult rhinitis, we cannot infer causality because of the cross-sectional nature of our analysis. Nevertheless, our findings are consistent with longitudinal studies on perceived control in asthma and arthritis using instruments on which the PCRQ was based. These findings have important implications, because they suggest that as health professionals, we need to focus not only on treating symptoms, but also on embracing strategies that will empower our patients to care for themselves. Longitudinal studies in rhinitis are needed to determine whether changes in perceived control will predict HRQOL and health outcomes prospectively.

CONCLUSION

Disease severity accounts for only a portion of the variation observed in rhinitis-specific HRQOL. Our findings suggest that psychosocial factors play an equally important role in explaining HRQOL—particularly an individual's perceived ability to deal with his or her condition. We have demonstrated that the PCRQ is a reliable instrument that can be used to assess perceived control in rhinitis. For the practicing physician, this study emphasizes the importance of educating patients to cope with their rhinitis effectively. Strategies may include teaching patients how to recognize the various symptoms of rhinitis, how to use environmental controls where necessary, and how to take their medications appropriately.

APPENDIX

Eight-item Perceived Control of Rhinitis Questionnaire

Item	Item-total correlation	Response rates (%)				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. My nasal condition is controlling my life	0.40	29.4	49.5	6.4	11.9	2.8
2. Too often, my nasal condition just seems to hit me out of the blue*	0.40	3.7	28.4	5.5	45.9	16.5
3. If I do all the right things, I can successfully manage my nasal condition	0.37	4.6	16.5	9.2	61.5	8.3
4. I can do a lot of things myself to cope with my nasal condition	0.32	1.8	3.7	8.3	73.4	12.8
5. I have considerable ability to control my nasal condition	0.47	0.9	23.9	11.9	54.1	9.2
6. No matter what I do or how hard I try, I just can't seem to get relief from my nasal condition*	0.53	5.5	50.5	11.0	29.4	3.7
7. I am coping effectively with my nasal condition	0.42	2.8	9.2	6.4	63.3	18.4
8. It seems as though fate and other factors beyond my control affect my nasal condition*	0.32	6.4	33.9	18.4	36.7	4.6

*Item is reverse-scored.

REFERENCES

- Blanc PD, Trupin L, Eisner M, Earnest G, Katz PP, Israel L, et al. The work impact of asthma and rhinitis: findings from a population-based survey. *J Clin Epidemiol* 2001;54:610-8.
- Benninger MS, Senior BA. The development of the Rhinosinusitis Disability Index. *Arch Otolaryngol Head Neck Surg* 1997;123:1175-9.
- Senior BA, Glaze C, Benninger MS. Use of the Rhinosinusitis Disability Index (RSDI) in rhinologic disease. *Am J Rhinol* 2001;15:15-20.
- Birch DS, Saleh HA, Wodehouse T, Simpson IN, Mackay IS. Assessing the quality of life for patients with chronic rhinosinusitis using the "Rhinosinusitis Disability Index". *Rhinology* 2001;39:191-6.
- Juniper EF. Measuring health-related quality of life in rhinitis. *J Allergy Clin Immunol* 1997;99:S742-9.
- Katz PP, Yelin EH, Eisner MD, Blanc PD. Perceived control of asthma and quality of life among adults with asthma. *Ann Allergy Asthma Immunol* 2002;89:251-8.
- Nicassio PM, Wallston KA, Callahan LF, Herbert M, Pincus T. The measurement of helplessness in rheumatoid arthritis. The development of the arthritis helplessness index. *J Rheumatol* 1985;12:462-7.
- Stein MJ, Wallston KA, Nicassio PM, Castner NM. Correlates of a clinical classification schema for the arthritis helplessness subscale. *Arthritis Rheum* 1988;31:876-81.
- Pleis JR, Coles R. Summary health statistics for U.S. adults: National Health Interview Survey, 1999. National Center for Health Statistics. *Vital Health Stat* 2003;10:1-14.
- Wasserfallen JB, Gold K, Schulman KA, Baraniuk JN. Development and validation of a rhinoconjunctivitis and asthma symptom score for use as an outcome measure in clinical trials. *J Allergy Clin Immunol* 1997;100:16-22.
- Ware JE Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care* 1996;34:220-33.
- Radloff L. The CES-D Scale: a self-report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385-401.
- Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. *Am J Epidemiol* 1977;106:203-14.
- Orme JG, Reis J, Herz EJ. Factorial and discriminant validity of the Center for Epidemiological Studies Depression (CES-D) scale. *J Clin Psychol* 1986;42:28-33.
- Krouse JH. Computed tomography stage, allergy testing, and quality of life in patients with sinusitis. *Otolaryngol Head Neck Surg* 2000;123:389-92.
- Rhee JS, Book DT, Burzynski M, Smith TL. Quality of life assessment in nasal airway obstruction. *Laryngoscope* 2003;113:1118-22.