Published in final edited form as:

Ann Allergy Asthma Immunol. 2008 May ; 100(5): 433–438. doi:10.1016/S1081-1206(10)60467-X.

The Quick Inventory of Depressive Symptomatology–Self-report: a psychometric evaluation in patients with asthma and major depressive disorder

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Abstract

Background—Despite the high co-occurrence between depression and asthma, few studies have addressed methods assessing the severity of depressive symptoms among patients with asthma.

Objective—To evaluate the psychometric properties of the Quick Inventory of Depressive Symptomatology–Self-report (QIDS-SR₁₆), a 16-item measure of depressive symptom severity, in patients with asthma.

Methods—The psychometric properties of the QIDS-SR₁₆ were compared at treatment exit with those of the 30-item self-report Inventory of Depressive Symptomatology (IDS-SR₃₀) and the 17-item clinician-rated Hamilton Rating Scale for Depression (HRSD₁₇) in 73 outpatients with asthma who were treated with citalopram or placebo for nonpsychotic major depressive disorder. Correlations between the depression rating scales and the Mini Asthma Quality of Life Questionnaire were calculated.

Results—Internal consistency at exit was strong for the QIDS-SR₁₆ (Cronbach α values are .87 for the QIDS-SR₁₆, .95 for the IDS-SR₃₀, and .87 for the HRSD₁₇). The QIDS-SR₁₆ and HRSD₁₇ total scores were highly correlated ($r = 0.85$), as were the QIDS-SR₁₆ and IDS-SR₃₀ total scores ($r = 0.97$). All QIDS-SR₁₆ item total score correlations were significant ($P < .001$). The QIDS-SR₁₆, IDS-SR₃₀, and HRSD₁₇ showed comparable sensitivity to symptom change, indicating high concurrent validity for all 3 scales. The total QIDS-SR₁₆ baseline to exit change score demonstrated a significant negative correlation ($r = -0.49$, $P < .001$) with the Mini Asthma Quality of Life Questionnaire. Thus, greater depressive symptom severity was associated with lower asthma-related quality of life.

Conclusions—The QIDS-SR₁₆ showed good reliability and impressive construct validity. Strong psychometric properties of this brief self-report format and its sensitivity to treatment change suggest that the QIDS-SR₁₆ is a valuable clinical tool.

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Disclosures: Dr Brown received an investigator-initiated research grant from Forest Laboratories, and Dr Rush is a paid consultant and speaker for Forest Laboratories.

INTRODUCTION

Major depressive disorder (MDD) has a lifetime rate of 14% to 25% in the general population, and lifetime rates of 31% to 47% are reported in adults with asthma.^{1–3} A population-based study⁴ in 17 countries (n = 85,088) found that asthma was associated with an elevated risk of depressive disorders (odds ratio, 1.6; 95% confidence interval, 1.4–1.7) and anxiety disorders (odds ratio, 1.7; 95% confidence interval, 1.4–2.1). Depression may be more common in patients with asthma than in patients with other general medical illnesses.^{5,6} A community-based study (n = 3,481) suggested that asthma was associated with a significantly greater risk of suicidal ideation (odds ratio, 2.3) and suicide attempts (odds ratio, 3.5) compared with the general population.⁷ Thus, depression in patients with asthma is an important public health concern.

Identifying and treating depression among patients with asthma are important because when depression and asthma co-occur, service use,⁸ emergency department visits,⁹ hospitalization for asthma,¹⁰ reduced pulmonary function,¹¹ asthma-related death,^{12–15} and medication nonadherence (>11-fold)¹⁶ increase. Effective depression treatment is associated with reduction in asthma symptoms and improved functioning.⁹ However, depression is commonly not recognized or treated in patients with asthma.^{1,2,17,18} Thus, tools to facilitate the detection of clinically significant depressive symptoms and to measure response to treatment in patients with asthma are needed.

Commonly used clinician-rated assessments of depressive symptom severity include the Hamilton Rating Scale for Depression (HRSD)¹⁹ and the Montgomery-Asberg Depression Rating Scale.²⁰ Available self-report instruments for the evaluation of depression in medical settings include the Center for Epidemiologic Studies Depression Scale,²¹ the Hospital Anxiety and Depression Scale,²² the Beck Depression Inventory,²³ and the Patient Health Questionnaire.²⁴ Rodin et al²⁵ provide a more extensive review of instruments for the evaluation of depression in medical settings. Self-report measures have an advantage over clinician-rated instruments in medical settings (eg, asthma clinics) because they do not require staff time or training to administer and can be completed in the waiting room by patients.

The 16-item Quick Inventory of Depressive Symptomatology–Self-report (QIDS-SR₁₆)¹³ is a brief self-report rating scale developed from the 30-item Inventory of Depressive Symptomatology.^{26,27} Selected for the QIDS-SR₁₆ and its equivalent clinician-rated scale, the QIDS-C₁₆, are items that evaluate the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition, Text Revision) (*DSM-IV-TR*)²⁸ 9 depression criterion symptom domains (ie, sad mood, concentration, self-criticism, suicidal ideation, interest, energy/fatigue, sleep disturbance, appetite/weight change, and psychomotor agitation/retardation). The QIDS-SR₁₆ rates symptom domains during the prior 7 days. Each item is scored on a scale from 0 to 3 points. Total scores range from 0 to 27. Studies of the QIDS-SR₁₆ in patients with MDD and bipolar disorder have shown good psychometric properties, including strong internal consistency, concurrent validity, sensitivity to symptom change, and ability to distinguish response and remission.^{27,29} Thus, the QIDS-SR₁₆ is the only brief self-report instrument that assesses all of the clinical domains used in making a diagnosis of MDD based on *DSM-IV-TR* criteria.

The present study evaluates the psychometric properties of the QIDS-SR₁₆, supporting the validity of the QIDS-SR₁₆ as a depressive symptom measurement tool for clinicians to use in patients with asthma.

METHODS

The present report is an analysis of data originally collected for a randomized controlled trial of citalopram vs placebo in adult outpatients with asthma and MDD.³⁰ The study design is described in the following section.

Participants

Ninety patients were recruited for participation in a randomized, double-blind, placebo-controlled trial of the antidepressant citalopram in depressed patients with asthma.

Subjects were identified by routine screening at the asthma clinic at a county hospital and through flyers and other advertisements. Patients included in the randomization met the criteria for asthma based on physician diagnosis, were taking medication for asthma, and met *DSM-IV-TR* criteria for current MDD based on the structured Mini-International Neuropsychiatric Interview.³⁰ Subjects were between 18 and 65 years old, spoke either English or Spanish, and had a current score of 17 or higher on the 17-item Hamilton Rating Scale for Depression (HRSD₁₇). Subjects provided institutional review board–approved written informed consent before participation.

Procedure

Subjects were randomly assigned to 12 weeks of treatment with citalopram, 20 mg/d initially, or placebo. Patients were evaluated at baseline and weeks 1, 2, 4, 8, and 12. If depression response, measured by HRSD₁₇ score, was inadequate at weeks 4 or 8, medication dosage or placebo was increased. Outcomes were obtained by self-report and clinician raters in the subjects' primary language. Details of treatment outcome have been previously published.³⁰

Materials

The 30-item self-report Inventory of Depressive Symptomatology (IDS-SR₃₀)^{26,27} was used to measure depressive symptoms on an item-by-item severity scale of 0 to 3, with possible total scores ranging from 0 to 84. The clinician-rated HRSD_{17,31,32} a depression rating scale commonly used in clinical trials,²⁷ was also administered. On the HRSD₁₇, items 4 to 6, 12 to 14, and 16 to 17 are rated on a 3-point scale, whereas items 1 to 3, 7 to 11, and 15 are rated on a 5-point scale.

In addition, the Mini Asthma Quality of Life Questionnaire (MiniAQLQ), a 15-item measure designed to evaluate functional impairment in adults with asthma,³⁴ was administered at baseline and week 12. Items on the MiniAQLQ are concerned with 4 domains: symptoms, activity limitation, emotional function, and environmental stimuli.

For the present study, scores for the QIDS-SR₁₆ were derived from the IDS-SR₃₀ items that correspond to the 9 depressive symptom criterion domains from the *DSM-IV-TR*. For symptom domains requiring more than 1 item (ie, appetite/weight change, sleep disturbance, and psychomotor agitation/retardation), the response to the highest scored item in the domain is included in the total score. Possible total scores range from 0 to 27 for the 9 domains. General guidelines for interpreting scores are as follows: no depression, less than 5; mild depression, 6 to 10; moderate depression, 11 to 15; severe depression, 16 to 20; and very severe depression, 21 or greater.

Statistical Analyses

Of the 90 patients randomized, 8 did not return for any postbaseline visits and 9 were missing either the HRSD₁₇ or IDS-SR₃₀ score at baseline or postbaseline visits. Thus, 73

patients were available for analysis. Exit scores were used in all analyses, except where indicated. Exit scores are typically preferable to baseline scores because the study enrollment criteria may result in a reduction in the variability of the baseline scores and may have been used in other studies on the psychometric properties of depression measures.^{35–37} This effect may be magnified in the present study because a minimum baseline score on the HRSD₁₇ was part of the inclusion criteria.

Classical Test Theory—The Cronbach α was computed³⁸ to determine internal consistency of the QIDS-SR₁₆ and HRSD₁₇ at baseline and exit. Because the Cronbach α tends to increase along with the number of items, the mean interitem correlations at exit were also reported. Baseline and exit means (SDs) for total score and individual items on the QIDS-SR₁₆ were calculated.

Effect sizes for sensitivity to treatment change (baseline to exit difference, divided by SD of the difference) for the QIDS-SR₁₆ and HRSD₁₇ were computed for both groups combined to determine if certain QIDS-SR₁₆ items were more sensitive to treatment effects over time.

Concurrent validity was calculated using Pearson product moment correlations between the QIDS-SR₁₆ and HRSD₁₇ at baseline and exit and for change from baseline to exit. For both groups combined, corrected individual item-to-total score Spearman rank correlations were computed for the QIDS-SR₁₆ and HRSD₁₇. These correlations were corrected in that the correlations between the item and total score, minus the item, were computed.

The QIDS-SR₁₆ and the HRSD₁₇ were compared in their agreement at identifying response and remission at exit. A reduction of 50% or greater in baseline total score for the scales (QIDS-SR₁₆ and HRSD₁₇) was determined a priori to constitute treatment response. Remission threshold of the QIDS-SR₁₆ total score of 5 or less was determined based on Item Response Theory (IRT) analysis, using scores on the QIDS-SR₁₆ that corresponded to a score of 7 on the HRSD₁₇. The remission threshold of 7 or less on the HRSD₁₇ was established a priori based on consensus in research on the measurement of depressive symptoms.³⁹ To evaluate whether the QIDS-SR₁₆ or HRSD₁₇ had greater likelihood of misclassifying patients as responders or nonresponders, the McNemar test was calculated.

Although all patients in the sample were depressed at baseline, we wanted to see if the QIDS-SR₁₆ could distinguish depressed from nondepressed patients. Therefore, patients with an HRSD₁₇ score of less than 7 were used as a proxy for nondepressed patients and receiver operating characteristic curve analysis was used to determine an optimum QIDS-SR₁₆ threshold to separate depressed from nondepressed patients. The quality index of Kraemer⁴⁰ was used to choose the best threshold. The performance of this threshold was characterized by the percentage correct, sensitivity, specificity, positive predictive value, and negative predictive value.

Spearman rank correlations were obtained to determine if baseline to exit improvement in total scores on the depression scales correlated with reduced functional impairment on the MiniAQLQ. Correlations for individual items on the QIDS-SR₁₆ were also examined for their relationship to perceived quality of life on the MiniAQLQ.

Item Response Theory—Item Response Theory (IRT)^{39,41} was used to establish a conversion between each pair of scales. In other words, given a total score for one scale, a score for another scale was chosen that represented an equivalent degree of symptom severity. Using exit scores, conversion between the QIDS-SR₁₆ total score and the total score on the HRSD₁₇ was estimated using IRT. IRT item parameters were estimated for each item of the QIDS-SR₁₆ and HRSD₁₇. Then, the procedure of Orlando et al (and

associated software)³⁸ was used to equate total scores for each pair of ratings. IRT assumes that a scale is unidimensional (ie, that all items measure the same latent trait). Dimensionality was evaluated by factor analysis.

RESULTS

Table 1 provides the demographic characteristics of the participants. Groups did not differ significantly ($P > .05$) on any demographic characteristic.

Classical Test Theory Analyses

High internal consistency (Cronbach α) was found for all measures using study exit scores ($n = 73$). Internal consistency was equivalent for the QIDS-SR₁₆ and the HRSD₁₇ ($\alpha = .87$). The Cronbach α coefficients increased from base-line to exit measures on the QIDS-SR₁₆ and HRSD₁₇, likely because of the greater range in scores at exit. The QIDS-SR₁₆ showed much stronger baseline internal consistency ($\alpha = .75$) than the HRSD₁₇ ($\alpha = .53$). Mean item intercorrelations at exit were 0.26 for the HRSD₁₇ and 0.45 for the QIDS-SR₁₆.

Table 2 provides baseline and exit item and total score means (SDs) for the QIDS-SR₁₆. A consistent trend toward improvement in depressive symptoms was found for all items.

Total score effect size for change from baseline to exit for the QIDS-SR₁₆ was 1.26 for both groups ($n = 73$). Individual items that showed a large effect size (>0.80)⁴² included sad mood (0.99), energy (1.11), involvement (0.86), and psychomotor change (0.80). Smaller effect sizes were observed for suicidal ideation (0.37), self-outlook (0.53), concentration (0.47), appetite/weight change (0.71), and sleep disturbance (0.61). The total score effect size was 1.35 for the HRSD₁₇ for both groups combined.

At study exit, total scores on the QIDS-SR₁₆ significantly correlated with total HRSD₁₇ scores (0.85) ($n = 73$).

Moderate baseline correlations were found between the HRSD₁₇ and QIDS-SR₁₆ (0.45). Baseline to exit change score correlations were moderate between the HRSD₁₇ and QIDS-SR₁₆ (0.67).

Exit-corrected item-total correlations were computed for the QIDS-SR₁₆. For sleep disturbance, $r = 0.52$; for sad mood, $r = 0.70$; for appetite/weight change, $r = 0.46$; for concentration, $r = 0.69$; for self-outlook, $r = 0.63$; for suicidal ideation, $r = 0.55$; for involvement, $r = 0.66$; for energy, $r = 0.62$; and for psychomotor change, $r = 0.75$. All item-total correlations were significant ($P < .001$). Item-total correlations exceeded 0.60 on all items, except suicidal ideation, appetite/weight change, and sleep disturbance.

On the HRSD₁₇, about one-third (6/17) of items had item-total correlations greater than 0.60, including depressed mood (0.70), guilt (0.63), middle insomnia (0.60), work/interests (0.73), psychic anxiety (0.66), somatic anxiety (0.61), and somatic energy (0.67).

Response and Remission Agreement

The response agreement between the QIDS-SR₁₆ and HRSD₁₇ at exit yielded a $\kappa = 0.56$, whereas the remission agreement between the QIDS-SR₁₆ and HRSD₁₇ yielded a $\kappa = 0.53$. A κ range of 0.41 to 0.60 is considered "moderate agreement."³⁴ A 78.1% response status agreement was found between the HRSD₁₇ and QIDS-SR₁₆. Subject response classification disagreement did not favor either rating in its ability to identify response status according to the McNemar test ($P < .62$).

Remission agreement between the QIDS-SR₁₆ and HRSD₁₇ was 76.7%. Overall, the HRSD₁₇ identified remission and the QIDS-SR₁₆ identified nonremission in 4.1% of patients. However, patients classified as remitters on the QIDS-SR₁₆ were classified as nonremitters on the HRSD₁₇ in 19.2% of subjects. The McNemar test indicated a significant difference ($P < .008$) in disagreement classification patterns, with the QIDS-SR₁₆ classifying patients as remitters and the HRSD₁₇ identifying patients as nonremitters significantly more often than the reverse.

Using an HRSD₁₇ of 7 or less to define absence of depression, as in other trials,⁴³ resulted in 59 depressed patients and 14 nondepressed patients at exit. The best threshold to detect absence of depressive symptoms on the QIDS-SR₁₆ was 4 or less. This threshold correctly identified 80.8% of patients, with a sensitivity of 81.6% and a specificity of 79.2%. The positive predictive value was 88.9%, whereas the negative predictive value was 67.8%.

Spearman rank correlation coefficients were calculated for changes (baseline to exit) in the MiniAQLQ scores ($n = 40$) and changes (baseline to exit) in depression inventory scores to determine if improvement in depressive symptoms correlated with reduced functional impairment. Baseline to exit change in the MiniAQLQ and QIDS-SR₁₆ resulted in a correlation of -0.49 ($P < .001$). The QIDS-SR₁₆ change score shared 23.9% of the variance with the MiniAQLQ change score.

All the individual item change scores on the QIDS-SR₁₆, from baseline to exit, showed negative correlations with the MiniAQLQ change scores. Five QIDS-SR₁₆ items showed significant correlations, with $P < .05$. Items with significant correlations included energy ($r = -0.50$, $P = .001$), sleep disturbance ($r = -0.49$, $P = .001$), sad mood ($r = -0.43$, $P = .006$), involvement ($r = -0.39$, $P = .01$), and concentration ($r = -0.36$, $P = .02$).

IRT Analyses

The requirements of unidimensionality for items on the QIDS-SR₁₆ and HRSD₁₇ were established by an unrotated common factor analysis that showed a dominant main factor (largest eigenvalue, 18.8; next largest eigenvalue, 3.2).

Conversions between the QIDS-SR₁₆ and HRSD₁₇ total scores using all subjects ($n = 73$) are available from one of us (E.S.B.). The QIDS-SR₁₆ total score, multiplied by a factor of 1.6, approximated the HRSD₁₇ total score.

DISCUSSION

Depression is common in patients with asthma. A brief self-report to detect clinically relevant depressive symptoms and monitor treatment response might facilitate the diagnosis and treatment of depression in this population. The QIDS-SR₁₆ is a brief self-report tool quantifying depressive symptom severity. In this report, we compared the QIDS-SR₁₆ with the HRSD₁₇ in a group of depressed outpatients with asthma.

The QIDS-SR₁₆ had acceptable test homogeneity at exit, as shown by the Cronbach α . The QIDS-SR₁₆ seemed to measure a single construct more effectively than the HRSD₁₇ in the present data sample. This may reflect the fact that the QIDS-SR₁₆ measures only the 9 core *DSM-IV-TR* diagnostic criteria and, therefore, adheres most closely to the central concept of depression, whereas the HRSD₁₇ includes anxiety items.

The QIDS-SR₁₆ was sensitive to depressive symptom change in patients with asthma over time. The QIDS-SR₁₆ may show greater sensitivity to remitting depression in patients with asthma than does the HRSD₁₇. Thus, the QIDS-SR₁₆ seems to be an acceptable tool for the

evaluation of depressive symptoms and for the monitoring of depression response to treatment in patients with asthma.

A significant negative correlation between change in the HRSD₁₇ and MiniAQLQ in this sample ($r = -0.51$, $P < .001$) was previously reported.⁹ In this report, a significant negative correlation was found between the QIDS-SR₁₆ and MiniAQLQ. On the QIDS-SR₁₆, the strongest correlation among items associated with improved quality of life was improvement in somatic symptoms of depression, including improved energy and sleep. This finding underscores the relationship between sense of physical wellness and perceived quality of life in patients with asthma. Cognitive and psychological symptoms that led to an increase in quality of life included better concentration, improvement in sad mood, and greater involvement in interpersonal and life activities. Changes in quality of life may be viewed as affirmations of effective treatment of depression and of sensitivity of the QIDS-SR₁₆ to treatment effects.

The QIDS-SR₁₆ has several advantages compared with clinician-administered ratings, such as the HRSD₁₇ in an allergy clinic. The QIDS-SR₁₆ takes only 5 to 7 minutes to complete, can be completed in the waiting room, does not require clinician time, and can be scored quickly. The QIDS-SR₁₆ could be a time-efficient method for evaluating the presence of depressive symptoms and for monitoring treatment outcomes in patients with asthma. The QIDS-SR₁₆ is as sensitive to depression as the HRSD₁₇, and it assesses severity of depressive symptoms and changes in depressive symptoms. Thus, the QIDS-SR₁₆ can also be used to rapidly evaluate response to antidepressant treatment. The QIDS-SR₁₆ is sensitive to treatment response and symptom remission. It can assist physicians in making decisions regarding treatment efficacy or the need to modify medical interventions and medication dosages as treatment for depression progresses.

The study has several limitations. The generalizability of these results may be limited by the small sample size and inclusion and exclusion criteria of the clinical trial from which the data were obtained. Much of the subject sample was Spanish speaking, and the performance and item properties of Spanish versions of measures used in the study may not be identical to English versions.

When patients present with complicated symptoms, including somatic complaints and medication adverse effects, it is challenging to identify the presence of depressive symptoms. The strong psychometric properties of the QIDS-SR₁₆, the self-report format, brief administration time, and sensitivity to treatment effects indicate that it is a valuable clinical tool in providing comprehensive care to patients with asthma. The QIDS-SR₁₆ is in the public domain and can be downloaded (available at: <http://www.ids-qids.org>).

Acknowledgments

Funding Sources: This study was supported by grant MH63133 from the National Institutes of Health (Dr Brown). Study medication was provided by Forest Laboratories.

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Table 1Demographic and Clinical Characteristics of the 73 Study Participants^a

Characteristic	Citalopram group (n =37)	Placebo group (n = 36)	Total (N = 73)
Age, y ^b	40.6 (10.8)	42.7 (10.7)	41.6 (10.7)
Female sex	33 (80.5)	33 (80.5)	60 (82)
Race/ethnicity			
White	2 (5)	4 (11)	6 (8)
African American	15 (41)	11 (31)	26 (36)
Hispanic	19 (51)	21 (58)	40 (55)
American Indian	1 (3)	0	1 (1)
Primary language			
English	20 (54)	20 (56)	40 (55)
Spanish	17 (46)	16 (44)	33 (45)
Annual gross income, \$			
0–15,000	20 (59)	21 (58)	41 (59)
>15,000	14 (41)	15 (42)	29 (41)
Baseline score ^b			
HRSD ₁₇	23.9 (4.4)	23.4 (4.8)	23.7 (4.7)
QIDS-SR ₁₆	14.2 (4.6)	15.7 (5.0)	15.0 (4.8)
FEV ₁ , %	73.5 (18.2)	71.9 (22.7)	72.7 (20.5)

Abbreviations: FEV₁, forced expiratory volume in 1 second; HRSD₁₇, 17-item Hamilton Rating Scale for Depression; QIDS-SR₁₆, 16-item Quick Inventory of Depressive Symptomatology–Self-report.

^aData are given as number (percentage) of each group unless otherwise indicated. Percentages are based on totals for each characteristic.

^bData are given as mean (SD).

Table 2Item and Total Data for the QIDS-SR₁₆ for the 73 Patients at Study Baseline and Exit^a

QIDS-SR ₁₆ item	Baseline	Exit
Sleep disturbance	2.62 (0.72)	1.89 (1.06)
Sad mood	1.97 (0.94)	0.88 (0.99)
Appetite/weight change	1.90 (0.96)	1.04 (1.02)
Concentration	1.40 (0.92)	0.90 (0.99)
Self-outlook	1.38 (1.17)	0.71 (1.16)
Suicidal ideation	0.48 (0.73)	0.19 (0.43)
Involvement	1.66 (1.06)	0.60 (0.94)
Energy	1.75 (0.92)	0.66 (0.80)
Psychomotor change	1.79 (0.85)	0.89 (0.94)
Total	15.00 (4.80)	7.80 (6.00)

Abbreviation: QIDS-SR₁₆, 16-item Quick Inventory of Depressive Symptomatology–Self-report.^aData are given as mean (SD) score.