Development and Validation of the SDDS-PC Screen for Multiple Mental Disorders in Primary Care

W. Eugene Broadhead, MD, PhD; Andrew C. Leon, PhD; Myrna M. Weissman, PhD; James E. Barrett, MD; Robert S. Blacklow, MD; Thomas T. Gilbert, MD, MPH; Martin B. Keller, MD; Mark Olfson, MD; Edmund S. Higgins, MD

Objective: To develop, validate, and cross-validate a patient-completed screen for multiple mental disorders in primary care.

Design: Comparison of a patient self-report screen with an independent diagnostic assessment by mental health professionals using the Structured Clinical Interview for *DSM-III-R* diagnoses as criterion standard.

Setting: Three Rhode Island family practices and a South Carolina family medicine residency.

Subjects: In the initial validation study, 937 patients in Rhode Island were screened; 388 were interviewed. In the cross-validation study, 775 patients were screened in Rhode Island and South Carolina, and 257 were interviewed.

Screen Items: Sixty-two questions pertaining to nine mental disorders and suicidal ideation.

Results: A 16-item screen remained after analysis of item and scale performance. Sensitivity, specificity, and positive predictive value, respectively, were calculated for the following scales: alcohol abuse or dependence (62%, 98%, and 54%), generalized anxiety disorder (90%, 54%, and 5%), major depression (90%, 77%, and 40%), obsessive-compulsive disorder (65%, 73%, and 5%), panic disorder (78%, 80%, and 21%), and suicidal ideation (43%, 91%, and 51%). Replication in a new sample showed attenuated but acceptable operating characteristics for cross-validation.

Conclusions: The Symptom-Driven Diagnostic System for Primary Care screen assesses multiple mental disorders that are common to primary care. It serves as a sensitive, valid, and patient-friendly first step in a new approach to recognizing and managing mental disorders in primary care. Finally, it aids the primary care clinician in selecting an appropriate diagnostic interview module for the disease for which the patient screened positive.

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From Duke University Medical Center, Durham, NC (Dr Broadhead); Cornell University Medical College (Dr Leon), the College of Physicians and Surgeons, Columbia University (Drs Weissman and Olfson), and the New York State Psychiatric Institute (Drs Weissman and Olfson), New York, NY; Dartmouth Medical School, Hanover, NH (Dr Barrett); Northeastern Ohio Universities College of Medicine, Rootstown, OH (Dr Blacklow); Brown University, Providence, RI (Drs Gilbert and Keller); and the Medical University of South Carolina, Charleston (Dr Higgins). Drs Broadhead, Leon, Weissman, Barrett, Keller, Olfson, and Higgins have served as consultants to the UpJohn Co, Kalamazoo, Mich.

ESTIMATES OF the prevalence of mental disorders in primary care practice vary from 9% to 35%.[1-3] Data from the 1980 and 1981 National Ambulatory Medical Care Survey show that almost half of the office visits that result in the diagnosis of a mental disorder are to nonpsychiatric physicians.[4] The Epidemiologic Catchment Area study data show that nearly half of the individuals with mental or addictive disorders who receive treatment are seen in the general medical sector (usually by primary care physicians).[5] Yet, a review of the medical literature reveals that these conditions are often unrecognized, untreated, or undertreated.[6] For example, the morbidity of depression[7-9] and the economic burden of depression and anxiety have been well described in the literature.[10-12] However, recognition rates by primary care physicians of less than 50% for major depression are consistently found,[3,13] except in the most severe cases.[14] Primary care physicians appear to undertreat patients with mental disorders frequently or to overtreat patients by prescribing psychotropic drugs without psychiatric indications.[4,15-20]

Screening questionnaires have been developed to try to improve recognition of mental disorders in primary care practice. These questionnaires either assess general distress, such as the General Health Questionnaire,[21-24] or symptoms of specific mental disorders,[25-30] but they do not screen for multiple specific mental disorders simultaneously.

Arguments against screening include the lack of proven long-term benefit,[31] the psychological risk of false-positive test results, harm to society-at-large by theoretically decreasing compliance with more proven screening tests for other disorders, and harming the physician-patient interaction.[32] Those in favor of using screening

Table 1. Number of Items on Prototype and Final Versions of the Screening Questionnaire for Each Disorder of Interest*

Disorder	62-Item Prototype Version	16-Item Final Version
Alcohol abuse and dependence	3	2
Agoraphobia (without panic)†	3	0
Drug abuse†	2	0
Generalized anxiety disorder	3	2
Major depression	26	5
Panic disorder	6	3
Obsessive-compulsive disorder	4	2
Social phobia†	2	0
Somatization†	10	0
Suicidal ideation	3	2

*Values are the number of items for a given scale.
†Removed from the final questionnaire.

questionnaires are ambivalent at best[33] or advocate for the potential use of questionnaires as case finders for mental disorders only among patients who have a greater prior probability of disorder[34] rather than advocating screening of the general patient population. Neither the Canadian Task Force on the Periodic Health Examination[35] nor the US Preventive Services Task Force[36] recommend screening for depression (the most commonly studied disorder) with established screening questionnaires. Screening is recommended for alcoholism but not for other mental disorders.[36]

However, clinical trials have shown that feedback from screening questionnaire data can significantly improve the rate of physician recognition of depression,[37-40] the rate of treatment of mental disorders,[40,41] and patient outcomes.[41] Naturalistic studies also have demonstrated that recognition and treatment of depression by primary care physicians improved outcomes, but this appears to be restricted to those with concomitant anxiety disorders.[14,42]

Potential explanations for the equivocal success of screening questionnaires include their limitation to single disorders when multiple mental disorders are possible and present in primary care patients and the absence of diagnostic criteria. Two newly developed systems, the PRIME-MD (Primary Care Evaluation of Mental Disorders)[43] and The Symptom-Driven Diagnostic System for Primary Care (SDDS-PC) (The UpJohn Co, Kalamazoo, Mich), are designed to screen for multiple common mental disorders in primary care and include, in a second stage, the application of diagnostic criteria. Both systems have been developed with the intent to increase the primary care physicians' diagnostic accuracy and, thus, the usefulness and likelihood of use of the system.

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In the SDDS-PC, a brief screen for multiple mental disorders is linked to a group of brief disorder-specific, criterion-based interview modules, which include medical "rule outs." These modules are based on *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition* (*DSM-III-R*)[44] criteria for each mental disorder and assist the physician in making specific mental disorder diagnoses. The screen scores for the diagnoses indicate which modules are appropriate to use. The screen is designed to be a brief, easy to use, and efficient way to simultaneously screen for multiple mental disorders in a primary care setting. The screen results can be followed by the appropriate confirmatory test: a brief structured interview by the patient's own physician or nurse.

The principal objectives of the two studies reported herein were to develop the brief screen and then to test its validity. Thus, two independent studies were conducted: an initial screen validation study and a cross-validation study. The design of the second study was based on the results of the first.

STUDY 1: THE INITIAL SCREEN VALIDATION STUDY

Methods

Subjects and Sampling. The initial screen validation study was conducted in the spring and summer of 1992 in three private family practice offices in cooperation with the Departments of Family Medicine and Psychiatry of Brown University, Providence, RI. The six full-time and one part-time board-certified family physicians and two nurse practitioners served both urban and suburban populations drawn from Rhode Island and neighboring Massachusetts. All consenting patients between 18 and 70 years of age who were able to read and write English were eligible. Pregnant women were excluded, as well as patients who did not have a face-to-face visit with the physician (eg, patients who only had laboratory work done). No patient was included in the sample twice.

A two-stage assessment procedure was used. Research assistants rotated between the three waiting rooms, and during their assigned recruitment times, they approached all possible eligible patients before patient visits with the physician. Recruitment times were assigned based on the availability of the research assistants. All consenting eligible patients were first screened and then asked to participate in a diagnostic interview (the Structured Clinical Interview for the *DSM-III-R*,[45,46] version P [SCID-P]). Screens were scored while the patients were seeing their physicians. Afterward, for the subset of consenting patients, the research assistants scheduled interviews with the SCID-P interviewers, who did not have prior knowledge of the patients' screen scores or the diagnoses made by the physicians. Patients from two of the Rhode Island family practices underwent in-person SCID-P interviews at the Brown University Department of Psychiatry nearby. Patients from the third practice were interviewed with the SCID-P at that office during periods of low patient volume. The SCID-P interviews were scheduled to be conducted as soon as possible but no later than 2 weeks after the initial screening questionnaire.

The Initial Screening Questionnaire. The prototype screening questionnaire included 62 items designed to be brief and easy to read, with yes and no answers based on a 1-month symptom recall window. Items were selected from a pool of questions used to screen patients for family genetic studies conducted by one of us (M.M.W.). Additional items were developed by us and selected through the use of focus groups of primary care physicians. **Table 1**

lists the 10 psychiatric diagnoses of interest, and the number of items on the prototype screening questionnaire expected to relate to each diagnosis.

Diagnostic Criteria. The diagnostic standard for this study was the SCID,[45,46] which has a standardized format designed for use by mental health professionals in making psychiatric diagnoses according to the *DSM-III-R*. For this study, the SCID-P version, which was developed by Michael First, MD, J. Williams DSW, R. Spitzer, MD, and M. Gibbon, PhD (unpublished data, 1991) for the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*)[47] dysthymia and major depression field trial, was used. For each of the disorders listed in Table 1 and for each patient, it was ascertained whether that disorder was present in the last month, with the exception of generalized anxiety disorder (GAD), for which a 6-month period was used.

Reflecting the comorbidity or coexistence of mental disorders in any population, some patients screened positive for one or more disorders or met the criteria for one or more SCID-P diagnoses. As a result, patients could be used in the analysis of operating characteristics for more than one diagnosis.

Training took place under the supervision of one of us (M.B.K.) in the Department of Psychiatric and Human Sciences at Brown University School of Medicine. Three of the five interviewers had master's degrees in psychology or counseling, and the two interviewers with bachelor's degrees had extensive clinical experience in these areas. Training generally involved instructional videos and 4 days of didactic training, mock interviews with feedback, observation of interviews, and testing using training videotapes as standards. Throughout the study, all interviews were edited for clinical and clerical accuracy, and feedback and suggestions regarding diagnostic issues were given to the interviewers as necessary.

Additional Validity Criteria. General construct validity criteria for all the diagnoses were three social impairment items that were developed for studies of genetic epidemiology by one of us (M.M.W.) and that address patient assessment of the following factors within the past month: their own emotional health, whether they had missed work or school or were unable to do housework because of emotional problems, and whether they got along with their spouse or partner. The Global Assessment Scale,[48] a self-rating of overall functioning on a scale of 0 to 100, also was used to examine the construct validity of the screens.

As a specific construct validity criterion for the disorder of major depression, the Burnam depression scale,[49] an eight-item screen for depression that was developed for the Medical Outcomes Study,[50] was used. As a specific construct validity criterion for alcoholism or alcohol abuse, the four CAGE[51] (cutting down, annoyance by criticism, guilty feeling, and eye openers) questions were given in a self-administered format.

Finally, information was obtained on patient attitudes about the questionnaire from a survey designed by the authors for this study.

Statistical Analyses. For each of the 10 disorders in Table 1, all possible subsets of the symptoms identified in advance by us as relevant for each disorder were examined. The patient's score for each subset was the number of items in the subset that were endorsed by the patient. The best subset of items for each diagnosis was selected in the following manner: each subset and each possible cutoff point for the resulting score were evaluated against the corresponding diagnostic criterion diagnosis for sensitivity, specificity, positive predictive value (PPV), and negative predictive value. Because of the large number of depression symptoms, only those symptoms that were most strongly associated with the SCID-P diagnosis (10 of 26 items based on stepwise logistic regression analysis) were examined in these analyses. The operating characteristics were calculated using the algorithms presented in Kraemer[52] for a prospective design. This strategy was used because a subset of patients who were screened also received the SCID-P. For each diagnosis, the choice of the best test (selection of items and cutoff points used to describe a positive screen result) was made to optimize sensitivity, specificity, and PPV while minimizing the number of items used. If the performance of the prototype was uniformly poor for all subsets of items of a diagnosis, it was removed from further consideration.

Table 2. Demographic Distributions for Patients Screened With the SDDS-PC Screening Questionnaire in the Initial Validation and Cross-Validation Studies*

Variable	Initial Validation Study†	Cross-Validation Study‡	P
Sex, No. (%)			
F	282 (72.9)	204 (79.4)	.06§
M	105 (27.1)	53 (20.6)	
Race, No. (%)			
W	380 (97.9)	184 (71.9)	<.001§
B	1 (0.3)	67 (26.2)	
Other	7 (1.8)	5 (2.0)	
Marital status, No. (%)			
Married	246 (64.4)	126 (49.6)	
Living with someone	20 (5.2)	21 (8.3)	.003§
Widowed	11 (2.9)	10 (3.9)	
Separated or divorced	34 (8.9)	40 (15.7)	
Never married	71 (18.6)	57 (22.4)	
Education, No. (%)			
Less than ninth grade	6 (1.6)	12 (4.7)	
High school	106 (27.7)	75 (29.4)	.001§
Some college	94 (24.6)	84 (32.9)	
Graduated college	176 (46.1)	84 (32.9)	
Age, y (mean±SD)	39.4±12.4	40.3±13.2	.38‖

*SDDS-PC (The UpJohn Co, Kalamazoo, Mich) indicates Symptom-Driven Diagnostic System for Primary Care.
†Took place in Rhode Island.
‡Took place in Rhode Island and South Carolina.
§P value obtained using the χ^2 test.
‖P value obtained using the t test.

Results

Patient Flow and Characteristics. A total of 1360 patients were approached to participate, and 937 were screened (a consent rate of 69%). Face-to-face SCID-P interviews were completed with 388 patients (29% of those approached, or 41% of those screened) in the initial validation study. Nonrespondents included those who made

direct refusals, missed appointments, or could not be contacted within 2 weeks. A comparison of those who were screened but not interviewed with those who were interviewed revealed no significant differences in age, gender, or education. Nonwhites were less likely (27%) to be interviewed than were whites (40%) (P=.007). Single persons were less apt to be interviewed (34%) than were married persons (43%) (P=.03).

The SCID-P interview took place within 14 days for 50% of the patients. The patients who were interviewed in the initial validation study (**Table 2**) were mostly female (72%), white (98%), and married (59%). Most had some college education (67%). Their mean age was 38.5 years.

Most patients (84%) believed that the initial screening questionnaire would help their physicians; 45% thought that it was helpful to themselves. Completion of the assessment package, which included demographic questions, the Burnam questionnaire, additional questions on depression, CAGE questions, social impairment questions, and patient opinions, took 10 to 15 minutes for 87% of the patients. Most patients (93%) did not find the assessment package confusing; 22% thought it was too long.

Selection of Items. Four of the diagnoses (agoraphobia without panic disorder, drug abuse, social phobia, and somatoform disorder) could not be identified easily using the prototype SDDS-PC screen questions. These diagnoses had poor sensitivities or PPVs and therefore were eliminated from further consideration in this study. For the remaining six disorders, the items selected and the best cutoff points are presented in **Table 3**. The selection procedure reduced the list of items used in the validation study to 16 from the 62 items that were tested in the prototype. The 16 items listed in Table 3 are, word for word, identical to the questionnaire, which has yes and no boxes in which the patients can mark their responses. The questions were, however, in random order.

Performance Characteristics. Sensitivity, specificity, PPV, negative predictive value, efficiency, and Cohen's κ for the resulting 16-item screen are presented separately for each disorder in **Table 4**.

The co-occurrence of other SCID-P diagnoses was examined for the two diagnoses with the lowest screen PPVs. Forty-one percent of the patients with a false-positive screen result for GAD had another SCID-P diagnosis or significant suicidal ideation. Patients with false-positive screen results for obsessive-compulsive disorder (OCD) had another SCID-P diagnosis or significant suicidal ideation 50% of the time.

Further Validity Results. The SDDS-PC depression and alcoholism screens were compared with two existing screens in **Table 5**. Patients with SCID-P major depression or positive SDDS-PC depression screen results had higher Burnam depression scale scores than did patients without major depression or with negative screen results for depression. Patients with SCID-P alcohol abuse or dependence or positive SDDS-PC alcohol abuse or dependence screen results had higher CAGE scores than did those with negative screen results or those who did not have SCID-P diagnoses of alcohol abuse or dependence.

Table 3. Sixteen SDDS-PC Screen Items and Cutoff Points*

Disorder	Items†	Cutoff Points
Alcohol abuse and dependence	Drinking in the morning Drinking too much	Any 1 item
Generalized anxiety disorder	Anxiety Nervousness	Any 1 item
Major depression	Crying Feeling sad or blue‡ Unhappiness Loss of pleasure	Any 2 items
Obsessive-compulsive disorder	Cleaning things over and over Same thoughts over and over	Any 1 item
Panic disorder	Fear Fear of crowds Sudden panic attack	Any 1 item
Suicidal ideation	Wishing you were dead Thoughts of death	Any 1 item

**SDDS-PC (The UpJohn Co, Kalamazoo, Mich) indicates Symptom-Driven Diagnostic System for Primary Care.*

†Sixteen items selected from the 62-item prototype by a best subset analysis. Items are listed verbatim from the questionnaire where they are used in a yes or no format.

‡For analyses purposes, the items "feeling sad" and "feeling blue" were combined.

The performance of the six SDDS-PC subtests in comparison with the general validation criterion of global functioning is presented in **Table 6**. For each diagnosis, those with positive screen results were functioning at significantly lower levels than those with negative results. The presence of one or more functional impairments is shown for major depression and panic disorder in **Table 7**. Patients with positive screen results for a given disorder or patients who had the disorder had higher rates of having one or more impairments.

STUDY 2: THE CROSS-VALIDATION STUDY

Methods

Subjects and Sampling. The cross-validation study done in the winter and spring of 1993 used the same eligibility criteria. It was conducted at two sites: the same Rhode Island practices as were used in the initial validation study and the family medicine residency practice of 10 medical residents who were associated with the Medical University of South Carolina, Charleston. Patients who had previously participated in the initial validation study were excluded from the cross-validation study at Brown University. The data reported herein were collected as part of a larger study evaluating the second step of the SDDS-PC, ie, modular diagnostic interviews for suicidal ideation and five diagnoses covered by the SDDS-PC screen.

Procedures for screening patients from the Rhode Island site were the same as those done in the initial validation study. The South Carolina site had one research assistant who recruited eligible patients from a few physicians' practices within the residency program on any given sampling day.

Unlike the initial validation study, a two-stage sampling method was used to select patients to interview based on the

Table 4. Initial Validation of Six SDDS-PC Tests by SCID-P Diagnoses*

Test†	Sensitivity, %	Specificity, %	PPV, %	NPV, %	Efficiency, %	κ
Alcohol abuse and dependence (n=12)	61.8	98.2	53.8	98.7	96.9	56.0
Generalized anxiety disorder (n=12)	89.8	54.0	5.4	99.5	55.0	5.1
Major depression (n=61)	90.4	77.2	39.7	98.0	79.1	44.1
Obsessive-compulsive disorder (n=8)	64.5	72.5	5.1	98.9	72.4	5.6
Panic disorder (n=27)	78.3	80.0	20.8	98.2	79.9	25.4
Suicidal ideation (n=70)	43.6	90.6	50.8	87.8	82.1	36.2

*SDDS-PC (The UpJohn Co, Kalamazoo, Mich) indicates Symptom-Driven Diagnostic System for Primary Care; SCID-P, Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition, version P; PPV, positive predictive value; and NPV, negative predictive value.

†n indicates the number of patients with this SCID-P diagnosis. A two-staged sampling strategy was used to select the sample that received the SCID-P. For that reason, prevalence estimates could not be obtained directly from these data. In a forthcoming manuscript, Bayesian procedures will be applied to make such estimates.

screening results. All who tested positive for a disorder on the screening test and a random sample of those who tested negative for the disorders were asked to complete the SCID-P interview.

The Screening Questionnaire. In this study, a 54-item screen was used that included all 16 items selected in the initial validation study just presented. The 54 items were a subset of the original 62; item selection was based on internal consistency analyses. The definition of a positive test result for each disorder accords with that presented in Table 3.

Diagnostic Criteria. The diagnostic criteria were the same as those in the initial validation study. The three SCID-P interviewers in South Carolina received the same training as the Rhode Island SCID-P interviewers. In South Carolina, a pilot study of 17 interviews was audiotaped and reviewed by the trainer from Brown University to ensure cross-site comparability. Feedback provided further training and adherence to a standard interviewing technique across both sites. Interviews were scheduled so that they would be completed within 72 hours. Patients were asked to complete an in-person interview or were offered a telephone interview if the in-person interview was not possible within the allotted time. The validity of telephone interviews in psychiatric disorders has been well documented.[53-55]

Results

Patient Flow and Characteristics. A total of 2089 subjects were approached, of whom 775 (37%) agreed to be screened and 257 (12%) completed the SCID-P. Table 2 presents the descriptors for patients who were screened in the cross-validation study. In the cross-validation study, 50% of the SCID-P interviews were completed within 5 days of the screen. Ninety-nine percent were completed within 14 days.

Cross-Validation Results. **Table 8** includes the performance characteristics of the five SDDS-PC screens that were developed in the initial validation study.

COMMENT

To evaluate the potential usefulness of the SDDS-PC screen, it must first be determined whether it meets some basic requirements for screening tests:

1. It should be inexpensive and easy to provide for large numbers of people. A 16-item paper-and-pencil or computerized screen easily meets this criterion.

2. It must screen for disorders or conditions with one or more generally accepted and effective treatments. This is true of the five disorders studied herein. Suicidal ideation is managed as part of one or more of the other disorders.

3. Because of the serious consequences that mental disorders pose to society, the test must be highly sensitive, ie, a high proportion of all cases must be detected by the test. This is certainly true of the more prevalent depression and anxiety disorder components of the SDDS-PC screen, with only moderate sensitivities for alcohol abuse and OCD.

4. For disorders in which false-positive test results may lead to increased cost and inconvenience to the patient and society, as well as to an increased risk of iatrogenic illness resulting from further evaluation, a low rate of false-positive results (high PPV) is desirable. The PPVs for the SDDS-PC screen are reasonable for alcohol abuse, major depression, panic disorder, and suicidal ideation. The risk and inconvenience for those tests with lower PPVs (GAD and OCD) is low.

The SDDS-PC screen is not diagnostic and should only trigger the use of a more specific test, for example, the appropriate SDDS-PC diagnostic interview module. The diagnostic interview module component, still under evaluation (M.M.W., unpublished data, 1994), is also a low-cost pencil-and-paper or computerized assessment instrument. Its greatest cost is the 5 to 10 minutes needed for the clinician or nurse to administer the appropriate interview module(s) for the patient with a positive screen result. It does not entail referral to a psychiatrist or psychologist, nor does it involve medically risky or expensive diagnostic or therapeutic interventions such as endoscopy, biopsy, or radiography. Because the SDDS-PC screen is not diagnostic, the stigma of a mental disorder diagnosis in a patient without mental illness should not be an issue.

Another factor to consider in evaluating the SDDS-PC screen involves comparing it with other tests for mental disorders. The SDDS-PC screen has been compared with two general and non–disease-specific mental health checklists, the Hopkins Symptom Checklist[23] and the General Health Questionnaire,[26] at their standard cutoff points (in other samples). The sensitivities of the SDDS-PC screen

Table 5. Specific Validation Criteria: The Burnam and CAGE Questionnaires in 388 Rhode Island Family Practice Patients (Initial Validation Study)*

Test	Test Result: Negative	Test Result: Positive	*t*	*P*
Depression (Burnam Scale Scores)				
SCID-P major depression	0.05 (0.13)	0.39 (0.32)	−8.07	<.001
SDDS-PC depression	0.02 (0.04)	0.25 (0.29)	−9.50	<.001
Alcohol (CAGE Scores)				
SCID alcohol abuse and dependence	0.31 (0.79)	2.00 (1.60)	−3.65	.004
SDDS-PC alcohol abuse and dependence	0.30 (0.78)	2.31 (1.11)	−6.48	<.001

**CAGE stands for cutting down, annoyance by criticism, guilty feeling, and eye openers; SCID-P, Structured Clinical Interview for the* Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition, *version P; and SDDS-PC (The UpJohn Co, Kalamazoo, Mich), Symptom-Driven Diagnostic System for Primary Care. Values in parentheses indicate SDs.*

Table 6. General Validation Criteria: The Global Assessment Scale in a Screening Sample of 937 Patients in Rhode Island (Initial Validation Study)*

Diagnosis	Negative Result of Screen	Positive Result of Screen
Alcohol abuse or dependence	70.38 (9.91)	57.62 (12.14)
Generalized anxiety disorder	74.75 (7.25)	65.68 (10.62)
Major depression	74.13 (7.50)	62.65 (10.30)
Obsessive-compulsive disorder	72.62 (9.05)	63.71 (10.17)
Panic disorder	72.94 (8.56)	62.03 (10.13)
Suicidal ideation	70.91 (9.60)	64.58 (11.98)

**P<.001 for all diagnoses.*

Table 7. General Validation Criteria: Functional Impairment (Rate per 100 Patients) for Major Depression and Panic Disorder (Initial Validation Study)*

Diagnosis	Screen Result	SCID-P Result†	No. of Patients	Rate of Impairment‡
Major depression	−	−	239	15.5
	−	+	5	60.0
	+	−	82	53.7
	+	+	56	89.3
Panic disorder	−	−	273	24.5
	−	+	5	40.0
	+	−	82	58.5
	+	+	22	81.8

**Impairment rates are not shown for the other diagnoses, which occurred too infrequently to make meaningful comparisons. Minus sign indicates negative; plus sign, positive.*

†Complete screen, Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition, version P *(SCID-P), and impairment data are available on only 382 patients of the 937 screened.*

‡Impairment is present if at least one of the following factors is endorsed: feeling in poor emotional health, missing work or school, or not getting along with partner.

in the initial validation study (Table 4) were higher than the Hopkins Symptom Checklist and the General Health Questionnaire, respectively, reported for the major depression scale (90.4% vs 84.8% and 85.7%) and the panic disorder scale (78.3% vs 45.5% and 55.8% for anxiety disorders).[56] The alcohol abuse or dependence sensitivity is also greater (61.8% vs 46.6% and 56.4% for all substance abuse disorders).[56]

Finally, a comparison of the SDDS-PC screen with commonly used biomedical tests may permit a better assessment of its potential usefulness in primary care practice. **Table 9**[57-61] lists examples of five commonly used tests and their corresponding sensitivities and positive predictive values. The sensitivities of the SDDS-PC screen are all within the range of these generally accepted tests, and PPVs appear to be better overall, in comparison. However, the PPVs for OCD and GAD are nonetheless quite low.

Based on these general assessments of the SDDS-PC screen, it appears to be as good as existing mental health screens at meeting the requirements of a useful screening instrument. The SDDS-PC screen provides the further advantage of screening for multiple disorders in a very brief format, thereby giving it more utility in primary care than the existing single-disorder, longer screens. Some additional comments are necessary, however.

The low sensitivity of the suicidal ideation screen indicates that this screen should not be used independently, apart from the rest of the 16-item screen. Nor should it be used in the absence of an interview when suicidal ideation is suspected. However, the strong PPV of this screen gives it great potential when coupled with the three screens that are typically associated with suicide and suicidal ideation (major depression, alcohol abuse or dependence, and panic disorder) to assist the primary care clinician in detecting unsuspected suicidal ideation.

The PPV is a function of sensitivity, specificity, and prevalence.[62] Thus, low PPVs for GAD and OCD largely may be due to the low prevalence of these disorders (12 cases and eight cases, respectively). Nevertheless, it is likely that in future applications, the majority of those who screen positive for GAD and OCD will have false-positive results. In addition, the GAD and OCD screens are sensitive to other mental disorders in patients who do not have GAD or OCD. That is, when positive, the GAD and OCD screens are strong although nonspecific predictors of mental illness.

The low PPV of the GAD scale also in part may be due to the 1-month duration requirement for the screen vs the 6-month duration specification of the *DSM-III-R* and the SCID-P. A review of some patients who screened positive for GAD but did not meet SCID-P diagnostic standards showed that many of these patients experienced the GAD symptoms but did not meet the duration criteria.

The screens for four diagnoses that are potentially relevant to primary care (agoraphobia, drug abuse, social phobia, and somatoform disorder) did not withstand the requirements of our test development procedures. This may be related to conceptual issues of detecting these disorders with a written test or to the brevity of the scales, which may not have permitted detection of a disorder with a broad array of presenting symptoms. For example, somatoform disorder that meets full *DSM-III-R* criteria is rare in primary care, so evaluation of the somatization scale against

Table 8. Cross-Validation of Six SDDS-PC Screen Tests by SCID-P Diagnoses in 257 Family Practice Patients From Rhode Island and South Carolina*

Test†	Sensitivity, %	Specificity, %	PPV, %	NPV, %	Efficiency, %	κ
Alcohol abuse and dependence (n=10)	37.6	98.9	60.0	97.2	96.2	44.3
Generalized anxiety disorder (n=14)	84.8	59.8	10.5	98.6	61.1	10.3
Major depression (n=47)	66.6	82.7	43.0	92.7	80.0	40.4
Obsessive-compulsive disorder (n=10)	24.3	81.2	4.9	96.4	79.1	1.9
Panic disorder (n=16)	65.3	83.5	19.6	97.5	82.4	23.3
Suicidal ideation (n=34)	62.7	91.5	48.0	95.2	88.4	47.8

**SDDS-PC (The UpJohn Co, Kalamazoo, Mich) indicates Symptom-Driven Diagnostic System for Primary Care; SCID-P, Structured Clinical Interview for the* Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition, *version P; PPV, positive predictive value; and NPV, negative predictive value.*

†n indicates the number of patients with this diagnosis according to the SCID-P. A two-staged sampling strategy was used to select the sample that received the SCID-P. For that reason, prevalence estimates could not be obtained directly from these data. In a forthcoming manuscript, Bayesian procedures will be applied to make such estimates.

Table 9. Examples of Sensitivities and Positive Predictive Values (PPVs) of Five Common Medical Laboratory Tests in Primary Care

Laboratory Test	No. of Tests Done	Sensitivity, %	PPV, %
Papanicolaou test[57]	748 871	80	73
Mammography[58]	27 114	93	10
Hemoccult[59]	1473	25	8
Prostate-specific antigen[60]	1002	81	24
Digital rectal examination[61]	2425	58	28

subthreshold syndromes (abridged[63] or borderline[64] somatization disorder), which are prevalent in primary care practices, may have resulted in a usable screen.

Another subthreshold syndrome described in primary care is "minor depression" (not including dysthymia or chronic depression), which has a greater prevalence (3.6% to 9.2%) than does major depression[2,65] and has significant associated morbidity in some dimensions that is similar to major depression.[7-9] Patients with minor depression also have an increased risk of developing major depression within 1 to 2 years.[7,8] Although of apparent relevance to primary care, attempts to develop a screen for minor depression as part of the initial validation study were unsuccessful. Sensitivities were good, but despite a moderately high prevalence, the PPV for minor depression was too low (8%) for screening nonselected patients.

The consistent results of the cross-validation study support the potential usefulness of these scales. The attenuation in sensitivities and other measures from the initial validation study is expected. Optimization of scales in one sample of subjects by selecting items to achieve certain desirable characteristics or to reduce scale length generally results in a reduction in performance when tested in a different sample. In addition, the results hold up despite significant differences in race, marital status, and education. This suggests generalizability of the SDDS-PC screen to broader ethnic and social groups than were present in the initial validation. However, the small sample size for some disorders in these two studies prevents further analysis of this issue.

The large refusal rates evident in these two studies limit the generalizability of the findings. Although there are mild differences in race and marital status between those who were screened and those who were finally interviewed, there may be other unmeasured characteristics that predict whether a person finished the study that may affect results.

The refusal rate is possibly an artifact of the study design. We asked active, busy, and often employed primary care patients to return for a face-to-face SCID-P interview on their own time. This may explain the low rates with which patients returned for this second phase of the evaluation. The higher refusal rates in the cross-validation study may have resulted from the complexity of adding the diagnostic interview modules to the protocol. These refusal rates may be reduced in future studies by paying participants and conducting the diagnostic interviews by telephone at times convenient to the patient. Such strategies are being used successfully in a second cross-validation of the SDDS-PC screen and diagnostic interview modules and have been described in other studies.[54,55]

Finally, the SDDS-PC screen has never been tested in its 16-item version. Rather, these 16 items have been imbedded in longer versions. The effects of adjacent items within the questionnaire on patient responses are not predictable. Only testing of the 16-item version in a standalone format will indicate the true operating characteristics of this screen.

CONCLUSIONS

The SDDS-PC screen is a diagnostic aid comprising three components that has been developed to assist primary care physicians in identifying specific mental disorders. In this article, the findings relative to the first component of the SDDS-PC, a brief (16-item) screening questionnaire, are presented. The findings relative to the second component of the SDDS-PC, symptom-specific diagnostic modules (5-minute physician-administered structured interviews based on psychiatric diagnostic criteria specified in the *DSM-III-R*), will be presented in a forthcoming paper. An evaluation of patient progress based on the first two components of the SDDS-PC (the screen and the diagnostic modules) can be recorded over time on a longitudinal tracking form, which accounts for the third component of the SDDS-PC.

The SDDS-PC screening questionnaire is designed to be self-administered by patients. It can detect from 62% to 90% of all patients with the disorders for which it screens. It also correctly classifies most of those without the disor-

ders. The rate of false-positive test results is excellent for alcohol abuse or dependence, major depression, and panic disorder. Patients who screen positive for OCD or GAD also are likely to have some mental disorder worthy of physician recognition and intervention. Revision and further testing is necessary to reduce the number of false-positive results and to make these two scales more useful as first-stage screens.

This screen was designed for screening unselected patients, but it is expected that some physicians will prefer to use it for case finding in high risk groups (such as those with chronic medical problems or those expressing emotional distress), as has been recommended by Coulehan et al[65] (depression screening). This also may be appropriate, but the screen has not been evaluated under such conditions.

The SDDS-PC screen offers evaluation of multiple mental disorders simultaneously, something currently available single-disorder screens are unable to do, thereby easing the burden of the primary care physician who is assessing patients with mental disorder symptoms. It has performance characteristics similar to other screening tests in primary care.

The entire SDDS-PC system is designed to assist in the treatment and follow-up of patients with mental disorders by helping the physician to target specific areas of concern. The use of the SDDS-PC as a training device in primary care residency programs was suggested by the family physicians in private practice who participated in this study and who noted their own experiences of learning about diagnoses they had not previously considered.

This is an interim report of a screening tool under development. A study is under way to upgrade the SDDS-PC screen with a new drug abuse and dependence scale and with revisions of the OCD and GAD scales. The screen and diagnostic interview modules have been revised to be consistent with the *DSM-IV*,[47] the criterion standard for the study. Later studies are planned to assess the effects of using the SDDS-PC on patient outcomes and health care delivery.

Because of its potential to increase clinical efficiency, the SDDS-PC conceivably could become a significant component of a health care system reform initiative with both fee-for-service and managed care clinicians. Although the extent of its effect has yet to be determined, the SDDS-PC has additional potential to decrease health care use and the costs of medical care by identifying treatable mental disorders in primary care that can generate significant costs when they remain unrecognized.

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Gerald L. Klerman, MD, was the initial principal investigator of this project until his death in April 1992. He served a prominent role in the design of the questionnaire and the studies. The three-part, symptom-driven system that constitutes the SDDS-PC was conceptualized at The Upjohn Co, which has sponsored and supported its development through its Pharmacosurveillance Unit (James A. Coleman, Director, and George B. Gross, Senior Project Manager) and its Health Care Economics and Policy Research Unit (Don Buesching, PhD, Senior Medical Sociologist).

Allen Frances, MD (Duke University, Durham, NC); Helena Kraemer, PhD (Stanford [Calif] University); and Larry Culpepper, MD, and Vince Hunt (Brown University School of Medicine) provided advice. Christina Provencal (Brown University School of Medicine) and Lois Zemp (University of South Carolina, Columbia) were site project coordinators. Christina Provencal supervised the interviewer training at both sites. Robert Moore, DrPH (Columbia University, New York, NY), assisted in data collection and management, and Christina Hoven, DrPH (Columbia University), Laura Portera (Cornell University Medical Center, New York, NY), and Jessica Tse (Duke University) assisted in the data analysis. The participating physicians and the Advisory Council members (leaders from organizations with an interest in primary care mental health who met with the investigators and provided input into the project) are listed in the box below.

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Reprint requests to Ambulatory Services of Danville, 142 S Main St, Danville, VA 24541 (Dr Broadhead).

Participating Physicians and Advisory Council Members

Participating Physicians

Medical University of South Carolina, Charleston: David B. Alzenman, MD; Clive D. Brock, MD, ChB; David R. Garr, MD; Barry L. Hainer, MD; A. Cleve Hurson, MD; Robert C. Jones, MD; Steven M. Ornstein, MD; J. Howard Rupard, MD, PhD; Mark T. Simon, MD.

Brown University, Providence, RI: David P. Carter, MD; Colleen A. Cleary, MD; Gary M. Cummins, MD; Arthur A. Frazzano, MD; Margaret S. Lytton, MD; Margaret Tryforos, MD; and Ira G. Warshaw, MD.

Advisory Council

Macaran Baird, MD (State University of New York Health Science Center, Syracuse); Dave Baron, DO (American Osteopathic Association, Chicago, Ill); Susan Blumenthal, MD (Assistant Surgeon General); Jorge A. Costa e Silva (World Health Organization, Geneva, Switzerland); Leah Dickstein, MD (University of Louisville [Ky] School of Medicine); Mary Jane England, MD (Washington [DC] Business Group on Health); Shervert H. Frazier, MD (McLean Hospital, Bethesda, Md); Roman H. Hendrickson, MD (American Academy of Family Physicians, Kansas City, Mo); Norman B. Kahn, MD (American Academy of Family Physicians); Kathryn Magruder, PhD (National Institute of Health, Bethesda); Harold A. Pincus, MD (American Psychiatric Association, Washington, DC); Darrell A. Regier, MD, MPH (National Institute of Mental Health, Bethesda); Rene Rodriguez, MD (National Confederation of Hispanic American Medical Association, Jackson Heights, NY); Richard Ruppert, MD (American Society of Internal Medicine, Washington, DC); Norman Sartorius, MD (World Health Organization); Richard Steinhilber, MD (Cleveland [Ohio] Clinic Foundation); William Van Stone, MD (Department of Veterans Affairs, Washington, DC); Elinor Walker (Agency for Health Care Policy and Research, Rockville, Md); Paul Young, MD (American Board of Family Practice, Lexington, Ky). Their presence on the Advisory Council in no way signifies an endorsement by these individuals or organizations.

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