

## Using five questions to screen for five common mental disorders in primary care: diagnostic accuracy of the Anxiety and Depression Detector<sup>☆</sup>

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### Abstract

**Objective:** Primary care providers are increasingly taking on the role of ad hoc mental health provider. However, before patients in primary care can be treated, they must be identified. This study set out to validate a very brief screening instrument for identifying primary care patients with anxiety and depression.

**Method:** Eight hundred one primary care patients completed a questionnaire screening for (1) panic disorder, posttraumatic stress disorder (PTSD) and social phobia, or (2) panic disorder, generalized anxiety disorder (GAD) and major depression. Screening was followed by a diagnostic interview. The properties of the questionnaires were examined to identify a small set of items that effectively and efficiently screened for panic disorder, PTSD, social phobia, GAD and depression.

**Results:** Five items were selected across the two versions of the questionnaire, comprising the Anxiety and Depression Detector (the ADD). The sensitivities for the items ranged from 0.62 to 1.00, and the specificity values ranged from 0.56 to 0.83. When a “yes” answer to any of the screening questions was used to predict the presence of any diagnosis, sensitivity values were 0.92 to 0.96 and specificity values were 0.57 to 0.82. Sensitivity and specificity values varied little by gender, age or ethnicity.

**Conclusions:** The five items of the ADD appear to comprise a useful screening device for anxiety and depressive disorders in primary care settings.

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**Keywords:** Primary care; Common mental disorders; Anxiety and Depression Detector

### 1. Introduction

Over the past decade, the bridge between medical and mental health care has become increasingly solid, as has the primary care provider's role in psychiatric care. Approximately 20% of primary care patients have had at least one diagnosable mental disorder in the past year [1], and 10–25%

have a current anxiety or depressive disorder [2,3]. Perhaps more importantly, emotionally distressed patients are several times more likely to see a medical provider than a mental health specialist [4]. The individual and societal costs for anxiety and depressive disorders, including decrements in functioning [3,5–8], lost work and productivity [5,9], and increased health care costs [10–15] underscore the need for treatment. Unfortunately, treatment is received by less than half of emotionally distressed primary care patients [5,7]. The research community has responded to the need for treatment by developing programs designed for the primary care setting [16–19].

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Before patients can be treated, however, they must be identified. In the absence of systematic screening, 30–40% [2,20–23] of patients with anxiety and depression are identified in primary care settings. Some reviews of published studies indicate that screening, on its own, does not improve patient outcomes [24–26]. Other reviews, however, concluded that there are beneficial effects of providing screening results to clinicians, with larger benefits when screening is combined with effective treatment and follow-up [27–29]. Recently, the United States Preventive Services Task Force (USPSTF) [27] published their recommendation that depression screening take place when appropriate diagnosis, treatment and follow-up are available.

The literature described above has focused almost exclusively on depression in primary care, whereas anxiety disorders have been virtually ignored. In fact, there is little controversy surrounding the issue of screening for anxiety because guidelines, or even suggestions, for screening for anxiety are almost nonexistent [30]. This is despite the fact that, when compared with depression, anxiety disorders are similarly prevalent [3,7] and patients with anxiety disorders suffer from decrements in functioning similar to patients with depression [5,31] or chronic diseases such as diabetes and congestive heart failure [31].

In considering the implementation of a screening program, one clear barrier is that the current screens are either lengthy [32–35] (even a scale such as the nine-item PHQ-9 [36] is probably too long when screening for multiple disorders), focus on a single disorder (e.g., panic disorder) [37] or both [38,39]. Several studies have indicated that a lengthy instrument is not necessary. For example, in a review of 18 studies reporting the properties of nine screening instruments for depression, ranging in length from 2 to 28 items, there were no differences in sensitivities or specificities of the screening instruments, leading the authors to conclude that one screen was as good as another, and choice of screening instrument could be based on the clinician's preferences and reasons for use [40]. Although others [41] have suggested using a series of single items (followed by longer assessments to assign diagnoses) to screen for multiple disorders, the psychometric properties of screens assessing multiple disorders, each with a single item, have not been assessed. An approach that has come close, however, is the identification of a few items that serve as clinical predictors, such as a general anxiety or depression screen, recent stress, a count of physical symptoms or relationship difficulties, the combination of which may identify primary care patients with psychiatric needs [45,46].

Are there patient characteristics, such as gender or ethnicity, that reliably influence the effectiveness of a screening instrument? To the best of our knowledge, prior studies have not set out to evaluate the effects of patient characteristics on screening results. The present study examined this question while assessing the diagnostic accuracy of a very brief five-item screening questionnaire for anxiety and depressive disorders in primary care.

## 2. Method

The study was conducted as part of the Collaborative Care for Anxiety and Panic (CCAP) study [16,17,42] and included patients from university-affiliated primary care clinics in Seattle and southern California. A total of 12,724 patients were approached and asked to participate in the study by one of 52 undergraduate research assistants during a visit to one of the clinics. Screening took place at various days and times over a 25-month period with a special effort made to sample from all possible days and times.

Of the patients who were approached, 4409 patients (34.7%) did not complete the screening questionnaire, either because they refused or were ineligible. Reasons for not completing the screening questionnaire included lack of interest (34.4%), having completed the screening questionnaire on a prior visit (16.1%), inability to speak English proficiently (9.5%), lack of time (7.8%), not having a primary care provider affiliated with the study (5.9%), being too ill (5.1%) and being above or below the age limits of the study (2.2%). An additional 13.7% of patients had another reason or did not provide a reason for not participating in the study, and 5.2% left the clinic without returning the questionnaire to the research assistant. The only data available for approached patients who did not participate in the study were the participants' gender, with 39.8% of the approached patients and 39.9% of the refusers being male [ $\chi^2(1)=.03$ , NS]. Patients' gender did not affect whether eligible patients agreed to participate in the interview [ $\chi^2(1)=3.30$ , NS], nor did it affect whether eligible patients who agreed actually completed the interview [ $\chi^2(1)=2.39$ , NS].

A total of 7738 patients completed a screening questionnaire. Patients ( $N=1494$ ) were considered eligible for the interview portion of the study if they screened positively for panic disorder, social phobia, posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD) or depression. Of these eligible patients, 867 agreed to participate in the interview. An additional sample of randomly selected patients ( $N=1107$ ) who screened negatively for everything was also considered eligible for the interview, and 452 agreed to participate. Of these patients, 569 screening positively actually completed the interview, and 232 screening negatively completed it. Selected patients who screened negatively on all items were less likely to agree to participate in the interview [41% vs. 58%;  $\chi^2(1)=75.27$ ,  $P<.01$ ] and were less likely to actually complete the interview after having agreed to participate [51% vs. 66%;  $\chi^2(1)=25.48$ ,  $P<.01$ ]. Data were not available regarding reasons for refusal, but patients often stated a lack of interest in completing the interview. Patients who had initially agreed to complete the interview but failed to do so were patients who did not respond to attempts to schedule the interview, stated they had changed their mind about being interviewed or no-showed for scheduled interviews.

Recruitment took place between February 1, 2000, and January 15, 2002. Undergraduate research assistants approached patients in the waiting rooms of the primary care clinics and asked patients to complete a screening questionnaire. The research assistants then evaluated the questionnaire and recruited eligible patients for a telephone interview. Patients who agreed to participate were contacted to complete the telephone interview portion of the study (median time between screening and interview=14 days), which consisted of the computerized version of the Composite International Diagnostic Interview (CIDI-Auto) [43]. Patients were paid \$20.00 for participation in the telephone interview. The institutional review board at each site reviewed and approved the research protocol, and all patients completing the CIDI provided informed, written consent.

## 2.1. Measures

### 2.1.1. Screening questionnaire

Patients completed a pencil-and-paper screening questionnaire. There were two versions of the screening questionnaire, and each patient completed one of the two versions. Patients recruited in the first 20 months of the study completed Version A, and patients in the final 5 months of the study completed Version B.

The original screening questionnaires contained two items screening for panic disorder and either (a) two questions each for social phobia and PTSD or (b) two items each for depression and GAD, for a total of six screening items per questionnaire. A “yes” answer to an item was considered a positive screen. The panic disorder items were previously validated in a primary care sample [27], and the remaining items were developed by the investigators. For social phobia and GAD, these items represented key aspects of the disorder, and for PTSD and major depression the items represent key symptoms of disorders. The items were not changed or refined over the testing period. In addition to the six screening items, each questionnaire included 11 items assessing demographic characteristics and exclusion criteria (psychiatric disability compensation, pregnancy, active psychiatric treatment and plans to leave the area) for the CCAP study. The exclusion criteria applied only to patients screening positively for panic disorder, as they would, upon completion of the diagnostic interview, be enrolled in the treatment study.

To reduce the number of items used in the screening questionnaire, the sensitivity and specificity of each screening item (or a meaningful combination of items) were examined in a randomly selected subsample (approximately 50%) of patients. For each diagnosis, the better-performing item was selected, and the specificity and sensitivity of each item were validated in a second randomly selected subsample (the remaining 50%) of patients. For the PTSD items, each item was examined independently and a combination of the items was also examined such that a yes

answer to either question (regarding flashbacks and nightmares) was considered a positive response, and the two items were combined into a single question. The results of these analyses are presented in Table 1, and the Anxiety and Depression Detector (ADD) can be found in Appendix A. Because these analyses are consistent with results of analyses using the full sample, the results using the entire sample are reported for the remaining analyses.

### 2.1.2. Composite International Diagnostic Interview

The reference standard for establishing diagnostic accuracy of the ADD was the interviewer-administered computerized version of the CIDI-Auto, version 2.1 [43]. The CIDI-Auto was administered during a telephone interview by one of 19 trained CIDI interviewers, and diagnoses were obtained for major depression, GAD, panic disorder, social phobia and PTSD. The CIDI-Auto is a fully structured interview in which each of the questions from the CIDI is presented on a computer screen, and the interviewer inputs the respondents’ answers directly into the computer. A database of responses is compiled for automatic scoring, which provides *DSM-IV* diagnoses. The CIDI-Auto was chosen as the reference standard because it is well

Table 1  
Split-half item analyses

| Item                                                                         | Sensitivity | Specificity |
|------------------------------------------------------------------------------|-------------|-------------|
| <i>Performance of items in randomly selected half of sample</i>              |             |             |
| Panic item 1 (heart suddenly raced, felt faint)                              | 0.80        | 0.78        |
| <b>Panic item 2 (suddenly feeling anxious)</b>                               | <b>0.92</b> | <b>0.75</b> |
| PTSD item 1 (had a terrible experience)                                      | 0.82        | 0.54        |
| PTSD items 1 and 2 (terrible experience and nightmares)                      | 0.49        | 0.88        |
| PTSD items 1 and 3 (terrible experience and flashbacks)                      | 0.62        | 0.84        |
| <b>PTSD items 1 and 4 (terrible experience and flashbacks or nightmares)</b> | <b>0.68</b> | <b>0.81</b> |
| Social phobia item 1 (nervous around people)                                 | 0.94        | 0.53        |
| <b>Social phobia item 2 (being nervous around people is a problem)</b>       | <b>0.76</b> | <b>0.77</b> |
| GAD screen question 1 (spend a lot of time worrying)                         | 0.88        | 0.48        |
| <b>GAD screen question 2 (bothered by nerves)</b>                            | <b>1.00</b> | <b>0.59</b> |
| Depression screen question 1 (felt sad, empty, or depressed)                 | 0.76        | 0.71        |
| <b>Depression screen question 2 (lost interest in things)</b>                | <b>0.84</b> | <b>0.69</b> |
| <i>Cross-validation of better-performing items in second half of sample</i>  |             |             |
| Panic item 2 (suddenly feeling anxious)                                      | 0.91        | 0.73        |
| PTSD items 1 and 4 (terrible experience and flashbacks or nightmares)        | 0.55        | 0.84        |
| Social phobia item 2 (being nervous around people is a problem)              | 0.63        | 0.75        |
| GAD screen question 2 (bothered by nerves)                                   | 1.00        | 0.54        |
| Depression screen question 2 (lost interest in things)                       | 0.88        | 0.77        |

All items are included in the top portion of the table, with the better performing items in bold. The better-performing items are reexamined in the second subsample, presented in the bottom half of the table.

established as a reliable diagnostic interview that can be administered by lay interviewers, making it practical for a study in which large numbers of patients were being interviewed. The interviewers had research experience or a bachelor's degree or both in psychology or psychiatry. Interviewers were not blind to the results of the screening questionnaire as some of the content in the remainder of the telephone interview (not pertinent to this study) was determined by their screening status.

To increase the clinical validity for *DSM-IV* diagnoses, some questions were modified and some exclusion rules were changed. Modifications included follow-up probes added to the panic disorder module that were designed to confirm the accuracy of negative answers. In addition, hierarchy rules inconsistent with *DSM-IV* were removed. A full description of and rationale for modifications is provided elsewhere [44].

### 2.1.3. Measures of impairment

Patients completed the 12-item version of the Medical Outcomes Study Short-Form Health Survey (SF-12) [45]. The SF-12 [45] contains a physical component summary (PCS), which provides an indication of overall physical health and is predictive of working at a paying job, hospitalization and mortality [46]. The questionnaire also contains a mental component summary (MCS), which provides an indication of overall mental health, correlates with measures of quality of life and predicts a diagnosis of depression and mental health treatment [46]. The SF-12 PCS accounts for 91% of the variance in the SF-36 PCS, and SF-12 MCS accounts for 92% of the variance in the SF-36 MCS [45].

As a further indication of functioning and disability, five screening items from the World Health Organization Disability Scale II [47,48] were also included. The WHODAS-II assesses limitations experienced by individuals when certain activities are performed, without regard to medical or mental diagnoses [49]. In the present study, five screening items from the WHODAS-II provided a brief indicator of disability. The items ask about difficulties experienced in carrying out physical and mental tasks, such as standing for long periods, completing household responsibilities or learning a new task. Difficulty completing each

task is rated on a five-point scale from “none” to “extreme/cannot do.”

### 2.2. Analyses

Sensitivity and specificity are reported for each screening question. We also present positive likelihood ratios, which provide the odds that a positive test result would be expected in a patient with (as opposed to without) the associated diagnosis. Confidence intervals for likelihood ratios were computed as recommended by Simel et al. [50]. In addition, we computed positive predictive values (PPV), which reflect the percentage of positive screens that are accurate. Because this statistic is affected by prevalence rates, we also present these values for a hypothetical sample that has a prevalence rate more similar to that established for these disorders in primary care in the published literature.

$\chi^2$  Analyses were used to determine the influence of demographic variables on participation rates. Because there were site differences in rates of participation and demographics, Cochran's Mantel–Haenszel  $\chi^2$  values are reported, controlling for site. Logistic regression analysis was used to determine the influence of demographic characteristics and comorbidity on the accuracy of the screening items.

## 3. Results

Approximately 62% of participating patients were female, and 38% were male. Patients ranged in age from 18 to 79 (mean=41.49, S.D.=12.48). The sample was fairly well educated, with 5% having less than a high school education, 17% having a high school diploma, 35% having completed technical school or some college, 27% having a college degree and 16% identifying graduate school as their highest level of education. Patients were asked to identify themselves as belonging to one or more of the following ethnic groups: African American (16%), Asian (4%), Pacific Islander (2%), Caucasian (65%), Hispanic (10%), Native American (3%) or other (4%).

$\chi^2$  Analyses were conducted to determine whether sociodemographic variables predicted differential rates of participation, controlling for site differences. These analyses indicated that eligible patients were less likely to participate

Table 2  
Prevalence rates and demographic characteristics of the sample

|                  | Total | Men         | Women       | Caucasians  | Non-Caucasians |
|------------------|-------|-------------|-------------|-------------|----------------|
| All participants | 801   | 303 (37.8%) | 498 (62.2%) | 518 (64.8%) | 281 (35.2%)    |
| Panic disorder   | 36.8% | 34.7%       | 38.2%       | 36.9%       | 36.7%          |
| PTSD             | 18.5% | 19.1%       | 18.2%       | 15.5%*      | 23.9%*         |
| Social phobia    | 25.9% | 22.8%       | 27.8%       | 24.8%       | 28.0%          |
| GAD <sup>a</sup> | 27.7% | 24.8%       | 29.6%       | 26.2%       | 30.5%          |
| Major depression | 39.8% | 35.6%       | 42.3%       | 38.7%       | 41.8%          |
| Any diagnosis    | 60.5% | 54.3%*      | 64.2%*      | 59.8%       | 61.8%          |

<sup>a</sup> A subset of patients (*N*=307) received the GAD module.

\* Prevalence rates in the same row with two asterisks are significantly different from one another at the *P*<.01 level.

Table 3

Correspondence between screening questions and diagnoses for all participants

| Diagnosis                 |          | Diagnosis |          | BR (%) | Sensitivity | Specificity | +LR (95% CI) |
|---------------------------|----------|-----------|----------|--------|-------------|-------------|--------------|
|                           |          | Positive  | Negative |        |             |             |              |
| <i>Diagnosis-specific</i> |          |           |          |        |             |             |              |
| Panic screen              | Positive | 270       | 133      | 36.8   | 0.92        | 0.74        | 3.48         |
|                           | Negative | 25        | 372      |        |             |             | (2.99–4.04)  |
| PTSD screen               | Positive | 86        | 95       | 20.4   | 0.62        | 0.83        | 3.54         |
|                           | Negative | 53        | 449      |        |             |             | (2.83–4.43)  |
| Social phobia screen      | Positive | 128       | 119      | 27.3   | 0.69        | 0.76        | 2.87         |
|                           | Negative | 58        | 377      |        |             |             | (2.39–3.45)  |
| GAD screen                | Positive | 30        | 37       | 26.1   | 10.00       | 0.56        | 2.30         |
|                           | Negative | 0         | 48       |        |             |             | (1.80–2.93)  |
| Depression screen         | Positive | 35        | 20       | 35.7   | 0.85        | 0.73        | 3.16         |
|                           | Negative | 6         | 54       |        |             |             | (2.13–4.69)  |
| <i>Any disorder</i>       |          |           |          |        |             |             |              |
| Panic screen              | Positive | 110       | 12       | 50.7   | 0.72        | 0.92        | 8.93         |
|                           | Negative | 43        | 137      |        |             |             | (5.14–15.50) |
| PTSD screen               | Positive | 32        | 8        | 52.4   | 0.33        | 0.91        | 3.63         |
|                           | Negative | 66        | 81       |        |             |             | (1.77–7.46)  |
| Social phobia screen      | Positive | 49        | 6        | 52.2   | 0.51        | 0.93        | 7.49         |
|                           | Negative | 48        | 83       |        |             |             | (3.38–16.63) |
| GAD screen                | Positive | 48        | 19       | 47.8   | 0.87        | 0.68        | 2.76         |
|                           | Negative | 7         | 41       |        |             |             | (1.88–4.05)  |
| Depression screen         | Positive | 43        | 12       | 47.8   | 0.78        | 0.80        | 3.91         |
|                           | Negative | 12        | 48       |        |             |             | (2.31–6.61)  |
| <i>Version A</i>          |          |           |          |        |             |             |              |
| Panic disorder            | Positive | 267       | 223      | 40.1   | 0.97        | 0.46        | 1.79         |
|                           | Negative | 8         | 188      |        |             |             | (1.63–1.96)  |
| PTSD                      | Positive | 133       | 354      | 20.4   | 0.96        | 0.35        | 1.47         |
|                           | Negative | 6         | 190      |        |             |             | (1.37–1.58)  |
| Social phobia             | Positive | 178       | 309      | 27.2   | 0.96        | 0.38        | 1.54         |
|                           | Negative | 8         | 188      |        |             |             | (1.43–1.66)  |
| GAD                       | Positive | 52        | 59       | 28.6   | 0.95        | 0.57        | 2.20         |
|                           | Negative | 3         | 78       |        |             |             | (1.79–2.69)  |
| Depression                | Positive | 254       | 234      | 40.5   | 0.92        | 0.43        | 1.59         |
|                           | Negative | 23        | 173      |        |             |             | (1.46–1.75)  |
| <i>Version B</i>          |          |           |          |        |             |             |              |
| Panic disorder            | Positive | 20        | 59       | 17.4   | 1           | 0.38        | 1.61         |
|                           | Negative | 0         | 36       |        |             |             | (1.38–1.88)  |
| PTSD                      | Positive | 9         | 70       | 7.8    | 1           | 0.34        | 1.51         |
|                           | Negative | 0         | 36       |        |             |             | (1.32–1.74)  |
| Social phobia             | Positive | 20        | 59       | 18.3   | 0.95        | 0.37        | 1.52         |
|                           | Negative | 1         | 35       |        |             |             | (1.26–1.82)  |
| GAD                       | Positive | 30        | 49       | 26.1   | 1           | 0.42        | 1.73         |
|                           | Negative | 0         | 36       |        |             |             | (1.45–2.08)  |
| Depression                | Positive | 40        | 39       | 35.7   | 0.98        | 0.47        | 1.85         |
|                           | Negative | 1         | 35       |        |             |             | (1.48–2.31)  |

Numbers in the second section of the table (under the heading “Any disorder”) reflect the use of each screening question to detect *any* diagnosis, rather than only the diagnosis associated with the question. Numbers in the third and fourth sections of the table (under the headings “Version A” and “Version B”) reflect the use of each of the three-item versions of the questionnaire to detect each individual disorder. BR, base rate; +LR, positive likelihood ratio.

if they were male (Mantel–Haenszel  $\chi^2=8.89$ ,  $P<.01$ ), were Asian (Mantel–Haenszel  $\chi^2=17.13$ ,  $P<.01$ ), had attended or completed graduate school (Mantel–Haenszel  $\chi^2=12.02$ ,  $P<.01$ ) or described their health as good or better (Mantel–Haenszel  $\chi^2=15.75$ ,  $P<.01$ ).

### 3.1. Properties and utility of the screening items

A breakdown of the sample by gender and ethnicity (Caucasian vs. non-Caucasian) along with rates of the

diagnoses in the sample is presented in Table 2. Rates of anxiety and depression in the sample are higher than would be expected in the target population because the sample was not random, but was selected based on screening status (including a random subsample of patients who did not screen positively for any disorder). A majority of patients had at least one disorder, but 40% of the sample had no diagnosis. Not reflected in Table 2 are comorbidity rates: approximately 17% of the sample had two disorders and an

Table 4

Estimates of PPV at sample and estimated population prevalence rates

| Sample characteristics                                        |                   |          |     | Estimated population characteristics |                  |          |     |
|---------------------------------------------------------------|-------------------|----------|-----|--------------------------------------|------------------|----------|-----|
| Panic disorder: sensitivity=0.92, specificity=0.74            |                   |          |     |                                      |                  |          |     |
| Prevalence=0.37                                               |                   |          |     | Prevalence=0.05                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 270               | 133      | 403 | Positive                             | 37               | 198      | 235 |
| Negative                                                      | 25                | 372      | 397 | Negative                             | 3                | 562      | 565 |
| Sum                                                           | 295               | 505      |     | Sum                                  | 40               | 760      |     |
|                                                               | PPV=270/403=67.0% |          |     |                                      | PPV=37/235=15.7% |          |     |
| PTSD: sensitivity=0.62, specificity=0.83                      |                   |          |     |                                      |                  |          |     |
| Prevalence=0.20                                               |                   |          |     | Prevalence=0.07                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 86                | 95       | 181 | Positive                             | 30               | 109      | 139 |
| Negative                                                      | 53                | 449      | 502 | Negative                             | 18               | 530      | 548 |
| Sum                                                           | 139               | 544      |     | Sum                                  | 48               | 639      |     |
|                                                               | PPV=86/181=47.5%  |          |     |                                      | PPV=30/139=21.6% |          |     |
| Social phobia: sensitivity=0.69, specificity=0.76             |                   |          |     |                                      |                  |          |     |
| Prevalence=0.27                                               |                   |          |     | Prevalence=0.08                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 128               | 119      | 247 | Positive                             | 38               | 150      | 188 |
| Negative                                                      | 58                | 377      | 435 | Negative                             | 17               | 477      | 494 |
| Sum                                                           | 186               | 496      |     | Sum                                  | 55               | 627      |     |
|                                                               | PPV=128/247=51.8% |          |     |                                      | PPV=38/188=20.2% |          |     |
| GAD: sensitivity=1.00, specificity=0.56                       |                   |          |     |                                      |                  |          |     |
| Prevalence=0.26                                               |                   |          |     | Prevalence=0.06                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 30                | 37       | 67  | Positive                             | 7                | 48       | 55  |
| Negative                                                      | 0                 | 48       | 48  | Negative                             | 0                | 60       | 60  |
| Sum                                                           | 30                | 85       |     | Sum                                  | 7                | 108      |     |
|                                                               | PPV=30/67=44.8%   |          |     |                                      | PPV=7/55=12.7%   |          |     |
| Depression: sensitivity=0.85, specificity=0.73                |                   |          |     |                                      |                  |          |     |
| Prevalence=0.36                                               |                   |          |     | Prevalence=0.07                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 35                | 20       | 55  | Positive                             | 7                | 29       | 36  |
| Negative                                                      | 6                 | 54       | 60  | Negative                             | 1                | 78       | 79  |
| Sum                                                           | 41                | 74       |     | Sum                                  | 8                | 107      |     |
|                                                               | PPV=35/55=63.6%   |          |     |                                      | PPV=7/36=19.4%   |          |     |
| Version A — Any diagnosis: sensitivity=0.92, specificity=0.82 |                   |          |     |                                      |                  |          |     |
| Prevalence=0.52                                               |                   |          |     | Prevalence=0.20                      |                  |          |     |
| Screen                                                        | Diagnosis         |          |     | Screen                               | Diagnosis        |          |     |
|                                                               | Positive          | Negative |     |                                      | Positive         | Negative |     |
| Positive                                                      | 90                | 16       | 106 | Positive                             | 34               | 27       | 61  |
| Negative                                                      | 8                 | 73       | 81  | Negative                             | 3                | 123      | 126 |
| Sum                                                           | 98                | 89       |     | Sum                                  | 37               | 150      |     |
|                                                               | PPV=90/106=84.9%  |          |     |                                      | PPV=34/61=55.7%  |          |     |

(continued on next page)

Table 4 (continued)

| Sample characteristics                                        |                     |          |    | Estimated population characteristics |                     |          |    |
|---------------------------------------------------------------|---------------------|----------|----|--------------------------------------|---------------------|----------|----|
| Version B — Any diagnosis: sensitivity=0.96, specificity=0.57 |                     |          |    |                                      |                     |          |    |
| Prevalence=0.48                                               |                     |          |    | Prevalence=0.20                      |                     |          |    |
| Screen                                                        | Diagnosis           |          |    | Screen                               | Diagnosis           |          |    |
|                                                               | Positive            | Negative |    |                                      | Positive            | Negative |    |
| Positive                                                      | 53                  | 26       | 79 | Positive                             | 22                  | 40       | 62 |
| Negative                                                      | 2                   | 34       | 36 | Negative                             | 1                   | 52       | 53 |
| Sum                                                           | 55                  | 60       |    | Sum                                  | 23                  | 92       |    |
|                                                               | PPV = 53/79 = 67.1% |          |    |                                      | PPV = 22/62 = 35.5% |          |    |

additional 21% had 3 or more. As indicated in the table, rates of PTSD were significantly higher for non-Caucasians than Caucasians, and overall rates of mental disorders were significantly higher in women than in men.

For each of the five ADD items, sensitivity, specificity and likelihood ratios are displayed in Table 3. Sensitivities for the individual items predicting the associated diagnosis range from 0.62 for PTSD to 1.00 for GAD, and specificities range from 0.56 for GAD to 0.83 for PTSD. The positive likelihood ratio for each disorder indicates that, across disorders, a positive screen is approximately three times more likely in a person with the disorder than in a person without the disorder. Each of the items was also evaluated for its ability to identify *any* diagnosis (i.e., PTSD, GAD, social phobia, panic disorder *or* major depression), and results are presented in the second section (labeled “Any disorder”) of Table 3. These analyses indicate that, for example, the PTSD item, with a sensitivity of 0.33, is not very effective at picking up overall psychopathology, whereas the GAD item, with an associated sensitivity of 0.87 is substantially better. With a specificity of 0.68, the GAD item is not particularly good at ruling out psychopathology, but the social phobia item, with a specificity of 0.93, is excellent. The positive likelihood ratios indicate that a person with a disorder is about three times more likely to

endorse the GAD item than a person with no diagnoses, and the same person is about nine times more likely to endorse the panic item than a person with no diagnoses.

Each version of the screening questionnaire was examined as a whole, and the two groups of three questions (i.e., panic, PTSD and social phobia; panic, GAD and depression) were evaluated to determine their sensitivities and specificities for detecting the presence of any one of the diagnoses. In other words, a “yes” answer to any of the questions was used to predict a positive diagnosis for each of the disorders. When used as a whole, the entire screening questionnaire was quite good at picking up each individual disorder, with sensitivities for the disorders ranging from 0.92 to 1.00. Not surprisingly, the specificities for the individual disorders were low, ranging from 0.34 to 0.57. When a “yes” answer to any of the questions was used to predict a positive diagnosis for *any* of the disorders, Version A of the screening questionnaire (panic disorder, social phobia and PTSD) had a sensitivity of 0.92 and a specificity of 0.82, and the positive likelihood ratio for Version A was 5.11. Version B of the screening questionnaire (panic disorder, GAD and depression) had a sensitivity of 0.96 and a specificity of 0.57 for detecting any of the disorders, and the positive likelihood ratio for Version B was 2.22.

Table 5  
Mean (S.D.) impairment in screen-positive and screen-negative patients

| Screen                                 | WHO disability                        |                 | SF-12 Physical scale                   |                 | SF-12 Mental scale                      |                 |
|----------------------------------------|---------------------------------------|-----------------|----------------------------------------|-----------------|-----------------------------------------|-----------------|
|                                        | Screen negative                       | Screen positive | Screen negative                        | Screen positive | Screen positive                         | Screen positive |
| Panic disorder ( <i>N</i> =684)        | 8.36 (3.75)<br><i>t</i> (677)=11.40** | 12.08 (4.75)    | 46.29 (11.59)<br><i>t</i> (682)=3.17** | 43.30 (13.03)   | 48.29 (11.35)<br><i>t</i> (682)=13.43** | 36.65 (11.22)   |
| PTSD ( <i>N</i> =573)                  | 9.53 (4.30)<br><i>t</i> (567)=6.78**  | 12.41 (5.02)    | 45.65 (12.11)<br><i>t</i> (571)=2.68** | 42.52 (13.21)   | 44.61 (12.21)<br><i>t</i> (571)=6.54**  | 37.02 (12.76)   |
| Social phobia ( <i>N</i> =572)         | 8.82 (3.83)<br><i>t</i> (566)=10.54** | 12.72 (4.93)    | 46.02 (11.82)<br><i>t</i> (570)=2.94** | 42.89 (13.28)   | 47.16 (11.55)<br><i>t</i> (570)=12.11** | 35.29 (11.15)   |
| GAD ( <i>N</i> =112)                   | 6.81 (2.98)<br><i>t</i> (109)=4.81**  | 10.21 (4.14)    | 50.07 (9.87)<br><i>t</i> (110)=3.63**  | 42.41 (11.85)   | 52.74 (8.46)<br><i>t</i> (110)=6.77**   | 39.83 (10.99)   |
| Depression ( <i>N</i> =112)            | 7.10 (3.17)<br><i>t</i> (109)=5.03**  | 10.60 (4.14)    | 49.83 (9.30)<br><i>t</i> (110)=4.27**  | 41.09 (12.31)   | 8.41 (1.09)<br><i>t</i> (110)=7.53**    | 10.88 (1.49)    |
| Any item on Version A ( <i>N</i> =573) | 7.62 (3.36)<br><i>t</i> (567)=10.09** | 11.55 (4.69)    | 46.73 (11.12)<br><i>t</i> (571)=2.52*  | 43.91 (12.98)   | 52.26 (8.19)<br><i>t</i> (571)=14.31**  | 38.10 (12.06)   |
| Any item on Version B ( <i>N</i> =112) | 6.06 (1.93)<br><i>t</i> (109)=5.45**  | 10.03 (4.16)    | 52.69 (6.15)<br><i>t</i> (110)=4.79**  | 42.38 (12.18)   | 54.85 (6.52)<br><i>t</i> (110)=6.80**   | 40.87 (11.13)   |

Higher scores on the WHO Disability Scale indicate more disability, whereas higher scores on the SF-12 PCS and MCS indicate less disability.

\*  $P < .05$ .

\*\*  $P < .01$ .

Table 6

Logistic regression results for predictors of screening status (positive vs. negative)

|            | N   | Overall $\chi^2$ | df | Odds ratio (95% CI)   |                     |                     |
|------------|-----|------------------|----|-----------------------|---------------------|---------------------|
|            |     |                  |    | Diagnostic status     | Comorbid anxiety    | Comorbid depression |
| Panic      | 792 | 393.66**         | 6  | 23.50** (14.75–37.43) | 1.97** (1.27–3.06)  | 2.14** (1.42–3.24)  |
| PTSD       | 677 | 111.35**         | 6  | 5.41** (3.412–8.57)   | 0.97 (0.63–1.51)    | 1.94** (1.27–2.98)  |
| SP         | 675 | 149.44**         | 6  | 4.89** (3.26–7.33)    | 1.65* (1.13–2.41)   | 2.04** (1.39–2.99)  |
| GAD        | 115 | 56.77**          | 6  | <sup>a</sup>          | 1.72 (0.44–6.71)    | 8.74** (2.02–37.79) |
| Depression | 115 | 46.44**          | 5  | 7.94** (2.62–24.06)   | 3.97** (1.42–11.14) | N/A                 |

Demographic variables (sex, ethnicity and age) were entered into each equation, but were nonsignificant predictors.

<sup>a</sup> Odds ratio for GAD could not be computed due to an empty cell (no false negatives).\*  $P < .05$ .\*\*  $P < .01$ .

### 3.2. Adjustment for population prevalence

As described above, the sampling procedure used in this study produced rates for the disorders that are higher than would be expected in a typical primary care population. It is therefore important to statistically adjust the test characteristics for typical primary care prevalence rates before making conclusions about the appropriateness of the screening items for use in primary care. Whereas prevalence does not affect sensitivity or specificity, it does affect the rate of misclassification or predictive validity [31,51,52]. In particular, positive predictive value (PPV) can be dramatically reduced with low base rates [33,51]. Table 4 presents the PPV for each item for the present sample and for an expected population prevalence rate. Because prevalence rates for mental disorders in primary care can vary widely depending on the study, expected population prevalence rates were obtained for panic disorder [19], GAD [53] and depression [27] by identifying articles that reviewed rates and provided an overall estimate. For social phobia, where data are more limited, the best study [54] was identified to provide an estimate. For PTSD, where there are few studies and a broad range of reported prevalence rates [3,55–58], a weighted average of prevalence rates was used.

As expected, PPV was considerably higher in the present sample than would be expected in a typical primary care sample. For example, whereas approximately half of patients in the present sample who screened positively for PTSD or social phobia would have a diagnosable disorder, it is probable that one in five patients in a typical practice who screened positively would receive a diagnosis. The PPV is better, however, when considered from the perspective of screening positive for *any* of the five disorders: we estimate that between a third and one-half of patients in a typical primary care practice screening positive for one or more items would receive at least one diagnosis.

### 3.3. Impairment

To further validate the instrument, we examined indicators of disability for the patients who completed the screening questionnaire and diagnostic interview. As can be seen in Table 5, across diagnoses, patients who screen positive on the screening questionnaire are, on average,

more disabled and have poorer physical and mental health than patients who screen negative.

### 3.4. Patient characteristics influencing performance of the screening items

Further analyses were conducted to determine whether demographic characteristics, such as sex or race, were related to the performance of the screening items. First, the performance of the screening items was evaluated separately for males and females, patients over 50 years and patients under 50 years, and Caucasians and non-Caucasians, and the sensitivities and specificities were compared by  $\chi^2$  analyses. There were no significant differences in the performance of the screening items by gender or age. The only significant difference by ethnicity was that the PTSD screen had a higher specificity for Caucasians (0.86) than for non-Caucasians [0.76;  $\chi^2(1, N=43)=8.53, P<.01$ ].

Finally, several sets of logistic regression analyses were conducted to evaluate the influence of demographic variables and comorbidity on screening status. The results of logistic regressions predicting screening status (positive vs. negative) for each disorder, along with odds ratios for diagnoses are presented in Table 6. Diagnostic status had a strong effect on screening status, but comorbid anxiety and depression also had strong effects, with depression, in particular, at least doubling the likelihood of screening positively on the anxiety screens.

## 4. Discussion

This study addressed the need for a brief, efficient screen for common anxiety and depressive disorders in primary care. The results suggest that five items can effectively screen for panic disorder, PTSD, social phobia, GAD and depression in primary care. When combined, we call these five items the Anxiety and Depression Detector (ADD). The five items of the ADD were administered across two screening questionnaires, each with three items. For the screening questionnaires, sensitivities ranged from 0.92 to 0.96, and specificities ranged from 0.57 to 0.82.

Overall, the two versions of the screening questionnaire had good sensitivity and specificity and were particularly

effective at picking up a general level of distress, as indicated by the ability of the aggregated items to indicate a likely positive diagnosis for *at least one* of the disorders. This may be particularly important for real-world use where a clinician receiving information that a patient had screened positively for a specific disorder would be likely to complete an assessment for at least the most common disorders, if not a thorough diagnostic evaluation. Indeed, if such an assessment were completed in a typical primary care population, approximately half of patients screening positively on Version A of the questionnaire would receive at least one diagnosis, and one in three patients screening positively on Version B of the questionnaire would receive a diagnosis.

We examined the effects of gender and ethnicity on screening outcomes and found that the screening items performed equally well for males and females and for Caucasians and non-Caucasians. The only exception was PTSD, which had a higher specificity for Caucasians than non-Caucasians. Thus, the ADD appears to be suitable for use in men and women and across the range of ethnic groups examined here (primarily Caucasian, Hispanic and Asian, with a smaller subgroup of African Americans).

For specific disorders, such as panic and depression, there are questionnaires [59,60] that have equally good or better sensitivities and specificities. For example, the PRIME-MD PHQ has a sensitivity of 0.73 and a specificity of 0.98 for depression, and a sensitivity of 0.81 and a specificity of 0.99 for panic disorder [32]. But the ADD merits particular consideration as a very brief questionnaire suitable for the detection of multiple common anxiety and depressive disorders. For example, the PRIME-MD depression module contains nine items, and the panic module contains five items. An instrument is unlikely to be used in primary care settings if it is too long to be completed and scored in a timely manner. The sensitivity of the social phobia and PTSD items, in particular, is lower than desired, and future studies should examine potential reasons for this and make modifications as needed. However, the authors envision this questionnaire being used as a whole, and the aggregated items have a significantly improved ability to pick up social phobia (sensitivity=0.95–0.96) and PTSD (sensitivity=0.96–1.00). Further research is required to develop improved single-item screens specific to social phobia and PTSD.

This study was limited by the fact that the entire set of questions was not given simultaneously to the sample. It is particularly important to consider how this might affect the generalizability of the performance of the test characteristics. When administered as a whole, it is unlikely that the five items would perform significantly worse than the individual three-item screens, since aggregating the items consistently increased their performance. Further research is required, however, to confirm that the same would be true of the entire questionnaire.

In the present study, diagnostic interviewers were not blind to the results of the screening questionnaire. In

future research, interviewer blindness would be an important part of the design. It should be noted, however, that the use of highly structured, computer-assisted interview (the CIDI-Auto) would limit potential interviewer biases in this regard.

The study was also limited by the lower than desirable response rates. This was particularly true for patients who screened negatively for all disorders, 60% of whom refused to be contacted for the follow-up interview. This is likely due to a lack of incentive to complete the research, and future studies may want to utilize a higher monetary (or other) incentive for such patients. Even after agreeing to participate, patients often (38% of screen-positive patients and 43% of screen-negative patients) failed to complete the interview. Future research should examine the reasons for failing to complete interviews and investigate methods for retaining participants. We examined the potential bias introduced by such refusals, and we therefore further recommend that future research make special effort to achieve unbiased inclusion of males, Asians, individuals with a graduate education and individuals in good health.

A further limitation is that the sample was a screened sample, and this increased prevalence rates of the disorders. Although prevalence rates do not affect the accuracy of the test (e.g., sensitivity and specificity), they do have a strong effect on predictive validity [33,51,52], with positive predictive value decreasing precipitously as base rates dip below 10% [33,51]. In an effort to evaluate the effects of the base rates in our sample, we have statistically adjusted the performance of the items for typical prevalence rates. As expected, predictive validity declined significantly. However, with overall rate of anxiety and depression in primary care estimated at approximately 20% [3], somewhere between one-third and one-half of patients screening positively for any one disorder on the ADD will receive a diagnosis of one of the five disorders, depending on the version of the questionnaire used. This level of positive prediction should be considered acceptable for such a brief, noninvasive, inexpensive test. To conclusively confirm the test characteristics, the entire questionnaire should be administered in a nonbiased primary care population. This would not only confirm the properties of the five-item questionnaire, but would decisively address issues related to prevalence of the disorders and the distribution of the severity of the disorders in a natural sample.

It should be noted that individuals with panic disorder who were already receiving treatment were excluded from the interview. The individuals receiving treatment for panic disorder may also have had other diagnoses, and this may have affected the performance of the other items. Future research on the ADD would do well to evaluate the performance of these items exclusively for individuals who are not already receiving treatment for the associated disorder, since these are the individuals who will most benefit from screening.

The ADD fulfills an important need in primary care research; that is, the ability to briefly and effectively screen primary care patients for common mental disorders that are associated with decrements in functioning, increased suffering, and higher medical and societal costs. Although controversy may exist about the benefits of screening in and of itself, the increasing evidence suggests that treatments for depression and anxiety can be effectively delivered in primary care settings. Clinical primary care practices generally have as their goal to effectively and appropriately diagnose, treat and follow patients with mental disorders and, consistent with the USPSTF recommendations [27], such practices will require an effective screening instrument to identify distressed patients. We offer the ADD as one potential tool that may aid in this effort.

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### Appendix A. The Anxiety and Depression Detector

Name: \_\_\_\_\_ Date: \_\_\_\_\_

In the past 3 months...

- |                                                                                                                                                                                                                                                                              |     |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1. Did you ever have a spell or an attack when all of a sudden you felt frightened, anxious, or very uneasy?                                                                                                                                                                 | Yes | No |
| 2. Would you say that you have been bothered by “nerves” or feeling anxious or on edge?                                                                                                                                                                                      | Yes | No |
| 3. Would you say that being anxious or uncomfortable around other people is a problem for you in your life?                                                                                                                                                                  | Yes | No |
| 4. Did you have a period of one week or more when you lost interest in most things like work, hobbies, and other things you usually enjoyed?                                                                                                                                 | Yes | No |
| 5. Some people have terrible experiences happen to them, like being attacked or threatened with a weapon; being in a fire or a bad traffic accident; being sexually assaulted; or seeing someone being badly injured or killed. Has anything like this ever happened to you? | Yes | No |

IF YES:

|                                                                                                                                                                                                               |     |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| In the past 3 months, have you had recurrent dreams or nightmares about this experience, or recurrent thoughts or “flashbacks” (times when you felt as though it was happening again, even though it wasn’t)? | Yes | No |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|

Note: a yes answer to any of items 1 through 4 or the second part of item 5 is considered a positive screen.

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