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Validity of the Hospital Anxiety and Depression Scale for Use With Patients With Noncardiac Chest Pain

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Consecutive patients seen in the first-heart-aid service of a university hospital and given a diagnosis of noncardiac chest pain completed the self-report Hospital Anxiety and Depression Scale. Patients with a score ≥ 8 on either the anxiety or depression subscale ($N = 266$, mean age = 55.81 years, $SD = 13.03$, 143 male patients) were compared with patients scoring < 8 ($N = 78$, mean age = 60.55 years, $SD = 10.84$, 50 male patients) by means of the Mini International Neuropsychiatric Interview. Panic disorder and/or depression identified by the diagnostic interview were highly prevalent in the group with a score ≥ 8 (73.3% versus 3.9% in the comparison group). The Hospital Anxiety and Depression Scale is an adequate screening instrument for the detection of affective disorders in patients with noncardiac chest pain. (Psychosomatics 2003; 44:329–335)

Panic disorder with or without comorbid depression is common among patients presenting to a first-heart-aid setting,¹ yet it often remains unrecognized as a cause of chest pain or palpitations.² In a pilot study in a first-heart-aid service of a hospital, a diagnosis of panic disorder and/or depression was received by 83% of patients presenting with noncardiac chest pain or palpitations who scored above 8 on either the anxiety or depression subscale of the Hospital Anxiety and Depression Scale. In only 15% of this group was a possible psychiatric problem recognized by the treating cardiologist.²

Patients with noncardiac chest pain or palpitations impose a large burden on the health care system. They have a high level of health care consumption, including frequent hospital admissions, numerous outpatient or first-aid visits, and repeated diagnostic investigations that may present a risk for iatrogenic complications.¹

The negative influence of anxiety as well as depression on cardiac prognosis both in patients after myocardial infarction as well as in healthy subjects has been clearly established.^{1,3,4} The quality of life of noncardiac chest pain patients with panic disorder is markedly poor.⁵

These findings suggest the need for a simple and validated screening instrument for use in the hospital first-heart-aid service to identify patients who have panic disorder and/or depression underlying noncardiac chest pain.

The Hospital Anxiety and Depression Scale⁶ is a reliable and valid instrument for assessing anxiety and depression in medical patients.^{7,8} It includes an anxiety subscale and a depression subscale, each of which contain seven questions. Validation studies for the Hospital Anxiety and Depression Scale have been performed in various somatically compromised populations.^{9–11} Herrmann et al.¹² suggested that the Hospital Anxiety and Depression Scale may be considered the standard instrument for assessing anxiety and depression in cardiac patients.

Although the Hospital Anxiety and Depression Scale

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HADS Use for Noncardiac Chest Pain Patients

is frequently used in research, it has not been validated for use with patients presenting with noncardiac chest pain or palpitations. In this study, the sensitivity and specificity of the Hospital Anxiety and Depression Scale for use in assessing such patients was evaluated by using the Mini International Neuropsychiatric Interview as the gold standard.¹³

METHOD

Subjects

The study participants were patients who presented to the first-heart-aid service of the University Hospital Maastricht between January 2000 and February 2002. They presented with chest pain, pain in their left arm or shoulder or epigastric region, or palpitations. Cardiological screening consisted of a full medical history, physical examination, and ECG. Additional tests, such as laboratory measurements of cardiac enzymes and troponin, exercise testing, echocardiography, or chest X-ray, were performed as needed, according to standard cardiological practice.

Procedure

Patients who had been discharged from the hospital's first-heart-aid service with a diagnosis of atypical chest pain, noncardiac origin of the complaints, no cardiac abnormalities, noncardiac chest pain, or hyperventilation received an envelope by mail. This envelope contained information about the study, an informed consent form, the Hospital Anxiety and Depression Scale, and an envelope in which to return the completed scale and consent form. Patients who did not return the Hospital Anxiety and Depression Scale within 2 weeks received a reminder phone call.

Patients with dementia, those who lived more than 50 km from the hospital, and those who did not speak Dutch were excluded. Patients who returned the Hospital Anxiety and Depression Scale and had a score ≥ 8 on either the anxiety or depression subscale were invited back to the hospital to be interviewed with the Mini International Neuropsychiatric Interview, which is based on the DSM-IV criteria. The cutoff value of 8 was determined on the basis of a review of previously published studies.⁷ The interviews were performed by a cardiologist (P.K.) and a psychiatrist or psychiatric resident who had been trained in use of the Mini International Neuropsychiatric Interview. The interviewers were not blind to the cardiological diag-

nosis received by the patient in the hospital's first-heart-aid service.

A comparison group consisting of consecutive patients who had been evaluated in the first-heart-aid service and had been discharged with no cardiac diagnosis but who scored below the cutoff score of 8 on either the anxiety or the depression subscale of the Hospital Anxiety and Depression Scale were also interviewed with the Mini International Neuropsychiatric Interview.

The study was approved by the local ethical committee.

Statistics

To determine the optimal cutoff scores, receiver operating characteristics curves¹⁴ were obtained for the Hospital Anxiety and Depression Scale. The receiver operating characteristics curve plots sensitivity and "1-specificity" (1 minus specificity) for every possible cutoff score. The optimal cutoff score is determined visually by assessing which score combines maximal sensitivity with maximal specificity. The scale with the largest area under the curve is better for distinguishing between depressed and nondepressed patients or between patients with and without anxiety disorders. In addition, positive predictive values and negative predictive values were measured for different cutoff scores in the central range of the scale scores.

All analyses were performed with Statistical Package for Social Sciences (SPSS) release 10. Differences between groups were analyzed by using t tests and chi-square tests. The results were considered statistically significant if $p < 0.05$.

RESULTS

Characteristics of the Study Patients

Between January 2000 and February 2002, 4,293 patients visited the first-heart-aid service of the University Hospital Maastricht. Of those patients, a total of 3,149 (73%) had chest pain, pain in their left arm or shoulder or epigastric region, or palpitations. Of this group, 1,796 (57%) received no cardiac explanation for their complaints (received a diagnosis of atypical thoracic complaints or hyperventilation). Of those patients, 134 were excluded for reasons such as dementia, living more than 50 km from the hospital, or not speaking the Dutch language. Of the remaining 1,662 patients, 844 (50.8%) returned the Hospital Anxiety and Depression Scale by mail. One hundred pa-

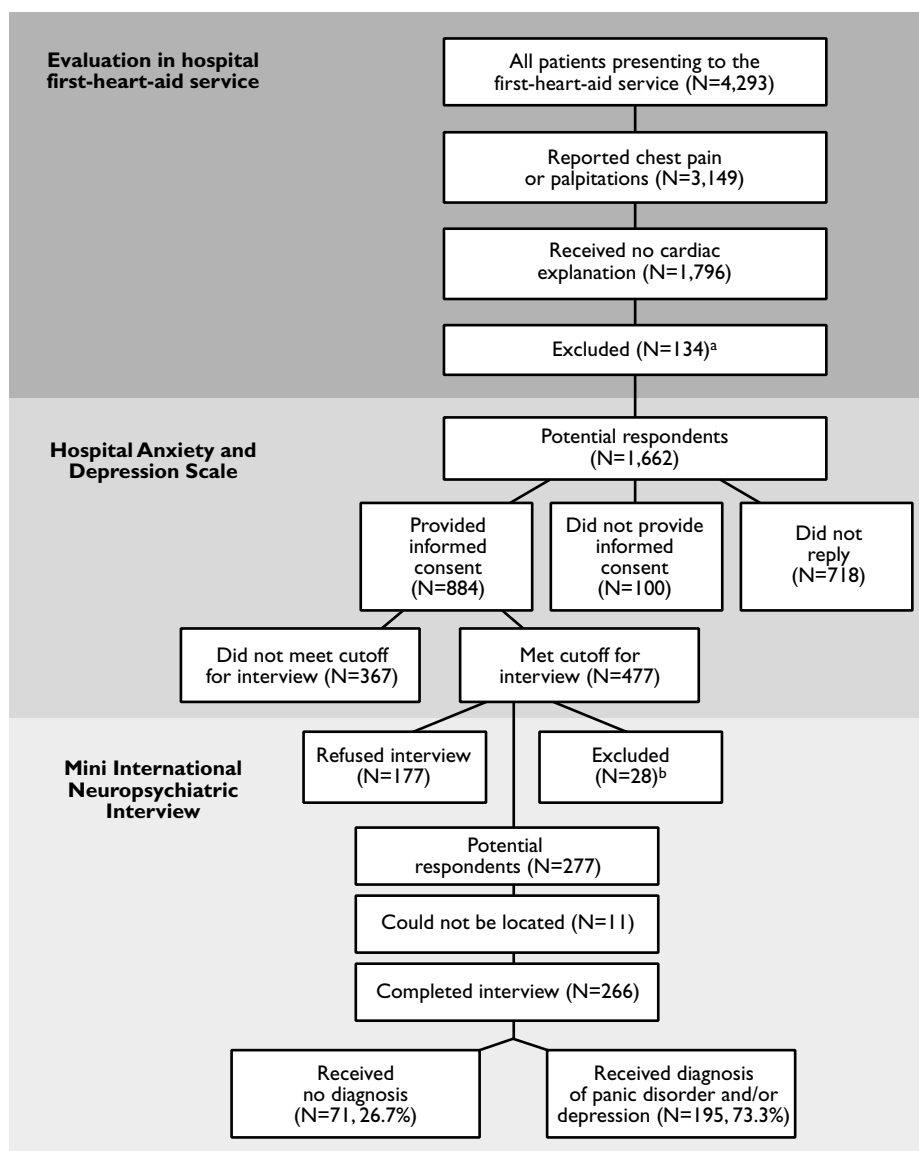
tients (6.0%) refused to participate. Patients with a Hospital Anxiety and Depression Scale score ≥ 8 on either subscale were invited to complete the Mini International Neuropsychiatric Interview. Four hundred seventy-seven patients (56.5%) scored above the cutoff value. One hundred seventy-seven patients (37.1%) refused the structured interview. Twenty-eight patients of the remaining 300 were excluded because they were found to have what appeared to be a cardiological cause of the initial complaint. Eleven patients could not be traced or did not come

for the interview, despite repeated efforts by the researchers to locate them. The remaining 266 patients were interviewed with the Mini International Neuropsychiatric Interview (Figure 1).

The comparison group, composed of patients who did not score above the cutoff score of 8 on the Hospital Anxiety and Depression Scale, consisted of 78 patients. The baseline characteristics of both groups are reported in Table 1.

The two groups differed significantly in age but did

FIGURE 1. Subjects in Phases of a Study of the Validity of the Hospital Anxiety and Depression Scale for Use in Screening Patients With Noncardiac Chest Pain Presenting to a Hospital First-Heart-Aid Service



^aPatients with dementia, those who lived >50 km from the hospital, and those who did not speak Dutch were excluded.

^bPatients found to have a cardiological cause for their initial complaint were excluded.

HADS Use for Noncardiac Chest Pain Patients

not differ in gender, previous cardiac history, and complaints when presenting to the first-heart-aid service.

As Table 1 shows, the patients who scored below the cutoff score on the Hospital Anxiety and Depression Scale were more likely to have received a diagnosis of atypical thoracic complaints and less likely to have received a diagnosis of hyperventilation, compared with the patients who scored above the cutoff. (We collected data on the frequency of a diagnosis of hyperventilation because this diagnosis probably reflects some recognition by the cardiologist of a psychiatric or psychological problem in the patient.)

Of the patients who scored above the cutoff value on either the anxiety or the depression subscale of the Hospital

Anxiety and Depression Scale, 95.1% scored above the cutoff on the anxiety subscale, compared with 2.6% of the patients who scored below the cutoff score on either subscale ($p < 0.001$). Of the patients who scored above the cutoff on either subscale, 63.2% scored above the cutoff score on the depression subscale, compared with 3.8% of the patients who scored below the cutoff score on either subscale ($p < 0.001$).

Affective Disorders

Among the patients who scored above the cutoff value on either subscale of the Hospital Anxiety and Depression Scale, 38.3% received a diagnosis of panic disorder com-

TABLE 1. Baseline Characteristics of Patients With Noncardiac Chest Pain Presenting to a Hospital First-Heart-Aid Service Who Scored Above and Below on the Cutoff Value on the Hospital Anxiety and Depression Scale

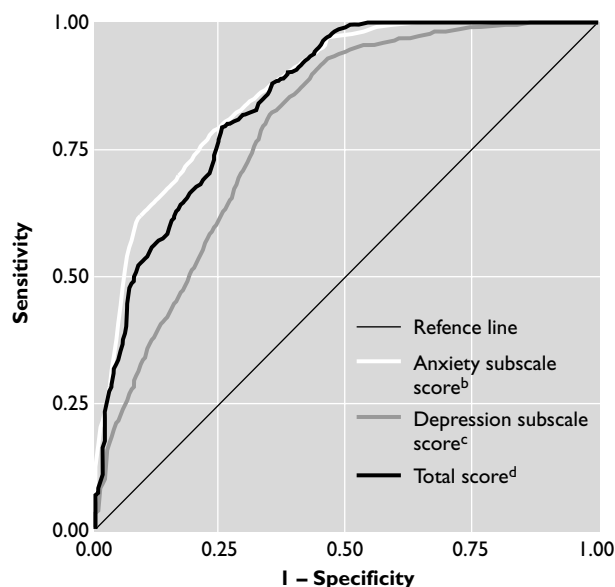
Characteristic	Patients Who Scored Above the Cutoff Value (N = 266) ^a		Patients Who Scored Below the Cutoff Value (N = 78) ^b		Analysis
	Mean	SD	Mean	SD	
Age (years)	55.81	13.03	60.55	10.84	p (t test) 0.001
	N	%	N	%	p (chi-square test)
Gender					
Male	143	53.8	50	64.1	n.s.
Female	123	46.2	28	35.9	0.11
Previous cardiac history					
No	100	37.6	20	25.6	n.s.
Yes	104	39.1	41	52.6	0.06
Screened, no abnormalities	31	11.7	5	6.4	
Unknown	31	11.7	12	15.4	
Complaint					
Chest pain or pain in the arm, shoulder, or epigastric region	245	92.1	76	97.4	n.s.
Palpitations	21	7.9	2	2.6	0.10
Diagnosis					0.03
Atypical thoracic complaints	233	87.6	75	96.2	
Hyperventilation	33	12.4	3	3.8	
	Mean	SD	Mean	SD	p (t test)
Hospital Anxiety and Depression Scale scores					
Depression subscale	9.24	4.33	1.85	2.47	<0.001
Anxiety subscale	12.03	3.54	3.27	2.67	<0.001
	N	%	N	%	p (chi-square test)
Mini International Neuropsychiatric Interview diagnosis					0.04
No diagnosis	71	26.7	75	96.1	
Panic disorder	80	30.1	0	0.0	
Depression	13	4.9	2	2.6	
Panic disorder and depression	102	38.3	0		
Other diagnosis	0	0.0	1 ^c	1.3	

^aScore ≥ 8 on either the anxiety or depression subscale of the Hospital Anxiety and Depression Scale.

^bScore < 8 on either the anxiety or depression subscale of the Hospital Anxiety and Depression Scale.

^cDysthymia.

FIGURE 2. Receiver Operating Characteristics Curve for the Hospital Anxiety and Depression Scale in a Study of Patients With Noncardiac Chest Pain Presenting to a Hospital First-Heart-Aid Service^a



^aReceiver operating characteristics of the Hospital Anxiety and Depression Scale assessed with reference to the Mini International Neuropsychiatric Interview.

^bArea under the curve = 0.90.

^cArea under the curve = 0.85.

^dArea under the curve = 0.90.

combined with a depressive episode on the basis of the Mini International Neuropsychiatric Interview, compared with none of the patients who scored below the cutoff value on either subscale. Thirty percent of the patients who scored above the cutoff value on either subscale received a diagnosis of panic disorder, compared with none of the patients who scored below the cutoff value. Of the patients who scored above the cutoff value on either subscale, 4.9% re-

ceived a diagnosis of a depressive disorder, compared with 2.6% of the patients who scored below the cutoff value. No psychiatric diagnosis was identified on the basis of the Mini International Neuropsychiatric Interview in 26.7% of the patients who scored above the cutoff value on either subscale and in 96.1% of the patients who scored below the cutoff value. Patients who scored above the cutoff value on either subscale were significantly more likely to receive a diagnosis of panic disorder and/or depression than the patients who scored below the cutoff value ($p = 0.04$).

Cutoff Values

The optimum cutoff scores on the Hospital Anxiety and Depression Scale for detecting panic disorder and/or depressive episode according to the Mini International Neuropsychiatric Interview are shown on the receiver operating characteristics curve (Figure 2).

For the Hospital Anxiety and Depression Scale anxiety subscale, the optimum cutoff score for screening purposes was 8/9, with a sensitivity of 88% and a specificity of 64%. For diagnostic purposes a high specificity is important. For diagnostic purposes, the optimal cutoff score on the anxiety subscale was 10/11, with a specificity of 84% and a sensitivity of 69%. On the receiver operating characteristics curve, the area under the curve was 0.90 for the anxiety subscale.

For the Hospital Anxiety and Depression Scale depression subscale, the optimum cutoff score for screening purposes was 4/5, with a sensitivity of 88% and a specificity of 57%. For diagnostic purposes the optimal cutoff score on the depression subscale was 3/4, with a specificity of 92% and a sensitivity of 54%. The area under the curve for the depression subscale was 0.85.

For the total score on the Hospital Anxiety and De-

TABLE 2. Presence of a Diagnosis of Panic Disorder and/or Depression in Patients With Noncardiac Chest Pain Presenting to a Hospital First-Heart-Aid Service Who Scored Above and Below on the Cutoff Value on the Hospital Anxiety and Depression Scale^a

Diagnosis of Panic Disorder and/or Depression ^b	Patients Who Scored Above the Cutoff Value (N = 266) ^c		Patients Who Scored Below the Cutoff Value (N = 78) ^d	
	N	%	N	%
Yes (N = 198)	195	73.3	3	3.8
No (N = 146)	71	26.7	75	96.2

^aSensitivity 98.48%; specificity 51.36%; positive predictive value 73.30%; negative predictive value 96.15%.

^bBased on the Mini International Neuropsychiatric Interview.

^cScore ≥ 8 on either the anxiety or depression subscale of the Hospital Anxiety and Depression Scale.

^dScore < 8 on either the anxiety or depression subscale of the Hospital Anxiety and Depression Scale.

HADS Use for Noncardiac Chest Pain Patients

pression Scale, the optimum cutoff score for screening purposes was 11/12, with a sensitivity of 97% and a specificity of 54%. For diagnostic purposes, the optimal cutoff score on the Hospital Anxiety and Depression Scale depression subscale was 18/19 with a specificity of 83% and a sensitivity of 64%. The area under the curve for the total score was 0.90.

DISCUSSION

In their updated literature review on the validity of the Hospital Anxiety and Depression Scale as a screening instrument, Bjelland et al.⁸ suggested that a cutoff score of ≥ 8 for both the anxiety and depression subscales most frequently results in an optimal balance between sensitivity and specificity of approximately 80%. This threshold was found in the general population as well as in somatically compromised populations. We found other cutoff values in the specific group of patients in our study, suggesting that the validity of self-report questionnaires cannot be generalized over populations with different somatic conditions.

Our results suggest that the optimal cutoff score on the Hospital Anxiety and Depression Scale anxiety subscale for screening for panic disorder and/or depressive episode in atypical chest pain patients is 8/9. The optimal cutoff score on the depression subscale for screening for depressive episode and/or panic disorder is 4/5. For the total score, the optimal cutoff value for screening for depressive episode and/or panic disorder is 11/12.

The comparison patients, who scored below the cutoff value on the Hospital Anxiety and Depression Scale, were as a group significantly older than the patients who scored

above the cutoff score ($p=0.001$) (Table 1). This finding suggests that psychiatric diagnoses such as panic disorder and depression may be more prevalent in younger patients with atypical chest pain.¹

Compared with patients who scored above the cutoff value, comparison patients were more likely to have a previous cardiac history (52.6% versus 39.1%) ($p=0.06$). Patients with a previous cardiac history who experienced atypical chest pain might have been more easily reassured by the cardiologist at the first-heart-aid service and thus might have reported fewer complaints of anxiety or depression on the Hospital Anxiety and Depression Scale.

A limitation of the study was the high number of patients who refused to participate in the study, which could mean that the patients who were willing to participate could constitute a biased group. In addition, the participating patients may have completed the Hospital Anxiety and Depression Scale at home with the help of a spouse, family member, or partner, which could have influenced the results.

Despite these limitations, the study results suggest that the Hospital Anxiety and Depression Scale is a sensitive screening instrument for patients with noncardiac chest pain or palpitations who are frequent utilizers of the cardiac health care system. The Hospital Anxiety and Depression Scale can be used as a practical screening instrument in a first-heart-aid service setting. Patients who score above the cutoff score should be referred to a psychiatry outpatient clinic for further diagnosis and treatment. Such intervention could help prevent a long-term pattern of poor quality of life, frequent utilization of first-aid or outpatient clinics, and worse cardiovascular prognosis, even in the absence of known cardiac disease.

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