

Patients With Depression Are Less Likely to Follow Recommendations to Reduce Cardiac Risk During Recovery From a Myocardial Infarction

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Background: Patients with depression are at greater risk of cardiac death in the first few months after a myocardial infarction (MI). This study was performed to determine whether depression affects adherence to recommendations intended to reduce the risk of cardiac events after an MI.

Methods: All consenting patients admitted to a university-affiliated teaching hospital during an 18-month period were interviewed 3 to 5 days following an acute MI using the Beck Depression Inventory to assess symptoms of depression and using the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*, to determine the presence of major depression and/or dysthymia. Accessible survivors (n=204; 116 men and 88 women) were interviewed by telephone 4 months later using the Medical Outcomes Study Specific Adherence Scale to measure self-reported adherence to recommendations to modify cardiac risk.

Results: Patients who were found in the hospital to have

symptoms of at least mild to moderate depression (Beck Depression Inventory score ≥ 10 , n=35 [17.2%]) or to have major depression and/or dysthymia (n=31 [15.2%]) reported lower adherence to a low-fat diet, regular exercise, reducing stress, and increasing social support 4 months later. Those with major depression and/or dysthymia also reported taking medications as prescribed less often than those without major depression and/or dysthymia. Diabetic patients with major depression and/or dysthymia were less likely to follow a diet for patients with diabetes than diabetic patients without depression.

Conclusions: Patients with depression following an acute MI are less likely to adhere to recommended behavior and lifestyle changes intended to reduce the risk of subsequent cardiac events. This finding could explain why depression in the hospital is related to long-term prognosis in patients recovering from an MI.

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DEPRESSION is common among patients recovering from myocardial infarction (MI)¹⁻⁴ and is an independent risk factor for 6-month² and 18-month³ mortality. Major depression has been reported in 15% to 20% of patients hospitalized for acute MI,¹⁻⁴ while approximately 45% have been found to have either major or minor depression.¹ In a study² from the Montreal Heart Institute, patients meeting modified criteria for the syndrome of major depression based on the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (DSM-III-R)*, between 5 and 15 days following an MI had an almost 6-fold higher mortality at 6 months than those who were not depressed. In a study³ by the same group, those patients with mild to moderate symptoms of depression assessed by the Beck Depression In-

ventory (BDI) had an almost 8-fold greater risk of dying by 18 months than those who were not depressed. The relation between depression and survival remained even after controlling for other established prognostic factors, including Killip class and prior MI.^{2,3}

The manner by which depression adversely affects survival in patients after an MI is unknown. It has been speculated that depression affects outcome by reducing adherence to prescribed treatment regimens in the post-MI period.⁵ Depression has been related to poor adherence in non-cardiac illness⁶⁻⁹ and is associated with poor adherence to prescribed aspirin therapy in elderly patients with coronary artery disease¹⁰ and to cardiac rehabilitation and certain lifestyle changes in the post-MI period.^{11,12} The present study was performed to determine whether depression following an MI is associated with poor adher-

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PATIENTS AND METHODS

PATIENTS

The study was approved by the Institutional Review Board of the Johns Hopkins Bayview Medical Center, Baltimore, Md. During an 18-month period, all patients admitted with a diagnosis of acute MI were approached for psychological assessment if they: (1) had no major problems with cognition, (2) were stable enough to complete the interview within the first 5 days after the MI, and (3) were not transferred to another facility or did not die within the first 48 hours after the MI. If a patient was admitted more than once for a diagnosis of acute MI during the study period, only data from the first accessible admission were used. Criteria for an acute MI were considered as 2 or more of the following: typical ischemic chest pain lasting 20 minutes or longer, presence of new pathologic Q waves on the electrocardiogram, a peak creatine phosphokinase (CPK) level greater than 1.5 times normal, or a CPK-MB value greater than 10 ng/mL with a simultaneous CPK value exceeding the normal limit. As part of usual care, patients were counseled to appropriately modify their disease- and patient-specific cardiac risks. All patients received advice to follow a low-fat, low-cholesterol, low-sodium diet; exercise regularly; reduce stress; take medications as prescribed; carry sublingual nitroglycerin (and/or inhalers if needed); and increase social support. In addition, current smokers were advised to stop and diabetic patients were advised to follow a diet for patients with diabetes and to check their blood glucose level.

Baseline clinical and demographic variables were determined by review of the patients' hospital records and computerized medical records by investigators (R.C.Z. and D.E.B.) who were blind to the results of the psychological evaluation at the time of the medical record review. Hyperlipidemia was defined by past history, use of lipid-lowering medications, or a cholesterol level of 6.2 mmol/L or more (≥ 240 mg/dL) on admission to the hospital. Patients were considered to have a history of coronary artery disease if they had a previously documented MI, a typical history of angina with a positive exercise test result, or angiographically documented stenosis of 50% or more.

ASSESSMENTS

Patients were interviewed as part of their usual care 3 to 5 days following an acute MI using the BDI to assess for symptoms of depression and using the Structured Clinical Interview for *DSM-III-R* (SCID) to determine the presence of current or lifetime mood disorder. The BDI is a self-report instrument that has been used in the early post-MI period,^{2,3} with BDI scores of 10 or greater indicating symptoms of at least mild to moderate depression.¹³ The SCID is a standard method for diagnosing current syndromes and lifetime history of psychiatric disorders¹⁴ using criteria specified in the American Psychiatric Association's *DSM-III-R*.¹⁵ Current major depression or bipolar disorder (symptoms within the month before the MI) and/or current dysthymia (symptoms within the 2 years immediately before the MI) were diagnosed by *DSM-III-R* criteria using the SCID. Past mood disorder was diagnosed if *DSM-III-R* criteria were met at any point during the patient's adult life before the month before the MI (for depression) or the 2 years before the MI (for dysthymia) and did not represent a continuation into a current mood disorder. The BDI and the SCID were used in this study since

previous studies indicate that the syndrome of major depression² and symptoms of at least mild to moderate depression³ are associated with increased post-MI mortality.

All accessible patients were reassessed by telephone interview 4 months after admission to the hospital using the Medical Outcomes Study Specific Adherence Scale.¹⁶ The Medical Outcomes Study Specific Adherence Scale is a self-report questionnaire that was reformatted as a structured interview and modified to assess 10 adherence behaviors relevant for patients who have had an MI: (1) following a low-sodium diet, (2) following a low-fat and low-cholesterol diet, (3) taking medications as prescribed, (4) exercising regularly, (5) reducing stress, (6) carrying medical supplies (eg, sublingual nitroglycerin), (7) following a diet for patients with diabetes (for those with diabetes), (8) monitoring blood glucose level (for diabetic patients), (9) stopping smoking (for current smokers), and (10) increasing social support. Patients were asked to rate how often in the past 4 weeks they had performed, as recommended, the behaviors assessed by the Medical Outcomes Study Specific Adherence Scale, from 0 (none of the time) to 5 (all of the time).

STATISTICAL ANALYSIS

Individuals scoring 10 or greater on the BDI were compared with the group scoring below the cutoff (BDI score < 10).³ Individuals with major depression and/or dysthymia, while hospitalized for an acute MI based on the SCID, were compared with those not meeting the criteria for major depression and/or dysthymia at that time. The relative risk statistic was used to investigate univariate relations between depression variables and demographic variables, indexes of MI severity, and comorbidity. This yielded information regarding the direction and strength of the relation between depression variables and the established risk factors. χ^2 Analyses were conducted to provide significance tests for those relations.

One-way multivariate analyses of variance (MANOVAs) were conducted on the 4-month adherence measures using the Pillai's trace statistic. The independent variable in the first set of analyses was BDI score, dichotomized at 10. The independent variable in the second set of analyses was the presence of major depression and/or dysthymia based on the SCID. As recommended,¹⁷ separate MANOVAs were run analyzing adherence behaviors previously shown to be related to depression in patients with coronary artery disease (diet, exercise, and adherence to prescribed medications)¹⁰⁻¹² and those not previously examined in this context (stress reduction, increasing social support, and carrying medical supplies). Specifically, the dependent variables in the first of 4 separate analyses for each of the previously described independent variables were self-reported adherence to: (1) following a low-sodium diet, (2) following a low-fat and low-cholesterol diet, (3) taking medications as prescribed, and (4) exercising regularly. The dependent variables in the second MANOVA were (1) reducing stress, (2) carrying medical supplies, and (3) increasing social support. The third MANOVA, in those identified as having diabetes, examined self-reported adherence to (1) following a diet for patients with diabetes and (2) monitoring blood glucose level. The final analysis of variance, in current smokers, examined self-reported adherence to smoking cessation. Bonferroni corrections for each pairwise comparison were done in follow-up analyses of variance.¹⁷ All values are presented as mean \pm SD.

Table 1. Baseline Characteristics of 204 Patients With and Without Depression*

Variable	All Patients†	Depressive Symptoms					Major Depression, Dysthymia, or Both				
		BDI Score‡		Relative Risk	95% CI	P	Mood Disorder§		Relative Risk	95% CI	P
		≥10 (n = 35)	<10 (n = 169)				Yes (n = 31)	No (n = 173)			
Age ≥65 y	52.7	40.0	55.4	0.54	0.26-1.13	.10	41.9	54.1	0.61	0.28-1.33	.21
Male sex	56.9	45.7	59.2	0.58	0.28-1.21	.14	51.6	58.4	0.76	0.35-1.64	.48
Current smoker	27.5	31.4	26.8	1.25	0.57-2.76	.58	29.0	26.7	1.12	0.48-2.61	.79
Hypertension	63.9	71.4	62.3	1.51	0.68-3.36	.31	71.0	63.2	1.43	0.62-3.29	.40
Hyperlipidemia	61.9	68.6	60.5	1.43	0.65-3.10	.37	71.0	59.6	1.65	0.72-3.81	.23
Diabetes mellitus	30.4	31.4	30.4	1.05	0.48-2.31	.90	35.5	31.4	1.20	0.54-2.68	.65
History of CAD	34.5	37.1	33.9	1.15	0.54-2.45	.72	38.7	33.7	1.24	0.56-2.73	.59
Chronic lung disease	12.8	5.7	14.3	0.36	0.08-1.62	.17	22.6	10.5	2.50	0.94-6.60	.06
Lives alone	17.6	23.5	16.4	1.57	0.64-3.84	.32	16.1	16.7	0.96	0.34-2.72	.94
Killip class >I	35.6	31.4	36.5	0.80	0.36-1.74	.57	32.3	35.1	0.88	0.39-1.99	.76
LVEF <35%	25.4	36.7	23.3	1.90	0.83-4.35	.12	23.1	24.6	0.92	0.35-2.45	.87
CPK level ≥500 IU/L	54.5	51.4	55.1	0.86	0.42-1.79	.69	54.8	53.8	1.04	0.48-2.25	.92
Current mood disorder	17.2	53.3	11.0	10.35	4.32-24.83	<.001	...	...	...	...	...
BDI score ≥10	14.9	...	...	...	...	...	48.5	8.3	10.35	4.32-24.83	<.001
Past depression	15.5	45.2	10.5	7.05	2.98-16.64	<.001	33.3	12.0	3.68	1.55-8.70	.002

*BDI indicates Beck Depression Inventory; CI, confidence interval; CAD, coronary artery disease; LVEF, left ventricular ejection fraction; CPK, creatine phosphokinase; and ellipses, data not applicable.

†Data are given as percentage of patients.

‡Scores of 10 or greater indicate symptoms of at least mild to moderate depression.

§Current mood disorder indicates that major depression, dysthymia, or both were determined during the hospitalization.

ence to recommended behaviors intended to reduce the risk of subsequent cardiac events in individuals recovering from an MI.

RESULTS

BASELINE CHARACTERISTICS

A total of 696 patients were admitted to the hospital with an acute MI during the study period. A total of 276 patients meeting enrollment criteria provided informed consent and were interviewed during the initial hospitalization. Of these, 204 patients were accessible and completed the 4-month interview. The status of the remaining patients initially interviewed but not completing the 4-month assessment was as follows: 43 unreachable (29 of these were known to be alive), 18 known to have died, and 11 successfully contacted but refused to be interviewed. Records of those patients admitted to the hospital with an acute MI during the study period, but not meeting enrollment criteria or providing informed consent for this study (n=420), revealed no differences compared with the study sample (n=276) in any of the baseline characteristics described in **Table 1**. Nonparticipants were not contrasted with study subjects on left ventricular ejection fraction because this information was not available for more than 50% of the nonparticipants.

The average age of the 204 patients who form the basis of this report was 64.3 ± 11.4 years. There were 116 men (56.9%) and 88 women (43.1%) (Table 1). Most had hypertension and hyperlipidemia. Patients with a BDI score of 10 or greater were more likely to have a current or a history of a mood disorder. Individuals with major depression and/or dysthymia were approximately 10 times more likely to have an elevated BDI score than those with-

out major depression and/or dysthymia. The association of BDI score of 10 or greater with a history of depression appears to be due chiefly to those with a BDI score of 10 or greater who also have major depression and/or dysthymia. A history of depression was found in 56.3% of those with concomitant major depression and/or dysthymia and a BDI score of 10 or greater vs 11.8% of those with a BDI score of 10 or greater alone (P<.001). Other than these differences, we detected no differences between depressed and nondepressed patients (using either the BDI or the SCID) for any other baseline variables. Most patients, regardless of depression status, had Killip class I infarcts, and the percentage of patients with a left ventricular ejection fraction of less than 35% was not significantly greater in those with depression compared with those without (P=.12 based on BDI; P=.87 based on SCID).

PREVALENCE OF IN-HOSPITAL DEPRESSION

Symptoms of mild to moderate depression (BDI score of ≥10) during the hospitalization for an acute MI were present in 35 (17.2%) of the 204 patients (Table 1). This was not different from the prevalence of a BDI score of 10 or greater in those who, at 4 months after discharge, either were unreachable (11 [25.6%] of 43 patients) or refused to be interviewed (2 [18.2%] of 11 patients). Of the 18 patients known to have died by 4 months, 7 (38.9%) had a BDI score of 10 or greater during the hospitalization (χ²=4.3, P<.04 vs other groups). Major depression and/or dysthymia (based on the SCID) were observed in 31 (15.2%) of the 204 patients (Table 1); no patient had bipolar disorder. This was not different from the prevalence of major depression and/or dysthymia in those who were unreachable (9 [20.9%] of 43 patients)

Table 2. Adherence Behaviors in Those With and Without Symptoms of at Least Mild to Moderate Depression*

MOSSAS Category	Mean \pm SD BDI Score		P†
	≥ 10	< 10	
Low-sodium diet	4.1 \pm 1.1	4.0 \pm 1.1	.73
Low-fat diet	3.3 \pm 1.3	3.7 \pm 1.2	.046
Prescription medication	4.8 \pm 0.7	4.9 \pm 0.6	.72
Regular exercise	2.4 \pm 1.9	3.3 \pm 1.7	<.01
Reduce stress	2.5 \pm 1.4	3.4 \pm 1.4	<.004
Carry medical supplies‡	3.4 \pm 2.3	3.6 \pm 2.2	.67
Social support	2.6 \pm 1.6	3.3 \pm 1.6	<.04
Diet for those with diabetes§	3.4 \pm 1.3	4.1 \pm 1.0	.06
Check blood glucose level§	3.6 \pm 1.7	3.3 \pm 2.3	.62
Stop smoking||	2.9 \pm 1.7	3.4 \pm 1.9	.42
Total score¶	23.3 \pm 5.7	26.1 \pm 5.2	<.01

*MOSSAS indicates Medical Outcomes Study Specific Adherence Scale; BDI, Beck Depression Inventory.

†P values were obtained from follow-up analyses of variance as described in the "Statistical Analysis" subsection of the "Patients and Methods" section.

‡Medical supplies indicate sublingual nitroglycerin (and/or inhalers if needed).

§Only those with diabetes mellitus were included in these categories.

|| Only current smokers were included in this category.

¶For the 7 adherence behaviors recommended to all patients.

or in those who refused to be interviewed (2 [18.2%] of 11 patients). Of the 18 patients known to have died by 4 months, 5 (27.8%) had major depression and/or dysthymia during the initial hospitalization ($P = .14$ vs other groups).

SELF-REPORTED ADHERENCE BEHAVIORS AT 4 MONTHS IN PATIENTS WITH DEPRESSIVE SYMPTOMS

Differences among those with a BDI score of 10 or greater vs those with a BDI score of less than 10 were observed for adherence behaviors in the first MANOVA ($F_{4,194} = 2.69$, $P < .03$) and in the second MANOVA ($F_{3,156} = 3.38$, $P < .01$) examining behavioral recommendations common to all patients (**Table 2**). Follow-up pairwise comparisons for the first and second MANOVAs found that patients with symptoms of at least mild to moderate depression had significantly lower adherence than those with a BDI score of less than 10 in following a low-fat and low-cholesterol diet ($F_{1,197} = 3.82$), exercising regularly ($F_{1,197} = 6.88$), reducing stress ($F_{1,158} = 8.42$), and increasing social support ($F_{1,158} = 4.11$). Patients with symptoms of at least mild to moderate depression did not differ from those with a BDI score of less than 10 in following a low-sodium diet, taking medications as prescribed, or carrying medical supplies. The total score (summation of scores in each of the individual categories) for the 7 adherence behaviors recommended to all patients was significantly lower in those with a BDI score of 10 or greater vs those with a BDI score of less than 10 (23.0 ± 5.3 vs 26.1 ± 5.3 ; $F_{1,158} = 7.87$).

There was a trend toward a significant difference in adherence to diabetes-specific behaviors among those with a BDI score of 10 or greater vs those with a BDI score of

Table 3. Adherence Behaviors in Those With and Without Major Depression, Dysthymia, or Both*

MOSSAS Category	Major Depression, Dysthymia, or Both	No Current Mood Disorder	P†
Low-sodium diet	3.8 \pm 1.2	4.0 \pm 1.1	.54
Low-fat diet	3.1 \pm 1.4	3.7 \pm 1.2	<.01
Prescription medication	4.6 \pm 1.0	4.9 \pm 0.6	<.03
Regular exercise	2.5 \pm 2.0	3.2 \pm 1.7	<.03
Reduce stress	2.2 \pm 1.2	3.4 \pm 1.4	<.001
Carry medical supplies‡	3.2 \pm 2.3	3.6 \pm 2.2	.56
Social support	2.2 \pm 1.4	3.3 \pm 1.6	<.003
Diet for those with diabetes§	2.9 \pm 1.6	4.2 \pm 0.8	<.003
Check blood glucose level§	2.4 \pm 2.5	3.4 \pm 2.2	.15
Stop smoking||	2.5 \pm 1.8	3.3 \pm 2.0	.23
Total score¶	21.0 \pm 7.0	26.2 \pm 4.7	<.002

*Data are given as mean \pm SD unless otherwise indicated. MOSSAS indicates Medical Outcomes Study Specific Adherence Scale.

†P values were obtained from follow-up analyses of variance as described in the "Statistical Analysis" subsection of the "Patients and Methods" section.

‡Medical supplies indicate sublingual nitroglycerin (and/or inhalers if needed).

§Only those with diabetes mellitus were included in these categories.

|| Only current smokers were included in this category.

¶For the 7 adherence behaviors recommended to all patients.

less than 10 ($F_{2,59} = 3.04$, $P < .06$). Diabetic patients ($n = 62$) with a BDI score of 10 or greater reported marginally less success in following a diet for patients with diabetes than diabetic patients without depression ($F_{1,60} = 4.37$, $P < .06$) but did not differ from diabetic patients without depression for monitoring their blood glucose level. Current smokers ($n = 56$) with a BDI score of 10 or greater did not differ from smokers with a BDI score of less than 10 for following recommendations to stop smoking.

SELF-REPORTED ADHERENCE BEHAVIORS IN PATIENTS WITH MAJOR DEPRESSION AND/OR DYSTHYMIA

Differences among those with major depression and/or dysthymia compared with those without were observed for adherence behaviors in the first MANOVA ($F_{4,194} = 3.04$, $P < .02$) and in the second MANOVA ($F_{3,156} = 7.35$, $P < .001$) examining behaviors recommended to all patients (**Table 3**). Follow-up pairwise comparisons for these MANOVAs found that patients with major depression and/or dysthymia compared with those without had significantly lower adherence to recommendations to follow a low-fat and low-cholesterol diet ($F_{1,197} = 6.41$), take medications as prescribed ($F_{1,197} = 4.82$), exercise regularly ($F_{1,197} = 4.77$), reduce stress ($F_{1,158} = 15.09$), and increase social support ($F_{1,158} = 8.88$). Given the observation that there was a difference between groups for taking medications as prescribed, the medications prescribed for the treatment of cardiac disease were examined in those with and without major depression and/or dysthymia. There were no differences in the percentages of patients with and without major depression and/or dysthymia who were prescribed aspirin, lipid-lowering therapy, angiotensin-converting enzyme inhibitors, digoxin, or diuret-

ics. Individuals with major depression and/or dysthymia were less likely to be prescribed a β -blocker at hospital discharge compared with those without major depression and/or dysthymia (72.4% vs 87.5%; $P < .03$).

Patients with major depression and/or dysthymia did not differ from those without on adherence to recommendations to follow a low-sodium diet or to carry medical supplies. The total score (summation of scores in each of the individual categories) for the 7 adherence behaviors recommended to all patients was significantly lower in those with major depression and/or dysthymia compared with those without (20.6 ± 5.1 vs 26.1 ± 5.1 ; $F_{1,158} = 22.69$, $P < .001$).

Major depression and/or dysthymia were found to be independent predictors of poor adherence to diabetes-specific behaviors among those with diabetes ($F_{2,62} = 6.96$, $P < .002$). Diabetic patients ($n = 62$) with major depression and/or dysthymia reported significantly less success in following a diet for patients with diabetes than those without major depression and/or dysthymia ($F_{1,63} = 14.45$, $P < .001$). There was no difference between groups for monitoring blood glucose level. Current smokers ($n = 56$) with major depression and/or dysthymia did not differ from smokers without a mood disorder for following recommendations to stop smoking.

COMMENT

The present study shows that patients who are depressed during the hospitalization for an acute MI report greater difficulty adhering to behavior and lifestyle recommendations intended to reduce the risk of subsequent cardiac events. When interviewed 4 months after the MI, patients with symptoms of at least mild to moderate depression (BDI score of ≥ 10) or with major depression and/or dysthymia (as determined by the SCID) during the hospitalization reported adhering less often to a low-fat diet, regular exercise, stress reduction, and regularly socializing than did nondepressed patients. Diabetic patients with depression were marginally less likely to report following a diet for patients with diabetes than diabetic patients without depression. Similarly, compared with those without major depression and/or dysthymia, those individuals with major depression and/or dysthymia at the time of hospitalization reported being less likely 4 months later to take medications as prescribed. This last finding cannot be explained by differences in medications prescribed for the treatment of their cardiac condition, since those with major depression and/or dysthymia were not prescribed more cardiac medications than those without major depression and/or dysthymia. This poorer adherence to recommendations to reduce cardiac risk may explain why depression in the hospital is related to a worse long-term prognosis in patients recovering from an MI.^{2,3}

The combined prevalence of major depression and/or dysthymia based on the SCID in this study is similar to the prevalence of major depression alone based on the results of the National Institute of Mental Health Diagnostic Interview Schedule in a previous study² of patients in the early post-MI period. While this suggests the

possibility that mood disorder is less prevalent in our population, we adhered to the 2-week duration and impairment criteria for major depression specified in the *DSM-III-R*, whereas other researchers^{1,2} shortened the 2-week criterion period and omitted the impairment criterion altogether. Approximately 20% of all patients interviewed during the initial hospitalization had symptoms of at least mild to moderate depression based on the BDI. In contrast, Frasure-Smith et al³ noted elevated BDI scores in approximately 30% of their patients. The lower rate of depressive symptoms in our study may at least in part be explained by differences in patient populations. In the present study, patients requiring coronary intervention in the first 48 hours were not assessed, since they required transfer to another facility for coronary angioplasty or bypass surgery. Although the medical records of those unavailable for this study indicate no significant differences for age, sex, infarct size, history of MI, or the presence of diabetes mellitus, it is possible that elevated BDI scores were more prevalent in patients in need of urgent coronary intervention. Another possible difference between the present study and that of Frasure-Smith et al may relate to the prevalence of previous depression in the patient samples. In their population, 27.5% of the patients reported at least 1 episode of major depression before the index MI.¹⁸ In contrast, the combined prevalence of past major depression or past dysthymia was only 15.5% in the present study. Since our study clearly shows that patients with a BDI score of 10 or greater are more likely to have a history of depression than those with a BDI score of less than 10, it is possible that differences in the prevalence of a psychiatric history may explain the observed differences in in-hospital BDI scores. In addition, other factors that may affect the prevalence of depression, such as educational level and socioeconomic status, may differ between the patient samples studied.

Depression has been associated with poor adherence in patients without cardiac disease⁶⁻⁹ and in patients with coronary heart disease.¹⁰⁻¹² Patients with a recent MI who dropped out of a recommended cardiac rehabilitation program were found to be more depressed, anxious, hypochondriacal, and socially introverted at enrollment than those who participated for the prescribed duration of therapy.¹² Depression, poor motivation, and poor body image during a hospitalization for unstable angina or acute MI were all inversely related to smoking cessation and increasing exercise activity 1 year later.¹¹ In another study,¹⁰ elderly patients with depression who had coronary artery disease adhered less often to prescribed aspirin therapy than patients without depression.

In summary, patients who are depressed and who exhibit more difficulty following recommendations intended to reduce their risk of subsequent cardiac events may be readily identified during a hospitalization for an acute MI. Since depression in the hospital is related to long-term prognosis in patients recovering from an MI,^{2,3} our study, in combination with findings from previous investigations,¹⁰⁻¹² suggests that therapies targeted at treating depression or at enhancing compliance may improve the post-MI prognosis in this high-risk popula-

tion. However, our study has several possible limitations. Since the method of providing recommendations intended to reduce the risk of a subsequent cardiac event was not standardized, the strength of these recommendations may have been influenced by specific patient characteristics or psychosocial status. Further investigation is needed to determine the effect of different presentation conditions and of the content and timing of recommendations on adherence behavior. Adherence to recommended risk-reducing behaviors was measured by self-report and was not independently verified. The validity of self-report data may be influenced by a more negative description of self in depressed patients, although the negative response bias observed in depressed subjects often coincides more with reality than does the self-report of nondepressed subjects.¹⁹ Nevertheless, the possible confounding effect of self-report data must be considered in this study. It is also possible that the presence of other medical conditions influenced the complexity of prescribed treatment regimens in the 2 groups. Some of the patients who were initially examined died or were lost to follow-up by the time adherence behavior was assessed at 4 months. The results of this study might have been different if information were available on adherence behavior in these individuals. Finally, this study used telephone interviews to determine adherence. Findings from telephone interviews may not always correspond to the findings obtained by in-person interviews, and it is possible that the results of this study may have been different if the Medical Outcomes Study Specific Adherence Scale had been administered in person. However, good to excellent agreement between telephone and in-person interviews on scores on the Medical Outcomes Study Short-Form Health Survey and medication compliance were found in a recent study.²⁰

Although the relation between nonadherence and mortality may be ascribed to the survival benefit of recommended lifestyle and behavior changes or prescribed medications, adherence behavior per se may relate to coronary heart disease outcomes.²¹ In the Coronary Drug Project Research Group study²² of clofibrate in patients with coronary heart disease and in the β -Blocker Heart Attack Trial,²³ nonadherence to either active drug or placebo was associated with decreased survival in patients with coronary disease. Further study is needed to determine whether treatments focused on depression per se or on compliance-enhancing interventions will improve the prognosis in patients recovering from an MI.

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