Patient-centered Processes of Care and Long-term Outcomes of Myocardial Infarction

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OBJECTIVE: To examine whether patients' experiences with nontechnical aspects of care such as patient education and discharge planning are associated with long-term outcomes.

DESIGN: Observational cohort study.

SETTING: Twenty-three New Hampshire hospitals during 1996 and 1997.

PARTICIPANTS: Acute myocardial infarction (AMI) patients ($N = 2,272$) enrolled prior to discharge.

MEASUREMENTS: Surveys asking about problems with care and health were mailed to patients 1, 3, and 12 months after discharge. Patients were stratified into "worse" or "better" care groups on the basis of their hospital care problem score. Outcomes included self-reported overall health, physical health, mental health, chest pain, and shortness of breath. Other clinical measures were obtained from hospital discharge abstracts.

MAIN RESULTS: The 1-, 3-, and 12-month surveys were returned by 1,346 (59.2%), 1,046 (46%), and 964 (42.4%) enrolled patients, respectively. The primary analytic cohort consisted of the 762 patients who completed both the 1- and 12-month surveys. After adjustment for postdischarge health status and other clinical factors, patients experiencing worse hospital care had lower ratings of overall health (48.4 vs 52.5 on 100-point scale; $P = .02$) and physical health (59.7 vs 68.4; $P < .001$), and were more likely to have chest pain (odds ratio [OR], 1.6; confidence interval [CI], 1.0 to 2.4; $P = .04$) 12 months after their AMI than other patients. However, differences in reports of chest pain were reduced if patients reporting worse hospital care had better experiences with subsequent ambulatory care.

CONCLUSIONS: Patients' experiences with nontechnical processes of AMI hospital care are associated with long-term outcomes; however the association between a negative hospital experience and subsequent chest pain may be offset by more positive outpatient experiences.

KEY WORDS: myocardial infarction; quality of care; patient-centered care; patient satisfaction; outcomes; health status; longitudinal study.

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Research on the quality of care for acute myocardial infarction (AMI) typically focuses on technical aspects of care, such as the use of specific medications and procedures.¹⁻⁴ Nontechnical aspects of care that are highly salient to patients and their families, such as education about their condition, emotional support, and discharge planning, are rarely evaluated.⁵ Consequently, little is known about the extent to which these aspects of care, often referred to as patient-centered processes of care, are associated with recovery from an AMI and longer-term health outcomes.

Surveys of recently hospitalized patients show relatively high rates of problems with nontechnical aspects of care, including respect for patient preferences, coordination of care, information and education, emotional support, involvement of family and friends, and continuity and transition.^{6,7} Such problems are not only associated with patient satisfaction,⁸⁻¹⁰ but also may be linked to clinical outcomes as well.^{5,11-13} For example, inadequate information and education or poor discharge planning can decrease patient adherence to treatments and lifestyle changes, or increase anxiety.¹⁴⁻¹⁷ Lack of adherence or persistent anxiety, in turn, is associated with worse post-myocardial infarction (MI) outcomes.¹⁸⁻²⁷

There is increasing use of patient surveys that ask about specific processes of care for quality improvement and accreditation purposes.^{7,28,29} However, much remains to be learned about whether such patient-reported problems are associated with worse clinical outcomes, particularly among disease-specific cohorts such as AMI patients.⁵ In a time of growing demands to improve quality with increasingly limited resources, such data are crucial to help providers and policy makers evaluate the best ways to enhance care and outcomes.

In this study, we examine whether patient-reported problems with nontechnical aspects of AMI hospital care are associated with health status and cardiac symptoms 1 year after discharge. We use 5 key measures of post-MI health: overall health, physical health status, mental health status, and presence of chest pain or shortness of breath. These data provide the opportunity to assess the association between MI survivors' hospital experience and changes in health status and symptoms over time, as well as potential mediating effects of follow-up care in ambulatory settings.³⁰⁻³²

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METHODS

Participants

Eligible patients included all adults with a principal diagnosis of AMI who were discharged between January 1, 1996 and December 31, 1997 from 23 New Hampshire hospitals participating in the Foundation for Healthy Communities Patient-Centered Care Project. A total of 2,272 (62%) of eligible patients were enrolled in the study.

Eligible patients were approached by a hospital staff member at each site who explained the study to them and obtained their agreement to participate. Hospital staff were encouraged to approach all patients regardless of their health status and were provided with a standardized script to minimize inclusion bias. Enrolled patients were younger (mean age 62.4 vs 67.4; $P < .001$) and less likely to be female (32.6% vs 39.1%; $P = .001$) than patients not enrolled. However, the 2 groups did not differ significantly by race. Additional information about patients not enrolled in the study was unavailable. Self-administered surveys were mailed to enrolled patients approximately 1, 3, and 12 months after discharge with reminder postcards mailed 1 week later. Patients who had not responded 2 weeks after the reminder postcard were mailed a second questionnaire. Of the 2,272 patients enrolled during their hospitalization, 1,346 (59.2%), 1,046 (46%), and 964 (42.4%) returned the 1-, 3-, and 12-month surveys, respectively. The primary analytic cohort in this study included only those patients who completed both the 1- and 12-month surveys. Of the 964 patients completing the 12-month survey, 202 patients had never completed the 1-month survey. Thus, the primary analytic cohort included 762 patients.

Nonrespondents to either the 1- or 12-month survey included 160 (7.0%) of the patients who returned illegible questionnaires or refused to participate, 135 (5.9%) who had incorrect addresses, and 59 (2.6%) who were reported by a relative or friend to have died. Nonrespondents were younger (mean age 61.5 vs 64.4; $P < .001$), had higher scores on the comorbidity severity index (0.45 vs 0.40; $P = .008$), were less likely to be in a high-AMI volume hospital (64.6% vs 71.3%; $P = .03$) or undergo a coronary artery bypass graft (CABG) (15.3% vs 20.9%; $P = .007$), and were more often transferred to another hospital after discharge (14.7% vs 8.1%; $P = .001$). However, nonrespondents and respondents were comparable in terms of gender, race, common cardiovascular comorbidities (e.g., diabetes), and number of comorbidities overall.

Survey Measures

Questions about hospital care were asked in the initial postdischarge (1-month) survey and were based on the previously validated and widely used Picker inpatient questionnaire.^{6,33} The Picker questionnaire

focuses on 7 dimensions of patient-centered care during hospitalization including: respect for patient preferences, coordination of care, information and education, physical comfort, emotional support, involvement of family and friends, and continuity and transition. In contrast to items in typical satisfaction surveys that ask patients to rate the quality of their care (e.g., excellent, good, fair, poor), questions in the 1-month survey asked patients to report whether or not specific processes of care had occurred. For example, a question relating to information and education was: "When you had important questions to ask a doctor, did you get answers you could understand?" An item about emotional support was: "If you had any anxieties or fears about your condition or treatment, did a doctor discuss them with you?" And an item relating to continuity and transition was: "Did they tell you when you could resume your usual activities, such as when to go back to work or drive a car?" An answer of "no" or "yes, somewhat" was scored as a problem for these items. Questions about ambulatory care asked in the 3-month survey were similar to those in the 1-month survey but focused on patient-centered aspects of ambulatory care since discharge.

Measures of health were based on patient responses to questions in the 1- and 12-month surveys. Functional health status measures were adapted from the Medical Outcomes Study questionnaire,³⁴ including a single item about general health and 2 three-item mental and physical functioning scales based on principal components analysis (Cronbach's α 0.76 and 0.86, respectively). For instance, an item in the mental health scale was: "How much of the time during the past 4 weeks have you felt downhearted and blue?" (6 response categories ranging from "all the time" to "none of the time"). An item in the physical health scale was: "Does your health now limit you in walking several blocks?" (3 response categories: "yes, limited a lot," "yes, limited, a little," and "no, not limited at all").

Cardiac symptoms were assessed using modified London School of Hygiene measures^{35,36} including 3 angina and 4 dyspnea items that asked whether symptoms occurred in various situations. For example, an angina item was: "Did you get it [chest pain] when you walked uphill or hurried?" and an item about dyspnea was: "Did you get short of breath when washing or dressing?" (response categories: "yes" or "no" for both items). We then computed dichotomous variables to indicate the presence or absence of chest pain or shortness of breath. A symptom was considered present if respondents answered yes to any of the angina or dyspnea items, respectively.

Administrative Data

Data on patients' age, gender, race, discharge diagnoses (International Classification of Diseases, Ninth Revision [ICD-9]-CM codes used, up to 10 diagnoses possible), procedures (Current Procedural Terminology [CPT]-4 codes), and hospital transfers to or from the index

hospital were obtained from uniform hospital discharge records provided voluntarily by participating hospitals.

Data Analysis

Patients' responses in the initial postdischarge survey to questions about their AMI hospital care were used to calculate an overall problem score. We first calculated the percent of items in each dimension for which a response indicated a problem with care. For example, a score of 40 corresponds to a response indicating a problem on 2 out of 5 items in a given dimension. We then computed the mean problem scores of the 7 individual dimensions with a range from 0 to 100, an increasing score indicating more problems. The distribution of patient-reported problems was skewed. However, we found similar associations between problems and outcomes regardless of which of several formulations of the problem score we used, including continuous, logged, and dichotomized versions. We present results based on the dichotomized version of the overall problem score. Patients experiencing "worse care" were defined as those with problem scores in the worst (i.e., top) quartile, and all other respondents were classified as having experienced "better care." To simplify interpretation of the 3 health status measures, including overall health, mental health, and physical health, we linearly transformed each to a 100-point scale with increasing score indicating better health.

We compared sociodemographic and clinical characteristics of patients who experienced better care to those who experienced worse care using the *t* test for continuous variables, the χ^2 or Fisher exact test for categorical variables, and the Wilcoxon rank sum test for ordinal variables. Unadjusted health status and relative odds of cardiac symptoms for the 2 patient groups after discharge and at 12 months were compared using the *t* test and χ^2 test, respectively.

In the multivariate analyses, we adjusted for the patient-reported measure of health status or symptoms during the initial postdischarge period that corresponded to the dependent variable in each model. For example, postdischarge physical health status was adjusted for in the model predicting 12-month physical health status.

To further adjust for the impact of comorbid illnesses on subsequent health, we used a previously validated comorbidity severity index that weights each comorbidity in terms of its impact on the likelihood (log-odds) of 2-year cardiovascular mortality.³⁷ This index captures both the effects of likely preexisting comorbidities such as diabetes as well as diagnoses that may have resulted from the AMI such as cardiopulmonary shock. We also included a variable indicating whether a patient had 5 or more secondary discharge diagnoses. This measure predicts 2-year cardiovascular mortality even when comorbidity severity is controlled.³⁷ Both measures were significant predictors of the health outcomes we examine in the present study.

Other variables in the multivariate analyses included patients' age, gender, race, education, hospitalization within 6 months before AMI, treatment type (medical, percutaneous transluminal coronary angioplasty [PTCA], or CABG surgery), annual hospital AMI volume (0 to 99 cases, 100–199 cases, ≥ 200 cases), and hospital transfers during the initial episode of AMI care.

Linear regression models were used to predict each of the adjusted health status scores for patients who experienced better care and those who experienced worse care, and logistic regression models were used to predict the adjusted odds of chest pain or shortness of breath for these 2 groups. Analyses were conducted with SAS statistical software (SAS 8.1; SAS Institute, Cary, NC). Two-tailed tests of significance were used.

To assess whether the association between a negative hospital experience and worse long-term outcomes could be mediated by subsequent outpatient care, we conducted a subgroup analysis in which we further categorized patients who experienced better or worse hospital care based on their experiences with ambulatory care during the first 3 months after discharge. We used patients' responses to the 3-month survey to compute an ambulatory care problem score employing the same methodology we used to compute the hospital care problem score. Patients with a score in the top quartile were classified as experiencing worse ambulatory care; all other patients were classified as experiencing better ambulatory care. Patients who completed the initial postdischarge, 3-month, and 12-month surveys were then stratified into 4 groups including those in: 1) both the worse hospital care and ambulatory care group; 2) the better hospital care and worse ambulatory care group; 3) the worse hospital care and better ambulatory care group; and 4) the better care group for both stages of care. We then re-ran the multivariate models used in the primary analyses with patients' experience with care measured with dummy variables for the first 3 groups and the fourth group treated as the comparison group.

RESULTS

Characteristics of Patients Experiencing Better and Worse Hospital Care

Patients who experienced worse care were somewhat more likely to have been hospitalized (22.2% vs 29.5%; *P* = .05) in the 6 months prior to their AMI than patients who experienced better care (Table 1). However, the 2 groups did not differ significantly in terms of sociodemographic and other clinical variables including age, gender, race, education, comorbidities, treatment, hospital AMI volume, and transfers.

Most patients reported relatively few problems with their AMI hospital care, but patients who experienced worse care had an average problem score of 38 (Table 2). Compared to patients who experienced better care, those who experienced worse care had higher average problem scores for all

Table 1. Sociodemographic and Clinical Characteristics of Respondents by Patient Hospital Experience*

Characteristic	Better Care (n = 571) [†]	Worse Care (n = 191)	P Value
Mean age, y (SE)	64.7 (0.5)	63.5 (0.9)	.24
Female, %	31.4	34.6	.41
Education, %			
Less than high school	20.8	16.9	
High school, some college, or technical school	56.6	57.9	.25
College graduate or postgraduate	22.6	25.3	
Race, % white	92.1	91.6	.83
Hospitalization in 6 mo prior to AMI, %	22.2	29.5	.05
Comorbidity Severity Index, Log-odds 2 year mortality (SE)	0.4 (0.02)	0.4 (0.04)	.99
>4 Secondary discharge diagnoses, %	66.4	66.5	.98
Selected related discharge diagnoses, %			
Prior myocardial infarction	8.2	4.2	.06
Congestive heart failure	18.9	22.0	.36
Hypertension	48.0	44.5	.40
Cerebrovascular disease	1.1	1.1	.99
Peripheral vascular disease	8.9	7.9	.65
Diabetes mellitus	21.4	17.8	.29
Arrhythmias	25.4	24.1	.72
Shock	6.3	6.8	.81
Hospital treatment, %			
Medical	45.7	46.1	
PTCA	33.5	33.0	.99
CABG surgery	20.8	20.9	
Hospital AMI volume, cases/yr, %			
1–99	6.1	3.7	
100–199	23.8	21.5	.17
≥200	70.1	74.9	
Transfer from another acute care hospital, %	52.2	56.0	.36
Transfer to another acute care hospital, %	5.6	4.2	.45

* Patient hospital experience based on initial postdischarge (1-month) survey. Worse care group defined as respondents with top quartile problem score (>22.8), better care group all other respondents.

[†] Analytic sample includes only respondents to both the initial post-discharge and 12-month surveys.

PTCA, percutaneous transluminal coronary angioplasty; CABG, coronary artery bypass graft; AMI, acute myocardial infarction.

7 dimensions of care (all $P < .001$); the most frequent problems (mean scores >40) occurred in the areas of information and education, emotional support, involvement of family and friends, and continuity and transition to home.

Health Status and Cardiac Symptoms among Better and Worse Hospital Care Patients

Table 3 shows patients' unadjusted health status and symptoms 1 month after hospital discharge. Patients who experienced worse care had poorer health outcomes than

those who experienced better care, including reported overall health (43.5 vs 54.9), mental health (58.6 vs 71.5), and physical health (50.2 vs 60.6) (all $P < .001$) and greater odds of having chest pain (odds ratio [OR], 2.4; 95% confidence interval [95% CI], 1.7 to 3.4) or shortness of breath (OR, 2.5; 95% CI, 1.8 to 3.5).

Despite small improvements in their mental and physical health 12 months after their AMI, the health status of patients who experienced worse care remained significantly lower than that of patients who experienced better care (Table 4) in terms of overall health (44.0 vs 53.6), mental health (64.7 vs 71.1), and physical health (54.9 vs 69.0) (all $P < .001$). Patients who experienced worse care also continued to be more likely to have chest pain (OR, 2.0; 95% CI, 1.4 to 2.9) and shortness of breath (OR, 2.0; 95% CI, 1.4 to 2.8), although the unadjusted odds ratio decreased for both types of symptoms between the initial postdischarge period and 12 months post-MI.

Adjusting for health status or symptoms 1 month after discharge and other clinical and demographic factors reduced these differences, but mean overall health (48.5 vs 52.5; $P = .02$) and physical health (59.7 vs 68.4; $P < .001$) remained significantly lower for patients who experienced worse care (Table 4). The likelihood of having chest pain also remained greater for this group of patients (OR, 1.6; 95% CI, 1.0 to 2.4; $P = .04$). Adjusted mental health 12 months after the AMI was nearly identical for the 2 groups (69.3 vs 69.6; $P = .84$), while the likelihood of dyspnea for patients who experienced worse care was greater than for patients who experienced better care but was of borderline statistical significance (OR, 1.5; 95% CI, 0.9 to 2.2; $P = .09$).

Table 2. Overall and Individual Dimension Hospital Problem Scores by Patient Hospital Experience*

Problem Scores [†]	Better Care (n = 571) [‡]	Worse Care (n = 191)
Overall problem score, 0 to 100		
Mean (SE)	7.5 (0.3)	37.8 (0.9)
Range	0 to 22.6	22.9 to 76.4
Individual dimension scores, 0 to 100, mean (SE)		
Respect for patient preferences	7.1 (0.6)	33.8 (1.7)
Coordination of care	8.1 (0.6)	27.5 (1.7)
Information and education	6.0 (0.5)	40.9 (1.7)
Physical comfort	1.0 (0.2)	10.4 (1.1)
Emotional support	8.6 (0.6)	45.5 (1.8)
Involvement of family and friends	7.2 (0.6)	47.5 (2.1)
Continuity and discharge	14.5 (0.9)	59.3 (2.3)

* Worse care group defined as respondents with top quartile problem score (>22.8), better care group all other respondents.

[†] All problems scores were significantly different between the two groups, all $P < .001$. Overall problem score and the individual dimension scores ranged from 0 to 100 with increasing score indicating more problems.

[‡] Analytic sample includes only respondents to both initial post-discharge and 12-month survey.

Table 3. Unadjusted Health Status and Cardiac Symptoms One Month after Discharge by Patient Hospital Experience*

Health Outcome [†]	Better Care (n = 571) [‡]	Worse Care (n = 191)
Overall health, mean (SE)	54.9 (0.9)	43.5 (1.5)
Mental health, mean (SE)	71.5 (0.8)	58.6 (1.4)
Physical health, mean (SE)	60.6 (1.3)	50.2 (2.3)
Chest pain		
With symptoms, %	28.3	48.9
Odds ratio (95% CI)		2.4 (1.7 to 3.4)
Shortness of breath		
With symptoms, %	36.4	59.0
Odds ratio (95% CI)		2.5 (1.8 to 3.5)

* Worse care group defined as respondents with top quartile problem score (>22.8), better care group includes all other respondents.

[†] All outcomes had significant differences between the two groups, all $P < .001$. Overall health, mental health, and physical health assessed on a 100-point scale with higher scores indicating better health. Chest pain and shortness of breath were measured as presence or absence of these symptoms.

[‡] Analytic sample includes only respondents to the initial post-discharge and 12-month survey.

CI, confidence interval.

To assess whether patients' postdischarge mental health altered the impact of their hospital experience on other outcomes, we repeated the main analyses predicting 12-month overall health, physical health, chest pain, and shortness of breath, respectively, with mental health 1 month after hospitalization included as a covariate. This adjustment did not change the association between experience of hospital care and subsequent physical health. However, the effects of a worse hospital experience on overall health (49.5 vs 52.1; $P = .13$) and chest pain (OR, 1.4; 95% CI, 0.91 to 2.2; $P = .13$) were reduced to nonsignificant levels; the effect on shortness of breath remained insignificant.

Mediating Effects of Patient-centered Ambulatory Care

A total of 612 patients completed all 3 surveys and were included in the subgroup analyses. As shown in Figure 1, patients who experienced both worse hospital and subsequent worse ambulatory care were nearly twice as likely (OR, 1.9; 95% CI, 1.0 to 3.5; $P = .05$) to report chest pain 1 year after their MI as were patients in the better care group for both stages of care. In contrast, patients in the worse hospital care group but better ambulatory care group were similarly as likely (OR, 1.2; 95% CI, 0.6 to 2.4) to have chest pain at 1 year as were those who experienced few problems during both stages of care. Patients in the better hospital care group but worse ambulatory care group were also no more likely (OR, 1.0; 95% CI, 0.5 to 1.9) to have chest pain at 1 year than were those in the better hospital and ambulatory care group. The pattern of results was similar for overall health and shortness of breath, although not significant because of small subgroup sample sizes. In

contrast, patients in the worse care hospital group had significantly worse physical health than patients in the better care group for both stages of care whether they were in the worse (56.2 vs 63.6; $P = .04$) or better (55.6 vs 64.2; $P = .02$) ambulatory care group.

DISCUSSION

Patients experiencing the most problems with an AMI hospitalization and their transition to home had worse health status and more symptoms than other patients during the first year after an AMI. Differences in all 5 measures of health were apparent both during the initial postdischarge period and 12 months after the AMI. These differences were reduced at 12 months when patients'

Table 4. Unadjusted and Adjusted Health Status and Cardiac Symptoms 12 Months after Discharge by Patient Hospital Experience*

Health Outcome [†]	Better Care (n = 571) [‡]	Worse Care (n = 191)	P Value
Overall health, mean (SE)			
Unadjusted	53.6 (1.0)	44.0 (1.6)	<.001
Adjusted [§]	52.5 (0.8)	48.5 (1.5)	.02
Mental health, mean (SE)			
Unadjusted	71.1 (.83)	64.7 (1.4)	<.001
Adjusted [§]	69.6 (.75)	69.3 (1.3)	.84
Physical health, mean (SE)			
Unadjusted	69.0 (1.4)	54.9 (2.5)	.001
Adjusted [§]	68.4 (1.1)	59.7 (2.0)	<.001
Chest pain			
With symptoms, %	22.8	37.5	.001
Unadjusted, odds ratio (95% CI)		2.0 (1.4 to 2.9)	.001
Adjusted [¶] , odds ratio (95% CI)		1.6 (1.0 to 2.4)	.04
Shortness of breath			
With symptoms, %	37.6	54.5	.001
Unadjusted, odds ratio (95% CI)		2.0 (1.4 to 2.8)	.001
Adjusted [¶] , odds ratio (95% CI)		1.5 (0.9 to 2.2)	.09

* Worse care group defined as respondents with top quartile problem score (>22.8), better care group as all other patients.

[†] Overall health, mental health, and physical health assessed on a 100-point scale with higher scores indicating better health. Chest pain and shortness of breath were measured as presence or absence of these symptoms.

[‡] Analytical sample includes only respondents to the initial post-discharge and 12-month survey.

[§] Linear regression adjusted for age, gender, race, education, postdischarge health status, comorbidities, prior hospitalization, treatment type, hospital acute myocardial infarction (AMI) volume, and transfers.

^{||} Odds ratio of worse care versus better care group having symptoms 12 months after AMI.

[¶] Logistic regression adjusted for age, gender, race, education, postdischarge symptoms, comorbidities, prior hospitalization, treatment type, hospital AMI volume, and transfers.

CI, confidence interval.

Patient Experience With Care*

* Only patients responding to all 3 surveys were included in this analysis. Sample sizes for the subgroups were $n=385$ for the comparison group (better hospital and ambulatory care) and $n=73$, 81 , and 73 for the 3 worse care groups (top to bottom), respectively.

FIGURE 1. Adjusted odds ratios and 95% confidence intervals of chest pain 12 months after myocardial infarction according to patient experiences with hospital and ambulatory care.

self-reported postdischarge health and other clinical and demographic factors were adjusted for, but differences remained significant for overall health, physical health, and chest pain. Differences in overall health and chest pain, but not physical health, were further reduced when post-discharge mental health was taken into account, suggesting that mental health may partly mediate or confound the association between hospital experience and subsequent outcomes.³⁸ Our analysis also suggests that while a negative hospital experience by AMI patients is associated with worse long-term outcomes, this association may be offset by more positive experiences with subsequent ambulatory care.

How can an AMI patient's hospital experience be associated with health outcomes a year later? Evidence from a variety of sources suggests several plausible pathways that could operate alone or in combination. For example, numerous studies have shown that the quality of communication with patients about their illness and necessary treatment, as well as interpersonal aspects of care more generally, can influence a variety of health-related behaviors that are crucial to successful recovery from acute illness and management of chronic conditions.^{9,11-13,16,20,21,39} Thus, patients experiencing

difficulty getting clear guidance about their condition and treatment may be less likely to take their medications appropriately after discharge and to make lifestyle changes that would improve their recovery. Similarly, patients who leave the hospital with little understanding of their condition and the next steps in their care, or who had negative encounters with their providers in the hospital, may be less likely to make and keep follow-up outpatient appointments or to report concerns or symptoms. Such patients also may be at greater risk of anxiety or depression, which are common after an AMI and are associated with increased post-MI morbidity and mortality, longer hospitalizations, and direct physiological effects on the cardiovascular system.^{22-24,26,27,40-45}

Ideally, providers could address patients' concerns or identify significant anxiety or depression during the first several office visits following discharge. However, even if AMI patients do see providers in the months following their AMI, there is no assurance that these issues will be addressed. For example, busy providers may assume that such concerns were adequately addressed prior to discharge or in patients' follow-up visits with other providers (e.g., a cardiac rehabilitation therapist). Consequently, they may spend little time reviewing potentially confusing topics with patients, particularly those who do not voice their concerns during these brief visits. Moreover, providers often do not detect clinically significant anxiety or depression during routine office visits.^{46,47} Conversely, providers who systematically ask about common areas of misunderstanding or screen for anxiety and depression may be more likely to uncover and address potential problems, thereby putting patients back on a trajectory similar to that of patients who experienced few problems with their AMI hospitalization.

Other factors may have contributed to better outcomes for patients who reported better care. For example, patients with social support have been shown to have better post-MI outcomes than those without support,⁴⁸ and social support may also help to facilitate better hospital care. Similarly, although we adjusted for education as a proxy for socioeconomic status (SES), unmeasured aspects of SES may have played a role since higher SES patients have been shown to receive better interpersonal care and have better outcomes.^{49,50} Finally, cardiac patients who are more adherent to treatment recommendations have been shown to have better outcomes than nonadherent patients, even if they receive a placebo.^{19,20} Providers may provide better interpersonal care to adherent patients than to nonadherent ones.

Psychosocial characteristics of patients reporting worse care may also have contributed to the associations we found. For example, anxious or depressed patients are not only prone to worse health outcomes after an AMI but are also more likely to report worse care than comparable patients without anxiety or depression.³⁸ When we adjusted for a 3-item mental health index 1 month after patients' hospitalization, although the association between hospital care and physical health was unchanged, it was

reduced for overall health and chest pain. However, we cannot determine whether patients' negative experiences with care in the hospital and during the month after discharge contributed to their post-MI mental health. Furthermore, regardless of whether a patient has clinically significant anxiety or depression, there is evidence that the care emotionally troubled patients receive may actually be worse, since providers may find care for these patients less satisfying and more frustrating.^{51,52}

Our results are consistent with a previous study by Covinsky et al.⁵ In this study, patients reporting 1 or more problems with communication during hospitalization had lower adjusted SF-36 physical component scores 3 months after their AMI compared to patients reporting no problems with their hospital care, and those reporting problems with the discharge process had lower physical and mental component scores. Our study extends these findings by examining outcomes beyond 3 months post-MI.

A major strength of our study is that patients were followed prospectively over a year, allowing sufficient time to observe changes in health status that might be due to interpersonal care processes. Also, we used patient reports about care at 1 month to predict health 1 year after the AMI, eliminating the potential confounding of current health status and patient reports about previous care in cross-sectional studies.⁵³ Furthermore, we controlled for differences in patient-reported health at 1 month, even though some of those differences could be the result of differences in quality of care. Although this approach is conservative, in that it might obscure some of the causal effects of process of care on outcomes, it has the advantage of adjusting for patient response styles, such as the tendency of some patients to give more negative reports about their health and care even when their experiences are similar to those of other patients.

We also adjusted for a comorbidity severity index that reflected both prior comorbidities and new conditions that were noted during the AMI hospitalization, the number of discharge diagnoses, hospitalization in the 6 months preceding their AMI, and other clinical and sociodemographic factors. Nevertheless, differences in unmeasured patient characteristics or other aspects of clinical care may have influenced the associations we found.

Although we had data on whether patients were treated medically or underwent PTCA or CABG surgery, we lacked information on the appropriateness of these treatments or the quality of other aspects of technical care during hospitalization. Similarly, although we had information on nontechnical aspects of care after discharge, we had no data on subsequent cardiac events or procedures. Future research on the quality of AMI care would be greatly strengthened by including measures of both technical and nontechnical processes of care and examining interactions between them, because poor patient-centered care may substantially hinder the effects of good technical care on long-term outcomes.

We had a moderate response rate, so our findings could reflect patients' willingness or ability to respond to the surveys. We did not have complete data on patients who died during the 12 months after their AMI hospitalization, so we could not evaluate these patients in our analysis. Nonrespondents had slightly worse comorbidity severity scores than respondents; however, other comorbidity measures were comparable. The 2 groups differed in several other respects, such as the likelihood of undergoing a cardiac revascularization procedure or being transferred, but these factors were not associated with reported problems in our sample. Although we did not have information about nonrespondents' experience with care, a study of nonrespondents to surveys about hospital care found that nonrespondents generally had more negative experiences with care than respondents, although the differences were small (e.g., 5 points on a 100-point scale).⁵⁴ Thus, not including nonrespondents in our analyses likely resulted in an underestimate of problems with care and an overestimate of average health status. However, these differences are small and are unlikely to have changed our results. Furthermore, we have no reason to suspect that the association between problems with care and outcomes would be different in respondents and nonrespondents.

Finally, because we studied a relatively homogenous population of patients in a single state where most of the initial AMI care was concentrated in a few large hospitals, our results must be confirmed in other institutions and regions. Similarly, because we only considered AMI patients in our analyses, it is unclear whether our findings are generalizable to other conditions.

Our results suggest that patient-reported measures can provide important information about processes of care in the inpatient and outpatient settings that are related to long-term outcomes. Although hospitals and health plans frequently use patients' reports about care, such information is often viewed solely as an indicator of patient satisfaction rather than as a measure of clinical quality of care. Such a view may underestimate the potential impact of patients' experiences with care on their outcomes. Further research is needed to disentangle the complex causal relationships between patient experiences with care and outcomes to identify the most effective ways to improve care and develop meaningful interventions for specific groups of patients at risk for poor outcomes.

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