

## Do Patients' Health Status Reports Predict Future Hospital Stays for Patients with an Acute Myocardial Infarction?

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**Objective:** *Although patients' reports of health status and functioning have been shown to be reliable and valid measures for use in health care research, there is limited information on their practical utility in clinical settings. The purpose of this study was to determine if patients' reports of physical and psychosocial health status have prognostic value by predicting future hospital stays in acute myocardial infarction (AMI) patients.*

**Methods:** *Research design was an observational, longitudinal follow-up study involving a sample of 132 AMI patients recently discharged from nine community hospitals. One hundred twelve patients (85%) completed the study. Patient reports of general health status, diagnosis-specific measures of health status, medical history, and demographic characteristics were collected one to two months post AMI; follow-up data were gathered six months later to identify occurrence of new cardiac-related stays.*

**Results:** *Poor psychosocial functioning and cardiac symptoms were significantly associated with the likelihood of being rehospitalized (odds ratios of 4.62 and 4.00). Multivariate results, however, show that poor psychosocial function and younger age—but not cardiac symptoms—are significant independent predictors of new hospital stays, after controlling for medical history and demographic variables.*

**Conclusion:** *Simple patient reports of health status, which physicians can obtain easily from AMI patients shortly after an infarction, are predictive of rehospitalization.*

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**KEY WORDS:** Health Status, Acute Myocardial Infarction, Hospital Stays

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Patients' reports of general health status, functioning, and well-being are reliable, valid, and accepted measures for health care research (1). They have been endorsed by the American College of Physicians, the World Organization of National Colleges of General and Family Practice (WONCA), and other leaders (2-4). There is limited empirical evidence, however, on their practical utility for clinical assessment, management, or prognosis (5,6). The general purpose of this study was to answer this question: Do patients' reports of physical and psychosocial health status predict future hospital stays in recent acute myocardial infarction (AMI) patients? A specific goal of this study was to evaluate the relative predictive value of generic, patient-based measures of health status compared to disease-specific patient reports.

## METHODS

The sampling frame consisted of all patients discharged during one month from nine community hospitals with a discharge diagnosis of AMI and length of stay (LOS) exceeding five days. A stay of greater than five days was used to improve the likelihood that the diagnosis of AMI was accurate and that the patient had suffered a recent coronary event. Discharge diagnoses and LOS were abstracted from medical records. Patient reports of general health status (physical function, psychosocial function), diagnosis-specific health status (cardiac capacity, cardiac symptoms), medical history (prior AMI history, recent hospital stay(s) within past two years) and demographic characteristics (age, sex) were gathered by mailed questionnaire or interview (i.e., telephone calls to non-respondents) one to two months post discharge. Patients were recontacted six months post discharge to determine if they had been hospitalized a second time for a cardiac-related problem (new stay). The occurrence of a new hospital stay was based on patient self-report, using standard wording and a recall window shorter than the 12 month window that's commonly used. Resource constraints precluded validation of these reports.

### Measures

Two generic health status scales were formed by combining previously validated COOP Charts (7,8). One scale is PHYSICAL FUNCTION which was formed by combining three COOP charts (i.e., Physical Condition, Daily Activities and Pain). A second scale is PSYCHOSOCIAL FUNCTION which was made by combining three other COOP Charts (i.e., Emotional Condition, Social Activities and Quality of Life). These two scales were used as measures of physical and psychosocial health status respectively. They were constructed

based on findings from a rotated factor analysis, which showed that six different indicators of general health status (i.e., COOP Charts) actually measure two distinct aspects of general health status—physical functioning and psychosocial functioning. These two scales were created by summing patients' reported degree of functioning (as assessed by a five-point scale, using the three COOP Charts identified by factor analysis), and by using the factor loadings for each COOP Chart produced by the factor analysis to weight the values of each chart in producing the total scale score. The COOP Charts are scored in a manner whereby higher scores indicate more dysfunction.

Prior research has demonstrated that the COOP Charts are both reliable and valid measures of functioning (7-9). Consequently, the "derived" variables used in this study should also be reliable and valid. The steps taken to combine the individual COOP Charts into two distinct dimensions—PHYSICAL FUNCTION and PSYCHOSOCIAL FUNCTION respectively—follow conventional scale construction methods, and therefore should produce valid and reliable "derived" scales. The reasons for this are: (1) for each scale, the individual COOP Charts that were used as "components" to create the new derived measure, were valid and correlated highly with another; (2) the groupings of COOP Charts to form the two distinct dimensions (PHYSICAL and PSYCHOSOCIAL) of functioning are natural, have face validity, and reflect dual aspects of overall health; and (3) the loadings from the factor analysis were used to better represent the weights (or contributions) that each respective Chart contributes to the overall dimension (or factor), than would be achieved by treating all weights as equal. The reason for using these "derived" variables to represent PHYSICAL and PSYCHOSOCIAL domains of function, was to reduce the number of independent variables and thereby decrease the likelihood of experiencing Type I error.

Two AMI-specific health status scales were formed based on patients' reports of their symptoms associated with congestive heart failure (Cardiac Symptoms), and their ability to perform cardiovascular system demanding physical activities such as carry heavy objects, walk up and down stairs, etc. (Cardiac Capacity). Examples of items used to measure Cardiac Symptoms associated with congestive heart failure were: "Do you need to use several pillows at night to relieve shortness of breath so you can sleep? Do you have puffy swelling of both your ankles (edema)?" Examples of items used to measure Cardiac Capacity were: "Can you walk down a flight of steps without stopping? Can you do light activities without stopping, like playing golf, bowling, or doing light work around the house?" These two scales are based on previously used and validated cardiac-specific measures of function (10-12).

We calculated odds ratios to determine the strength of the association between patients' health status one to two months post AMI and whether they had a subsequent hospital stay. In order to compute odds ratios, it was necessary to

dichotomize continuous variables; the dichotomies were made in the following manner for each ordinal or continuous, independent variable: (a) PHYSICAL FUNCTION and PSYCHOSOCIAL FUNCTION—High = function score  $> \bar{x} + 1$  S.D. vs. Low = function score  $\leq \bar{x} + 1$  S.D.; (b) Age— $< 65$  years vs.  $\geq 65$  years; (c) LOS— $< 8$  days (median) vs.  $\geq 8$  days (median); (d) Cardiac Symptoms and Cardiac Capacity— $<$  median score vs.  $\geq$  median score. Multiple logit analysis was used to determine the independent contribution that health status variables made to predicting rehospitalization (New Stays) after controlling for medical history (i.e., prior history of AMI, hospital stay past two years, and length of index hospital stay) and demographic variables (i.e., age and gender).

## RESULTS

### Response Rates and Response Bias

Eighty-five percent ( $n = 112$ ) of the 132 patients who responded at one month responded at six months. There were no statistically significant differences between the original sample frame ( $n = 164$ ) and patients who responded to the one- and six-month questionnaires with respect to demographic characteristics, diagnosis, and LOS. For example, the results showed no significant differences on the mean ages of the three groups, which were 62.0, 62.2 and 62.0 respectively.

### Predictors of New Hospital Stays

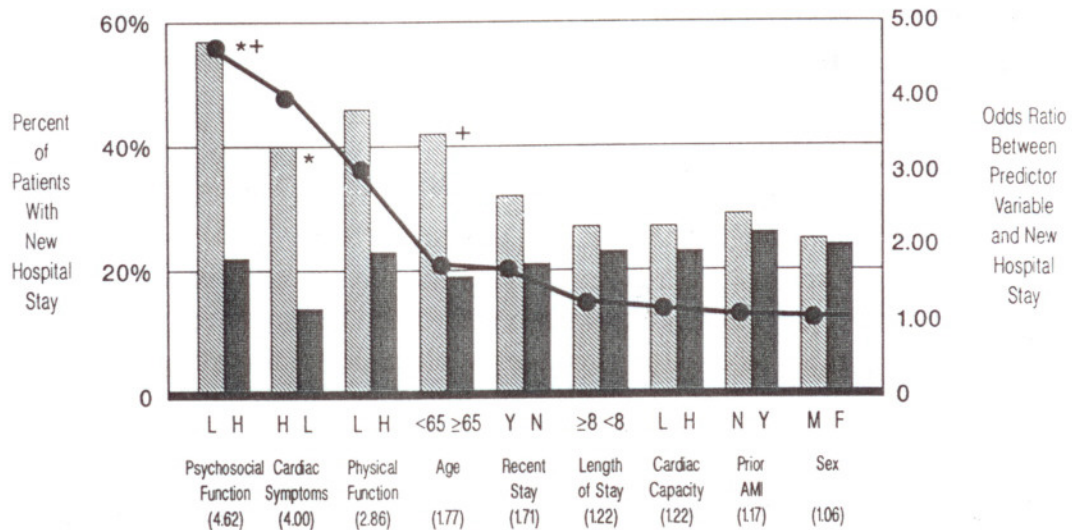
The main substantive results are summarized in Table 1 and Figure 1. Twenty-seven percent (27%) of the patients reported a new hospital stay within six months after discharge. Low PSYCHOSOCIAL FUNCTION and high Cardiac Symptoms were significant predictors of rehospitalization (Figure 1,  $p < 0.01$ , odds ratios of 4.62 and 4.00 respectively). Fifty-seven percent of patients scoring in the bottom third of PSYCHOSOCIAL FUNCTION one month post AMI were rehospitalized in contrast to only 7% scoring in the top third. Low PHYSICAL FUNCTION, younger Age, and occurrence of a Recent Hospital Stay (i.e., within past two years) had elevated odds ratios, but were not statistically significant (Figure 1).

Multiple logistic regression analyses (not shown here), however, show that only two variables—PSYCHOSOCIAL FUNCTION and Age—significantly predict New Stays ( $p \leq 0.05$ ) after controlling for the other factors. Further exploratory multivariate analyses were conducted to determine which specific subcomponents of the two general health status scales were most important in

**Table 1.** Summary of the Predictive Value of Independent Variables on the Likelihood of Rehospitalization Among Cardiac Patients

Predictor Variable & (Category Predicting New Stay)	Bivariate Odds Ratio & (Confidence Limits)	Significant on Bivariate Odds Ratio?	Significant on Multiple Logit Analysis?
<i>Generic Health Status</i>			
Physical Function (low)	2.86 (-0.18, 2.28)	No	No
Psychosocial Function (low)	4.62 (0.33, 2.74)**	Yes	Yes
<i>Disease-Specific Health Status</i>			
Cardiac Symptoms (high)	4.00 (0.46, 2.31)**	Yes	No
Cardiac Capacity (low)	1.22 (-0.68, 1.07)	No	No
<i>Medical History</i>			
Prior AMI History (No)	1.17 (-0.75, 1.08)	No	No
Recent Stay Past 2 Years (yes)	1.71 (-0.85, 1.92)	No	No
Length of Stay ( $\geq 8$ days)	1.22 (-0.68, 1.09)	No	No
<i>Demographics</i>			
Age (younger)	1.77 (-0.34, 1.48)	No	Yes
Sex (Male)	1.06 (-0.89, 1.01)	No	No

Double asterisks (\*\*) indicate statistically significant odds ratios at  $p < 0.01$ .



**Fig. 1.** Prediction of Future Hospital Stay: Percentage of Patients with New Cardiac-Related Stay Based on Demographic, Medical History and Functional Status Variables Collected One Month Post Acute Myocardial Infarction. *Notes:* Figure 1 is based on 112 patients with acute myocardial infarction (AMI). The bivariate association between predictor variables and a rehospitalization (New Stay) is shown by the height of the bar for each category of the variable (e.g., L=low vs. H=high, <65 years vs.  $\geq 65$ , Y=yes vs. N=no,  $\geq 8$  days vs. < 8 days, M= male vs. F= female) and by the size of the odds ratio. An asterisk (\*) indicates that the odds ratio for the bivariate relationship is statistically significant at 0.05 level and a cross (+) indicates that the multiple logit analytic results show that the variable is a significant predictor of rehospitalization after controlling for the effects of all the other variables listed. The odds ratio of the bivariate relation is listed in parentheses below the predictor variable name. The predictor variables are listed in rank order based on the size of the bivariate odds ratio. The circles connected by the thick descending black line shows the odds ratio for rehospitalization for each respective predictor variable.

predicting rehospitalization. These results showed that three measures of general health status—i.e., COOP Chart measures of Daily Activities ( $t=2.29$ ,  $p<0.05$ ), Social Activities ( $t=2.58$ ,  $p<0.05$ ) and Quality of Life ( $t=2.11$ ,  $p<0.05$ )—contribute significantly to predicting rehospitalization after controlling for disease-specific measures, medical history, and demographics.

## DISCUSSION

Simple patient reports of generic health status, which physicians can obtain easily from AMI patients within one month of a coronary event, appear to predict subsequent hospitalization. In the multivariate analyses, only patient Age and the PSYCHOSOCIAL FUNCTION scale made independent contributions to predicting rehospitalization for a cardiac problem after controlling for other factors; moreover, three subcomponents of general health status independently predicted new stays—i.e., Daily Activities from the PHYSICAL FUNCTION scale as well as Social Activities and Quality of Life from the PSYCHOSOCIAL FUNCTION scale. Interestingly, the patients' medical history and their reports of disease-specific health status (i.e., Cardiac Symptoms and Cardiac Capacity) were not statistically significant in the multivariate analyses that controlled for the impact of other variables.

These preliminary results are limited because they are based on: (1) a small sample of cardiac patients, (2) incomplete data on adverse events experienced in the six-month period following AMI (i.e., 20 patients were lost to follow-up), (3) limited clinical data on patient morbidity at admission, and (4) use of patient reports for data on new hospital stays (i.e., patients with more symptoms may be more likely to obtain care for procedures such as PTCA and CABG, and therefore, are more likely to be readmitted; unfortunately, no data are available on the type of readmission). Financial constraints precluded further actions to gather more complete data and more follow-up information on a larger sample of patients.

In conclusion, further research is needed to obtain better information on the unique prognostic value of clinical factors (such as the type and size of the infarction and co-morbidity) vis-a-vis the unique prognostic value of patient-reported health status measures (both general and disease-specific) for predicting future adverse events like hospital stays among cardiac patients. Nevertheless, these findings are consistent with a growing body of evidence suggesting that a person's psychosocial status and social support system have a strong relationship with their physical well-being (13). It may be possible for physicians to use simple patient reports of health status to identify those at risk for new cardiovascular problems, and work to prevent their occurrence.

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## CLINICAL TIPS

The Dartmouth COOP Charts provide one easy to use method for assessing functional status and screening for dysfunction in office practice. COOP Charts for adults are available for use in "tool kit" form. These can be obtained by writing to John H. Wasson, MD, Department of Community and Family Medicine, The COOP Project, Dartmouth Medical School, Hanover, NH 03755, or call Deborah Johnson at the Dartmouth COOP Project (603-650-1220). COOP Charts for adolescents have been recently developed and validated. These will be available for general use in the future (ie, as soon as the validation work has been published) (1-3).

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