



## The Relationship Between Meeting Patients' Information Needs and their Satisfaction with Hospital Care and General Health Status Outcomes

CELIA O. LARSON,<sup>1</sup>\*† EUGENE C. NELSON,‡ DAVID GUSTAFSON§ and PAUL B. BATALDEN‡

\*Metropolitan Davidson County Health Director of Evaluation, Bureau of Assessment and Evaluation, 311 23rd Avenue North, Nashville, TN 37203, USA

†Metropolitan Davidson County Health Department, Director of Evaluation, Bureau of Assessment and Evaluation, 311 23rd Avenue North, Nashville, TN 37203, USA

‡Dartmouth-Hitchcock Medical Center, 1 Medical Center Drive, Lebanon, NH 03756, and the Department of Community and Family Medicine, Dartmouth Medical School, Hanover, NH 03755, USA

§Industrial Engineering Department, University of Wisconsin, 1513 University Avenue, Madison, WI 53706, USA

**Objective:** The objective of this study was to determine if there is an association between meeting patients' information needs and their overall satisfaction with care and their general health status outcomes.

**Study design:** This non-experimental study used data from hospital medical records as well as patient-completed surveys conducted two and eight weeks post discharge. The setting involved three community hospitals in the southeastern section of the US that provided care to a series of 167 acute myocardial infarction (Acute MI) patients.

**Measures:** The independent variable was an index measuring how well patients' information

needs were met. The dependent variables were patient satisfaction (ratings of satisfaction with care process, global satisfaction, and health benefit) and general health status outcomes (physical function, psychosocial function and quality of life). Covariates used as control variables to hold patient characteristics constant, included demographics (age, gender) and clinical measures of acute MI severity, comorbidity, angina (at eight weeks), and dyspnea (at eight weeks).

**Analysis:** Univariate analyses were employed to: (1) describe patients' characteristics; (2) determine the relative importance of meeting different types of information needs; and (3) identify information need areas most likely not to be met. Multivariate linear regression and logistic regression was used to evaluate the association between patients' ratings of meeting information needs with satisfaction and health outcomes, respectively, after controlling for covariates.

**Results:** The multivariate regression results show that meeting information needs are positively and significantly associated with both patient satisfaction measures (i.e. Ratings of Care Processes,  $p < 0.01$ ; Global Satisfaction,  $p < 0.05$ , Perceived Health Benefit,  $p < 0.01$ ) and one general health status measure (i.e. Quality of Life,  $p < 0.01$ ).

**Conclusion:** The results suggest that providers of care should ensure that they meet the information needs of patients with specific conditions because patients' perceptions of both quality of care and quality of life are associated with the clinicians' ability to transfer key information to their patients. Copyright © 1996 Elsevier Science Ltd.

Received 27 December 1995; accepted 4 June 1996.

<sup>1</sup>This research was supported in part by Mellon Foundation, Agency for Health Care Policy and Research, Hospital Corporation of America.

## INTRODUCTION

Systematic research on what occurs during health-care encounters has increased as pressure on the health-care community to improve the quality of care in measurable ways has increased. While most providers have a sincere interest to improve the care of patients in treatment, the need for this kind of research in the USA has also been driven by external factors such as increased competition and fear of litigation [1]. As a consequence, quality is now being measured not only by patients' biological health outcomes, but also by their functional health status, their perceived health benefit and judgments of satisfaction with the care received [2,3]. One vital aspect of quality is the extent to which information needs of patients and their family members are met. A crucial ingredient, therefore, in the aim of optimizing the quality of services provided, is to identify the most important information for patients to know and the most effective means of communication.

Much of the research which studies the interaction between healthcare professionals and patients, has focused on two components: patient satisfaction with the provider-patient relationship and patient education to build knowledge and influence health behavior. One study has shown that patients were more satisfied with physicians who provide counseling for psychosocial issues and create an atmosphere characterized by interest and friendliness than with those physicians who discuss only biomedical issues and create an atmosphere of physician dominance [4]. Therefore, the manner and style in which the provider delivers information can affect the patient's view of the physician. This perception may influence both the patient's satisfaction and health status. Although it is generally believed that satisfaction and health status are related, the nature of this relationship is not clear. One study showed that patients were satisfied with their care even though they were in poor health [5], while other studies have demonstrated a positive association between patients' satisfaction and patients' functional health [6,7], self-perceived health and emotional health [8]. It is possible that the provider's relationship with the patient mediates this effect. Hall [9] conducted a longitudinal study and found tentative evidence that there is a causal link between

health and satisfaction. The health variable most predictive of patient satisfaction with the health care experience was overall self-perceived health. This suggests that the experience of ill health may be one of the most salient factors in patients' level of satisfaction with the care. An interesting question is whether, and to what extent, providers may have influenced patients' perceptions of their health and, therefore, satisfaction.

In addition to the importance of the provider's communication style and the social milieu for developing a relationship that fosters patient learning, it is necessary to identify the best educational strategies and techniques. Though much research has been done, the results are not clear regarding best practices to educate patients to influence their health knowledge, attitudes about health care, personal health care practices, and health care utilization. It has been shown that as information increases in complexity and is conveyed under less than optimal circumstances (e.g. when the person experiences a great deal of stress), recall regarding recommended health behavior decreases [10]. Merely relaying information to someone does not ensure that it will be remembered. It has also been shown that computer systems, which convey information and provide social support in the home at any time and at the user's pace, lead to improved quality of life and reduced use of health service [11].

It is believed that patient satisfaction can be enhanced and subsequent health behavior improved, if providers create an environment that fosters dialogue between the health professional and the patient that enables them to identify the most important and relevant information to transmit to patients and families. It can be hypothesized that understanding and meeting patients "need to know"—through communicating important information desired by the patient—can produce more knowledgeable and competent patients who are in a better position to assist their own recovery from illness and manage their own health. While these factors may vary by diagnostic conditions and patient characteristics there is growing evidence that the impact of information may be helpful [11].

The present study examined one aspect of the provider-patient information exchange process

with a sample of patients diagnosed with acute myocardial infarction (MI). The purpose was to identify topics that patients consider important for them to know about their illness, and how their level of satisfaction and health status is affected by how well providers communicate information on these topics.

## METHOD

**Sample:** Two hundred fifty eight acute MI patients who were admitted to three community hospitals in the Southeast region of the US were eligible to participate in the study. Screening to confirm acute MI was based on the following: (a) enzyme evidence of myocardial necrosis as manifested by an increase in CPK total to two times the upper limit of normal; (b) electrocardiograms (i.e. EKG results 2 mm ST elevation in two continuous chest leads or 1 mm ST elevation in two continuous limb leads), and chest pain typical for angina and myocardial ischemia (i.e. anterior or left arm pain described as pressure or heavy sensation). Eligibility was based on a discharge diagnosis of acute MI and elevated enzymes, or documented evidence of EKG abnormalities consistent with acute MI. Of the total sample, 167 patients who responded to a questionnaire administered eight weeks post discharge were included in the analysis.

**Data Collection:** Data utilized in the present study were gathered from the medical record, and patients' responses to questionnaires. The medical record data were gathered by nurses experienced in cardiac care who were trained to extract medical record information. The patient self-report information was gathered at two points in time, two and eight weeks post discharge. The questionnaires were designed to gather the most salient information at appropriate time intervals following discharge. The primary focus of the two week questionnaire was to gather perceptions regarding the hospital experience, e.g. ratings of satisfaction, importance and intentions etc. The eight week questionnaire focused predominantly on health, clinical status and the extent to which help was needed and received. Two weeks post discharge, patients were mailed self-administered questionnaires that contained a series of questions that assessed patients' satisfaction with the hospital care they received, and identification of informa-

tion they felt was important to know about their illness, treatment and recovery. The satisfaction questions described twelve aspects of the process of care to which respondents indicated their level of satisfaction with the quality of care provided on a five point scale where 5 = excellent, 4 = very good, 3 = good, 2 = fair, and 1 = poor. In addition, two satisfaction questions ascertained respondents' future intentions of recommending or returning to the hospital for care if it was needed. Importance questions were derived from a content analysis of information gathered from focus groups and personal interviews with patients about hospital quality. These areas of importance were framed into questions that depicted different types of information given to patients throughout the process of an episode of care. Respondents indicated how important each type of information was to them on a five point scale i.e. 5 = essential, 4 = very important, 3 = important, 2 = slightly important, and 1 = not important (see Appendix). In an attempt to obtain information from all patients, the nonrespondents were mailed a postcard reminder and another copy of the questionnaire within four weeks of the first mailing.

Eight weeks post discharge, patients were mailed a different questionnaire that assessed patients' functional health status, perceptions of the overall quality of their life, and helpfulness of information provided to them by their physicians and other medical staff. The questions that asked patients to rate the helpfulness of information given to them were the same items on which importance ratings were obtained two weeks post discharge (see Appendix). Nonrespondents were mailed a postcard reminder and a second questionnaire within two weeks. Patients who had not responded by the thirteenth week post discharge were contacted by phone and a trained interviewer obtained the information from the patients and completed the questionnaire at that time. This process resulted in a 65% response rate for the two week post discharge survey and an 88% response rate for the eight-week post discharge survey. Patients were eliminated from the study if they met any of the following conditions: deceased (32); severely incapacitated (9); rehospitalized (8); or other problems (13) such as no contact address or telephone.

**Variables:** The independent variable was a

measure of information needs met. Scoring was based on patients' ratings of the degree to which they received helpful information on 18 important topics (e.g. chances of another heart attack, information on heart disease etc.). The dependent variables included three functional health and well-being measures (i.e. physical functioning, psychosocial functioning, and overall quality of life) and three patient satisfaction measures (i.e. overall satisfaction with hospital care, global satisfaction and perceived health benefit). Six patient characteristic variables were used as covariates (or control variables); these measured patient health status (i.e. acute MI severity, comorbidity, dyspnea, angina) and patient demographics (i.e. age and gender). See Appendix for more specific operational definitions.

**Statistical Procedures:** First, univariate analyses were performed to: (a) describe the patient population; (b) evaluate the relative importance of different types of information to meet patients' needs; and (c) determine which areas of information, ranked as important to know by patients, were most likely to not be met by providers. Second, a multivariate analysis was performed to determine if the outcome indicators vary by the patient characteristics and should consequently be used as covariates. A multiple analysis of variance was computed to determine if significant differences exist for each outcome indicator. Third, reliability coefficients

were computed on the five scales, (constructed from individual Likert response items) which were used in subsequent analyses. The results were: (1) psychosocial functioning (three items,  $\alpha = 0.62$ ); (2) physical functioning (three items,  $\alpha = 0.72$ ); (3) overall satisfaction (12 items,  $\alpha = 0.87$ ); (4) global satisfaction (two items,  $\alpha = 0.76$ ); and (5) information needs (18 items,  $\alpha = 0.95$ ). All scales were transformed to a 0–100 response format for ease of interpretation; a score of 0 represents the least positive response and 100 represents the most positive response. Last, multiple linear regression analyses were performed to evaluate the independent contribution of the helpfulness of information provided to patients (i.e. information needs met) to their functional health status and overall satisfaction with the care received. Logistic regression analyses were performed to evaluate how well information provided to patients predicted two single ordinal responses, patients' perceptions of quality of life and their perceived health benefit.

## RESULTS

### *Descriptive statistics*

Table 1 displays descriptive statistics on patient characteristics, patient health status and satisfaction variables. Patients' mean age was 63 and 70% were males. Only 18% of the acute MI

**TABLE 1. Patient characteristics, satisfaction and health status: univariate results for acute MI patients ( $n = 167$ )**

Demographics	Mean	Percentage	95% Confidence interval
Age	63		61.14–64.86
Gender: % male		70%	63.1%–76.9%
Clinical status			
AMI severity: % medium + high		18%	12.2%–23.8%
Comorbidity: % medium + high		38%	30.7%–45.3%
Dyspnea: % medium + high		35%	27.8%–42.2%
Angina: % medium + high		36%	28.7%–43.3%
Satisfaction measures			
Information needs met	61.68		58.69–64.67
Satisfaction with total process	79.98		76.82–83.14
Global satisfaction	93.77		90.99–96.55
Perceived health benefit	64.85		59.86–69.84
Health status	69.03		64.9–73.16
Psychosocial function scale	74.41		58.06–78.40
Physical function scale	62.05		58.23–65.87

patients were classified as "medium" or "high" on severity but larger proportions had substantial comorbidity (38%) and suffered from dyspnea (35%) and angina (36%). Patients' ratings of satisfaction with the process of care were almost at 80% of the maximum achievable score (79.98 on 0–100 scale) and for global satisfaction was at over 90% of the maximum achievable score (93.77 on a 0–100 scale); however patients' ratings of health benefit were only 65% of maximum and meeting information needs were even lower averaging only 62% of the best possible score. Measures of health status were also quite low, with quality of life averaging 69 and both psychosocial and physical function at 62 on a 0–100 scale.

The univariate results, shown in Table 2, indicated that the five areas where information needs were rated most important were: (1) knowing the chances of another heart attack; (2) knowing the questions to ask a doctor about heart disease; (3) training on how to recognize another heart attack; (4) knowing what the diagnosis of heart attack means; and (5) under-

standing what the treatment will be like. The areas where patients' information needs were not met were: (1) how to hold the business, family and finances together; (2) knowing what expenses insurance will cover; (3) stopping depression quickly; (4) finding out where the most up to date medicine is being practiced; and (5) training on how to recognize another heart attack.

### *Communication of essential information*

Several information areas that were rated as "inessential" received large percentages of "no help" or "made it worse" ratings. For example, the top ranked information need area was to learn "what the chances are of another heart attack?" Twenty percent of patients indicated what they learned was either not helpful or harmful. Similarly, the third ranked information need area was for "training on how to recognize another heart attack" and one in five patients (20.3%) rated this "no help"/"made it worse". Even less success on meeting information needs

**TABLE 2.** Rank order of information rated as most essential and areas where no help was given or made it worse

Rank	Area of information need	Two weeks post discharge % rated information "essential"	Eight weeks post discharge % rated "No help" or "made it worse"
1	What the chances are of another heart attack?	36.8	20.0
2	What questions to ask a doctor about heart disease	33.0	14.6
3	Training on how to recognize another heart attack	32.1	20.3
4	What the diagnosis of heart attack means to me	31.5	9.0
5	Understanding what the treatment will be like	31.3	9.9
6	Finding where the most up to date medicine is being practiced	29.5	30.6
7	Will my insurance cover the costs and what if it does not?	25.0	44.8
8	Stopping depression quickly	24.4	35.2
9	How to find someone to give me information	22.2	14.9
10	How to hold the business, family and finances together	19.3	61.4

\*Note: The other items were (a) how to get the family into a good counselling program; (b) dealing with changes in roles of family members; (c) making sure your family doesn't feel shut out; (d) what does the future hold; (e) what side effects to expect and watch out for; (f) how to get the best recovery possible; (g) help with decisions on when and whether to have surgery or other medical procedures; and (h) how close to your previous state of health you can expect to return.



was observed for other top ten areas such as “stopping depression quickly” and information on insurance cover and financial planning.

#### *Relationships between covariates and outcomes*

A multiple analysis of variance was conducted to determine how the outcome indicators (i.e. satisfaction with care, global satisfaction, perceived health benefit, quality of life, psychosocial and physical function) vary by each patient characteristic that was used as a covariate (i.e. age, gender, severity of illness, level of comorbidity, level of angina and dyspnea). The results, summarized in Table 3, indicated that there were overall significant differences for global satisfaction ( $F_{10,63} = 2.16, p < 0.03$ ), physical functioning ( $F_{10,120} = 16.45, p < 0.01$ ), psychosocial functioning ( $F_{10,118} = 8.80, p < 0.01$ ), health benefit ( $F_{10,121} = 3.47, p < .01$ ), and quality of life ( $F_{10,117} = 3.93, p < 0.01$ ). There were significant differences by level of angina on three outcomes: psychosocial functioning ( $F_{2,118} = 7.64, p < 0.01$ ), quality of life ( $F_{2,117} = 4.54,$

$p < 0.01$ ), and physical functioning ( $F_{2,120} = 31.21, p < 0.01$ ). Significant differences were also observed by level of dyspnea on two outcomes: psychosocial functioning ( $F_{3,118} = 3.67, p < 0.01$ ) and perceived health benefit ( $F_{3,121} = 2.67, p < 0.05$ ). In addition there was a significant difference by level of comorbidity for patients' perceptions of the quality of life ( $F_{1,117} = 4.54, p < 0.05$ ). Differences by gender were found to be significant only for physical functioning ( $F_{1,120} = 4.92, p < 0.05$ ). Differences by age groups were found to be significant for global satisfaction ( $F_{2,63} = 5.18, p < 0.01$ ). No significant differences were found by level of severity of illness. The covariates relationship with dependent variables are shown in Table 3.

Included in the multiple analysis of variance was the information needs met variable to determine the extent to which patient characteristics may vary by this independent variable. No significant differences were found.

It is interesting to note that ratings of overall satisfaction were insensitive to any patient characteristics. A similar short form overall

**TABLE 3. Outcomes by patient characteristics used as covariates for regression model**

	Perceived health benefit	Quality of life	Physical function	Psychosocial function	Satisfaction with total process	Global satisfaction
<b>Age</b>						
< 60	66.79 (29.57)	68.52 (22.82)	66.02 (26.79)	75.59 (25.39)	82.01 (11.21)	97.22 (9.69)
60–69	56.52 (28.10)	68.99 (18.03)	61.59 (23.60)	77.18 (23.36)	75.81 (9.46)	88.14 (20.30)
70 +	69.54 (20.13)	69.64 (20.13)	57.80 (22.54)	70.88 (29.07)	82.36 (14.25)	94.79 (8.13)
<b>Gender</b>						
Male	64.95 (28.62)	70.40 (19.91)	53.30 (22.54)	69.39 (26.19)	81.55 (10.99)	93.08 (15.21)
Female	64.58 (22.06)	65.58 (22.06)	63.77 (25.38)	75.33 (25.05)	79.89 (16.53)	96.51 (8.24)
<b>Acute MI severity</b>						
Low	64.72 (29.08)	68.95 (21.18)	62.77 (25.37)	75.33 (25.05)	80.18 (15.54)	93.33 (14.12)
Medium + high	63.39 (29.25)	67.24 (18.63)	51.43 (31.81)	66.71 (31.81)	83.91 (10.15)	99.51 (2.02)
<b>Comorbidity</b>						
None + mild	66.18 (28.29)	71.57 (17.49)	64.14 (25.89)	76.08 (25.76)	81.98 (12.61)	95.52 (9.81)
Medium + high	62.69 (30.08)	64.72 (24.57)	58.47 (24.46)	71.58 (26.84)	78.01 (18.09)	91.22 (17.56)
<b>Angina</b>						
Low	70.51 (27.06)	73.95 (19.63)	74.09 (20.58)	84.95 (19.23)	81.65 (13.88)	94.44 (10.36)
Medium	66.67 (22.82)	64.17 (11.18)	52.18 (13.28)	69.38 (22.68)	79.86 (11.80)	97.22 (4.10)
High	44.83 (27.85)	53.45 (23.72)	29.44 (17.19)	48.70 (29.54)	78.18 (21.43)	92.16 (22.53)
<b>Dyspnea</b>						
None	75.00 (24.15)	68.82 (17.61)	69.76 (23.77)	76.25 (22.43)	78.57 (13.54)	93.33 (14.16)
Low	71.10 (28.98)	75.68 (19.35)	72.04 (20.17)	86.13 (18.39)	82.07 (14.12)	94.15 (10.70)
Medium	56.45 (28.84)	64.52 (23.46)	49.22 (21.98)	66.80 (26.81)	78.23 (19.72)	95.83 (5.42)
High	44.23 (21.57)	55.76 (16.29)	39.42 (25.12)	47.76 (27.23)	78.78 (22.86)	91.11 (23.88)

Note: This table shows the mean scores (0–100 scale) and standard deviations of each outcome indicator by patient characteristics.

satisfaction scale (identical to the one used here with the exception of two items) has been shown to have reliable and valid psychometric properties with a more general patient population [12]. It may be that the scale is less sensitive to characteristics of subgroups of patients who have a similar clinical condition.

*Impact of communication on patient satisfaction and health status*

To determine the relationship between patients' ratings of how well their information needs were met and their satisfaction with care, their perceived health benefit and functional health status, after controlling for patient characteristics, series of multiple regression analyses were performed on the multi-item outcome scales and logistic regression analyses were performed on the two single item outcome indicators. As shown in Table 4, meeting patients' information needs had the greatest effect on patients' satisfaction with the overall process of care, patients' global satisfaction, and patients' perceived level of health benefit and quality of life. In each case, meeting information needs demonstrated a substantial (weights ranged from 0.29 to 0.39) and statistically significant ( $p < 0.01$ ) relationship to explaining variation on these measures of satisfaction and health. Meeting information needs made no independent contribution to patients' perceptions of their physical functioning or psychoso-

cial functioning after controlling for patient characteristics.

## DISCUSSION

The results clearly demonstrate that providing acute MI patients with information about their illness and recovery has a significant relationship with their perceptions of the quality of their life, their satisfaction with hospital care, and the benefit of treatment. The top five most important areas of information identified by acute MI patients involved building knowledge about the disease and its treatment. It is noteworthy that among these areas, a substantial percentage (20%) of patients' needs were not well met in receiving information about how to recognize another heart attack, and knowing the chances of having another heart attack. Other topics where patients' information needs were not well met concerned psychosocial issues and finances. It is generally believed that psychosocial concerns can elevate the patients' level of stress and may adversely influence their perceptions of health and overall quality of life [11].

The study reported herein has important limitations that should be noted. First, the generalizability of the findings may be limited because the population observed represents just one clinical condition cared for in three hospitals. Second, causal inferences are restricted because of the non-experimental nature of the design and the timing of measurements of the

**TABLE 4. Predictors of patient outcome: variables making independent contribution to explaining satisfaction and general health status outcomes**

Dependent Variable	Predictor	Standardized estimates	t	p	R <sup>2</sup>
Satisfaction with total process (0–100 scale)	Information needs met (0–100 scale)	0.37	3.185	0.002	17%
Global satisfaction (0–100 scale)	Information needs met (0–100 scale)	0.24	2.10	0.04	10%
	Comorbidity (1–4 scale)	–0.23	–1.96	0.05	
Physical function (0–100 scale)	Age (years)	–0.16	–2.139	0.01	55%
	Gender (male)	0.15	–2.630	0.01	
	Angina (1–3 scale)	–0.70	–9.268	0.001	
Psychosocial function (0–100 scale)	Angina (1–3 scale)	–0.50	–5.43	0.001	33%

independent and dependent variables. Third, the lack of substantive associations between information needs met and physical and psychosocial functioning may be explained by the relatively low alpha coefficients. Fourth, although the concept of meeting information needs is old, the creation of valid and reliable measures of this critical aspect of doctor-patient communication is new. The independent variable, information needs met, had good psychometric properties (i.e. variability, reliability of 0.95) but is a new measure that has not been used in other settings.

Despite the design limitations listed above, this study's results are compelling. The findings suggest that clinicians can have a positive influence on their patients' perceptions of both quality of life and health benefit even among patients with variations in clinical status by identifying the information that is important to the patient and ensuring that it is delivered in a clear, understandable and useful manner.

## REFERENCES

- Hickson G B, Clayton E W, Githens P B and Sloan FA, Factors that prompted families to file medical malpractice claims following perinatal injuries [see comments]. *Journal of the American Medical Association* 1992; **267**: 1359-1363.
- Tarlov A R, Ware J E, Greenfield S, Nelson E C, Perrin E and Zubkoff M, The medical outcomes study. *Journal of the American Medical Association* 1989; **262**: 925-930.
- Batalden P B, Roberts J S and Nelson E C, Linking outcomes measurement to continual improvement: the serial versus way of thinking about improving clinical care. *Joint Commission Journal of Quality Improvement* 1994; **20**: 167-180.
- Bertakis K D, Roter D and Putnam S M, The relationship of physician medical interview style to patient satisfaction. *The Journal of Family Practice* 1991; **32**: 175-181.
- Patrick D L, Scrivens E and Charlton J R H, Disability and patient satisfaction with medical care. *Medical Care* 1983; **21**: 1062-1075.
- Hall J A, Roter D L and Katz N R, Meta-analysis of correlates of provider behavior in medical encounters. *Medical Care* 1988; **26**: 257-275.
- Hall J A, Feldstein M, Fretwell M D, Rowe J W and Epstein A M, Older patients' health status and satisfaction with medical care in an HMO population. *Medical Care* 1990; **28**: 261.
- Greenley J R, Young T B and Schoenherr R A, Psychological distress and patient satisfaction. *Medical Care* 1982; **20**: 373.
- Hall J A, Milburn M A and Epstein A M, A causal model of health status and satisfaction with medical care. *Medical Care* 1993; **31**: 84.
- Grover G, Berkowitz C D and Lewis R J, Parental recall after a visit to the emergency department. *Clinical Pediatrics* 1994; **4**: 194-201.
- Gustafson D, Hawkins R, Pingree S, Boberg E and Bricker E, The impact of computer support on HIV infected individuals. Preceedings of the XVII Annual Meeting of the American Medical Informatics Association, Washington, DC, November 1994.
- Hays R D, Larson C, Nelson E C and Batalden P B, Hospital quality trends: a short form patient based measure. *Medical Care* 1991; **29**: 661.
- Nelson E C, Ferreira P L, Cleary P D, Gustafson D and Wasson J H, Do patients health status reports predict future hospital stays for patients with an acute myocardial infarction? *Family Practice Research Journal* 1994; **14**: 119.
- O'Connor G T, Plume S K and Olmstead E M, Multivariate prediction of in-hospital mortality associated with coronary artery bypass graft surgery. *Circulation* 1992; **85**: 21102-21118.
- Greenfield S, Apolone G, McNeil B J and Cleary P D, The importance of coexistent disease in the occurrence of postoperative complications and one-year recovery in patients undergoing total hip replacement: comorbidity and outcomes after hip replacement. *Medical Care* 1993; **31**: 141-154.
- Cleary P D, Greenfield S and Mulley A G, Variations in length of stay and outcomes for six medical and surgical conditions in Massachusetts and California. *JAMA* 1991; **266**: 73-79.
- Cleary P D, Epstein A M and Oster G, Health related quality of life among patients undergoing percutaneous transluminal coronary angioplasty. *Medical Care* 1991; **29**: 939-950.
- Nelson E C, Landgraf J M, Hays R D, Wasson J H and Kirk J W, The functional status of patients: how can it be measured in physicians' offices? *Medical Care* 1990; **28**: 1111-1126.
- Ware J E, Jr, Nelson E C, Sherbourne C D and Stewart A L, Preliminary tests of a 6-item general health survey: a general population application. In Stewart A L, Ware L E, Jr (eds) *Measuring Functioning and Well-Being*. Duke University Press, Durham, NC and London, England, 291-303, 1992.
- Nelson E C, Hays R D, Larson C and Batalden P B, The patient judgment system: reliability and validity. *Quality Review Bulletin* 1989; **15**: 185-191.
- Meterko M, Nelson E C and Rubin H R (eds), Patient judgments of hospital quality: report of a pilot study. *Medical Care*, J.B. Lippincott Company, Philadelphia, PA, **22**:S1-S56, Supplement, 1990.



## APPENDIX

### Description of variables used in analysis and sources of data

#### Demographics:

Age: age in years. Gender: male or female.

#### Health status covariates:

**Acute MI severity level [13].** Acute MI severity was a three-level index based on the number and nature of cardiac problems (i.e. high = cardiogenic shock, or cardiopulmonary arrest; medium = CHF complications, ventricular arrhythmia, third degree block or SVT; and low = none of the above. This ordinal variable was based on prior work performed by O'Connor *et al.* [14]

**Comorbidity level [14].** The comorbidity index, known as the Index of Co-Existent Disease (ICED), classifies patients into four levels based on the number and nature of diseases and level of physical impairment associated with the disease. This ordinal variable was based on the work of Greenfield, *et al.* [15].

**Angina scale [13].** The angina scale ranged from 1 to 3 with higher numbers indicating more chest pain. Patients were classified based on their answers to four yes/no questions: (a) Do you ever have any pain or discomfort in your chest? (b) If no, do you ever have any pressure or heaviness in your chest? (c) Do you have this pain, discomfort, pressure, or heaviness when you walk uphill or hurry? (d) Do you have these symptoms at an ordinary pace on level ground? This variable was based on the work of Cleary *et al.* [16,17].

**Dyspnea scale [13].** The dyspnea scale ranged from 1 to 4 with higher numbers indicating more shortness of breath. Patients were classified based on their answers to four yes/no questions: (a) Are you troubled by shortness of breath when hurrying on level ground or walking up a slight hill? (b) Do you get short of breath when walking with other people your

own age? (c) Do you have to stop for breath when walking at your own pace on level ground? (d) Do you have to stop for breath when you are washing or dressing? This variable was based on the work of Cleary *et al.* [16,17].

#### Functional outcomes and well being:

**Physical functioning [13].** The physical functioning scale ranged from 0 to 100 with higher scores indicating better function. The scoring was based on three questions each of which had five levels of response: (a) What was the most strenuous level of physical activity you could do for at least two minutes? (b) During the past four weeks, how much difficulty did you have doing your daily work, both inside and outside the house, because of your physical health or emotional problems? (c) During the past two weeks, how much bodily pain have you generally had? This scale was based on the work of Nelson and Ware *et al.* [19].

**Psychosocial functioning [13].** The psychosocial functioning scale ranged from 0 to 100 with higher scores indicating better function. The scoring was based on three questions each of which had five levels of response: (a) How much have you been bothered by emotional problems which as feeling unhappy, anxious, depressed, irritable? (b) Has your heart condition interfered with visiting relatives or friends? (c) Has your heart condition interfered with participating in community activities such as religious services, social activities, or volunteer work? This work was based on the work of Nelson *et al.* [18] and Ware *et al.* [19].

#### Satisfaction with care:

**Satisfaction with total process.** The overall satisfaction scale ranged from 0 to 100 with higher scores indicating greater satisfaction with the hospital care. The scoring was based on twelve questions which had five response choices (5 = excellent, 4 = very good, 3 = good, 2 = fair, 1 = poor). The questions represented the following areas of care: (1) efficiency of the admitting procedure; (2) coordination of care; (3) ease of getting information; (4) attention of nurses to your condition; (5) attention of doctor

to your condition; (6) how well housekeeping staff did their jobs; (7) skill of IV starters; (8) restfulness of atmosphere; (9) discharge instructions; (10) explanations about costs and how to handle your hospital bills; (11) pain management; and (12) coordination of transfers. This work was based on the work of Nelson *et al.* [20] and Meterko *et al.* [21].

*Global satisfaction.* The global satisfaction scale consisted of the following two questions: (1) Would you recommend this hospital to your family and friends if they needed hospital care? (2) How likely would you be to return to this hospital if you ever need to be hospitalized again? The first question had four response choices and the second question had seven response choices that were transformed to a 0 to 100 scale for ease of interpretation. This scale was based on the work of Nelson *et al.* [20].

*Perceived health benefit.* This single question "How much were you helped by this hospitalization?" has five response choices which were converted to a 0 to 100 scale. This work was based on the work of Nelson *et al.* [20] and Meterko *et al.* [21].

*Quality of life.* This single question "Overall how are things going for you?" has five response choices which were converted to a 0 to 100 scale. The work was based on the work of Nelson *et al.* [18].

#### *Information questions—importance ratings and needs met scale*

Eighteen importance of information ratings were on a five-point scale showing the importance of each type of information. The response categories were 5 = essential, 4 = very important, 3 = important, 2 = slightly important, 1 = not important.

The information needs met scale ranged from 0 to 100 with higher scores indicating greater help received from the information given. The scoring was based on eighteen items that had five response choices indicating the amount of help the patient received from the information communicated by the medical professionals, i.e. enormous help, quite a bit of help, some help, no help, made it worse.