Prognostic Importance of Marital Quality for Survival of Congestive Heart Failure

James C. Coyne, PhD, Michael J. Rohrbaugh, PhD, Varda Shoham, PhD,
John S. Sonnega, PhD, John M. Nicklas, MD, and James A. Cranford, PhD

Mounting evidence indicates that social support is associated with better outcomes of cardiovascular disease and reduced all-cause mortality. Much less is known about the specific contribution of marital functioning to these outcomes, and the potential prognostic significance of marital quality for congestive heart failure (CHF) has not been explored. Interview and observational measures of marital quality obtained from 189 patients with CHF (139 men and 50 women) and their spouses were examined as predictors of patient survival up to 48 months after assessment and compared with prediction based on illness severity (New York Heart Association [NYHA] class). Four-year survival rates were 52.5% and 68% for male patients and female patients, respectively. In Cox regression analyses, a composite measure of marital quality predicted 4-year survival as well as the patient's concurrent NYHA class did (both p <0.001). Adjusting for CHF severity did not diminish the prognostic significance of marital functioning, and prediction of survival from marital quality appeared stronger for female than for male patients. Thus, when marital quality and NYHA class are considered jointly, they both make independent, statistically significant contributions to the prediction of patient mortality. ©2001 by Excerpta Medica, Inc.

(Am J Cardiol 2001;88:526–529)

Growing evidence indicates that social support is associated with better outcomes of cardiovascular disease and reduced all-cause mortality.[1–3] Much less is known about the specific contribution of marital functioning to these outcomes, and the potential prognostic significance of marital quality for congestive heart failure (CHF) has not been investigated. This report examines marital quality, assessed in home interviews with male and female patients with CHF and their spouses, as a predictor of patient survival over the next 4 years. Measurement of marital functioning went beyond usual social support methodologies by including self-reports from partners and direct observation of their interaction. We hypothesized that marital quality would predict all-cause mortality after adjusting for concurrent illness severity (New York Heart Association [NYHA] class). A secondary question was whether the contribution of marital quality to survival varied with the patient's gender.[4–6]

METHODS

Participants: Patients (n = 189, 139 men [79%]) and spouses were recruited from intake cases at the University of Michigan Medical Center CHF clinics from 1993 to 1995. The CHF diagnosis was confirmed by 1 of the investigators (JMN), and inclusion required documentation during the past year of a left ventricular ejection fraction (LVEF) <35%, assessed via radionuclide ventriculography. Of 258 heterosexual couples invited to participate, 201 (78%) enrolled in the study. Ten patients who underwent heart transplantation were excluded from the survival analyses, and 2 couples did not provide sufficient marital data.

Mean ages of patients and spouses were 53 years (range 29 to 78) and 52 years (range 29 to 75), respectively. Couples had been married an average of 25 years, and 33% of the patients had been married previously. The sample was 83% white and 11% African-American. Most patients (75%) had at least a high-school education. Median reported household income was $35,000.

Data collection: Home assessments were conducted by a 2-interviewer team. In an initial conjoint phase, the patient and spouse were asked to identify an area of disagreement in their relationship. They were then interviewed individually in separate rooms, and assessment included parallel self-report measures of marital functioning. The couple then engaged in a 10-minute videotaped discussion of their problem topic without the interviewers present. Tapes of these discussions were rated for exchanges of positive and negative partner affect, based on the Living in Familial Environments coding system[7] by trained observers at the Oregon Research Institute.

Physician ratings of NYHA class and other available biomedical data were extracted from medical charts. Over the next 4 years we monitored all-cause mortality and confirmed dates of death from public records. For purposes of survival analysis, death events were aggregated in 1-month intervals up to 48 months after the home interview.

CHF severity: The main measure of CHF severity was NYHA functional class, a known predictor of mortality.[8] Some patients were classified as between 2 NYHA classes and given an average rating (e.g., class II/III = 2.5). Physicians' NYHA ratings were distrib-

uted as follows: class I, n = 21 (11.1%); class I/II, n = 7 (3.7%); class II, n = 80 (42.3%); class II/III, n = 21 (11.1%); class III, n = 44 (23.3%); class III/IV, n = 4 (2.1%); and class IV, n = 12 (6.3%). Mean NYHA rating in our sample was 2.4 ± 0.8 (mean ± SD), and median years since diagnosis was 6.8.

Other measures of CHF severity obtained were LVEF and, when available, peak oxygen consumption (VO_2) during a recent cardiopulmonary stress test. Sample means for LVEF and VO_2 were 21.6 ± 7.3 and 17.1 ± 5.0 O_2 mm/kg. As expected, NYHA ratings and VO_2 levels correlated negatively and significantly with each other (r = −0.40, p <0.01), but neither was related to LVEF scores, probably due to the latter's restricted range. Women had more severe functional impairment than men according to both NYHA class (mean 2.8 vs 2.0, t = 2.35, p = 0.02) and VO_2 level (mean 15.4 vs 17.8, t = 2.59, p = .01); yet CHF diagnosis was more recent for women than for men (median 3.7 vs 7.4 years, p = 0.03), and diagnosis within the past 5 years was associated with lower (milder) NYHA class for women (r = −0.41, p = 0.01) but not men. Because VO_2 data were incomplete (n = 142) and sometimes submaximal, we used NYHA class as the primary proxy for illness severity in the survival analyses.

Marital quality: The marital quality composite was computed by averaging standardized (z) scores for 4 intercorrelated measures of patient and spouse marital functioning. Three of the measures, marital satisfaction (6 items), marital routines (10 items), and useful illness discussions (8 items), were taken from the individual patient and spouse interviews, and the fourth, observed positivity, was based on the couple's videotaped discussion of their marital disagreement. The justification for combining these measures into a composite score was based on confirming that the correlations between them, when corrected for attenuation related to each measure's reliability, were sufficiently high within and across couples to suggest a common underlying construct.[9]

The marital satisfaction scale has shown satisfactory reliability and validity in studies of couples coping with myocardial infarction.[10,11] The measure of useful illness discussions (how often the couple talks about various aspects of coping with heart disease), which correlates with the marital satisfaction scale, was developed specifically for use with cardiac patients and their spouses.[10] Our measure of marital routines combines relevant marital items from 2 longer inventories of family routines.[12,13] Patient and spouse alphas were satisfactory for each of these self-report measures in the present sample (marital satisfaction >0.73, useful illness discussions >0.84, and marital routines >0.81). Finally, the observed positivity measure reflects the proportion of each partner's coded interpersonal behavior that was positive and facilitative rather than aversive or dysphoric.[7] Using observers' categorizations of every speech unit during the 10-minute interaction as positive, negative, or neutral, we computed a positivity score for each partner by dividing the number of positive units by the sum of his or her positive and negative units. A similar ratio measure of positive-to-negative marital exchanges has been shown to predict later divorce in samples of nonclinic couples.[14]

Strikingly, female-patient couples had higher (better) scores than male-patient couples on composite marital quality (means 0.31 vs −0.13, t = 3.62, p <0.001). Although marital quality was unrelated to CHF severity (NYHA class) in the full sample (r = −0.06) separate analyses by gender revealed that lower marital quality was associated with more severe CHF in the female (r = −0.38, p = 0.006) than the male (r = −0.03) patient.

Data analysis: Cox proportional-hazards regressions were used to investigate associations between the predictor variables and mortality, and results were checked with logistic regressions analyzing survival status at yearly intervals after the initial assessment. The 2 methods produced similar results, so only the Cox regression results will be reported here. Survival analyses were performed using continuous and dichotomized measures of marital quality and CHF severity, and, in each case, patient gender and relevant interactions were included in the initial regression model. To facilitate interpretation and comparison of relative risk (risk hazard) ratios, we used a common z-score metric for both of the continuous predictor variables and reversed the severity (NYHA) scale so that higher scores on both the marital quality and severity indexes indicate better functioning. Survival functions are presented graphically for the dichotomized predictors, with high versus low marital quality representing cases above and below the overall sample median, whereas low versus high CHF severity divides NYHA classes I and II from classes III and IV (with the II/III half-level considered high).

RESULTS

CHF severity, patient demographics, and survival: As expected, NYHA class was strongly associated with patient survival. (Figure 1 shows gender-adjusted survival functions for NYHA class I/II vs III/IV.) Cox regressions yielded significant severity effects for both the continuous and dichotomous NYHA class predictors (Wald = 21.47, p <0.001 and Wald = 9.58, p = 0.002). Gender-adjusted relative-risk ratios (RRs) for survival were 1.92 per SD (95% confidence interval [CI] 1.46 to 2.53) and 1.70 for NYHA class I/II versus III/IV (95% CI 1.21 to 2.38). There was also a significant patient-gender effect favoring longer survival by women (Wald = 5.15, p = 0.023) but no gender by severity interaction. In other analyses, age, education, race, religion, household income, and time since diagnosis were not related to patient survival during the 4-year study period.

Marital quality and survival: As Figure 2 suggests, marital-quality also predicted the patient's survival with an effect size roughly equivalent to that observed for NYHA class (Figure 1). With severity excluded, gender-adjusted marital quality was significant for continuous and dichotomous predictor variables (Wald = 16.74, p <0.0001 and Wald = 12.55, p
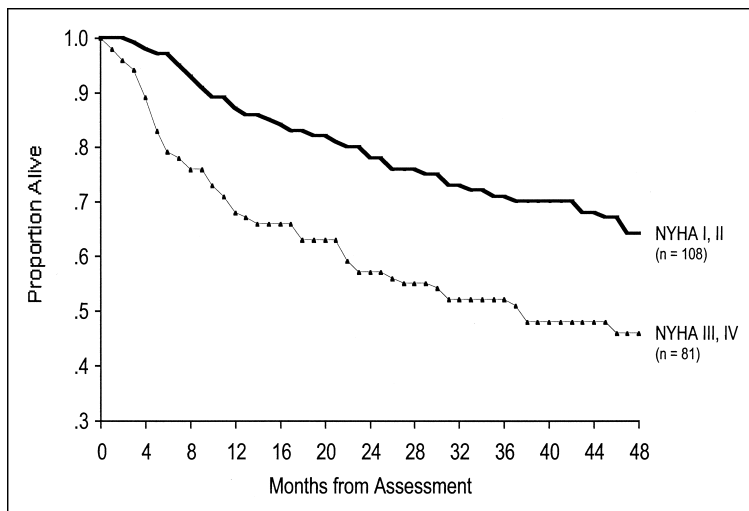
FIGURE 1. Patient survival by baseline NYHA class (I/II vs III/IV) over a 4-year period. Survival functions for low- and high-severity patients differ at p <0.001 (RR = 1.70, 95% CI = 1.21 to 2.38).
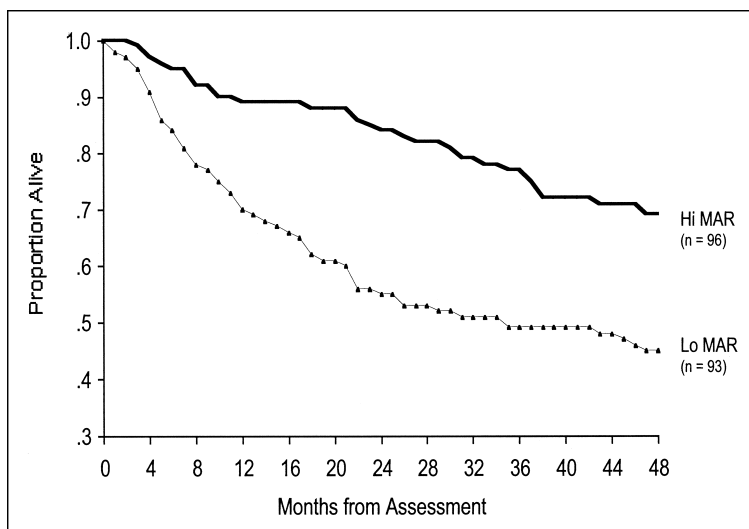

FIGURE 2. Four-year survival by baseline marital quality, grouping couples above and below the median on composite marital quality. Survival functions for patients with low versus high marital quality differ at p <0.001 (RR = 1.65, 95% CI = 1.25 to 2.17).

<0.001), and respective RRs were 1.81 (95% CI 1.36 to 2.40) and 1.65 (95% CI 1.25 to 2.17). Patient gender was not a significant main effect in these analyses, but gender interacted with the continuous marital-quality variable in predicting patient survival (Wald = 8.40, p = 0.004), suggesting a stronger association between marital functioning and survival for female than for male patients. Indeed, 7 of the 8 female patients with the poorest marital quality died within 2 years of the initial assessment.

When marital quality and CHF severity were considered jointly in the same Cox regression model, both remained significant predictors of survival (all p <0.01), and they did not interact. Controlling NYHA class did not diminish the contribution of marital quality to patient survival, regardless of whether other terms (such as interactions with gender) were included. Figure 3 represents the independent contributions of CHF severity and marital quality by presenting cumulative survival curves for 4 patient subgroups formed by crossing low/high NYHA (classes I/II vs III/IV) with low/high marital quality. Patients with relatively severe heart problems and poorer marriages were clearly at high risk (4-year survival = 41.9%), whereas patients with milder heart conditions in good marriages had the lowest risk (4-year survival = 77.6%). The gender by marital-quality interaction remained significant (Wald = 4.11, p = 0.043) with NYHA class in the Cox regression model; marital quality contributed significantly to survival in separate analyses for male and female patients. When we repeated the main analysis substituting VO_2 for NYHA class as the proxy for CHF severity, this slightly smaller sample of cases (due to missing VO_2 data) yielded a highly similar pattern of results.

DISCUSSION

Despite its high prevalence and grim prognosis,[8,15,16] CHF has so far attracted relatively little research on social relations. Although some patients with CHF are unmarried, many live with a spouse or committed partner in a position to provide support and help manage the illness. Living with CHF can be stressful because the condition makes stringent and complex demands on patients and their families.[17] The quality of a patient's marital life may therefore be crucial to how effectively he or she meets these demands, and ultimately to the patient's survival.

Our findings highlight the prognostic importance of marital functioning for survival of CHF. This contribution could not be explained by illness severity because the effects of marital quality and NYHA class were statistically independent. In fact, having a relatively good marriage appeared to influence survival about as much as having less severe CHF symptoms. Although the sample of female patients with CHF was relatively small, the results also suggest that marital functioning may be more crucial to the survival of women. This is consistent with evidence that emotional support perceived by elderly, hospitalized patients with CHF predicts subsequent cardiovascular events for women but not men,[6] and with broader published data on gender differences in links between close relations and health.[18,19]

Psychosocial assessment of the couples occurred only at baseline, so the data can do little to illuminate mechanisms linking marital quality to survival. One possibility is that marital functioning affects cardiac
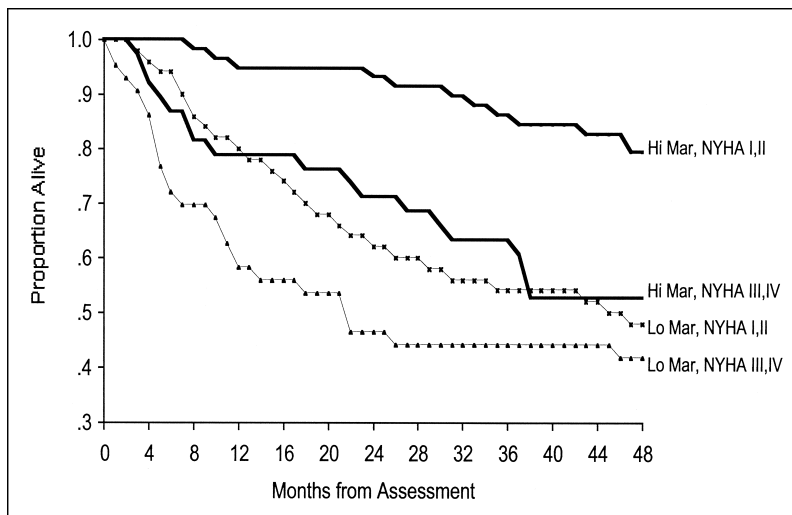
FIGURE 3. Four-year survival for subgroups formed by crossing high/low marital quality (Mar) and high/low CHF severity (NYHA class): Hi Mar, NYHA I/II (n = 58), Hi Mar, NYHA III/IV (n = 38), Lo Mar, NYHA I/II (n = 50), Lo Mar, NYHA III/IV (n = 43). Cox regression shows significant main effects for both marital quality and NYHA class (p <0.001), and the 2 predictors do not interact.

function by facilitating sustained adherence to complex dietary, exercise, and medication regimens.[20,21] Alternatively, there may a direct physiologic pathway by which marital interaction affects neuroendocrine or other regulatory systems.[22,23]

Limitations of the study include possible selection biases. Because patients were recruited from a university cardiology department with an active transplant program, they tended to be younger than patients with CHF in most community samples, and perhaps also to have more severe functional limitations. Although a recruitment rate >75% is excellent for a study involving the intrusion and burden of home interviews and videotaped interactions, couples may have declined participation because of the severity of the patient's condition or poor marital quality. In addition, because all were married, we may have sampled a rather restricted range of psychosocial functioning and social embeddedness. The effect of such a restricted range, however, should be a bias toward null findings; despite this, we found a robust association between marital quality and survival. Future research might profitably examine a broader range of social report and distinguish marital from other types of social relations.

Despite these limitations, the results highlight the prognostic importance of marital quality after heart failure, and underscore the utility of going beyond the usual patient report of perceived support to include measures based on direct observation of family interaction, and self-report data from spouses as well as patients. Given the evidence presented here and in other reports, showing that close relations play an important role in chronic illness, studies that address the mechanisms accounting for these associations deserve high priority.

1. Oth-Gomer K, Rosengren A, Wilhelmsen L. Lack of social support and incidence of coronary heart disease in middle-aged Swedish men. *Psychosom Med* 1993;55:37–43.
2. Berkman LF. The role of social relations in health promotion. *Psychosom Med* 1995;57:245–254.
3. Williams RB, Barefoot JC, Califf RM, Haney T, Saunders W, Pryor D, Hlatky M, Siegler I, Mark D. Prognostic importance of social and economic resources among medically treated patients with angiographically documented coronary artery disease. *JAMA* 1992;267:520–524.
4. Moser DK. Heart failure in women. *Crit Care Nurs Clin N Am* 1997;9:511–519.
5. Konstam V, Salem D, Pouleur H, Kosis J, Gorkin L, Shumaker S, Mottard I, Woods P, Konstam MA, Yusuf S. Baseline quality of life as a predictor of mortality and hospitalization in 5,025 patients with congestive heart failure. *Am J Cardiol* 1996;78:890–895.
6. Krumholz HM, Butler J, Miller J, Vaccarino V, Williams CS, Mendes de Leon CF, Seeman TE, Kasl SV, Berkman LF. Prognostic importance of emotional support for elderly patients hospitalized with heart failure. *Circulation* 1998;97:958–964.
7. Hops H, Davis B, Longoria N. Methodological issues in direct observation: Illustrations with the Living in Family Environments (LIFE) coding system. *J Clin Child Psychol* 1995;24:193–203.
8. Domanski MJ, Garg R, Yusuf, S. Prognosis in congestive heart failure. In: Hosenpud JD, Greenberg BH, eds. Congestive Heart Failure: Pathophysiology, Diagnosis, and Comprehensive Approach to Management. New York: Springer-Verlag, 1994:622–627.
9. Nunnally JC. Psychometric Theory. New York: McGraw-Hill, 1978.
10. Coyne JC, Smith DA. Couples coping with a myocardial infarction: a contextual perspective on wives' distress. *J Pers Social Psychol* 1991;61:404–412.
11. Suls J, Green P, Rose G, Lounsbury P, Gordon E. Hiding worries from one's spouse: associations between coping via protective buffering and distress in male post-myocardial infarction patients and their wives. *J Behav Med* 1997;20:333–349.
12. McCubbin HI, McCubbin MA, Thompson AI. FTRI-family time, and routine index. In: McCubbin HI, Thompson AI, eds. Family Assessment Inventories for Research and Practice. Madison, WI: University of Wisconsin Press, 1987.
13. Boyce WT, Jensen EW, James S, Peacock JL. The family routines inventory: theoretical origins. *Soc Sci Med* 1983;1983;17:193–200.
14. Gottman JC. What predicts divorce? The Relationship Between Marital Processes and Marital Outcomes. Hillsdale, NJ: Lawrence Erlbaum, 1994.
15. Garg R, Packer M, Pitt B, Yusuf S. Heart failure in the 1990s: evaluation of a major public health problem in cardiovascular medicine. *J Am Coll Cardiol* 1993;22(suppl A):3A–5A.
16. O'Connell JB, Bristow MR. Economic impact of heart failure in the United States: time for a different approach. *J Heart Lung Transplant* 1994;13:S107–S112.
17. Hawthorne MH, Hixon ME. Functional status, mood disturbance, and quality of life in patients with heart failure. *Prog Cardiovas Nurs* 1994;9:22–32.
18. Burman BA, Margolin G. Analysis of the association between marital relationship and health problems: an interactional perspective. *Psychol Bull* 1992;112:39–63.
19. Revenson TA. Social support and marital coping with chronic illness. *Ann Behav Med* 1994;16:122–130.
20. Everson SA, Kauhanen J, Kaplan GA, Goldberg DE, Julkunen J, Tuomilehto J, Salonen JT. Hostility and increased risk of mortality and acute myocardial infarction: The mediating role of behavioral risk factors. *Am J Epidemiol* 1997;146:142–152.
21. Lyons RF, Mickelson KD, Sullivan MJ, Coyne JC. Coping as a communal process. *J Pers Soc Relationships* 1998;15:579–605.
22. Seeman TE, Berkman LF, Blazer DG, Rowe JW. Social ties and support and neuroendocrine function. *Ann Behav Med* 1994;16:95–106.
23. Uchino BN, Cacioppo JT, Kiecolt-Glaser JK. The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. *Psychol Bull* 1996;119:488–531.