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The Influence of Age, Gender, and Race on the Prevalence of Depression in Heart Failure Patients

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OBJECTIVES The goal of this study was to determine the prevalence of depression in an out-patient heart failure (HF) population; its relationship to quality of life (QOL); and the impact of gender, race, and age.

BACKGROUND Most studies of depression in HF have evaluated hospitalized patients (a small percentage of the population) and have ignored the influence of various patient characteristics. Although reported depression rates among hospitalized patients range from 13% to 77.5%, out-patient studies have been small, have reported rates of 13% to 42%, and have not adequately accounted for the impact of age, race, or gender.

METHODS A total of 155 patients with stable New York Heart Association functional class II, III, and IV HF and an ejection fraction <40% were given questionnaires to assess QOL and depression. These included the Medical Outcomes Study Short Form, the Minnesota Living with Heart Failure questionnaire, and the Beck Depression Inventory (BDI). Depression was defined as a score on the BDI of ≥10.

RESULTS A total of 48% of the patients scored as depressed. Depressed patients tended to be younger than non-depressed patients. Women were more likely (64%) to be depressed than men (44%). Among men, blacks (34%) tended to have less depression than whites (54%). Depressed patients scored significantly worse than non-depressed patients on all components of both the questionnaires measuring QOL. However, they did not differ in ejection fraction or treatment, except that depressed patients were significantly less likely to be receiving beta-blockers.

CONCLUSIONS Depression is common in patients with HF, with age, gender, and race influencing its prevalence in ways similar to those observed in the general population. These data suggest that pharmacologic or non-pharmacologic treatment of depression might improve the QOL of HF patients. (J Am Coll Cardiol 2004;43:1542–9) © 2004 by the American College of Cardiology Foundation

Many factors appear to affect the prevalence of depression in patients with chronic disease. The nature of the underlying disease, the treatment administered, when the patient is assessed, social support, gender, race, and age all may affect psychological status. Thus, up to 46% of cancer patients have been reported to meet criteria for depression (1), and 26% of males and 47% of females are estimated to have depression after a myocardial infarction (MI) (2).

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Congestive heart failure (HF) is a common chronic condition that affects both genders, all races, and people in various age groups. It is estimated to be present in greater than five million Americans (3) and accounts for more than 20 billion dollars in medical care annually (4). Yet most studies of depression in HF have evaluated hospitalized patients (a small percentage of the population) and have ignored the influence of various patient characteristics. Although reported depression rates among hospitalized patients range from 13% to 77.5% (5–8), out-patient studies have been small, have reported rates of 13% to 42%, and have not adequately accounted for the impact of age, race, or gender (9–11).

Depression may have an important effect on many quality of life (QOL) aspects in patients with HF. In these patients, depression is associated with more frequent hospital admissions, a decline in activities of daily living, and worse New York Heart Association (NYHA) functional classification (6,11,12). The presence of depression in HF patients has been associated with increased medical costs (13). It has even been reported that depressed patients have higher mortality rates (7).

Because of the potential importance of depression in the QOL of patients with HF and the lack of information about its prevalence, we sought to determine the prevalence of depression in an unselected out-patient HF clinic population. We particularly wanted to assess the importance of race, age, and gender on the frequency of depression and to ascertain the relationship between depression and QOL measurements. Perhaps by understanding these relationships, the question as to how often HF leads to depression, or whether depression leads to perception of worse HF, can be illuminated.

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Abbreviations and Acronyms

BDI = Beck Depression Inventory
CI = confidence interval
HF = heart failure
MI = myocardial infarction
MLWHF = Minnesota Living With Heart Failure questionnaire
NYHA = New York Heart Association
OR = odds ratio
QOL = quality of life
SF-36 = Medical Outcomes Study Short Form

METHODS

Patients with stable NYHA functional class II, III, and IV HF were recruited for this study from an out-patient academic HF practice between December 2000 and December 2001. All patients had an ejection fraction of <40% documented by nuclear ventriculography or echocardiography and did not have an acute exacerbation of symptoms. None of the participants had HF due to thyroid disease, a recent acute MI, or unstable angina. None of the participants was pregnant. Patients were approached at the conclusion of a normal office visit and were asked to participate in the study; informed consent was obtained.

Each participant completed a questionnaire to provide demographic information, including age, race, gender, living situation, and current medications. Patients' charts were reviewed to ascertain co-morbid medical conditions, NYHA functional class, and measured ejection fraction. Survey questionnaires to assess QOL and depression were then filled out by the patient. These were done in private, except for patients who were unable to read the questionnaire. In those patients, a nurse or physician read the form to the patient.

Forms. Quality of life was assessed with two tools, the Medical Outcomes Study Short Form (SF-36) and the Minnesota Living with Heart Failure Questionnaire (MLWHF). The SF-36 was used to obtain information about general QOL, while the MLWHF was used to obtain information specifically about the effect of HF on QOL. Depression was assessed with the Beck Depression Inventory (BDI).

The SF-36 was designed for use in clinical practice and research, health policy evaluations, and general population surveys. It is designed to assess QOL in persons 14 years and older. It includes 36 questions that assess health in eight subscales: 1) physical activity limitations; 2) social activity limitations; 3) usual role activity physical limitations; 4) bodily pain; 5) general mental health (psychological distress and well-being); 6) usual role activities emotional limitations; 7) vitality (energy and fatigue); and 8) general health perceptions (14). The SF-36 shows high test-retest reliability, with a reliability coefficient >0.75 for all dimensions except social functioning and is able to distinguish between groups with expected health differences. The SF-36 was able to detect low levels of ill health in patients who had scored 0 (good health) on the Nottingham health profile (15). Use of the SF-36 has also been validated in an elderly population (16). Standardized scores on the SF-36 scales were used for all computations and analyses.

The MLWHF questionnaire is designed to assess the effect of HF on QOL. It consists of 21 questions to measure the effect of symptoms that are specifically related to HF and its treatment in adults (17). Two subscales—physical and emotional—are identified. Both have high test-retest reliability (0.89, 0.93, respectively). Total score has been shown to improve with active medication, compared with no improvement in a placebo group. Changes in MLWHF scores over three months correspond well with changes in patients' rating of shortness of breath and fatigue (18).

Depression was assessed with the BDI. The BDI is the most widely used tool for self-assessment of depression in clinical research. The BDI is short, simple, and easy to administer. It consists of 21 items, each with four response options, and it has a reading level of approximately fifth grade. The scale is intended to rate severity of depression in individuals age 13 years and older. Internal consistency of the scale is high (0.86 to 0.88 among psychiatric patients and 0.81 with non-psychiatric subjects). There is ample evidence of construct and concurrent validity; BDI and clinical ratings of depression among psychiatric samples were highly correlated in meta-analyses. The BDI scores also were moderately to highly correlated with scores on the Minnesota Multiphasic Personality Inventory Depression, Zung Self Rating Depression, Hopelessness, and Hamilton scales (19). Depression was defined as a score on the BDI of ≥10.

Statistics. Chi-square or *t* tests were used to examine differences in demographic characteristics, illness severity, health history, and QOL between patients who were and were not depressed. Pearson correlation coefficients were used to examine the relationships of age and left ventricular ejection fraction with degree of depression. Correlations were also used to examine the relationships between depression score and QOL. Stepwise, hierarchical logistic regression was used to assess the usefulness of demographic, medical characteristic, and QOL factors in predicting which patients scored as depressed and to examine whether QOL contributed to prediction of depression status beyond the contributions of the other factors.

RESULTS

Subjects. A total of 155 patients participated in the study and completed study forms. Table 1 includes a summary of the demographic and medical characteristics of the patients. Patients ranged in age from 33 to 85 years (mean, 64 ± 12 years), and 79% were men. There were slightly more blacks than whites. Left ventricular ejection fraction varied from 10% to 40% (mean, 24 ± 7%), and over half of the patients were classified as NYHA functional class III. Slightly fewer

Table 1. Comparison of Demographic and Health Status Characteristics of the Patients With Heart Failure According to Depression Status, Mean ± SD, or Frequency and (%) of Depressed or Non-Depressed Patients Who Exhibited This Characteristic

	All Patients (n = 155)	Depressed (n = 75)	Non-Depressed (n = 80)	p Value
Age	64 ± 12	62 ± 14	65 ± 11	0.086
Ejection fraction	24 ± 7	25 ± 7	24 ± 7	0.970
NYHA class				
II	55 (36%)	19 (25.3%)	36 (45%)	0.038*
III	91 (59%)	51 (68%)	40 (50%)	
IV	9 (6%)	5 (6.7%)	4 (5%)	
Race				
Black	89 (57%)	40 (53.3%)	49 (65.3%)	0.344
White	65 (42%)	35 (46.7%)	30 (40%)	
Chinese	1 (1%)	0	1 (1.2%)	
Gender				
Men	122 (79%)	54 (72%)	68 (85%)	0.048*
Women	33 (21%)	21 (41.2%)	12 (15%)	
Medications				
Diuretics	131 (85%)	65 (86.7%)	66 (82.5%)	0.474
Digoxin	130 (84%)	64 (85.3%)	66 (82.5%)	0.632
ACE inhibitor	124 (80%)	60 (80%)	64 (80%)	1.0
Beta-blocker	102 (66%)	43 (57.3%)	59 (73.8%)	0.031*
Angiotensin receptor blocker	24 (16%)	13 (17.3%)	11 (13.8%)	0.538
Medical history				
Coronary artery disease	72 (46%)	26 (34.7%)	33 (41.2%)	0.787
Diabetes	59 (38%)	32 (42.7%)	19 (23.8%)	0.399
Hypertension	51 (33%)	16 (21.3%)	21 (26.2%)	0.012*
Myocardial infarction	37 (24%)	13 (17.3%)	10 (12.5%)	0.502
CABG	23 (15%)	4 (5.3%)	2 (2.5%)	0.378
Stroke	6 (4%)	2 (2.7%)	3 (3.8%)	0.352
PTCA	5 (3%)	2 (2.7%)	2 (2.5%)	0.703
PVD	4 (3%)	1 (1.3%)	1 (1.2%)	0.937
Coronary artery disease	72 (46%)	26 (34.7%)	33 (41.2%)	0.787
Living situation				
Lives alone	40 (26%)	18 (24%)	22 (36.7%)	0.619
Education				
<9 yrs	17 (11%)	7 (9.3%)	10 (12.5%)	0.232
9 to <12 yrs	25 (16%)	11 (14.7%)	14 (17.5%)	
High school graduate	52 (34%)	28 (37.3%)	24 (30%)	
Some college	25 (16%)	15 (20%)	10 (12.5%)	
College graduate	18 (12%)	5 (6.7%)	13 (16.2%)	
Depression status				
BDI <10	80 (52%)			
BDI 10 to 19	48 (31%)			
BDI >19	27 (17%)			

*$p < 0.05$ (two-tailed).
ACE = angiotensin-converting enzyme; BDI = Beck Depression Inventory; CABG = coronary artery bypass graft surgery; NYHA = New York Heart Association; PTCA = percutaneous transluminal coronary angioplasty; PVD = peripheral vascular disease.

than one-half had coronary artery disease, and approximately one-third had diabetes mellitus. A majority of the patients were being treated with diuretics, digoxin, angiotensin-converting enzyme inhibitors, and beta-blockers. Only 11 patients (7%) were receiving an antidepressant medication. A total of 26% of the patients lived alone.

Frequency of depression. In this unselected population, 48% of the HF out-patients scored as depressed, as assessed with the BDI. Scores on the BDI ranged from 0 to 43 (mean, 12 ± 9). Approximately one-sixth of the patients were severely depressed, as shown by markedly elevated BDI scores. The distribution of scores on the BDI is shown in Figures 1 and 2. Among the HF patients with a BDI ≥10, the mean BDI score was 19 ± 8. The demographic, medication, and medical history, as well as the disease severity characteristics, of the depressed and non-depressed patients are compared in Table 1.

Age. Patients with BDI ≥ 10 tended to be younger than non-depressed patients (t [140.84] = 1.69, p = 0.086). Using a median split of age (≤64, >64), younger patients had worse QOL on the entire MLWHF scale, as well as on both the emotional and physical subscales, than older patients (Table 2). Younger patients also had worse bodily pain, mental health, and general functioning than older patients according to scores on the SF-36. Age

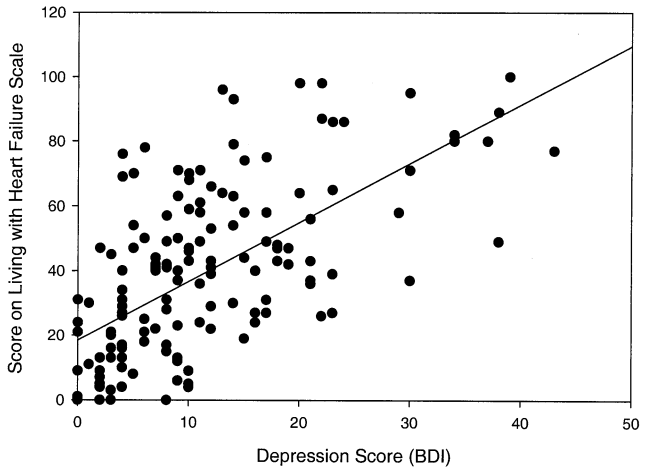

Figure 1. The relationship between extent of depression, as measured by the Beck Depression Inventory (BDI), and the severity of functional limitations, as measured by the Minnesota Living With Heart Failure Questionnaire, in 155 patients with chronic heart failure. r = 0.64, p < 0.001.

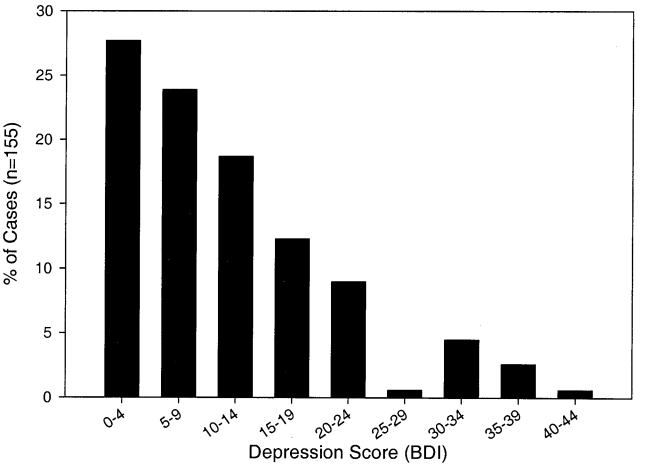

Figure 2. Distribution of scores on the Beck Depression Inventory (BDI) in 155 patients with chronic heart failure.

correlated with the scores on the MLWHF scales and with the bodily pain subscale of the SF-36 (Table 3).

Race and gender. Frequency of BDI ≥ 10 did not differ between blacks (53%) and whites (47%) (chi-square [n = 154] = 1.19, p = 0.275).

Women with HF were more likely (64%) to score as depressed than men (44%) (chi-square [n = 155, 1 df] = 3.9, p = 0.048). The mean BDI was 15 ± 11 for women and 11 ± 9 for men (p = 0.030).

Among men, blacks (34%) tended to score as depressed less frequently than whites (54%) (chi-square [n = 121, df = 1] = 3.14, p = 0.077), while among women there was a non-significant trend, with blacks (70%) scoring as depressed more than whites (54%) (chi-square [n = 33, 1 df] = 0.89, p = 0.35).

Influence of other factors. There was no difference in the prevalence of BDI ≥10 among those who lived alone and those who lived with others, or according to educational status.

There was no significant difference between those who scored as depressed and those who did not, regarding use of diuretics, digoxin, angiotensin-converting enzyme inhibitors, or angiotensin receptor blockers (Table 1). However, depressed patients were significantly less likely to be receiving beta-blockers (chi-square [n = 155, 1 df] = 4.64, p = 0.031).

Patients scoring as depressed had a higher prevalence of hypertension than those who did not (chi-square [n = 155, 1 df] = 6.27, p = 0.012) but did not differ in history of coronary artery disease, diabetes mellitus, MI, coronary artery bypass surgery, stroke, prior coronary angioplasty, or peripheral vascular disease.

Frequency of BDI ≥ 10 differed significantly according to NYHA functional class (chi-square [n = 155, 2 df] = 6.51, p = 0.038). Patients classified as NYHA functional class III and IV were more likely to score as depressed than class II patients, but class III and IV patients did not differ from each other in frequency of depression. Ejection fraction did not differ between patients scoring as depressed and those who did not (t [153] = 0.64, p = 0.95).

Depression status and QOL. Depressed patients scored significantly worse than non-depressed patients on all components of both the measures of QOL. Tables 4 and 5 compare scores of the depressed and non-depressed patients (as determined by the BDI) on the SF-36 and the MLWHF scales, respectively.

Severity of depression correlated with severity of impairment in QOL as measured on both questionnaires. Figure 1 shows the relationship between the depression score on the BDI and the MLWHF total score. Correlation coefficients for the BDI score and other QOL scores are listed in Table 3.

Neither severity of depression nor QOL scale scores correlated with ejection fraction (Table 3).

Predication of depression status. Stepwise, hierarchical logistic regression was used to assess the usefulness of demographic, medical characteristic, and QOL factors at predicting which patients scored as depressed. A hierarchical approach was used to force patient demographic factors and disease severity factors into the analysis before examining the contributions of QOL scale scores to patients' likelihood of having depressive symptoms. The demographic factors were entered on the first step (chi-square [3] = 10.84, p = 0.013). In the first analysis, gender (Wald [1] = 4.0, p < 0.045; odds ratio [OR] = 0.424, 95% confidence interval [CI] = 0.183 to 0.983) and age (Wald [1] = 4.09, p < 0.043; OR = 1.03, 95% CI = 1.001 to 1.06), but not race, (Wald [1] = 2.87, p < 0.101; OR = 0.749, 95% CI = 0.531 to 1.058) were significant predictors of depression status. Using a classification table with a cutoff of 0.5, the model correctly predicted depression status in 58.9% of the cases. The second step added NYHA functional class to the model (chi-square [1] = 7.18, p = 0.007). In this analysis, NYHA functional classification was a two-level variable (II; or III and IV). The NYHA functional classification made a

Table 2. Mean (± SD) Scores on the SF-36 Subscales and the MLWHF Scales for Younger (Age ≤64 Years) and Older (Age >64 Years) Heart Failure Patients

	Age ≤64 Years (n = 74)	Age >64 Years (n = 78)	t (df)	p Value
SF-36 subscale				
Physical functioning	31.8 (11.9)	32.4 (1.4)	−0.3 (150)	0.74
Role–physical	34.8 (11.4)	35.0 (1.3)	−0.1 (150)	0.90
Bodily pain	40.4 (12.5)	45.5 (1.4)	−2.5 (149)	0.015
General health	33.2 (11.3)	36.9 (1.4)	−2.0 (150)	0.053
Vitality	42.9 (11.7)	45.7 (1.4)	−1.4 (150)	0.15
Social functioning	39.7 (13.2)	42.9 (1.6)	−1.4 (150)	0.15
Role–emotional	38.9 (13.3)	41.1 (1.6)	−1.0 (149)	0.32
Mental health	44.6 (15.0)	50.2 (1.4)	−2.5 (150)	0.014
MLWHF scale				
Total	46.0 (27.72)	32.7 (24.0)	3.2 (150)	0.002
Emotional component	8.9 (8.0)	6.1 (6.5)	2.3 (140.8)	0.022
Physical component	20.1 (12.6)	15.6 (14.4)	2.0 (150)	0.042

Note, a higher score on the Medical Outcomes Study Short Form (SF-36) indicates better functioning; a higher score on the Minnesota Living With Heart Failure questionnaire (MLWHF) indicates increased disruption of life.

significant contribution to prediction of depression status (Wald [1] = 6.87, p = 0.009; OR = 0.386, 95% CI = 0.186 to 0.784). The improved model correctly predicted the depression status of 62.9% of the patients. The final step involved the addition of the QOL measures to the two preceding steps. Adding the vitality subscale of the SF-36 made a significant additional contribution (chi-square [1] = 21.94, p < 0.001) to the prediction of depression status based on the preceding model. Vitality was a significant predictor of depressive symptoms (Wald [1] = 18.624, p < 0.001; OR = 1.079, 95% CI = 1.042 to 1.117). The five predictor variables were simultaneously entered into a logistic regression model (chi-square [5] = 39.96, p < .001). The model predicted depression status correctly in 73% of the patients. However, only vitality and age made significant contributions to the model. Therefore, a final model using only age and vitality was computed (chi-square [2] = 35.64, p < 0.001). This model correctly predicted depression status in 74% of the patients—74% of those who were depressed, and 73% of those who were not depressed. Being younger (Wald [1] = 2.89, p = 0.09; OR = 1.026; 95% CI = 0.996 to 1.056) and having worse vitality (lower scores on the vitality subscale of the SF-36) (Wald [1] = 24.66, p < 0.001; OR = 1.09, 95% CI = 1.023 to 1.056) are predictive of having depressive symptoms. Thus, for every 10 years above the mean age, the likelihood of exhibiting depressive symptoms decreases by 26%, and for every 10 points below the mean vitality score, the patient's likelihood of having depressive symptoms increases by 90% (almost doubles).

Table 3. Correlation Coefficients of Quality of Life Measures With Depression Score, Age, and Left Ventricular EF

	BDI	EF	Age
MLWHF			
Total score	0.641*	0.028	−0.269*
Physical	0.561*	0.076	−0.226*
Emotional	0.730*	0.008	−0.171*
SF-36			
Physical functioning	−0.274*	−0.077	−0.023
Role–physical	−0.455*	0.128	−0.013
Bodily pain	−0.142‡	−0.063	0.215†
General health	−0.379*	−0.026	0.136
Vitality	−0.458*	0.064	0.089
Social functioning	−0.336*	−0.033	0.068
Role–emotional	−0.321*	0.022	0.043
Mental health	−0.394*	0.008	0.146

Higher score on BDI is more depressed, higher score on MLWHF score is more impaired, higher score on Medical Outcomes Study Short Form (SF-36) is better functioning. *p < 0.001, †p < 0.05, ‡p <0.10.

EF = ejection fraction. Other abbreviations as in Tables 1 and 2.

DISCUSSION

Prevalence of depression. The present study demonstrates that depression is extremely common in the HF population, with 48% of respondents scoring as depressed. While previous studies have reported high prevalence of depression in hospitalized HF patients (5–8,20), this is the largest study to look at out-patients with chronic HF. The high proportion of patients scoring as depressed is surprising. The small patient studies have generally reported depression rates of between 13% and 42% (9–11).

The present study suggests that depression is common in HF patients, but the exact frequency is certainly affected by multiple factors related to the nature of the study. For example, it was performed in an academic center. In addition, the BDI cutoff of 10 was designed to be sensitive. Certainly, some patients scoring as depressed would not meet other definitions of depression. This has been previously seen (7).

The high prevalence of depression in HF patients is consistent with previous reports of other chronic diseases. In the general population, major depression has been reported to be common in individuals with chronic medical illnesses. The prevalence of depression is even directly related to the number of chronic diseases for a given individual. In patients with more than two chronic conditions (i.e., severe arthritis, chronic obstructive pulmonary disease, hyperten-

Table 4. Mean (± SD) Scores on the SF-36 Subscales for Depressed and Non-Depressed Heart Failure Patients

SF-36 Subscale	Concept Measured	Depressed Patients (n = 73)	Non-Depressed Patients (n = 79)	t (df)	p Value
Physical functioning	Level of physical activity	29 ± 10	35 ± 13	3.67 (143.4)	< 0.001
Role–physical	Work limitations due to physical problems	30 ± 8	39 ± 12	5.4 (134.4)	< 0.001
Bodily pain	Degree of bodily pain	40 ± 13	55 ± 13	2.44 (149)	0.016
General health	Current health outlook	31 ± 10	38 ± 13	3.83 (141.4)	< 0.001
Vitality	Energy level and well-being	39 ± 9	49.7 ± 12	6.2 (150)	< 0.001
Social functioning	Impact of health problems on social functioning	37 ± 11	45 ± 15	3.68 (144.4)	< 0.001
Role–emotional	Work limitations due to emotional problems	36 ± 13	44 ± 14	3.33 (149)	0.001
Mental health	Anxiety, depression, well-being, and loss of control	42 ± 11	52 ± 15	4.42 (150)	< 0.001

A higher score on the Medical Outcomes Study Short Form (SF-36) indicates better functioning.

sion, diabetes, MI, end-stage renal disease, and cancer), the prevalence of major depression was 12.5% (21). The Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV-text revision) states that approximately 20% to 25% of people with general medical conditions will become depressed during the course of their chronic condition (22).

Gender. Although women in the general population are more likely to experience depression, there have been no publications on the effect of gender on depression in HF patients. This is a crucial issue because women in the general population have more severe depressive episodes with increased functional impairments and are more likely to develop chronic depression than men (23–26). Even in a general population, 2.6% of males and 7% of females score as depressed (27). In the present study, consistent with that seen in the general population, women had significantly worse depression scores than men. This difference tended to be significant even after controlling for age or other factors.

Our finding that women score as having worse QOL is consistent with a small prior study in HF. That study showed that, despite controlling for age, ejection fraction, and NYHA functional classification, women with HF had worse QOL scores than men (28). Physicians should therefore be particularly cognizant of the potential impact of depression in women with congestive HF.

Race. The present study showed that, overall, black and white patients with HF did not significantly differ in depression rates. However, black men scored as less depressed than white men, while black women had a non-significantly higher rate of depression than white women. The Epidemiologic Catchment Area and National Comorbidity Survey studies of mental health care demonstrated that, in the general population, blacks are less likely to be affected by major depression than whites (29). However, they are consistent with the present study in demonstrating that prevalence rates were higher among black females than black males.

The difference in prevalence between white and black men with HF is consistent with the observation that blacks utilize out-patient mental health services at approximately one-half the rate of whites. Social barriers, including stigma, physician mistrust, concerns about anti-depressant medications, and beliefs about the etiology of depression might contribute to better scores on depression surveys, a decreased incidence of a diagnosis of depression, and a different utilization rate of mental health services (30).

There has been limited work evaluating the relationship between race and depression in the HF population. One prior study looked at racial differences in depression in 60 hospitalized HF patients. It found that 17% of patients had major depression, and all of these patients were white. Although major depression was more common among white than black patients with HF (31), that study included very few black patients, and lack of depression in such a small population has limited value.

Age. Depression was seen more commonly among younger than older patients in the present study. Surprisingly, in the general population, this comparison is evident as well.

Table 5. Mean (± SD) Scores on the MLWHF Subscales for Depressed and Non-Depressed Heart Failure Patients

	Depressed Patients (n = 73)	Depressed Patients (n = 79)	t (df)	p Value
Total MLWHF	54 ± 24	25 ± 21	8.1 (150)	< 0.001
Physical component of MLWHF	12 ± 8	3 ± 4	8.4 (112.3)	< 0.001
Emotional component of MLWHF	25 ± 14	11 ± 10	6.7 (150)	< 0.001

A higher score on the scales indicates increased disruption of life.
MLWHF = Minnesota Living With Heart Failure questionnaire.

Although loneliness, diminished health and strength, and death of friends might be expected to lead to higher depression rates in the elderly, depression is more common in younger individuals than in those over the age of 65. The prevalence of major depression is 5.0% in 19- to 29-year olds, 7.5% in 30- to 44-year olds, and 1.4% in those 65 years and older (32).

The higher incidence of depression in the young suggests that depression is due to a larger disparity between the perception of functional status and the expectation. The differences in the MLWHF scales between older and younger patients support this conjecture. In this study population, younger patients report that their HF interferes more with total QOL and with both the emotional and physical components of the scale. Younger patients also report more bodily pain and worse general QOL on the SF-36. This was true even though objective evidence of cardiac function by ejection fraction was the same in depressed and non-depressed patients. Coping with the physical and emotional limitations caused by HF may be more difficult for younger individuals to accept.

Of course, there may be other reasons that older patients score as less depressed on the BDI. For example, it is possible that older individuals are less likely to report depressive symptoms for cultural reasons or that they have more difficulty with self-administered questionnaires for cognitive reasons.

Depression and QOL. In the present study, the presence of depression was associated with reduced QOL scores. It cannot be excluded that patients with worse HF experience a lower QOL and are subsequently depressed. However, our prior study of depression in HF patients suggested that depression leads to a perception of lower QOL (10). We showed that, although depressed individuals tend to report worse physical functioning, the objective assessment of energy expenditure by cardiopulmonary exercise testing actually tended to be better. Indeed, the depressed group showed less exertion on testing, with a lower respiratory quotient. Similarly, the mean ejection fraction of the depressed patients was higher.

Other studies also suggest that QOL scores relate poorly to functional status. In one study, the 6-min walk test and peak oxygen uptake correlated with only one of the eight QOL domains (physical functioning). Left ventricular ejection fraction showed no clear association with QOL, with multiple regression analysis showing that only the subjective NYHA functional class was associated with all QOL scales (33). Although other studies found that baseline functional status, including limitation of activities of daily living and dyspnea at rest, was related to depression, reports of these symptoms are subjective, and objective evidence is lacking (5,6).

The current study, in combination with previous data, is consistent with the notion that depressed HF patients may perceive their QOL to be lower and to underestimate their functional status. As discussed in the preceding text, the finding that younger patients are more depressed, with more impaired QOL, suggests that patients' perceptions of their health status are more important than their absolute physiological impairment in determining both degree of depression and QOL. This may lead physicians caring for depressed HF patients to classify them as more severely compromised and rate their NYHA functional class higher. Of course, it is possible that depressed patients do have more advanced HF. It is likely, however, that the combination of having HF and being depressed has an additive effect on worsening the individual's QOL.

Depression and beta-blockade. Although beta-blockers are commonly thought to cause depression, we found that depressed patients were actually significantly less likely to be receiving beta-blocker therapy. Although this may be explained by the reluctance of doctors to prescribe beta-blockers to depressed individuals, it does suggest that beta-blockers are not likely to cause depression. This is consistent with a recent meta-analysis that found no significant increased risk of depressive symptoms in patients receiving beta-blocker therapy (34).

The lower incidence of depression in patients receiving beta-blockers may also be secondary to beta-blocker-induced improvement of HF with consequent perception of improved QOL. The present study indicates that the concern of the relationship between beta-blockers and depression is overstated in patients with HF. Depression is not a reason to withhold beta-blockers in HF patients.

Prediction of depression. The combination of a young age and decreased vitality was able to accurately predict depression in 74% of depressed patients, while falsely predicting depression in only 27% of patients with a BDI < 10. This is important, as the administration of a depression survey may be resisted by patients; physicians may be able to diagnose depression by specifically evaluating younger patients with non-threatening and simple vitality questions. By focusing on relatively young, high-risk patients with lower vitality, physicians may be able to efficiently identify patients who could benefit from psychiatric interventions.

Clinical implications. The data suggest that pharmacologic or non-pharmacologic treatment of depression could conceivably reduce morbidity and, perhaps, mortality. A recent study evaluated the effect of stress management training for patients with HF and found significant improvements in perceived stress, emotional distress, 6-min walk, and symptoms of depression (35). Treatment of depression may also help to reduce the medical costs of HF; a retrospective analysis found that, after adjusting for age, gender, medical co-morbidities, and length of stay at an index hospitalization, costs were significantly higher over a three-year period for depressed HF patients than for non-depressed patients. Increased in-patient and out-patient utilization contributed to the higher costs (13).

Both depression and congestive HF affect clinical status in important ways. The additive effect of these conditions on an individual's QOL is evident. The best way of treating depressed HF patients is not known, and certainly other

factors might influence which patients will benefit from various interventions. Because depression is common in patients with HF, however, the effects of various anti-depression strategies should be evaluated.

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