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A SYSTEMATIC REVIEW OF DEPRESSION IN ADULTS WITH HEART FAILURE: INSTRUMENTS AND INCIDENCE

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Abstract

Heart failure (HF) is a life-threatening condition affecting 2.5% of Americans. Depression is reported to be present in 9.5% of the general population, but its incidence is higher in individuals with HF. The aims of this systematic review of older adults with HF were to examine the literature to: (1) identify instruments used to evaluate depression/depressive symptoms; and (2) determine the incidence of depression/depressive symptoms reported. Sixteen articles met inclusion criteria. Six self-reporting screening instruments and two diagnostic-interviews for depression were identified. Depression/depressive symptoms were reported in 14–60% of adults with HF. Use of screening instruments resulted in higher frequencies of depression/depressive symptoms (21–60%) than did diagnostic interviews (14–39%). Screening instruments established prior to the 1987 diagnostic guidelines may not reflect the current definition of depression. Depression screening instruments appear to overestimate the incidence of depression in older adults with heart failure. A complete diagnostic interview for depression should be performed prior to the treatment of older adults with HF.

Heart failure (HF) is a life-threatening condition where the heart can no longer pump blood effectively to the body. It affects 2.5% of Americans over age 20 with the incidence increasing to 5% at age 60 and climbing to 10% by age 70. There are over 550,000 new cases diagnosed each year. The risk of developing HF doubles when hypertension is uncontrolled (Thom et al., 2006). The one-year mortality risk for HF is estimated at 20%. Chronic HF is the most common diagnosis listed for hospitalized patients over 65, with 33.2 billion dollars spent in direct and indirect cost (Thom et al., 2006). As cardiac function declines, symptoms of HF emerge. Typical symptoms include dyspnea, coughing, wheezing, edema, fatigue, sleep disturbances, decreased appetite, nausea, confusion or impaired thinking, and increased heart rate and/or palpation (Thom et al., 2006). Cardiac function in HF ranges from no apparent symptoms (New York Heart Association [NYHA] class I) to extremely limited function (NYHA classes III-IV) (Bonow et al., 2005).

Depression is a mood disorder characterized by anhedonia (decreased interest in pleasurable things), anxiety, irritability, or a combination of these symptoms, and may be masked by the presence of somatic complaints or cheerfulness (smiling depression) (Beers, 2007). The National Institute of Mental Health (NIMH) reports that the incidence of depression in the

United States is 9.5% in the general population (NIMH, 2002). Yet, for individuals living with heart failure, depression has been reported as a comorbid diagnosis in 22–77% of the samples examined (Johansson, Dahlstrom, & Brostrom, 2006).

Depressive symptom screening is conducted with the use of self-rated survey instruments that evaluate symptom severity. These instruments only screen for symptoms of depression and are not meant to be diagnostic of depression. An extensive interview with specific interviewer-rated questions found in categorical/diagnostic instruments must be conducted by an appropriately trained individual for a clinical diagnosis of depression to be made (Beers, 2007). Few studies can afford the expense of a diagnostic interview for the determination of a diagnosis of depression; as a result, depressive symptom screening scales are frequently utilized in the research setting.

In a recent meta-analysis significant associations were found between HF and depression/depressive symptoms and increased morbidity and mortality (Rutledge, Reis, Linke, Greenberg, & Mills, 2006). The authors reported a major discrepancy in the incidence of depression; 33.6% using screening instruments versus 19.3% from diagnostic interviews. Rates of depression reported in this meta-analysis continued to increase nearly 10% per NYHA class (11% NYHA class I up to 42% in NYHA class IV). Thus, HF severity appears to have a large impact on the reported rates of depression. The purposes of this systematic literature review were to determine: (1) What instruments are being used to measure depression/depressive symptoms in adults with HF? and (2) What is the incidence of the depression/depressive symptoms that these instruments identified in older adults with HF?

METHODS

A librarian familiar with nursing literature, and two doctoral prepared nursing faculty experienced in the procedures and publication of systematic reviews assisted in the selection of databases and search terms utilized for this review. The databases CINAHL, MEDLINE, PsycARTICLES, PsycEXTRA, PsycINFO, and the Psychology and Behavioral Science Collection were searched from 2000–2007. Key words were “adults,” “depression,” “heart failure,” “congestive heart failure,” and “CHF.” Reported research was included in this review if it included an adult sample 45 years or older diagnosed with HF, was written in English, reported the incidence of depression/depressive symptoms in the sample, and measured cardiac functional status as NYHA class. Fifty-one articles were identified. The reference lists of retrieved studies were examined to identify other studies reporting the incidence of depression in older adults with HF, resulting in 15 additional articles included for the review (66 total). Articles were then excluded from this review if they were practice guidelines, letters or reviews, or drug trials examining depression/functional status as an outcome related to medication; focused on genetic causes of depression, depression related to fertility, child-bearing, or end-of life (last 6-months); dealt with participants with or wait-listed for cardiac transplant or animal studies; or determined depression by diagnostic coding only.

RESULTS

Sixteen articles met the inclusion and exclusion criteria for this review. Fourteen of the studies measured depressive symptoms using a screening instrument. These instruments were the Beck Depression Inventory (BDI), the Center for Epidemiological Studies-Depression Scale (CES-D), the Diagnostic Interview Schedule (DIS), the Geriatric Depression Scale (GDS), the Hospital Anxiety and Depression Index (HADI), the Medical Outcome Survey-Depression instrument (MOS-D), the Structured Clinical Interview (SCI), and the Zung Depression Scale (Zung) (see Table 1). The incidence of depressive symptoms reported in these studies ranged from 21–78% of the sample under investigation (see Figure 1).

Measures of Depression

The following sections describe the eight instruments noted in the reviewed studies. Of the studies reviewed, 11 used only screening instruments to determine depression symptoms, three used a combination of screening instruments and diagnostic interviews, and two used only a diagnostic interview.

The Beck Depression Inventory—The Beck Depression Inventory (BDI) is a 21-item self-rating of attitudes and symptoms of depression (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI was updated to correspond to the revised diagnostic criteria for depressive disorders as listed in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition in 1996 (*DSM-IV*; American Psychiatric Association [APA], 1996) (Beck, Steer & Brown, 1996). Intensity of symptoms experienced is scored from 0–3 for each question. Scores are to be interpreted in ranges: not depressed (0–13); mild depression (14–19); moderate depression (20–28); and severe depression (29–63) (Beck, Steer, & Brown, 1996). Four of the studies included in this review utilized the BDI as the measure of depressive symptoms (Friedman, Thomas, Liu, Morton, Chapa, Gottlieb, 2006; Gottlieb et al., 2004; Jiang et al., 2004; Schweitzer, Head, & Dwyer, 2007), and two additional studies used both the BDI and the Diagnostic Interview Schedule (Freedland, Rich, Skala, Carney, Dávila-Román, & Jaffee, 2003; Jiang et al., 2001)

Four of the six studies using the BDI determined that NYHA class was significantly associated with depression (Freedland et al., 2003; Friedman et al., 2006; Gottlieb et al., 2004; Jiang et al., 2001), but there was no association in the studies by Jiang et al. (2004) and Schweitzer et al. (2007). The percentages of the samples that were reported depressed by scores from the BDI in six studies ranged from 30% to 48% (see Figure 1). The highest incidence of depression, at 48%, was found in a sample of clinic patients (Friedmann et al., 2006), the only other study to examine outpatients reported a similar incidence of depression to those reported in hospitalized samples (36%) (Friedmann et al., 2006).

The Center for Epidemiological Studies-Depression Scale—In two studies (Lessman-Leegte, Jaarsma, Sanderman, Lissen, & van Veldhuisen, 2006; Skotzko et al., 2000), the Center for Epidemiological Studies-Depression Scale (CES-D) was the primary measure of depressive symptoms. The CES-D, a 20-item self-report measure of depressive symptoms, is scored on a Likert 4-point scale. Scores range from 0–60 with scores of 16–26

indicative of mild depression and a score of 27 representative of major depression (Radloff, 1977). Skotzko and colleagues (2000) reported on a small sample of 33 participants. Four of the participants did not have their NYHA class reported; there was a trend towards significance between NYHA class and depression ($p = .1$). In the other study, a large number of participants ($N = 572$) were examined at the time of hospital admission. Participants with NYHA class I were not included in the study (Lessman-Leegte et al., 2006). Regardless of sample size, neither of the studies found a relationship between the CES-D score and NYHA class (Lessman-Leegte et al., 2006; Skotzko et al., 2000).

The Diagnostic Interview Schedule—The Diagnostic Interview Schedule (DIS) is a structured interview designed to yield a psychiatric diagnoses according to the *DSM-IV-TR* (APA, 2000). Trained lay interviewers can administer the DIS. When compared to the DSM criteria, the DIS had a sensitivity of 80% and specificity of 84% for depression. Consequently, this instrument has been used extensively to study the epidemiology of depression in large population studies. Two studies included the DIS as a comparison to the results of the BDI (Freedland et al., 2003; Jiang et al., 2001). A positive relationship between depression and NYHA class was reported in both of these studies. The incidence of depression using the DIS was 13.9–19.8%, or approximately half of what was noted by the BDI. This was an expected finding since the BDI was used as a rapid screening instrument designed to have high sensitivity, but it is not possible to diagnosis depression from the scores. The DIS is designed to be both sensitive and specific, and therefore is a more accurate measure for a diagnosis of depression (APA, 2000).

The Geriatric Depression Scale—The Geriatric Depression Scale (GDS) is a brief (30-item) dichotomous scale developed specifically for use with older populations (Yesavage, Brink, Rose, Lum, Huang, Adey, & Leirer, 1983). The GDS is often abbreviated into a 15-item scale for rapid clinical use. It is easy to use, and has been determined to be appropriate in both medically ill and cognitively impaired individuals (Koenig, Meador, Cohen, & Blazer 1988). One study in this review (Subramanian, Weiner, Gradus-Pizlo, Wu, Tu, & Murray, 2005) utilized the 30-item GDS and a second (Fulop, Strain, & Stettin, 2003) reported on the 15-item GDS and compared the results with the Structured Clinical Interview. Fulop and associates (2003) examined a sample of outpatients using the 30-item GDS to determine the course of depression in participants six months after hospitalization for HF. Participants completed the 30-item GDS during hospitalization and again at four and 24 weeks after hospital discharge. These investigators determined that the higher the NYHA class at discharge from the hospital, the more likely the individual was to be depressed at all three time points. Subramanian and colleagues (2005) used the 15-item GDS scale in a longitudinal study to determine the agreement of patient-versus provider-assigned NYHA class. They reported that somatic symptoms found in both HF and depression, as measured by the 15-item GDS, decreased the reliability of the GDS by including symptoms common to both disorders, making the conditions more highly associated than they actually were. The authors statistically controlled for items examining somatic symptoms in their analysis (correlations not reported in report).

The Hospital Anxiety and Depression Index—The 14-item HADI consists of two seven-item scales for depression and anxiety with each item scored from 0 = absent to 3 = severe (Bjelland, Dahl, Haug, & Neckelmann, 2002). A score >7 on the seven items in the depression portion of the scales indicates the presence of depression with a sensitivity and specificity of approximately 0.80. One study was identified that used the HADI to examine depression and mortality in adults with HF (Jüger et al. 2005). The researchers examined a sample of participants with stable symptoms to prospectively determine the influence of depression on mortality. These researchers reported that NYHA class and depression were associated (see Table 1).

Medical Outcomes Study-Depression—The Medical Outcomes Study-Depression (MOS-D) is an 8-item survey of depression. The MOS-D contains six items from the Center for Epidemiological Studies Depression Scale that determines depressive symptom frequency over the previous week on a four-point scale (0 = rarely or none of the time to 3 = most or all of the time). There are two yes/no items from the Diagnostic Interview Schedule to assess the presence of 2-weeks or longer of depressed mood or anhedonia. The scoring of the MOS-D uses a logistic regression model with scores ranging from 0 to 1 with a cutoff point of 0.06 being used to indicate depression (Burnam, Wells, Leake, & Landsverk, 1988). One study reported examining depressive symptoms using the MOS-D in a prospective multi-center outpatient study to determine the factors associated with the development of depression in outpatients with HF at baseline and in a 12-month follow-up telephone call (Havranek, Spertus, Masoudi, Jones, & Rumsfeld, 2004). Participants were excluded if they had a score indicating depression at baseline. Researchers reported that in this sample, NYHA class was not associated with the development of depression at one-year of living with HF as measured by the MOS-D (see Table 1).

The Structured Clinical Interview—The Structured Clinical Interview (SCI) is a semi-structured interview for diagnosing psychiatric disorders according to the *DSM-IV-TR* (APA, 2000). This instrument requires a trained mental health professional for administration, or the training of an assistant when used in clinical trials. The SCI requires one to two hours to administer. Two of the studies included in this review (Haworth, Moniz-Cook, Clark, Waddington, & Cleland, 2005; Turvey, Klein, & Pies, 2006) utilized the SCI to determine the incidence of depression in older adults with HF. Hayworth et al. (2005) determined the prevalence of depression using a clinical reference standard (SCI) to determine the predicting variables influencing depression in an outpatient sample of older adults (67 years of age, SD = 11). They reported a significant increase in the incidence of depression as NYHA class increased (see Table 1). In contrast, the second research report (Turvey et al., 2006) examined older adults (66 years of age, SD = 9.1) admitted to a HF transplant specialty intensive care unit. Participants were assessed at baseline only for NYHA class, and the SCI was used at baseline, 8-, and 16-weeks to determine if attitudes about impairment contributed to depression. These authors reported that there was no relationship between NYHA class and depression, but did not report the values for all three time points.

The Zung Depression Scale—The Zung Depression Scale is a 20-item self-administered survey using positive and negatively worded questions to evaluate depressive symptoms (Zung, 1965). The frequency of the symptom experience is scored from 1–4 (a little of the time, some of the time, good part of the time, most of the time) with a range in scores of 20–80. A score of 50–69 is typically used to determine depression, and a score above 70 is indicative of severe depression. Two studies in this review (Murberg, Bru, Aarsland, & Svebak, 1998; Pihl, Jacobsson, Fridlund, Stromberg, & Martensson, 2005) utilized the Zung Depression Scale to evaluate depressive symptoms. Depression was associated with NYHA class in an outpatient sample of 119 older adults (66 years of age, SD = 9.1) with symptomatic HF (Murberg et al., 1998). Pihl and associates (2005) supported these findings in a report, examining outpatients over 60 years of age, living with HF (see Table 1).

DISCUSSION

The majority of studies reported an association indicating that as NYHA class increased (i.e., HF progressed) depression worsened. In the six studies that did not find this association, one excluded all participants that had evidence of depression at baseline (Havranek et al., 2004) and another measured NYHA class on admission to an acute care facility, but did not reassess for a change in NYHA class after treatment and discharge (Turvey et al., 2006). In two studies, the CES-D consistently found no association between NYHA class and depression (Lessman-Leege et al., 2006; Skotzko et al., 2000). The participants were recruited in an outpatient setting, however, no participants were included in either study with NYHA class I HF.

When the BDI was used as the screening measure, less consistency was found in the studies that reported the relationship of depression with NYHA class. Two of the six studies reported no significant relationships. A possible explanation for this may be in the way assessment of NYHA classification was obtained for the study. Schweitzer et al. (2007) identified NYHA classification in outpatients from recent hospitalization records. It is possible that NYHA class was improved by the time the participant completed the BDI as a result of the treatment received during the hospitalization. Jiang and associates (2004) assessed NYHA on admission to the hospital, but did not reassess post-discharge or at the one year follow-up, again raising the question of whether a NYHA class assessment at the time of hospital admission is an accurate assessment of the patients' level of depression.

The environment in which participants are questioned may influence their perceptions and responses to questions about depressive symptoms (Subramanian et al., 2005). An admission for HF exacerbation is accompanied by increased symptoms, worsening of NYHA class, difficulty breathing, possible chest pain, and fear. Estimates of NYHA class and ejection fractions at this time are typically worse than they are at the time of discharge or office follow-up. In addition, NYHA class can rapidly change with hydration status. We recommend a reassessment of NYHA class at the time of recruitment and testing, and a reassessment of NYHA class when repeated measurements are used, to determine if an association between depression and NYHA class manifests. Finally, if a relationship

between NYHA class and depression is to be fully examined it is desirable that the sample have equal distribution of the participants in each classes to prevent a skewing of the results.

All of the survey instruments identified in the studies we reviewed have extensive reliability and validity data established in a wide variety of samples, but they include items that are reflective of the HF symptom experience, and not necessarily depressive symptoms. One possible solution would be to scale the instruments according to the severity of NYHA class. Another alternative is to develop an instrument that avoids the assessment of somatic symptoms found in HF. A final solution would be to use an instrument that avoids somatic symptoms altogether (like the Patients Health Questionnaire) when examining conditions with somatic symptoms.

CLINICAL APPLICATIONS FOR ADVANCED PRACTICE

It has long been recognized that depression interferes with older adults' cognitive functions and their ability to perform activities of daily living (Harper, Harper, & Kirby, 1990). Older patients often attribute the symptoms they are experiencing to other chronic conditions, or simply "getting old." Older hospitalized patients may be fearful that additional health problems may lead to what they consider undesirable outcomes, such as extended hospitalization, loss of independence, or changes in living conditions, and are therefore reluctant to admit they are having difficulty. For these reasons, a complete psychometric assessment may be required to determine if symptoms are related to depression, HF, or other comorbid factors.

Depression is not recognized in 16% of older adults seen in primary care (Unutzer et al., 2002). When depression is diagnosed, providers often are reluctant to prescribe treatment due to the concerns about adverse affects, and the patient's reluctance to accept treatment. Older adults do not typically present with the classic *DSM* criteria for depression. Instead, they exhibit somatic complaints, weight loss, and exaggerated pain (Buckley & Lachman, 2007). Somatic complaints are frequently found in older adults with class NYHA II-IV HF; therefore distinguishing between the symptoms of HF and depression is required prior to any treatment recommendations.

Any instrument selected needs to be evaluated by clinicians for its ease of understanding, time to administer, and complexity of scorings so that the provider can interpret the results, make referrals, and treat the client appropriately. For these reasons, short-screening instruments with high sensitivity such as the ones examined in this review make good clinical sense. The selected instrument can be completed while waiting for the appointment, and scores can be reviewed prior to the visit. Any client that is positive on a screening test can then receive further examination to determine the cause of their symptoms, and if indicated, a referral for more extensive examination and appropriate treatment. This review does not support any one screening instrument as best for use in older adults with HF. Examination of the items and concepts contained in these instruments is needed to determine if there is an overlap in the symptoms of depression and HF that may influence the instrument scores and reliability of the instrument.

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FIGURE 1.

Percent of sample exhibiting depressive symptoms or depression by measurement. BDI = Beck Depression Inventory; CES-D = Center for Epidemiological Studies-Depression Scale; Zung = Zung Depression Inventory; HADI = Hospital Anxiety Depression Index; MOS-D = Medical Outcomes Survey-Depression; GDS = Geriatric Depression Scale; DIS = Diagnostic Interview Schedule; SCI = Structured Clinical Interview for DSM-IV; Results for each instrument connect studies with line for ease of comparison. Single points represent results of instruments reported in only one study.

TABLE 1.
Studies Examining Depression in Heart Failure by New York Heart Association Classification

Author	N	M/F	Mean Age (SD)	% NYHA Class: I/II/III/IV	Purpose Stated for Study	% Reporting Depression	Results
					Beck Depression Inventory (BDI)		
Friedmann et al., 2006	153	127/26	60.6 (10.9)	-/114/39/-	Determine prevalence and relationship of psychosocial factors to mortality	36	NYHA class and depression are associated ($r = 0.44$, $p < .001$)
Gottlieb et al., 2004	155	122/33	64 (12)	-/55/91/9	Determine prevalence in outpatients, and relationship with quality of life (QoL) gender, race, and age	48	NYHA class significantly predicted depression ($p = .009$; OR = 0.386; CI = 0.186–0.784)
Jiang et al., 2004	291	187/104	63.0 (13)	53/39/8 (I/II/III & IV)	Determine prognostic value and interaction of anxiety and depression	30	Depression was not associated with NYHA class ($p = .25$)
Schweitzer et al., 2007	102	72/30	63.6 (14.23)	6/28/58/10	Determine if depression, anxiety, and self-efficacy predict adherence	33	Depression categorized as none, minor, moderate, or major; BDI score was not significantly associated with NYHA class
					BDI and the Diagnostic Interview Schedule (DIS)		
Freedland et al., 2003	682	327/355	66 (12)	60/331/244/47	Determine demographic, medical, and psychosocial factors that affect the prevalence of depression	36 BDI, 19.8 DIS	BDI >10: 34% = major, 21% = minor, and 45% = not depressed on DIS; depression was more prevalent if age < 60, female, disabled, and higher NYHA class ($p < .001$)
Jiang et al., 2001	331	181/150	63 (13)	-/132/139/21	Determine prevalence in hospitalized patients, and the effect of depression on all causes of mortality and readmissions	35.3 BDI 13.9 DIS	Depression categorized as none, minor, or major; higher NYHA class was observed in both mild and major depression (compared to no depression)
					Center for Epidemiologic Studies Depression Scale (CES-D)		
Lessman-Leegte et al., 2006	572	355/217	71 (12)	-/6/51/43	Determine the prevalence in elderly hospitalized patients and the relationships between demographic and clinical variables	41	Depression was not associated with NYHA class; the number of HF symptoms was a predictor of depression ($p < .001$)
Skotzko et al., 2000	33	30/3	64 (11) depressed 66.5 (7) not-depressed	0/20/13/0	Determine prevalence in ambulatory patients; determine the relationship of depression with objective and subjective functional status	42	A trend for participants with higher NYHA to be more depressed ($p = .1$) (note 4/33 participants [2 in each class] were not included in the analysis)
					Geriatric Depression Scale (GDS)		
Subramanian et al., 2005	156	50/106	63 (9)	32/69/49/6	Assess the agreement of patient versus clinician assigned NYHA class	36.5	Symptoms of depression (e.g., fatigue) overlapped with symptoms of HF

Author	N	M/F	Mean Age (SD)	% NYHA Class: I/II/III/IV	Purpose Stated for Study	% Reporting Depression	Results
Fulop et al., 2003	203	95/108	76.8 (7.8)	33/138/26/6	GDS and the Structured Clinical Interview (SCI) Prospective examination of depression identified at discharge for individuals with HF	36% GDS, 22% SCI	GDS had 14% higher incidence than the SCI; more depressed patients were NYHA class III or IV than non-depressed ($\chi^2 = 8.02$, $df = 1$, $p < .05$)
Junger et al., 2005	209	180/129	54 (10)	24/93/92/-	Hospital Anxiety and Depression Inventory (HADI) Prospectively examine the influence of depression on mortality in individuals with HF	30.1	Non-survivors scored higher on depression ($p < .05$); NYHA class and depression were associated ($r = .40$, $p < .01$)
Havranek et al., 2004	245	183/62	Depressed 60.5 (11.3), Not depressed 63.1 (12.5) at 1-year follow-up	36/114/89/6	Medical Outcome Survey-Depression (MOS-D) Identify factors associated with development of depressive symptoms in outpatients without baseline depression	21.2	In a baseline non-depressed sample, NYHA class was not associated with depression when measured at 1-year follow-up ($p = .27$)
Haworth et al., 2005	100	83/17	67 (11)	5/65/26/1	SCI Examine the prevalence using a diagnostic clinical reference standard	18.4	Depression was associated with worse NYHA class ($r = .35$, $p < .02$)
Turvey et al., 2006	83	41/42	69 (7)	4/28/50/1	Examine the contribution of attitudes about impairment to the incidence of depression	38.6	Depression was not associated with NYHA class when controlling for attitude about impairment
Murberg et al., 1998	119	85/34	66 (9.1)	4/33/37/7	Zung Depression Scale (Zung) Determine prevalence and associations among physicians' ratings of functional status and depression	40	Depression correlated with NYHA class ($r = .22$, $p < .05$); physician and patient rated perceptions of function were related ($r = .38$, $p < .01$)
Phil et al., 2005	47	34/13	78 (5)	-/51/40/2	Determine if elderly adults with HF and their spouses experience similar levels of QoL and depression	60	NYHF class was associated with depressive symptoms ($r = .30$, $p < .05$) in patients, but not spouses