

Psychological Aspects of Heart Failure

Debra K. Moser¹ · Cynthia Arslanian-Engoren² · Martha J. Biddle³ ·
Misook Lee Chung⁴ · Rebecca L. Dekker³ · Muna H. Hammash⁵ ·
Gia Mudd-Martin⁶ · Abdullah S. Alhurani⁷ · Terry A. Lennie⁸

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Abstract Psychological conditions such as depression can have a greater impact on morbidity and mortality outcomes than traditional risk factors for these outcomes. Despite their importance, it is rare for clinicians to assess patients for these conditions and rarer still for them to consistently and adequately manage them. Illumination of the phenomena of comorbid psychological conditions in heart failure may increase awareness of the problem, resulting in improved assessment and management.

Keywords Anxiety · Depression · Cognitive function · Social support · Caregivers

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✉ Debra K. Moser
dmoser@uky.edu

Cynthia Arslanian-Engoren
cmae@umich.edu

Martha J. Biddle
mjbidd0@uky.edu

Rebecca L. Dekker
rdekker@uky.edu

Muna H. Hammash
mhhamm01@exchange.louisville.edu

Gia Mudd-Martin
Gia.Mudd@uky.edu

Abdullah S. Alhurani
Dr.alhurani@gmail.com

Terry A. Lennie
tlennie@uky.edu

Introduction

As a clinical syndrome, and not a disease, heart failure is not diagnosed with a test, but as a result of recognition of symptoms and signs of the condition. Every practicing clinician can name the cardinal symptoms of heart failure—dyspnea (including paroxysmal nocturnal dyspnea and orthopnea), edema, and exercise intolerance or fatigue. Yet, few clinicians can name the most common psychological symptom seen in heart failure—depressive symptoms. Fewer still appreciate the consequences of depression and depressive symptoms on functional status, engagement in effective self-care behaviors, adherence to medication and diet recommendations, and

¹ Professor and Linda C. Gill Chair of Nursing, University of Kentucky, College of Nursing, 315 CON, Lexington, KY 40536-0232, USA

² University of Michigan, School of Nursing, 400 North Ingalls, Ann Arbor, MI 48109-5482, USA

³ University of Kentucky, College of Nursing, 315 CON Building, Lexington, KY 40536-0232, USA

⁴ University of Kentucky, College of Nursing, 529 CON, Lexington, KY 40536-0232, USA

⁵ University of Louisville, College of Nursing, Louisville, Kentucky, USA

⁶ University of Kentucky, College of Nursing, 533 CON, Lexington, KY 40536-0232, USA

⁷ The University of Jordan, Amman, Jordan

⁸ University of Kentucky, College of Nursing, 521 CON, Lexington, KY 40536-0232, USA

rehospitalizations and mortality. There are other psychological problems that have important negative consequences for patients with heart failure and that have been largely ignored in clinical medicine, including poor social support and anxiety. Although not strictly a psychological problem, cognitive dysfunction is important to consider in any discussion of psychological problems because of the interaction of psychological phenomenon and cognition and because depression is commonly accompanied by cognitive dysfunction [1]. For example, current evidence suggests that abnormalities of the hippocampus exist in both depression and cognition dysfunction in patients with heart failure [2].

We have previously speculated [3] about reasons for lack of incorporation of psychological assessment and management into practice among clinicians and these include lack of education on the topic and failure to understand that there are highly plausible biologic and behavioral pathways linking psychological problems with physical outcomes (Fig. 1) [4, 5]. In the current paper, we provide evidence that psychological problems must be included in routine clinical assessment and management in order to make a greater impact on clinical outcomes and quality of life than seen with attention to traditional risk factors and medical therapy alone [6••]. Even among those with advanced heart failure, in whom physical concerns would dominate, issues with social support and psychological problems are paramount concerns that negatively affect daily life [7]. Thus, these must also be addressed for humanistic reasons in order to reduce patient suffering.

Depression and Depressive Symptoms

Depression and depressive symptoms are not associated with objective markers of illness severity [8] and are common in heart failure. A meta-analysis of 23 studies including more than 10,000 participants with heart failure demonstrated the prevalence of major depressive disorder was 20 % in outpatients and inpatients [9]. The prevalence of depressive symptoms rose to 30 % when self-reported depression questionnaires were used [9]. These levels are substantially higher than the 6.7 % seen in the US population. Furthermore, we have demonstrated that levels of depressive symptoms are significantly higher in patients with heart failure than in those with other cardiac conditions or in healthy elders [10], that depression and anxiety are common comorbidities [11], and that depression and anxiety levels are higher in African-Americans than other minorities or than Caucasians [12]. Others have confirmed these findings [13••].

It is not only major depressive disorder that has negative clinical consequences for patients with heart failure. Most investigators to date have based their findings on self-reported depressive symptoms and these also have substantial adverse effects. For example, patients with heart failure and depressive

symptoms have double the risk of dying and being rehospitalized as those without depressive symptoms [6••, 9, 14••]. Further, patients with depression are at greater risk for multiple all-cause admission rehospitalizations than those without [15••]. Depression measured at an index hospitalization and quarterly for 1 year was predictive of higher all-cause mortality compared with no depression up to 20 years after the index hospitalization [6••]. Patients with persistent or worsening depression had the highest risk of subsequent mortality. Even in the presence of multiple established traditional risk factors for mortality, depression was predictive and, in fact, was the strongest predictor.

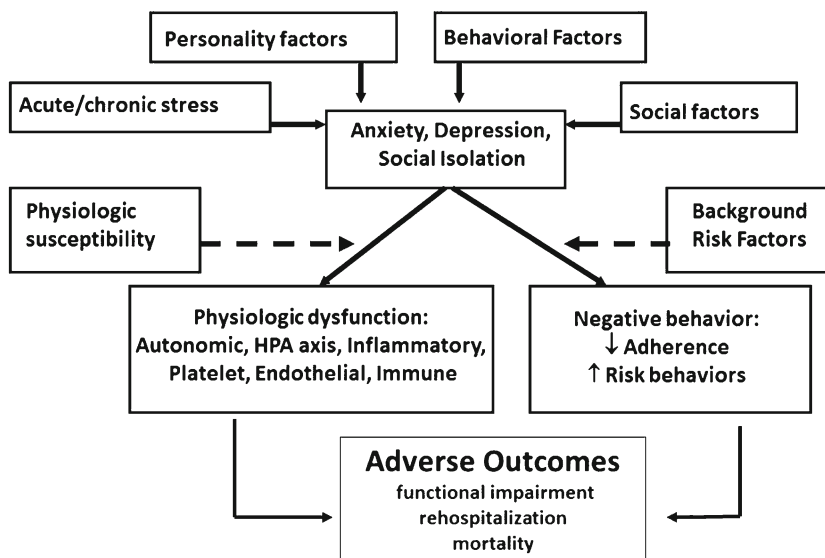
Adding to the evidence that depression and morbidity and mortality are linked in patients with heart failure is the presence of a dose–response relationship between depressive symptoms and mortality in patients with heart failure. Patients with mild, moderate, and severe depressive symptoms were respectively, 21, 53, and 83 % more likely to die during a 7-year follow-up period than patients without depressive symptoms [9, 16]. When depression is comorbid with anxiety, the risk of mortality is even higher [17••]. Depressive symptoms also are associated with worse health-related quality of life (HRQOL) in patients with heart failure [18–20], particularly when depression is persistent [21].

The mechanisms linking depression with poor outcomes in those with heart failure have been studied but are not yet fully defined. Depression is likely linked to poor outcomes in heart failure by pathophysiological and behavioral factors (Fig. 1). Depression in patients with heart failure is associated with proinflammatory cytokines expression, dysrhythmias, sympathetic nervous system activation, and increased platelet aggregation, all of which may worsen heart failure. Depression also promotes negative outcomes in heart failure via behavioral links such as non-adherence and poor social support [22, 23].

Depression and depressive symptoms are often not recognized in patients with heart failure [24, 25]. As many as 40 % of depressed patients are not recognized as depressed by health-care providers [26]. In one study, patients had depressive symptoms for an average of 4 years before being treated, and of these treated, 17 % saw no improvement, 40 % never had a dose adjustment, and 62 % still had symptoms [25]. The treatment of depression in this population is complicated by a lack of intervention research that could guide management of depressive symptoms in patients with heart failure. Although researchers have described the problem of depression in patients with heart failure, little is known about which treatments may be effective.

Results from the recent SADHART-HF study [27••], in which treatment with sertraline versus placebo resulted in no differences in depression level or cardiac outcomes. In the general population, pharmacological management of depression is modestly effective compared to placebo. In a meta-analysis of antidepressant efficacy from clinical trial data

Fig. 1 Conceptual model of factors linking psychosocial factors with adverse outcomes. *HPA* hypothalamic–pituitary–adrenal



submitted to the Federal Food and Drug Administration, there was no difference between antidepressant and placebo except in patients with very severe depression [28, 29]. Given evidence that antidepressant use is associated with mortality in patients with heart failure, regardless of depression status [30••], or that therapy with a selective serotonin reuptake inhibitor has no impact on depression, rehospitalization, or mortality among patients with heart failure [125], intensive research is warranted to find appropriate and effective therapies for depression that both improve depression and sever the link between depression and morbidity and mortality.

Cognitive behavior therapy (CBT) has shown promise as a non-pharmacological intervention for depression. CBT has been used successfully to treat depression in multiple populations [22]. Our team has demonstrated that CBT is an intervention that can be administered by nurses and may be effective for the management of depressive symptoms in hospitalized patients and outpatients with heart failure [31]. Non-pharmacological interventions may become the preferred method of treatment for depressive symptoms in patients with heart failure given the lack of effectiveness seen with drug therapy. This, however, will also require additional evidence to demonstrate the effectiveness of non-pharmacological interventions for depressive symptoms in patients with heart failure.

Anxiety

Anxiety is a negative mood state that occurs when an individual perceives threat and the subsequent situation is characterized by a perceived inability to predict or control threat and surrounding events [32]. Anxiety is an emotional experience that often co-exists with, but is distinct from depression. The

prevalence of anxiety may be as high as 63 % depending on the subgroup of patients with heart failure considered. As many as 40 % of patients with heart failure may suffer from major anxiety and anxiety levels are 60 % higher than seen in healthy elders [10, 33]. Compared to other cardiac patients and patients with cancer or lung disease, patients with heart failure have similarly high or worse anxiety levels [10, 34]. In a very recent meta-analysis, the authors reported a prevalence of 13 % for anxiety disorders, 29 % probable clinically significant anxiety, and 56 % for elevated symptoms of anxiety [35••].

Only a few investigators have evaluated the association of anxiety with patient outcomes [36–38] and the results of these investigations have been mixed [39, 40••]. In two meta-analyses from 2015, the investigators reported that only six studies were found in which the association had been examined, and the evidence did not support an association with mortality, although there is a significant but small association with rehospitalizations despite discrepant results [39, 40••].

Reasons for these inconsistencies may include the use of different measures of anxiety. Another reason lies in the variable nature of anxiety and the potential of an anxiety-reducing effect of neurohormones expressed in heart failure. Atrial natriuretic peptide reduces anxiety in animal models, and in a recent study, anxiety was found to be lowest in patients with the most severe heart failure and highest atrial natriuretic peptide levels [41]. Recently, we demonstrated that when considered together, the interaction of both anxiety and depression predicted mortality in patients with heart failure [17••], suggesting that the relationships between anxiety and morbidity and mortality outcomes may be more complex than previously appreciated. Further research is warranted in this area to explicate the nature of the relationship. This research should include measurement of anxiety at more than one time-

point to determine the impact of persistent anxiety, which is associated with increased morbidity and mortality in patients with heart disease [42], instead of just at one point, a weakness of previous studies [39, 40••]. Additionally, severity of heart failure should be controlled as should depression.

Cognitive Function

Cognitive impairment describes mild to severe declines in memory, concentration, or decision-making that interferes with everyday life [43, 44]. It is common among individuals living with chronic heart failure [44, 45], with its prevalence ranging from 25–50 % [46–48] to as high as 80 % [49]. Impaired cognitive function in patients with heart failure negatively affects memory and learning, attention-working memory, language, executive function, psychomotor speed, and visuospatial recall [42, 44, 50, 51] and is associated with increased mortality [52, 53] and psychological co-morbidities, such as depression [53, 54] and anxiety [42]. Compared to heart failure patients with similar characteristics, those with cognitive impairment have a 33 % higher risk of dying compared to those without cognitive impairment [53]. Being older, having lower rates of diabetes and lower body mass index, and being male are characteristics associated with memory impairment [55].

Depression is believed to contribute to cognitive impairment via reduced cardiovascular fitness [54, 55] and exercise non-adherence [54], while the contribution of anxiety is demonstrated by its negative impact on neuropsychological test scores of cognitive function [42]. Individuals hospitalized for acute heart failure with higher depressed mood scores have slower simple reaction and working memory times, reduced accuracy in completing simple reaction times, and abnormally slow speeds in completing attention/working memory measures [56].

The contribution of cognitive function to the prediction of HRQOL in patients with heart failure is less clear. Erceg et al. reported older patients with heart failure with cognitive impairment who were hospitalized for chronic heart failure had worse overall HRQOL compared to age-matched patients with preserved cognitive function [57]. However, Pressler et al. reported cognitive deficits do not mediate the relationship between severity of heart failure and HRQOL [58] and Gathright et al. found cognitive function did not predict HRQOL in patients with heart failure [59]. Riegel and colleagues reported impaired cognition in patients with heart failure to be a significant predictor of poor HRQOL, but only when combined with excessive daytime sleepiness [60]. The combination of these factors, described as double jeopardy [60], significantly reduced HRQOL.

In a recent study, Nikendei et al. examined patient cognitive performance and assessed psychosocial variables in 24

patients with heart failure in need of mitral valve repair [61]. Cognitive domains of long-term memory and executive function were tested and psychosocial assessment measures were performed (Short-Form Health Survey-36, Patient Health Questionnaire-9; STAI state-anxiety). Executive function, memory scores, anxiety, and HRQOL all improved after MitraClip repair. After adjusting for improvements in anxiety and depression, cognitive function scores improved with MitraClip surgery, which the authors speculated was due to increased cerebral perfusion.

The management of cognitive impairment includes medications to treat heart failure (e.g., diuretics, angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta blockers, and statins) [62], cardiac resynchronization therapy to improve left ventricular ejection fraction [63], cardiac rehabilitation [64••], and computer-based cognitive training programs [65, 66]. Resynchronization therapy improves executive function, global cognition, and visuospatial function [63], while cardiac rehabilitation has been shown to improve attention and executive function [64••]. Self-care behaviors, well-being, and prospective memory improved using a computerized board game that simulates daily activities [65], and delayed memory improvements were noted following computerized plasticity based cognitive training [67].

Exercise has been proposed as a possible mechanism to improve cognitive function [68]. Alosco et al. recently used brain MRI and cognitive tests (e.g., Trail Making A and B, California Verbal Learning Test-2nd edition, Animal Fluency) to examine the neurological benefits of daily physical activity in 50 stable older adults with heart failure who engaged in higher daily physical activity for 7 days [69]. Improvements in cognitive function (attention/executive function, episodic memory, and language) and subcortical brain volume were reported, providing encouraging new evidence of the protective nature of physical activity against neurological impairment. However, extended, longitudinal follow-up is needed to determine if physical activity can reduce the risk of cognitive impairment in patients with heart failure.

Social Support and the Role of Caregivers in Patient Health

Family members are central in the support of patient self-care and disease management [70–72]. Most heart failure self-care is performed in the home and many patients, possibly most, need family member support or care to effectively manage their condition. When patients do not get support in the home, they often fail to develop or maintain self-care skills.

A family caregiver is defined as an informal family support person who is not financially compensated for his/her services [73, 74]. A family caregiver can provide assistance in activities of daily living, instrumental (i.e., refilling prescribed

medications, preparing meals, transportations, shopping, house-keeping, and managing finances) or emotional support to the patient, and in some cases, actual physical care, although assumption of the family caregiving role does not require that one provide physical care [73–75].

There is accumulating evidence that poor or low levels of support from family caregivers are associated with patients' poor health outcomes. Absence of a committed caregiver or perceived poor support are associated with low level of adherence to prescribed medications [76] and a sodium-restricted diet [77], poor HRQOL [78], increased rehospitalization rates, and higher death rates [79, 80]. Perceptions of poor or no support also are significant predictors of depression in patients with heart failure [81]. Researchers also have found that family conflict and criticism are associated with depression among patients with heart failure [82]. In the context of psychological distress or depression, social or family support may have buffering effect by protecting patients from the potentially harmful influence of psychological distress or depressive symptoms.

While providing care and support for patients with chronic health conditions can be fulfilling, caregiving also commonly causes substantial distress and burden [73, 83]. General stress levels in family caregivers of patients with heart failure are 50 % higher than the score among families with healthy partners [84]. Chronic stress related to caregiving is known to be a major predictor of caregivers' psychological distress, particularly depression [85–89]. In heart failure, caregivers with depressive symptoms reported higher level of caregiving burden, more time spent on caregiving tasks, and greater difficulty related to caregiving task than caregivers without depressive symptoms [90]. From 23 to 47 % of family caregivers have reported mild to severe depressive symptoms [90–93]. Effective intervention should aim to reduce burden related to caregiving, and individualized intervention is need for family caregivers to meet their needs in supporting a patient with heart failure. In addition, further investigation is needed to determine whether improving caregivers' depression and sense of burden can improve the quality of support they provide to patients.

Interestingly, patients with heart failure and their caregivers experience similar levels of depression [90, 93]. The theory of emotional contagion, the notion that individuals' moods and distress are easily transferred to other individuals in close or intimate interpersonal relationships, has been used to explain the similarity in psychological make-up of partners [94–96]. We [97] investigated how individuals' depression levels affected HRQOL in patients with heart failure and their family caregivers using the actor-partner interdependence model, a dyadic regression model that better estimates outcomes in paired data. We found that depressive symptoms among patients and caregivers were associated with not only their own HRQOL but also their partners' HRQOL. These findings

suggest the importance of screening for depression among patients and caregivers given the negative association of depression with outcomes in patients and the negative association of depression with well-being and ability to provide support among caregivers. Two meta-analyses of caregivers suggested non-pharmacological interventions including individual or group counseling or support programs were effective in improving depression of caregivers [98, 99]. Further investigation is needed to examine effects of those programs on improving caregivers and on patients given the dyadic interactions that occur in families with heart failure.

Psychological Interventions

Screening

Psychological factors such as depression and anxiety are associated with increased risk for poor outcomes following heart failure diagnosis [100, 101]. Although current treatment guidelines do not directly address psychological comorbidities [102], routine screening is recommended. A commonly used brief screening instrument is the Patient Health Questionnaire-2 (PHQ-2) [62, 103], which is composed of two items that assess anhedonia and mood. This instrument can be used in the hospital, in primary care settings, and in cardiology settings. The PHQ-2, along with scoring instructions and risk assessment can be found free at http://www.commonwealthfund.org/usr_doc/PHQ2.pdf. If the PHQ-2 provides evidence of depressive symptomology, the PHQ-9 (available free, along with scoring information at http://www.cqaimh.org/pdf/tool_phq9.pdf) should be administered [104, 105]. A second commonly used screening instrument is the Hospital Anxiety and Depression Scale (HADS, available free with scoring instructions at <http://www.scalesandmeasures.net/files/files/HADS.pdf>) [106], a 14-item questionnaire used to assess depression and anxiety. The ENRICH Social Support Inventory (ESSI, an article that includes the ESSI and scoring instructions, available free at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC434528/>) can be used to assess quality of social support available to a patient and consists of only seven items. All of these instruments approximately 5 min to complete and have documented internal consistency and validity and ability to detect clinically important conditions [104, 106, 107]. The use of these brief screening instruments for depression, anxiety, and poor social support is practical for the busy clinician in the hospital, primary care setting, and specialty settings. They also provide a starting place for providers to have an honest conversation with patients that often leads to appropriate referral or treatment of the psychosocial condition.

Interventions

In all care settings, the need to address psychosocial factors that negatively impact health outcomes of patients with heart failure is underappreciated. For example, analyses of data from the National Study of Physician Organizations that included nearly 1400 primary care practices showed that significantly fewer care management processes were used to address patient depression than to address asthma or diabetes [108]. The authors concluded that medical practices may be better equipped to address medical conditions such as diabetes than such psychological conditions as depression.

Care providers are challenged to develop practical interventions to assist patients with the psychosocial aspects of their treatment plan [109, 110]. Improved treatment of psychological factors associated with poor outcomes in heart failure patients requires development of brief but effective strategies that can be realistically incorporated into clinic settings. These include interventions that promote positive well-being rather than focusing exclusively on negative aspects of psychosocial stressors. A dose response has been observed between increasing optimism and decreasing incidence of heart failure [111]. Optimism may exert beneficial effects for patients with heart failure including healthier physiological responses (reduced systemic inflammation, improved endothelial function, and improve blood pressure) and support healthy lifestyle behaviors including increased daily physical activity and improved dietary habits [111].

The promotion of self-efficacy and reinforcement of successful coping skills are important components of a behavioral change that fosters optimism and supports psychological well-being [112, 113]. Outcomes from recent research suggest that interventions of 2 weeks of daily 5 min session of imaging one's best possible self can increase optimism [114, 115]. Additionally, brief CBT sessions can be delivered in the clinical practice setting to help patients envision a positive outlook in their lives [116].

There is some evidence that more intensive therapies can be incorporated into a variety of care settings using a collaborative care model. A low-cost model was tested in a clinical trial in the UK for the management of depression comorbid with diabetes or cardiovascular disease [117]. This approach involved brief psychological therapy delivered by case managers who were well-being practitioners certified in delivery of low-intensity interventions. Based on initial assessment of patient's psychological status, the well-being practitioner delivered an appropriate standardized treatment involving eight 30-min face-to-face sessions. All standardized treatments included helping patients link their psychological status with treatment of cardiovascular disease. The intervention was associated with a reduction in depressive symptoms in patients

who received treatment. Anxiety was also reduced. Further study of such approaches in patients with heart failure may confirm the value of this approach in widespread use.

The addition of a psychiatric advanced practice nurse to the healthcare team provides a collaborative care model that includes a professional mental health practitioner who can provide more intensive therapy. Given the high prevalence of cardiovascular disease with comorbid depression, this collaborative approach is cost-effective [118]. Psychiatric advanced practice nurses are ideal for delivering interventions such as CBT. CBT is a psychotherapeutic intervention focused on helping patients with cognitive reframing of perceptions. It has the advantage of being effective with no risk of side effects associated with antidepressant medications [119]. A recent clinical trial demonstrated that CBT can be used effectively in a clinical setting. The intervention consisted of 6 months of weekly 1-h CBT sessions tapered over the next 6 months to biweekly then to monthly sessions. A total of 79 patients with heart failure were randomized to the treatment of which 59 completed all sessions. Six-month depression scores were 26 % lower in the treatment group than the control, an effect that persisted for most patients in the treatment group at 12 months. Similar to the previous study, anxiety was also reduced in the treatment group. Less-intensive CBT has also been shown to be effective in decreasing depressive symptoms [31].

Depression and anxiety may interfere with a person's ability to cope with stress, make rational decisions, and recognize symptoms of a worsening condition, thus impeding self-care activities [120–122]. Patients with depression and heart failure have difficulty with adherence to the complex treatment plan [123]. One method to improve patient adherence to complex treatment plans is to plan the provider-patient discussion with a patient-centered focus. The basic elements of patient-centered communication include the following:

- a. Pausing 1–3 s after a patient's comment or question
- b. Repeating and clarifying key words or sentences from the patient's comments or questions
- c. Demonstrating empathy by allowing patients the opportunity to reflect on their emotions and moods during the discussion
- d. Providing summarization to signal understanding of comments and messages delivered by both provider and patient

These elements combine to foster a trusting relationship between provider and patient as well as increasing patient's adherence with complex treatment plans. The term adherence indicates there is established agreement between the patient and healthcare provider which is based on mutual respect and collaboration [124].

Conclusions

Psychological problems are common among patients with heart failure and they are part of, and contribute to, the negative outcomes seen in this condition. Depression is the most well-known and studied of the psychological morbidities seen in heart failure, yet depression has yet to become an important part of the assessment and management regimen. Even when assessed and treated, follow-up is poor and symptoms often remain. There is growing recognition of the advantage of integrating treatment of affective disorders within the primary care setting [118]. The major advantage is the integration of the treatment of heart failure and depression or other psychological conditions. This approach decreases the risk of fragmented care that can occur when patients are referred to an outside mental health practitioner for treatment. Such an approach may be successful in improving the care of psychological conditions in heart failure.

Compliance with Ethical Standards

Conflict of Interest Debra K. Moser, Cynthia Arslanian-Engoren, Martha J. Biddle, Misook Lee Chung, Rebecca L. Dekker, Muna H. Hammash, Gia Mudd-Martin, Abdullah Alhurani, and Terry A. Lennie declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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