

Heart Failure Clinics: Much More than Pharmacotherapy

ABSTRACT

Introduction: Heart failure (HF) is a major cause of increased morbidity and mortality and its prevalence is expected to increase because of the aging population, increased prevalence of risk factors and improved post myocardial infarction survival. There is a relationship between high quality care and improved patient outcome particularly when the care is from specially trained providers. This has brought about the creation of disease specific clinics. The heart failure clinic (HFC) is established for many reasons which include, improvement of clinical outcomes, early detection of symptoms and identification of factors that may lead to progression of heart failure such as poor adherence, socioeconomic and psychological factors. The purpose of this study is to review the multidisciplinary approach to the management of heart failure through the heart failure clinic.

Materials and methods: A literature search using the database on Pubmed, Research gate, google scholar, Science direct, African Journal online and British Medical Journal was carried out using the key phrases; heart failure, heart failure clinic, management of heart failure.

conclusion: Optimization of guideline-directed medical therapy and the establishment of multidisciplinary heart failure clinics would address several domains of care. It aims to provide comprehensive patient management that would lead to reduced hospitalization and better patient outcomes, if appropriately implemented.

Keywords: Heart failure; pharmacotherapy; medical adherence; patient care.

1. INTRODUCTION

“Heart failure (HF) is a clinical syndrome characterized by signs and or symptoms caused by a structural and or functional cardiac abnormality and corroborated by elevated natriuretic peptide levels and/or objective evidence of pulmonary or systemic congestion. Heart failure is among the leading causes of hospitalization and mortality and its incidence is increasing particularly in the older population” [1]. The management of heart failure is directed towards reduction of symptoms, improvement of quality of life and also increasing life span. This treatment is dependent on severity which is graded according to the functional status of the New York heart association (NYHA). Caring for patients living with heart failure includes both management during hospital stay due to acute failure and chronic management in patients that does not require hospitalization. Outpatient care provide opportunities for health care professionals to improve patient's quality of life through early identification of disease progression and monitoring of medical adherence.

Heart failure leads to most of the visits in population accessing medical care [2]. A heart failure clinic is an important factor when caring

for patients with heart failure [3]. Over the years, emphasis has been on pharmacologic therapy and later device or surgical therapy. Non-pharmacologic therapy has however been neglected during the care of a heart failure patient. Using the multidisciplinary approach, individualized care has been proposed as a way to reduce frequent decompensation or hospital admissions. Documentation of performance and adherence in the HFC leads to the reduction of hospital visits and thereby reducing cost [4,5].

The setting up a heart failure clinic requires highly committed health care personnel, and a physical base of operation where outpatient can be seen. Adequate financial resources are required to support educational initiatives, infrastructure and the specialized training of health personnel for a coordinated multidisciplinary care . The heart failure clinic provides an adequate patient-to-health provider ratio for quality patient care. The purpose of this study is to discuss the multidisciplinary approach to the management of heart failure through the heart failure clinic.

2. MATERIALS AND METHODS

A literature search using the data base on PubMed, Research gate, google scholar, Science direct, African Journals online and British Medical Journal was carried out using the key phrases; heart failure, heart failure clinic, management of heart failure.

3. RESULTS

Patients that would benefit most from HF clinics include, patients with recent heart failure hospitalization or high risk patients with other co-morbidities like renal impairment. The heart failure clinics is usually run by a physician or nurse but will include various health specialist during treatment and patient care [6]. It is advised that heart failure clinics that cannot provide all that is required to run an advanced clinic, should partner or merge with a facility that can offer such services like mechanical circulatory support and heart transplantation for those that may need it.

Most studies and articles that were published greatly dealt on the management/treatment of the diseases and some of them sparingly discussed the operation of a heart clinic. There is a lack of accepted standards when it comes to the processes of care and the structural elements required in a HF clinic. One of such previous studies discussed the services available in a heart failure clinic as well as a list of outcome measures but did not discuss any acceptable standard on setting up or running a heart failure clinic [7].

4. SOME IMPORTANT COMPONENTS OF A HEART FAILURE CLINIC

1. Disease management
2. Evaluation of functional status
3. Assessment of quality of life
4. Drug evaluation/ medical therapy
5. Evaluation of device
6. Assessment of nutrition
7. Follow-up
8. Planning ahead
9. Training of personnel

5. DISEASE MANAGEMENT

Management of disease includes best practices involved in caring for patients with heart failure that would reduce the costs of treatment and improve measurable positive outcome during care. Management of heart failure in a HFC encourages individualized patient care enables the assessment of severity of the disease in each

patient. Drug administration is done to avoid wasting medical supplies by giving drugs according to guidelines to those that need them [8]. The pathway for management of the disease can be categorized into three distinct group which may either occur singly or as a hybrid of more than one groups. They include, Heart failure clinics, Home care and Tele monitoring.

Heart failure clinics is usually based on an outpatient office, a hospital or an office-based clinic with the use of a team made up of professionals that plays their various role in making sure that the patient receives the best quality care. The team may involve a cardiologist, nurses with special training in HF, pharmacists, dietitians, social workers, psychologists, and other health care professionals that specialize in heart failure management [9]. The team creates a relationship with each patient thereby offering individual-patient centred management resulting in better outcomes.

The clinic can also provide resources and basis for other forms of disease management protocols to function effectively. Home care is performed with the aid of some already established home health care vendors with employed nurses and some other health care professionals. Visitation of patients at home by physicians ensures adherence especially for home bound patients and those living far away from the HFCs. Telemonitoring involves care from remote locations to using phones and video coverage by nurses and physician with adequate provider training [10].

Some assistive instrument may also be kept at patient's home for self-check and examination in which the results will be relayed to the physician during the routine tele visit. The readings of the blood pressure, heart rate and body weight may be sent to the HF team [11]. However, it is interesting to note that not everyone can afford these innovative home care settings and hence the generalized clinic visit is recommended in such circumstances.

It is challenging to achieve the best possible clinical outcomes and cost-effective treatment through the enactment of modern, evidence-based heart failure care. This is because of the finances involved in caring for the patients. In some developing countries like ours most patients pay out of pocket and are not able to sustain the financial demands of this specialized care. The presence of co-morbidities is also

considered in the management of these patients [2]. HFC is however still beneficial to the patient as it provides cost effective therapy in line with current guidelines using a multidisciplinary approach.

5.1 Components of a Disease Management Program of a Heart Failure Clinic

The Heart Failure Society of America (HFSA) has recommended that disease management programs should include several components depending on what the patient needs. Some recommendations that may apply to heart failure clinics include;

- a. Standard education and counseling where personalized patient information will be given to the family and caregivers of the patient.
- b. A philosophy that promotes self-care, including self-adjustment of diuretic therapy in appropriate patients (with a family member/caregiver assistance, as necessary).
- c. Usage of individual-based therapy, including an emphasis on behavioral strategies to increase adherence.
- d. Timely follow up after hospitalization or periods of decompensation for HF and early detection of signs and symptoms of fluid overload.
- e. Solving social and financial problems either directly or through appropriate referrals.
- f. The health professional to patient ratio should be adequate to provide personalized care to patients.
- g. Establishment of facilities that will permit coordination of care between primary physician with other aspects of the HFC [12].

6. ASSESSMENT OF FUNCTIONAL STATUS

Assessment of functional status in heart failure patients is required for effective examination and evaluation. There are three commonly used methods for assessment of functional status. They include; Evaluation of the NYHA class; the 6-Minute Walk Test (6MWT); and Cardiopulmonary exercise stress (CPX) testing [13]. The functional status may be assessed by the use of pedometers, Chester's step test and physical activity scales [14].

NYHA Class: This classification is closely related to the pattern of mortality in patients with heart failure due to left ventricular dysfunction. It also assesses the likelihood of being exposed to non fatal events like hospitalization and the need for right intervention response [15]. This assessment method is thought to be less objective than the other two.

6MWT: The 6-Minute-Walk-Test is an easy tool that involves the patient walking on level floor and determination of the distance covered by the patient. It reveals a patient's capability to perform daily activities to a much higher degree as it is easier to perform than the peak oxygen uptake cardiopulmonary exercise testing. The 6MWT correlates adequately with peak oxygen uptake [16]. About 15% to 20% of patients may not be able to undergo the test because of marked obesity, osteoarthritis, stroke patients with residual neurological deficit or severe chronic obstructive airway disease. When the result of a 6MWT is less than 300 meters, the risk of mortality is increased. A reduction of 50 m distance in the 6MWT is considered significant [17].

Cardiopulmonary exercise Testing: It assesses exercise tolerance using the peak exercise oxygen uptake and this information can be used for risk assessment [18]. CPX has been combined with NYHA classification in the past to ascertain if an intervention like Cardiac transplantation is required [19]. The CPX test can be administered on a patient with basic exercising tools like a treadmill or a bicycle ergometer and it requires the presence of trained health care providers for interpretation of the output.

6.1 Reason for Assessing Functional Status

Assessment of the functional status includes; determining morbidity and mortality due to cardiovascular disease, to determine a change in risk over time, to ascertain the therapy required for treatment of heart failure and the response and adherence to the administered medication.

6.2 Components of a Functional Status Assessment

The components when assessing the functional status of a heart failure clinic includes;

- a. The NYHA functional class should be assessed at every clinic visit and symptomatic HF patients should be documented in the medical records. A

baseline 6MWT should be taken usually on discharge and during follow-up clinic visits when necessary. These should also be put in the medical records so that significant changes would be easily detected for urgent intervention.

- b. Patients with NYHA Class III or IV symptoms who are candidates for advanced therapy should be baseline and repeated CPX carried out by trained health professionals to assess response to therapy or the indication for LV assist device or cardiac transplantation.

7. ASSESSMENT OF QUALITY OF LIFE

In the management of any chronic condition especially Heart failure, quality of life is paramount. During assessment, most instruments may combine quality of life components with some other components of general health status [20]. "The 36-item Medical Outcomes Study short-form composed of 8 domains can be used to measure quality of life or the EuroQol-5D, a 5-item survey covering mobility, self-care, activities, pain, and anxiety/depression using a visual analog scale (0 to 100) can also be used in the measurement of quality of life" [21]. "A change of 5 or more is thought to be clinically important" [22]. These measures can be self-administered whenever feasible or obtained during a structured interview. Their validity, reliability, and responsiveness to clinical change have been evaluated.

7.1 Reason for a Quality of Life Assessment

"The Minnesota Living with Heart Failure Questionnaire (MLHFQ) and Kansas City Cardiomyopathy Questionnaire(KCCQ) have been used to predict survival and hospitalization for outpatients with HF" [23]. These questionnaires correlate favorably with the NYHA Class, 6MWT and LV ejection fraction. The Minnesota Living with Heart Failure Questionnaire and Kansas City Cardiomyopathy Questionnaire assesses activities of daily living, socioeconomic and emotional status that may be affected in a HF patient [24]. The quality of life survey can also be used to identify patients that require immediate intervention and possible titration of guideline directed medical therapy.

7.2 Components that Makes Up Quality of Life Assessment

The quality of life assessment components in a HF clinic include the following:

1. Quality of life survey questionnaire should be administered to patients especially when there are changes in clinical status. This should be done periodically to assess patient well being.
2. Recording results and interpretations obtained from the questionnaire.
3. Making the medical records easily assessable to health personnel so that the patients progress can be monitored.

8. DRUG EVALUATION AND MEDICAL THERAPY

The Heart Failure society of America has published protocols for the pharmacotherapy of heart failure. Compliance with these guidelines, however, varies considerably by region, hospital, and prescribing physician. HF clinics should include features that will promote optimal medication prescribing practices, including an effective drug therapy evaluation process.

8.1 Reason for Medical Therapy and Drug Evaluation

The following drugs are of benefit to the heart failure patient; angiotensin-converting enzyme (ACE) inhibitors, mineralocorticoid receptor antagonists, beta-blockers, and sodium glucose co-transporter inhibitors [25]. Use of medications in outpatient clinic is noted to be significantly lower than in inpatient setting, probably due to cost or long-term side effects [26]. One of the major objectives of the heart failure clinic is the provision of adequate care that is based on evidence-based practice guidelines [27]. For patients that do not receive the optimal dose for their treatment, extra steps are taken to titrate them back to the normal doses.

An extensive drug evaluation and adherence to the appropriate therapy will lead to reduction in hospitalization and improved quality of life [28]. "The goals of such an evaluation are to: devise a medical regimen consistent with evidence based standards of care, minimize interactions and other drug-related side effects improve patient adherence, quality of life and satisfaction. Several studies involving intensive reviews of patients' medical records and treatment plans have demonstrated improvement in HFC outcomes compared with usual care" [28].

8.2 Components of Medical Therapy and Drug Evaluation

The components required to meet the optimal dosage for proven medical therapies in a heart failure clinic include;

- a. The management of heart failure with reduced ejection fraction can be achieved by therapies like Beta-blockers, Angiotensin receptor antagonists, Angiotensin Converting enzyme inhibitors, Angiotensin receptor neprilysin inhibitors, Sodium glucose co-transporter 2 inhibitors,
- b. Clear and readily accessible documentation of reasons for not prescribing recommended medical therapies or for not titrating to recommended dosage levels.
- c. Self-management of diuretics, which also includes education of patients and close look into the hepatic and renal functions.
- d. Drug evaluation should be carried out immediately the patient is enrolled in the heart failure clinic and repeated during regular intervals to monitor progression. The evaluation may be performed by the physician, a specially trained nurse, or a clinical pharmacist. For optimal evaluation, the patient's family or caregiver should be engaged if possible. Patients should also be advised to bring all medication bottles or a list of all current medications to the HFC.

Components to be considered for a drug therapy evaluation include the following:

- I. Instructions concerning medications should be documented and explained to the patient or caregiver regarding the indications for each drug, common side effects, and medications and dietary choices to avoid. Reasons for change in medications should also be clearly explained and documented in the medical records
- II. All medications being taken by the patient should be reviewed including supplements and medications taken for other medical conditions which may cause drug-drug interactions
- III. The patient's allergy history should be discussed and true allergies documented so that they can be avoided in the future.
- IV. Adherence to medications should be critically reviewed at each clinic visit especially if there is evidence of

decompensation. In cases of non adherence the cause should be identified such as pill burden or side effects of medications. A patient friendly plan should be implemented to encourage patient's adherence to medications.

9. EVALUATION OF DEVICE

The use of Implantable cardioverter defibrillators (ICDs) and biventricular pacing (CRT-P and CRT-D) have increased in patients with left ventricular dysfunction and heart failure [29]. There is an evolving role of heart failure clinic in this area. The Cardiologist in HFC's should be able to identify patients who may require for device therapy. They should also evaluate the devices and address programming issues or when there is the need to upgrade devices.

9.1 Reasons for Device Evaluation

"Before embarking on device therapy the HFC must have a formal system that ensures that devices are monitored appropriately. This should include referral to providers who manage devices, if rhythm monitoring is not performed directly in the HF clinic" [30]. The HFC physicians and staff should have undergone special training to enable them monitor devices and handle patient's needs appropriately. They should also have some knowledge of how the device was manufactured so as to differentiate device malfunctions from other causes of variations. Patient can be referred to the team's electrophysiologist if abnormal results are noticed. The electrophysiologist would monitor and intervene where necessary [31]. Several factors have to be considered before choosing a particular device to assist therapy. Before taking a decision to commence device therapy reversible causes should be treated. The clinical state and left ventricular function should be evaluated following guideline-based treatment [32]. The guideline directed optimal medical therapy should be implemented before the use of device therapy [33]. Discussions on procedures and possible side effects of the devices should be done with the patient and patient's consent obtained before moving on with the procedure.

9.2 Components used for Device Evaluation

The important components used for device therapy in a heart failure clinic include the implementation of standard procedures and the documentation of device functioning and patient well-being, as well as the aiding of

communication with the electrophysiologist and any other personnel involved in the care of the patient [34,35,36]. There is need to also identify patients that would benefit most from device implantation.

Components that are relevant to patients with existing Cardiac Device

- a. A site registry, updated and reviewed regularly, of all patients in whom cardiac devices have been implanted.
- b. A clear and consistent system for device evaluation, including documentation in the medical record, and a mechanism to monitor patients with a frequency established by a protocol.
- c. Coordination of care with electrophysiologists to avoid duplication of services and conflicting interventions.
- d. A system to respond to alerts or recalls produced by regulatory agencies or device manufacturers. This includes a mechanism to rapidly identify affected patients and to permit early clinical follow-up.

10. ASSESSMENT OF NUTRITION

Assessing the nutrition of patients is important in the management of patient with heart failure. Patients with other co-morbidities are managed on an individualized basis depending on the disease. Nutritional assessment should start immediately a patient is diagnosed with heart failure. Outpatient follow-up is also required to prevent re-hospitalization [37,38].

Non-adherence to nutritional requirement accounts for at least 18% of avoidable hospitalization for heart failure. Proper adherence to sodium intake is important. Poor adherence may lead to diuretic-induced electrolyte imbalance, such as hyponatremia or hypokalemia which may further exacerbate the condition [39]. "Co-morbidities such as coronary artery disease, diabetes mellitus, and chronic kidney disease often require a special kind of diet. Depression and poor finance may also contribute to poor nutrition and non-adherence to nutritional plans. The main objective of adherence to nutrition is to reduce disease progression and prevent episodes of decompensation" [40]. Right ventricular heart failure can contribute to cachexia by affecting the absorption of nutrients across the gastrointestinal wall or by impairing hepatic synthetic function.

10.1 Components that Makes Up Nutritional Assessment

Assessment of nutrition in a HF clinic should occur in the context of patient comorbidities. The components may include:

- a. Evaluation of the patient's nutrition, by a registered dietitian trained in the management of HF patients or by a nurse with special training in nutrition. An initial nutritional assessment and plan of care should be performed at the time of diagnosis and during subsequent clinic visits. Patients should be counseled on dietary sodium and fluid restriction with appropriate documentation and reinforcement during clinic visits.
- b. A system to measure, record, and track body weight and body mass index regularly. Calorie counts should be obtained if cachexia is clinically suspected and appropriate nutritional supplementation prescribed if unintended weight loss is documented.

11. FOLLOW UP

"Continuity of care is a major milestone in the management of patient with heart failure, and the HF clinic is uniquely positioned to provide directed assessment. Patients should be advised on how to recognize and respond to recurrence of symptoms" [41]. "Health personnel should create a mechanism for early outpatient follow-up after recent hospitalization, emergency department visit. History and physical examination by the physician may be augmented with repeat imaging and blood chemistry. Follow up strategies vary with each patient, but there is need for regular evaluation of patients with HF at risk for adverse events and re-hospitalization. The frequency of patient follow-up will be guided based on provider's judgment" [42].

11.1 Reasons for Follow-Up

"Inclusion of follow-up care as a major component of the heart failure clinic is important for any chronic disease that limits patient well-being, associated with repeated hospital admissions, and having a high rate of mortality. HF is the leading cause of 30-day rehospitalization in the Medicare population and has a high mortality rate. Lack of continuity of care may contribute to unnecessary utilization of resources, partially through inadequate provider-patient and provider-provider communication. Patients in a heart failure clinic should be

followed up until they or their family/caregiver demonstrate independence in the prescribed treatment plan, adequate or improved adherence to treatment guidelines, improved functional capacity, and symptom stability” [5]. Patients experiencing increased episodes of exacerbation or who demonstrate instability after discharge from a program should be referred again to the heart failure clinic.

11.2 Components of Follow Up

The main focus in follow-up is the establishment of well-defined parameters for patient monitoring after a hospitalization or after outpatient visit and the confirmation of patient/ caregiver comprehension about said parameters.

- a. During discharge, an outpatient visit should be scheduled in the HF clinic within 7 to 10 days, as clinically indicated. Higher risk patients should receive follow-up no longer than 72 hours after discharge via such means as telephone contact, home health visit, telemonitoring, or clinic visit. The patient should be counseled on symptoms that might occur and mechanisms to contact a provider at the clinic if symptoms recurs and is prolonged. A defined plan of action is provided for the patient or caregiver in case of a sudden or unexplained change in clinical status.
- b. Systematic follow-up after an outpatient HF clinic visit. A return visit should be scheduled within no more than 12 months for a stable patient and sooner for patients with advanced symptoms.
- c. Serial evaluations of electrolytes, renal function, and other objective monitoring, such as assessment of LV function, with a frequency determined by the provider as part of individualized treatment plans. These frequencies may also be set by reasonable clinical standards of care; for example, patients on diuretics should have electrolytes and renal function monitored at least semiannually.
- d. Telephone contact or the use of telemonitoring devices, if available, on an individualized basis.

12. PLANNING AHEAD

The AHA advocates that advanced HF patients be referred to specialized teams at heart failure clinics to assess suitability for advanced care and/or palliative care [43]. Such patient should be approached in an empathetic manner to discuss preferences before the disease

progresses to its pre-terminal stage [44]. The act of mapping out the types of medical and non-medical care a patient would like to receive before the condition deteriorates is referred to as advance care planning. This type of planning is usually done between the patient, care providers, spouse, family members. It is a dynamic process that may require modification or revision as the patient’s illness and thought processes evolve.

“Advance care plans address the challenges of living with chronic illness, the complications likely to arise, and the treatment options available. Advance care decisions should include the patient’s desire for cardiopulmonary resuscitation”[45]. Device deactivation should be considered in patients with end-stage HF. Invasive procedures, surgery, and hospitalizations should be discussed with the patient. Open-ended questions provide an effective way for evaluating advanced care planning [46].

A major aspect of advance care planning is the advance directive. This may include a living will, health care proxy, or durable power of attorney for health care. Advance directives can be oral or written and, usually state the patient’s preferences and may specify who the surrogate would be to make medical decisions when the patient is no longer able to do so.

12.1 Reasons for Advanced Planning

With advance care planning, the patient’s wishes are adhered to and the physician can improve patient satisfaction and provide compassionate care at the end of life. The patient takes all the decisions concerning the type and intensity of care to be given in advance care planning except the patient can no longer express his or her intentions.

12.2 Components of Advance Planning

The provider must introduce the topic, provide resources, and offer access to a structured process that will lead to clarity about patient preferences. The components related to advance care planning in a HF clinic regarding advance planning include the following:

- a. The care team should be trained and capable of implementing advance care planning.
- b. Advanced care planning discussions should be part of the longitudinal care of HF patients.
- c. The care team should be willing to refer patients to other professionals for

assistance, if and when they express an interest in devising a formal advance directive.

- d. The advance care plan should be recorded clearly in the patient chart, including a copy of the advance directive, if one exists.

13. TRAINING OF PERSONNEL

“Professional education is an integral component in the quality of HF care” [47]. “Provider education in the HF clinic encompasses a full range of initiatives designed to ensure provider competence. To ensure competence health personnel should undergo training and retraining recognizing signs and symptoms of HF, pathophysiologic changes associated with HF, standards of care, effective communication skills, and the development of a culture in the practice that is focused on performance assessment and continuous quality improvement. Educational options should include didactic lectures, skills workshops, online activities and work place based assessment” [48].

“Decision-making in HF care is rapidly evolving considering the recent advances in clinical trials and translational research that provide the framework for evidence-based practice. Provider education enhances the implementation of standardized learning about treatment and evaluation modalities, practice assessment, performance measures and mechanisms that help to ensure that improvements in HF care are readily translated into daily practice. This approach that incorporates practice-based learning would improve compliance with HF guidelines” [49].

13.1 Components of Provider Education

The educational program of a HF clinic should be designed to update clinical competencies [50]. The components in a HF clinic include the following:

1. Regular training and retraining via continuous medical education preferably reflecting the current Heart Failure Practice Guidelines.
 - A. Training for physicians especially if the HFC attends to patients that require advanced care.
 - B. Training for nurses that includes pathophysiology, pharmacology, patient self-care management approaches, psychosocial influences on patient

behaviors, and quality of-life and palliative care issues [51,52].

2. The availability of multiple educational modes in the critical areas of HF care to maximize the translation of education into practice [53].
3. Periodic practice assessment as a component of practice-based learning [54,55].

14. CONCLUSION

Heart failure is associated with increased morbidity and mortality worldwide with worse outcomes in resource poor countries. The establishment of multidisciplinary heart failure clinics would provide comprehensive patient care, reduce hospitalization and should be an essential component of outpatient HF care.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart disease and stroke statistics-2021 update: a report from the American heart association. *Circulation*. 2021;143(8):e254-e743.
2. Center for Medicare and Medicaid Services data compendium; 2020. Available:<http://www.cms.hhs.gov/DataCompendium>
3. Konstam MA. Executive council of the heart failure society of America. Heart failure training: a call for an integrative, patient focused approach to an emerging cardiology subspecialty. *J Am Coll Cardiol*. 2004;44:1361-1362.
4. McAlister FA, Stewart S, Ferrua S, et al. Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials. *J Am Coll Cardiol*. 2004;44:810-819.
5. Adams KF, Lindenfeld J, Arnold JM, Baker D, Barnard DH, Baughman KL, et al. HFSA 2006 Comprehensive Heart Failure Practice Guideline. *J Card Fail*. 2006;12:1e119.

6. Gustafsson F, Arnold JMO. Heart failure clinics and outpatient management: review of the evidence and call for quality assurance. *Eur Heart J.* 2004;25:1596-1604.
7. Silver MA. The heart failure clinic. In: Hosenpud JD, Greenberg BH, editors. *Congestive heart failure.* 3rd ed. Philadelphia: Lippincott Williams & Wilkins. 2007;656-659.
8. Hunt SA, Abraham WT, Chin MH, Feldman AM, Francis GS, Ganiats TG, et al. ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult. *Circulation.* 2005;112:154-235.
9. Rich MW, Beckman V, Wittenberg C, et al. A multidisciplinary intervention to prevent the readmission of elderly patients with congestive heart failure. *N Engl J Med.* 1995;333:1190-1195.
10. Gattis WA, Hasselblad V, Whellan DJ, O'Connor CM. Reduction in heart failure events by the addition of a clinical pharmacist to the heart failure management team: results of the pharmacist in heart failure assessment recommendation and monitoring (PHARM) study. *Arch Intern Med.* 1999;159:1939-1945.
11. Grancelli H, Varini S, Ferrante D, Schwartzman R, Zambrano C, Soifer S, et al. Randomized trial of telephone intervention in chronic heart failure (DIAL): study design and preliminary observation. *J Card Fail.* 2003;9:172-179.
12. Ypenburg C, Bax JJ, van der Wall EE, Schalij MJ, van Erven L, et al. Intrathoracic impedance monitoring to predict decompensated heart failure. *Am J Cardiol.* 2007;99:554-557.
13. Oddone EZ, Weinberger M, Giobbie-Hurder A, Landsman P, Henderson W. Enhanced access to primary care for patients with congestive heart failure. Veterans affairs cooperative study group on primary care and hospital readmission. *Effective Clin Practice.* 1999;2:201-209.
14. Williams SG, Ng LL, O'Brien RJ, Taylor S, Wright DJ, Li YF, et al. Complementary roles of simple variables, NYHA and N-BNP, in indicating aerobic capacity and severity of heart failure. *Int J Cardiol* 2005; 102:279-286.
15. Craig CL, Marshall AL, Sjo"stro"m M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003;35: 1381-1395.
16. Zugck C, Kruger C, Durr S, Gerber SH, Haunstetter A, Hornig K, et al. Is the 6-minute walk test a reliable substitute for peak oxygen uptake in patients with dilated cardiomyopathy? *Eur Heart J.* 2000;21:507-508.
17. Passantino A, Lagioia R, Mastropasqua F, Scrutinio D. Short-term change in distance walked in 6 min is an indicator of outcome in patients with chronic heart failure in clinical practice. *J Am Coll Cardiol.* 2006;48:99-105.
18. Corra U, Mezzani A, Bosimini E, Giannuzzi P. Prognostic value of time-related changes of cardiopulmonary exercise testing indices in stable chronic heart failure: a pragmatic and operative scheme. *Eur J Cardiovasc Prev Rehabil.* 2006;13:186-192.
19. Weber K, Janicki J. *Cardiopulmonary exercise testing: physiologic principles and clinical applications.* Philadelphia: WB Saunders; 1986.
20. Myers J, Gullestad L, Vagelos R, Do D, Bellin D, Ross H, et al. Cardiopulmonary exercise testing and prognosis in severe heart failure: 14 ml/kg/min revisited. *Am Heart J.* 2000;139:78-84.
21. Wilson JR. Exercise and the failing heart. *Cardiol Clin.* 1987;5:171-181.
22. Ware JJ, Sherbourne CD. The MOS 36-item short-form health survey(SF-36). I. Conceptual framework and item selection. *Med Care.* 1992;30:473-483.
23. Kind P. The EuroQol instrument: an index of health-related quality of life. In: Spilker B, editor. *Quality of life and Pharmacoeconomics in clinical trials.* 2nd ed. Philadelphia: Lippincott-Raven Publishers; 1996.
24. Rector TS, Tschumperlin LK, Kubo SH, Bank AJ, Francis GS, Mc Donald KM, et al. Use of the living with heart failure questionnaire to ascertain patients' perspectives on improvement in quality of life versus risk of drug induced death. *J Card Fail.* 1995;1:201-206.
25. Spertus J, Peterson E, Conard MW, Heidenreich PA, Krumholz HM, Jones P, et al. Cardiovascular outcomes research consortium. Monitoring clinical changes in patients with heart failure: a comparison of methods. *Am Heart J.* 2005;150:707-715.
26. Konstam V, Salem D, Pouleur H, Kostis J, Gorkin L, Shumaker S, et al. Baseline quality of life as a predictor of mortality and

- hospitalization in 5,025 patients with congestive heart failure. SOLVD Investigations. Studies of left ventricular dysfunction investigators. *Am J Cardiol.* 1996;78:89-105.
27. Soto GE, Jones P, Weintraub WS, Krumholz HM, Spertus JA. Prognostic value of health status in patients with heart failure after acute myocardial infarction. *Circulation.* 2004;110:546-551.
 28. Schoen C, How SK. National scorecard on U.S. health system performance: technical report. The Commonwealth Fund; 2006.
 29. Roe CM, Motheral BR, Teitelbaum F, Rich MW. Angiotensin converting enzyme inhibitor compliance and dosing among patients with heart failure. *Am Heart J.* 1999;138:818-825.
 30. Rich MW, Gray DB, Beckham, Wittenberg C, Luther P. Effect of a multidisciplinary intervention on medication compliance in elderly patients with congestive heart failure. *Am J Med.* 1996;101:270-276.
 31. Sadik A, Yousif M, McElney JC. Pharmaceutical care of patients with heart failure. *Br J Clin Pharmacol.* 2005;60:183-193.
 32. Kadish A, Mehra M. Heart failure devices: implantable cardioverter defibrillators and biventricular pacing therapy. *Circulation.* 2005;111:3327-3335.
 33. Small RS. Integrating device-based monitoring into clinical practice: insights from a large heart failure clinic. *Am J Cardiol.* 2007;99:17-22.
 34. Greenberg BH, Barnard DD. Contemporary diagnosis and management of heart failure. Newtown (PA): Handbooks in Health Care Company; 2005.
 35. McNutt RA. Shared medical decision making: problems, process, progress. *JAMA.* 2004;292:2516-2518.
 36. Zickmund SL, Blasiolo JA, Brase V, Arnold RM. Congestive heart failure patients report conflict with their physicians. *J Card Fail.* 2006;12:546-553.
 37. Califf RM, Vidaillet H, Goldman L. Advanced congestive heart failure: what do patients want. *Am Heart J.* 1998;135:S320-326.
 38. Allen LA, Yager JE, Funk MJ, Levy WC, Tulsy JA, Bowers MT, et al. Discordance between patient-predicted and model-predicted life expectancy among ambulatory patients with heart failure. *JAMA.* 2008;299:2533-2542.
 39. Stevenson LW, Desai AS. Selecting patients for discussion of the ICD as primary prevention for sudden death in heart failure. *J Card Fail.* 2006;12:407-412.
 40. Goldenberg I, Vyas AK, Hall WJ, Moss AJ, Wang H, He H, et al. Risk stratification for primary implantation of a cardioverter-defibrillator in patients with ischemic left ventricular dysfunction. *J Am Coll Cardiol.* 2008;51:288-296.
 41. Koelling TM, Johnson ML, Cody RJ, Aaronson KD. Discharge education improves clinical outcomes in patients with chronic heart failure. *Circulation.* 2005;111:179-285.
 42. Levy W, Mozaffarian D, Linker DT, Sutradhar SC, Anker SD, Cropp AB, et al. The Seattle heart failure model: prediction of survival in heart failure. *Circulation.* 2006;113:1424-1433.
 43. 2022ACC/AHA/HFSA Guideline for the management of heart failure. *Journal of Cardiac Failure.* 2022;28;4
 44. Advance care planning; 2007. Available:<http://www.ahrq.gov/research/endliferia/endria.htm>
 45. Krumholz HM, Phillips RS, Hamel MB, Teno JM, Bellamy P, Broste SK, et al. Resuscitation preferences among patients with severe congestive heart failure: results from the support project. *Circulation.* 1998;98:648-655.
 46. Formiga F, Chivite D, Ortega C, Casas S, Ramon JM, Pujol R. End of-life preferences in elderly patients admitted for heart failure. *QJM.* 2004;97:803-808.
 47. Michalsen A, Konig G, Thimme W. Preventable causative factors leading to hospital admission with decompensated heart failure. *Heart.* 1998;80:437-441.
 48. Bass EB, Fortin AH 4th, Morrison G, Willis S, Mumford LM, Goroll AH. National survey of clerkship directors in internal medicine on the competencies that should be addressed in the medicine core clerkship. *Am J Med.* 1997;102:564-571.
 49. Maclure M, Nguyen A, Carney G, Dormuth C, Roelants H, Ho K, et al. Measuring prescribing improvements in pragmatic trials of educational tools for general practitioners. *Basic Clin Pharmacol Toxicol.* 2006;98:243-252.
 50. DeLong JF, Allman RM, Sherill RG, Schiesz N. A congestive heart failure project with measured improvements in care. *Eval Health Prof.* 1998;21:472-486.
 51. Thomson O'Brien MA, Freemantle N, Oxman AD, Wolf F, Davis DA, Herrin J. Continuing education meetings and workshops: effects on professional

- practice and health care outcomes. Cochrane Database Syst Rev. 2001;(2):CD003030.
52. Bonow RO, Bennett S, Casey DE Jr, Ganiats TG, Hlatky MA, Konstam MA, et al. American College of Cardiology; American Heart Association Task Force on Performance Measures; Heart Failure Society of America. ACC/AHA clinical performance measures for adults with chronic heart failure: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures (Writing Committee to Develop Heart Failure Clinical Performance Measures): endorsed by the Heart Failure Society of America. *Circulation* 2005;112:1853-1887.
 53. Konstam MA. Executive council of the heart failure society of America. Heart failure training: a call for an integrative, patient focused approach to an emerging cardiology subspecialty. *J Am Coll Cardiol*. 2004;44:1361-1362.
 54. Donabedian A. Twenty years of research on the quality of medical care: 1964-1984. *Eval Health Prof*. 1985;8:243-265.
 55. Krumholz HM, Wang Y, Mattera JA, Wang Y, Han LF, Ingber MJ, et al. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with heart failure. *Circulation*. 2006;113:1693-1701.

© 2022 Dodiya-Manuel et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.