Managed Care Patients With Heart Failure: Spectrum of Ventricular Dysfunction and Predictors of Medication Utilization

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ABSTRACT

Background: Heart failure (HF) is a common clinical syndrome resulting in high morbidity and mortality. We examined the spectrum of ventricular dysfunction, and investigated the predictors of angiotensin-converting enzyme (ACE) inhibitor, β-blocker, and spironolactone prescription in 1613 managed care patients with HF.

Methods and Results: The diagnosis of HF was made by a HF discharge diagnosis or at least 3 physician encounters with a HF diagnosis during 2000. Logistic regression was used to identify predictors of medication prescription. Preserved systolic function was documented in 37%, moderate-severe systolic dysfunction in 31%, mild systolic in 14%, and 18% had inadequate documentation. The mean age was 69 years, 58% were women, 24% African American, and 60% were Medicare patients. Patients without HF type documented were the least aggressively treated. Coronary artery disease, hypertension, and diabetes predicted increased utilization of ACE inhibitor and β-blocker therapies. History of nephropathy was associated with less ACE inhibitor prescription. Advancing age predicted less utilization of β-blockers and spironolactone. Neither ethnicity nor gender influenced medication prescription.

Conclusion: Preserved left ventricular function was common. Documentation of significant systolic dysfunction was associated with improved quality of care. Interventions to encourage documentation of HF type and further study of HF with preserved systolic function are warranted.

Key Words: Preserved systolic function, Systolic dysfunction, ACE-Inhibitor, β-blocker.

Heart failure (HF) is an epidemic encompassing patients with depressed and preserved systolic function. Both types of HF result in substantial mortality and morbidity.[1–3] Prescription of evidence-based therapies for systolic HF has been suboptimal in US populations studied in the last decade.[4,5] Current pharmacologic management of patients with mild systolic dysfunction and preserved systolic function is not readily available. Little is known about predictors of β-blocker and spironolactone utilization in a general population of patients with HF. Description of a current HF population including predictors of pharmacologic management has not been reported recently.

We examined the spectrum of left ventricular dysfunction, patient characteristics, and current medication utilization of 1613 managed care patients with HF surveyed in 2000 in the North Carolina Achieving Cardiac Excellence (NC-ACE) Project. We investigated the predictors of angiotensin-converting enzyme (ACE) inhibitor, β-blocker, and spironolactone prescription in this population.

Methods

The NC-ACE Project was designed to increase the utilization of ACE inhibitor and β-blocker therapies in managed care patients with systolic heart failure. The NC-ACE Project is a collaboration of Wake Forest University Health Sciences, Medical Review of North Carolina, the state Medicare Quality Improvement Organization, and 5 managed care plans in North Carolina. The Institutional Review Board at Wake Forest University approved this study. We report the baseline data of this project.

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Participating managed care plans were asked to identify their population of Medicare or Medicaid heart failure patients. Patients had to (1) have been continuously enrolled in the plan for at least 180 days before and including December 31, 2000, and (2) have at least 1 of the following: (a) discharge from an acute care hospital with a principal discharge diagnosis of heart failure or (b) at least 3 physician encounters with a diagnosis of HF between January 1, 2000, and December 31, 2000, where heart failure is defined by *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, and 428.x. Patients on chronic renal dialysis were excluded as documented by any of the following: ICD-9-CM diagnosis codes V56.0, V56.8; ICD-9-CM procedure codes 39.95, 54.98; or current procedural terminology codes 90935, 90937, 90940, 90945, 90947, 90989, and 90993. For this analysis, patients were excluded if age <18 years.

Managed care plans transmitted electronic databases of information on the HF patient enrollees meeting the inclusion criteria to Medical Review of North Carolina, Inc. Patient information sent by the plans included demographics, insurance type, and the patient's primary care physician name and address.

After receiving training in the use of the data collection instrument, registered nurses collected patient medical record data through onsite visits to physician's offices. Data were entered into an electronic database at Medical Review of North Carolina, Inc. Data quality was monitored by selecting a 10% random sample of patient records within each managed care plan for reabstraction. Only patient records from physician offices with at least 8 records were eligible for reabstraction. Intrarater and interrater reliability statistics were calculated and agreement was greater than 90%.

In addition to patient demographics, information collected from patient medical records included medical history of chronic conditions (eg, coronary artery disease, hypertension, diabetes mellitus, nephropathy, neuropathy, peripheral vascular disease). Current smokers were defined as patients with documentation of smoking cigarettes at any time during the 1-year study period. Assessment of left ventricular function was abstracted from the patient chart as documented by echocardiogram, cardiac catheterization with left ventriculogram, radionuclide ventriculogram, or magnetic resonance imaging (MRI) scan, or by billing codes for these procedures. Systolic dysfunction was defined as a left ventricular ejection fraction <40% or qualitatively as moderate or severe systolic dysfunction. Mild systolic dysfunction was characterized as an ejection fraction of 40% to 49% or qualitatively as mild dysfunction. Preserved systolic function was defined as an ejection fraction ≥50%, diastolic, normal, or preserved ventricular function. The unknown group included patients who did not have an assessment of ventricular function documented or who had evidence of an assessment but did not have the results recorded in the chart. The following medications were also abstracted: ACE inhibitors, angiotensin II receptor blockers (ARB), β-blockers, diuretics, long-acting nitrates, hydralazine, digoxin, and calcium channel blockers. Information on intolerance or contraindications for ACE inhibitors (angioedema, allergy, intolerance, potassium >5.5 mEq/dL on 3 or more occasions, moderate-severe aortic stenosis, bilateral renal artery stenosis, three recordings of Cr >3 mg/dL, systolic blood pressure <80 mm Hg on 3 readings), and β-blockers (allergy, intolerance, second or third-degree heart block, severe bradycardia, chronic obstructive pulmonary disease or reactive airway disease, symptomatic hypotension) were collected only for those not prescribed these respective medications. Abstractors were instructed to obtain the most recent information for assessment of left ventricular function and medications.

Statistical Analysis

Data for continuous variables are presented as mean ± standard error of the means. Data for all other variables are presented as percentages. Logistic regression was used to identify predictors of ACE inhibitor, β-blocker, and spironolactone prescription. Regression analyses were weighted to account for specific sampling fractions associated with each managed care plan. Regression analyses were performed using Sudaan PROC LOGISTIC (Research Triangle Institute, Research Triangle Park, North Carolina). During analyses, we determined that some outcomes of interest were relatively common. In this situation, the odds ratio (OR) is not a good estimate of relative risk (RR). For selected results, we examined RR by adjusting the OR using the method of Zhang and Yu.[6] All other analyses were performed using SAS (SAS, Inc., Cary, North Carolina). Patients who had contraindications to the medication considered as the dependent variable in each regression model were excluded.

Results

Preserved systolic function was documented in 37%, moderate to severe systolic dysfunction in 31%, and mild systolic in 14% (Table 1). Cardiac function could not be determined for 256 (12%) patients who did not have an assessment of ventricular function documented and 35 (6%) patients who had evidence of an assessment but did not have the results recorded in the chart. The mean age of the entire population was 69 years, 58% were women, and 24% were African American. Medicare patients comprised 60% of the population and the remainder were Medicaid patients. Overall, left ventricular assessment was adequately documented in 82% of patients and the mean left ventricular ejection fraction was 44% ± 0.5. Patient characteristics of the subgroups are presented in Table 1. The prevalence of coronary artery disease and hypertension was high in all groups. Diabetes was documented in almost 50% of patients. Patients with preserved systolic function were more commonly older women with hypertension. Patients with systolic dysfunction were more often men with coronary artery disease.

The pattern of medication utilization is presented in Fig. 1. Diuretics were the most commonly prescribed agents in all patient subgroups. Vasodilators, which included ACE inhibitors, angiotensin receptor blockers, or a combination of long-acting nitrates and hydralazine, were prescribed in the majority of patients with documented cardiac function. Prescription of ACE inhibitor, β-blocker, digoxin, and spironolactone therapies were highest in the patients with moderate to severe systolic HF. Patients with mild systolic dysfunction were treated similarly as patients with moderate-severe systolic dysfunction. Angiotensin-receptor blockers were prescribed in 15% or less of all subgroups. Calcium channel blockers were most commonly prescribed in patients with preserved systolic function and least prescribed in patients with systolic dysfunction. Patients with inadequate documentation of left ventricular function received less pharmacologic therapy compared with the other subgroups.