JACC: HEART FAILURE
VOL. 3, NO. 11, 2015

ISSN 2213-1779/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jchf.2015.06.012

Characteristics, Treatments, and Outcomes of Hospitalized Heart Failure Patients Stratified by Etiologies of Cardiomyopathy

Supriya Shore, MD, MSCS,* Maria V. Grau-Sepulveda, MD, MPH,† Deepak L. Bhatt, MD, MPH,‡ Paul A. Heidenreich, MD, MS,§ Zubin J. Eapen, MD, MHS,† Adrian F. Hernandez, MD, MHS,† Clyde W. Yancy, MD,‖ Gregg C. Fonarow, MD¶

ABSTRACT

OBJECTIVES The authors sought to describe characteristics, treatments, and in-hospital outcomes of hospitalized heart failure (HF) patients stratified by etiology.

BACKGROUND Whether characteristics and outcomes of HF patients differ by cardiomyopathy etiology is unknown.

METHODS The authors analyzed data on 156,013 hospitalized HF patients from 319 U.S. hospitals participating in Get With The Guidelines-HF between 2005 and 2013. Characteristics, treatments, and in-hospital outcomes were assessed by HF etiology. Standard regression techniques adjusted for site and patient-level characteristics were used to examine association between HF etiology and in-hospital outcomes.

RESULTS Median age was 75 years, 69.2% were white, and 49.5% were women. Overall, 92,361 patients (59.2%) had ischemic cardiomyopathy and 63,652 patients (40.8%) had nonischemic cardiomyopathy (NICM). Hypertensive (n = 28,141; 48.5%) and idiopathic (n = 17,808; 30.7%) cardiomyopathies accounted for the vast majority of NICM patients. Post-partum (n = 209; 0.4%), viral (n = 447; 0.8%), chemotherapy (n = 721; 1.2%), substance abuse (n = 2,653; 4.6%), familial (n = 556; 1.0%), and other (n = 7,523; 13.0%) etiologies were far less frequent. There were significant differences in baseline characteristics between those with ischemic cardiomyopathy compared with NICM with respect to age (76 years vs. 72 years), sex (44.4% vs. 56.9% women), and ejection fraction (38% vs. 45%). Risk-adjusted quality of care provided to eligible patients varied minimally by etiology. Similarly, in-hospital mortality did not differ among ischemic compared with NICM patients. However, among NICM patients, only hypertensive cardiomyopathy had a lower mortality rate compared with idiopathic NICM (adjusted odds ratio: 0.83; 95% confidence interval: 0.71 to 0.97).

CONCLUSIONS Characteristics of hospitalized HF patients vary by etiology. Both risk-adjusted quality of care and in-hospital outcomes did not differ by etiology. (J Am Coll Cardiol HF 2015;3:906–16)

From the *Division of Cardiology, Emory University School of Medicine, Atlanta, Georgia; †Duke Clinical Research Institute, Durham, North Carolina; ‡Division of Cardiology, Brigham and Women's Hospital Heart & Vascular Center and Harvard Medical School, Boston, Massachusetts; §Division of Cardiology, Stanford University, Palo Alto, California; ‖Division of Cardiology, Northwestern University, Chicago, Illinois; and the ¶Division of Cardiology, University of California, Los Angeles, California. This study was supported by the Young Investigator Database Research Seed Grant-supported by the Council on Clinical Cardiology, the Stroke Council, and the Council on Quality of Care and Outcomes Research. The Get With The Guidelines-Heart Failure (GWTG-HF) program is provided by the American Heart Association. GWTG-HF has been funded in the past through support from Medtronic, GlaxoSmithKline, Ortho-McNeil, and the American Heart Association Pharmaceutical Roundtable. Dr. Bhatt is on the Advisory Board of Cardax, Elsevier Practice Update Cardiology, Medscape Cardiology, and Regado Biosciences; is on the Board of Directors of Boston VA Research Institute and Society of Cardiovascular Patient Care; has received research funding from Amarin, AstraZeneca, Bristol-Myers Squibb, Eisai, Ethicon, Forest Laboratories, Ischemix, Medtronic, Pfizer, Roche, Sanofi, and The Medicines Company; has done unfunded research for FlowCo, PLx Pharma, and Takeda; is the Chair of the American Heart Association Get With The Guidelines Steering Committee; is on the Data Monitoring Committees of Duke Clinical Research Institute, Harvard Clinical Research Institute, Mayo Clinic, Population Health Research Institute; has received honoraria from the American College of Cardiology (Senior Associate Editor, Clinical Trials and News, ACC.org), Belvoir Publications (Editor in Chief, *Harvard Heart Letter*), Duke Clinical Research Institute (clinical trial steering committees), Harvard Clinical Research Institute (clinical trial steering committee), HMP Communications (Editor in Chief, *Journal of Invasive Cardiology*), *Journal of the American College of Cardiology* (Associate Editor;

Although mortality due to heart failure (HF) is declining secondary to improved therapies, the prevalence of HF continues to increase (1,2). Whereas ischemic cardiomyopathy remains the most common etiology, over one-third of HF patients have nonischemic cardiomyopathy (NICM) (3). More recent studies in developed nations have suggested a shift in NICM epidemiology with a decline in hypertensive cardiomyopathy and increase in idiopathic NICM (1,4). Accordingly, contemporary etiologies and characteristics of HF patients need to be evaluated and can inform primary and secondary HF prevention strategies.

Furthermore, because the pathophysiology of NICM subtypes may vary, their prognosis may differ as well (5). However, previous studies have largely been limited to comparing outcomes among patients with ischemic cardiomyopathy and NICM. The association between specific NICM etiology and prognosis has not been well described. Identifying NICM etiologies associated with worse prognosis can help ensure that patients receive appropriate consideration for available therapies.

Accordingly, the objective of this study was to describe characteristics and in-hospital prognosis of hospitalized HF patients stratified by their etiology using a national, prospective HF registry. More specifically, we first examined the prevalence of ischemic cardiomyopathy, NICM, and NICM further characterized on the basis of specific etiologies, and assessed their temporal trends over the course of this study. Next, we described clinical characteristics and in-hospital treatment provided to HF patients by their etiology. Finally, we examined the association between HF etiologies and in-hospital outcomes.

METHODS

DATA SOURCE. Get With The Guidelines-Heart Failure (GWTG-HF) is an ongoing, prospective, in-hospital quality improvement program initiated in January 2005. Details and objectives of this American Heart Association-sponsored program have been previously described (6). In brief, it enrolls adults hospitalized with a primary discharge diagnosis of HF. Participation is voluntary, and participating institutions submit data on consecutive, eligible patients in compliance with The Joint Commission and Centers for Medicare & Medicaid standards. Trained hospital personnel use standardized definitions to abstract extensive data from medical records on patient demographics, medical history, laboratory values, pharmacological and nonpharmacological interventions, HF performance measures, and outcomes at discharge. Data are submitted and assessed for completeness and quality using an Internet-based patient management tool (Get With The Guidelines-Heart Failure Patient Management Tool; Quintiles, Cambridge, Massachusetts). This Internet-based system performs checks to ensure data completeness. The data quality is also monitored for completeness and accuracy. Only fully participating hospitals and variables with a high degree of completeness (>95%) are used in analyses.

All participating institutions are required to comply with local regulatory and privacy guidelines, and to submit the program protocol for review and approval by their institutional review boards. Because data are used primarily at the local site for quality improvement, sites were granted a waiver of informed consent. The Duke Clinical Research Institute serves as the data center analysis and has an agreement to analyze the aggregate de-identified data for research purposes.

STUDY POPULATION. From January 1, 2005, to March 31, 2013, a total of 219,953 patients were enrolled in the GWTG-HF registry from 357 fully participating sites with a primary diagnosis of HF with good quality data. We excluded patients without documented HF etiology (n = 63,937) and men misclassified with post-partum cardiomyopathy (n = 3). Our final study population consisted of 156,013 patients with etiology documented as ischemic

ABBREVIATIONS AND ACRONYMS

CI = confidence interval
CRT = cardiac resynchronization therapy
EF = ejection fraction
HF = heart failure
IQR = interquartile range
NICM = nonischemic cardiomyopathy
OR = odds ratio

Section Editor, Pharmacology), Population Health Research Institute (clinical trial steering committee), Slack Publications (Chief Medical Editor, *Cardiology Today's Intervention*), and WebMD (CME steering committees); and is a Deputy Editor of *Clinical Cardiology*. Dr. Eapen is on the Advisory Boards of Novartis and Cytokinetics; has received honoraria from Janssen; and is a consultant for Amgen. Dr. Hernandez is on the Advisory Boards of Bristol-Myers Squibb, Novartis, Gilead, Boston Scientific, and Janssen; and has received research grants from Janssen, Bristol-Myers Squibb, Novartis, Portola, Amgen, AstraZeneca, GlaxoSmithKline, and Merck. Dr. Fonarow is a consultant for Amgen, Novartis, Baxter, Bayer, Johnson & Johnson, and Medtronic; and has received research grants from Novartis, Gambro, National Heart, Lung, and Blood Institute, and National Institutes of Health/National Institute of Allergy and Infectious Diseases. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received April 17, 2015; revised manuscript received June 1, 2015, accepted June 12, 2015.