

Etiologies, Trends, and Predictors of 30-Day Readmissions in Patients With Diastolic Heart Failure



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An estimated half of all heart failure (HF) populations has been categorized to have diastolic HF (DHF), but sparse data are available describing etiologies and predictors of 30-day readmission in DHF population. The study cohort was derived from the National Readmission Database 2013 to 2014, a subset of the Healthcare Cost and Utilization Project sponsored by the Agency for Healthcare Research and Quality. DHF was identified using International Classification of Diseases, 9th Revision code 428.3x in primary diagnosis field. Readmission etiologies were identified by International Classification of Diseases, 9th Revision code in primary diagnosis field. The primary outcome was 30-day readmission. Hierarchical multivariable logistic regression was used to adjust for confounders. In total, 192,394 patients with DHF were included, of which 40,927 (21.27%) patients were readmitted with total readmissions of 47,056 within 30 days. Predictors of increased readmissions were age (odds ratio [OR] 1.002, 95% confidence interval [CI] 1.001 to 1.0003, $p < 0.001$), diabetes (OR 1.08, 95% CI 1.05 to 1.11, $p < 0.001$), chronic pulmonary disease (OR 1.18, 95% CI 1.15 to 1.21, $p < 0.001$), renal failure (OR 1.21, 95% CI 1.17 to 1.25, $p < 0.001$), peripheral vascular disease (OR 1.05, 95% CI 1.02 to 1.09, $p = 0.002$), anemia (OR 1.12, 95% CI 1.10 to 1.15, $p < 0.001$), transfusion during index admission (OR 1.18, 95% CI 1.13 to 1.23, $p < 0.001$), discharge to the facility (OR 1.13, 95% CI 1.10 to 1.16, $p < 0.001$), length of stay > 2 days, and Charlson comorbidity index ≥ 3 , whereas obesity (OR 0.82, 95% CI 0.80 to 0.85, $p < 0.001$), elective admissions (OR 0.88, 95% CI 0.83 to 0.94, $p < 0.001$), and non-Medicare/Medicaid primary payer were predictors of lower readmission rate. Most common etiologies of readmission were acute HF (28.01%), infections (9.54%), acute kidney injury (5.35%), acute respiratory failure (4.86%), and pneumonia (3.92%). In conclusion, DHF population with higher comorbidity burden, longer length of stay, and discharge to facility were prone to increased readmissions, with most common etiologies of readmission being HF, infections, and acute kidney injury. © 2017 Elsevier Inc. All rights reserved. (Am J Cardiol 2017;120:616–624)

Heart failure (HF) is an important healthcare issue; by 2030, Heidenreich et al has projected a 3 million (~25%) increase in prevalence and about \$70 billion (~120%)

increase in HF healthcare cost.^{1,2} Also, an estimated half of all HF populations has been categorized to have diastolic HF (DHF) termed as HF with preserved ejection fraction. Converse to Heart Failure with reduced Ejection Fraction (systolic HF) readmission rates which are on dramatic decline, readmission rates of DHF have increased with increased average days of hospital stay.³ In light of these concerning observations, it becomes imperative to comprehensively describe etiologies, predictors, and trends of DHF readmissions to identify areas to target intervention measures for better management in the US population.

Methods

The study cohort was derived from the Healthcare Cost and Utilization Projects National Readmission Database (NRD) of 2013 to 2014, sponsored by the Agency for Healthcare Research and Quality. The NRD⁴ is one of the largest publicly available all-payer inpatient care database in the United States, which represents 49.3% of total US hospitalizations and includes data on approximately 15 million discharges in year 2013 to 2014, estimating roughly

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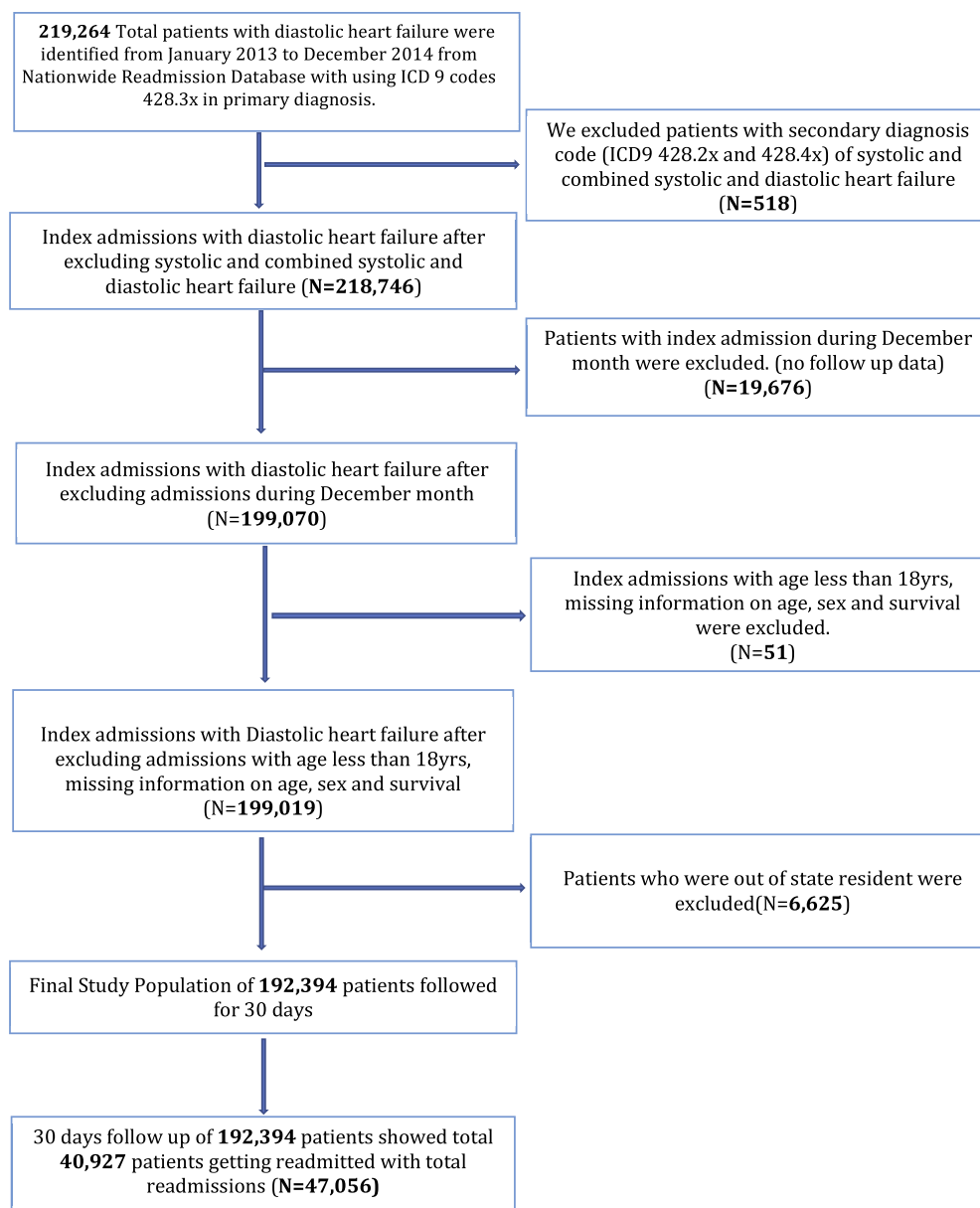


Figure 1. Flowchart of study population.

35 million discharges from 22 states with reliable, verified linkage numbers. Patients were tracked using the variable “NRD_visitlink” and time between 2 admissions was calculated by subtracting the variable “NRD_DaysToEvent.” Time to readmission was calculated by subtracting length of stay (LOS) of index admissions from time between 2 admissions.

DHF hospitalizations were classified as those with a principal discharge diagnosis of DHF based on the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) code 428.3x. We only included first admission of the year and excluded patients with missing information on age, gender, mortality, and age ≤ 18 . We also excluded December admissions as there were no follow-up data on the same. For further accuracy, we removed non—state resident patients. We identified a total of

192,394 unweighted index admissions. Patients who were readmitted within 30 days during the same calendar year were further evaluated ($n = 40,927$) (Figure 1). Similar methods were used in the past.⁵

The primary outcome was 30-day readmissions which was further divided into readmissions with and without DHF. Readmission causes were identified using ICD-9 codes in primary diagnosis filed. We identified 1,683 different ICD-9 diagnosis codes and combined the ones with similar diagnoses to make clinically important groups (Supplementary Table 1).

NRD variables were used to identify patients’ demographic characteristics including age, gender; hospital characteristics such as bed size and teaching status; and other patient-specific characteristics including median household income category for patient’s zip code, primary

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