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ORIGINAL ARTICLE

Thirty-Day Readmission Rate in Acute Heart Failure Patients Discharged Against Medical Advice in a Matched Cohort Study

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Abstract

Objective: To determine the readmission rate in patients with acute heart failure (AHF) discharged against medical advice (AMA).

Methods: We performed a retrospective analysis using the 2014 National Readmission Database. Patients admitted with a primary diagnosis of AHF were selected. Only those discharged to home and who left AMA were included in the study. The primary outcome was 30-day readmission. We compared the readmission rates among those discharged AMA vs routinely discharged patients using propensity score matching (PSM) to address imbalance in variables between the 2 groups. We matched 3 routinely discharged patients to 1 patient who left AMA.

Results: We identified 273,489 patients with AHF, of whom 116,869 qualified for further study analysis. A total of 2014 patients (1.7%) were in the AMA group and 114,855 (98.3%) were in the routinely discharged group. After PSM, 6042 routinely discharged patients were matched with 2014 patients from the AMA group. The standard mean difference for each variable was less than 10% postmatching. The 30-day readmission rate among those who left AMA was higher than among those routinely discharged (33% vs 20.1%; $P<.001$). Heart failure (44.8%) was the most common cause of readmission in the AMA group. Patients who left AMA were more likely to be readmitted to a different hospital compared with those routinely discharged (37.4 vs 23.1%; $P<.001$). They also had a high rate of leaving AMA during the readmission (18 vs 2%; $P<.001$).

Conclusion: Patients with AHF discharged AMA had a significantly higher 30-day readmission rate than did the routinely discharged group.

An estimated 1% to 2% of admitted patients leave against medical advice (AMA) throughout the United States.[1] With varying degrees of severity and consequences linked to specific disease, leaving AMA has been shown to impact 30-day readmission rates and increases the risk for worse outcomes.[2] Studies have shown a higher rate of leaving AMA among patients who are African American, among those belonging to low socioeconomic status, among those with presence of underlying psychiatric disorders, and among those with comorbid alcohol abuse.[3] Although many studies have researched demographic influences accounting for these occurrences, very few have

focused on the downstream effects related to leaving AMA in the setting of disease states such as heart failure (HF).

Heart failure affects approximately 6 million adults in the United States, contributes to 1 in 9 deaths, and is estimated to cost more than $30 billion each year. As the leading cause of hospitalization among adults older than 65 years, it is estimated that more than 1 million individuals are hospitalized annually with a primary diagnosis of acute heart failure (AHF).[4,5] This is further complicated by an even greater risk of 1-month and 6-month readmissions rate of more than 20% and more than 50%, respectively, in AHF. Despite continued research on identification of risk

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TABLE 1. Diagnosis Codes Used in the Study

Diagnosis	ICD-9 or CCS codes
Acute heart failure	ICD-9 codes: 428.21, 428.23, 428.31, 428.33, 428.41, 428.43
Acute myocardial infarction	ICD-9 codes: 410.X1 (410.01-410.91), 411.1, 410.70-410.72
Readmission etiologies	
Heart failure etiology	CCS: 108
Arrhythmias	CCS: 105-107
AMI or CAD	CCS: 100, 101
Other cardiac etiologies	CCS: 96-99, 102-105
Infectious etiologies	CCS: 2, 159, 197, 246
TIA or stroke	CCS: 109, 112

AMI = acute myocardial infarction; CAD = coronary artery disease; CCS = Clinical Classifications Software; ICD-9 = International Classification of Diseases, 9th revision; TIA = transient ischemic attack.

factors for readmission, utilization of clinical markers, and implementation of multimodal HF teams comprising physicians, nurses, and case managers, patients with HF continue to get readmitted at high rates.[6,7] For this reason, a thorough evaluation of leaving AMA in the HF patient population is warranted and direct attention to this high-risk population. We aimed to explore 30-day readmission among patients with AHF who left AMA and to identify factors that predicted such readmission.

METHODS

National Readmission Database

The National Readmission Database (NRD) is one of largest publicly available databases to query for readmission-based analysis.[8] The data were obtained from various hospitals across the country. It contains more than 14 million cases and is designed to represent 49.3% of all US hospitalizations. The NRD includes patient demographic characteristics, diagnoses and procedure codes, hospital-level information, and hospital charges. Clinical Classifications Software (CCS) is a meaningful cluster of similar diagnosis that is provided as additional variables for both diagnoses and procedures. Importantly, the strength of the database is that it provides reliable patient tracking information for readmissions. To protect patients' privacy, the database has deidentified personal information and date of admissions; instead, alphanumerical codes and numbers were created to represent these variables, respectively. Please refer to Table 1 for complete lists of International Classification of Diseases, 9th revision (ICD-9) and CCS codes.

We used unweighted cases for conducting analyses.

Index Admissions

The index admissions were defined as the first admission carrying AHF as a primary diagnosis for a patient from January 01, 2014, to November 30, 2014. We excluded December 2014 data because of incomplete follow-up data within this patient population. Previous studies have used similar techniques to identify index admissions.[9,10] The database provides 1 primary diagnosis and 29 secondary diagnoses. Patients younger than 18 years, those who died during index admission or were discharged to inpatient/nursing facilities, and had missing data for disposition status, median household income, primary payer, or elective status of admission were excluded from the consideration of index admission. Patients who left AMA were categorized as the "AMA" group vs those who had "routine" discharge to home. The details on disposition status available within the database can be found online.[11] To match the AMA group with the routinely discharged group, we performed propensity score matching (PSM) to balance baseline patient demographic characteristics, hospital characteristics, and comorbidities. The methodology of PSM is outlined below.

READMISSIONS

Once the index admission cases were identified, these cases were followed using the "NRD_Visitlink" variable, a unique alphanumerical assigned to an individual patient within the database. In the case of multiple