CLINICAL RESEARCH STUDY

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Beta-blocker Use and 30-day All-cause Readmission in Medicare Beneficiaries with Systolic Heart Failure

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ABSTRACT

BACKGROUND: Beta-blockers improve outcomes in patients with systolic heart failure. However, it is unknown whether their initial negative inotropic effect may increase 30-day all-cause readmission, a target outcome for Medicare cost reduction and financial penalty for hospitals under the Affordable Care Act.

METHODS: Of the 3067 Medicare beneficiaries discharged alive from 106 Alabama hospitals (1998-2001) with a primary discharge diagnosis of heart failure and ejection fraction <45%, 2202 were not previously on beta-blocker therapy, of which 383 received new discharge prescriptions for beta-blockers. Propensity scores for beta-blocker use, estimated for each of the 2202 patients, were used to assemble a matched cohort of 380 pairs of patients receiving and not receiving beta-blockers who were balanced on 36 baseline characteristics (mean age 73 years, mean ejection fraction 27%, 45% women, 33% African American).

RESULTS: Beta-blocker use was not associated with 30-day all-cause readmission (hazard ratio [HR] 0.87; 95% confidence interval [CI], 0.64-1.18) or heart failure readmission (HR 0.95; 95% CI, 0.57-1.58), but was significantly associated with lower 30-day all-cause mortality (HR 0.29; 95% CI, 0.12-0.73). During 4-year postdischarge, those in the beta-blocker group had lower mortality (HR 0.81; 95% CI, 0.67-0.98) and combined outcome of all-cause mortality or all-cause readmission (HR 0.87; 95% CI, 0.74-0.97), but not with all-cause readmission (HR 0.89; 95% CI, 0.76-1.04).

CONCLUSIONS: Among hospitalized older patients with systolic heart failure, discharge prescription of beta-blockers was associated with lower 30-day all-cause mortality and 4-year combined death or readmission outcomes without higher 30-day readmission.

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KEYWORDS: Beta-blockers; Hospitalization; Older adults; Readmission; Systolic heart failure

Heart failure is a leading cause of hospital readmission for Medicare beneficiaries, many of which are considered potentially preventable.[1,2] The Affordable Care Act, the new US health care reform law, has identified 30-day all-cause readmission in hospitalized Medicare beneficiaries aged ≥65 years as a target outcome for reduction of Medicare costs. It is projected that hospitals may collectively lose about $7 billion over the next 10 years for

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above-average 30-day all-cause readmission. In patients with systolic heart failure, beta-blockers reduce mortality and hospitalization in the randomized controlled trial setting,[3,4] and their use has been associated with lower risk of 1-year mortality and readmission in the post-discharge setting.[5] However, beta-blockers have an early transient negative inotropic effect and concern remains that discharge initiation of these drugs in hospitalized patients with heart failure and reduced ejection fraction may adversely affect short-term outcomes, and this has lately been heightened by the focus on 30-day all-cause hospital readmission in the Affordable Care Act. Therefore, the objective of the current study was to examine the association of discharge initiation of beta-blockers with 30-day all-cause hospital readmission in hospitalized systolic heart failure patients.

CLINICAL SIGNIFICANCE

- Beta-blocker use was associated with lower risk of 30-day all-cause mortality without higher 30-day all-cause or heart failure readmissions in older Medicare beneficiaries hospitalized for acute systolic heart failure.
- This benefit of beta-blockers was observed throughout the first 4 years after discharge.

MATERIALS AND METHODS

Data Source and Study Patients

We used the Alabama Heart Failure Project data for the current study, the details of which have been described previously.[6] Briefly, medical records of fee-for-service Medicare beneficiaries discharged with a principal diagnosis of heart failure from 106 Alabama hospitals between July 1, 1998 and October 31, 2001 were identified.[6-9] A diagnosis of heart failure was based on the International Classification of Diseases, 9th Revision, Clinical Modification, codes for heart failure. Copies of the 9649 charts were abstracted by trained technicians who directly entered data into a computer database. The 9649 hospitalizations occurred in 8555 unique patients. For patients with multiple hospitalizations, charts from the first hospitalization were used. The selected medical records were then transferred from participating hospitals to the Central Clinical Data Abstraction Centers, where trained technicians abstracted data from charts directly into a computer database using a data collection tool programmed by MedQuest Software. The Central Clinical Data Abstraction Centers ensured reliability of the abstraction process through internal and external re-abstractions of 40 charts monthly. Reliability findings demonstrated agreement values >80% and Kappa values >0.60.[6]

New Use of Beta-Blockers: Assembly of an Inception Cohort

Of the 8555 patients, 8049 were discharged alive; of these, 5479 (68%) had data on left ventricular ejection fraction, of which 3067 (68%) had ejection fraction <45%. Of these 3067 patients, 2202 (72%) were not on beta-blockers at admission. Of these, 383 (17%) received a discharge prescription for beta-blocker. Extensive data on baseline demographics, medical history including use of medications, hospital course, discharge disposition including medications, and physician specialty were collected.

Propensity Matching: Assembly of a Balanced Cohort

Because of the imbalances in baseline characteristics between patients receiving and not receiving beta-blockers (**Table 1**), we used propensity scores to assemble a cohort of patients in which those receiving and not receiving these drugs would be well balanced on measured baseline characteristics.[10-14] We began by estimating propensity scores or probability of receiving discharge prescription of beta-blockers for each of the 2202 patients using 36 measured baseline characteristics displayed in **Figure 1**. Using a greedy matching protocol, we were able to match 380 of the 383 patients receiving beta-blockers with 380 patients not receiving these drugs who had similar propensity scores.[15-17] We then estimated absolute standardized differences of the 36 measured covariates for the 2 treatment groups, and presented the percentages of pooled standard deviations as Love plots.[18-21] An absolute standardized difference of 0% indicates no residual bias and differences <10% are considered inconsequential.

Outcomes

The primary outcome of the current analysis was 30-day all-cause hospitalization. Secondary outcomes included all-cause mortality, heart failure hospitalizations, and the combined end point of all-cause readmission or all-cause mortality. Time to all outcomes started from the date of discharge from the index hospitalization. Data on outcomes and time to events were obtained from the Centers for Medicare and Medicaid Services Denominator File, Medicare Provider Analysis and Review File and Inpatient Standard Analytical File.

Statistical Analysis

For descriptive analyses, we used Pearson chi-squared and Wilcoxon rank-sum tests for comparisons. Kaplan-Meier plots and Cox regression analyses were used to determine the associations of discharge initiation of beta-blocker therapy with 30-day all-cause readmission. We