Calcium Channel Blockers and Outcomes in Older Patients With Heart Failure and Preserved Ejection Fraction

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Background—Little is known about associations of calcium channel blockers (CCBs) with outcomes in patients with heart failure and preserved ejection fraction (EF).

Methods and Results—Of the 10570 hospitalized patients with heart failure and preserved EF, ≥65 years, EF ≥40%, in the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF; 2003–2004), linked to Medicare data (through December 31, 2008), 7514 had no prior history of CCB use. Of these, 815 (11%) patients received new discharge prescriptions for CCBs. Propensity scores for CCB initiation, calculated for each of the 7514 patients, were used to assemble a matched cohort of 1620 (810 pairs) patients (mean age, 80 years; mean EF, 56%; 65% women; 10% black) receiving and not receiving CCBs, balanced on 114 baseline characteristics. The primary composite end point of all-cause mortality or heart failure hospitalization occurred in 82% and 81% of patients receiving and not receiving CCBs (hazard ratio for CCBs, 1.03; 95% confidence interval, 0.92–1.14). Hazard ratios (95% confidence intervals) for all-cause mortality, heart failure hospitalization, and all-cause hospitalization were 1.05 (0.94–1.18), 1.05 (0.91–1.21), and 1.03 (0.93–1.14), respectively. Similar associations were observed when we categorized patients into those receiving amlodipine and nonamlodipine CCBs. Among 7514 prematch patients, multivariable-adjusted and propensity-adjusted hazard ratios (95% confidence interval) for primary composite end point were 1.03 (0.95–1.12) and 1.02 (0.94–1.11), respectively.

Conclusions—In hospitalized older patients with heart failure, new discharge prescriptions for CCBs had no associations with composite or individual end points of mortality or heart failure hospitalization, regardless of the class of CCBs. **(*Circ Heart Fail*. 2014;7:945-952.)**

Key Words: calcium channel blockers ■ heart failure

Heart failure (HF) is the leading cause for hospital admission and readmission.[1,2] Nearly half of the estimated 6 million HF patients in the United States have diastolic HF or HF with preserved ejection fraction (HFpEF).[1] The vast majority of HF patients are ≥65 years, most of who have HFpEF.[3] However, there is little randomized controlled trial (RCT) evidence to guide therapy for HFpEF patients.[4,5] Calcium channel blockers (CCBs) have been hypothesized to be beneficial in patients with HFpEF.[4] In small studies, CCBs have been shown to improve HF score, exercise capacity, and diastolic function in HFpEF patients.[6,7] However, the role of CCBs on clinical outcomes in HFpEF patients remains unclear. When RCT data are unavailable or it is impractical or unethical to conduct RCTs, propensity score–matched non-RCT studies based on retrospective outcome-blinded assembly of balanced cohorts may provide evidence in a timely and cost-effective manner.[8–11] Therefore, in the current study, we examined the clinical effectiveness of CCBs in a propensity-matched cohort of older patients with HFpEF.

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Methods

Data Sources and Study Population

The Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF) is a national registry of hospitalized HF patients, the rationale and design has been described in detail, previously.[12–14] Briefly, charts of 48612 hospitalizations due to HF or associated with HF in 259 hospitals in 48 US states were collected between March 2003 and December 2004.[12,13] Charts with a primary discharge diagnosis of HF based on International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes

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were selected, regardless of whether a patient was hospitalized for decompensated HF or developed HF symptoms after admission for another admitting diagnosis. Data on baseline demographics, medical history, hospital course, and discharge dispositions were collected in detail. Because HF patients with EF 40% to 50% have similar clinical and prognostic characteristics than those with EF >50%,[15] we used EF cutoff ≥40% to define HFpEF. Of the 48 612 HF hospitalizations, 20 839 occurred in patients with HFpEF.

The OPTIMIZE-HF collected short-term outcome data only for a small subset of patients for 60 to 90 days. To obtain long-term outcome data, we linked OPTIMIZE-HF to Medicare data using 100% Medicare Provider Analysis and Review (MedPAR) File and 100% Beneficiary Summary File between January 1, 2002, and December 31, 2008. Of the 20 839 HFpEF hospitalizations, we were able to link 13 270 hospitalizations to Medicare data that occurred in 11 997 unique patients. Of these, 10 889 were aged ≥65 years, and 10 570 were discharged alive.[16] OPTIMIZE-HF was approved by institutional review boards of the participating hospitals.

Assembly of an Eligible Cohort

Data on admission and discharge use of CCBs and other key HF medications such as angiotensin-converting enzyme inhibitors, angiotensin receptors blockers, aldosterone antagonists, and β-blockers were collected by chart abstraction. After excluding 146 patients with contraindications to the use of CCBs, such as patients having second- or third-degree atrioventricular block (n=33), and who had symptomatic hypotension defined as admission systolic blood pressure (BP) <90 mm Hg (n=113), the remaining 10 424 patients were considered eligible for CCB therapy.

Assembly of an Inception Cohort

Because prevalent drug use may cause bias by left censoring or by affecting baseline characteristics,[17–19] we assembled an inception cohort of patients who were not receiving prior CCB therapy. Therefore, we excluded 2910 patients receiving CCBs during hospital admission. Thus, the final sample size for our inception cohort consisted of 7514 patients, of whom 815 (11%) received a new discharge prescription for CCBs.

Assembly of a Balanced Cohort

To eliminate the imbalances in measured baseline characteristics because of selection bias associated with a discharge prescription of CCBs, we used propensity score or the probability of receiving a discharge prescription of CCBs to assemble a matched cohort of patients receiving and not receiving CCBs that would be well balanced on all measured baseline covariates.[8–10] Using nonparsimonious logistic regression model, we estimated propensity scores for each of the 7514 patients.[20–22] In this model, the receipt of CCB was the dependent variable and 114 baseline characteristics were used as covariates. Using a greedy matching protocol, we were then able to match 810 of the 815 patients receiving CCBs with another 810 patients not receiving them but had similar propensity to receive it.[23,24] The effectiveness of propensity score model was assessed by estimating absolute standardized differences, and results were presented as a Love plot (Figure 1).[25–27] Absolute standardized difference values <10% are considered inconsequential, and 0% indicates no residual bias.

Outcomes

The primary outcome for the current analysis was a composite end point of all-cause mortality or HF hospitalization during 6 years of follow-up (median, 2.7 years). Secondary outcomes were all-cause mortality, HF hospitalization, and all-cause hospitalization. As described earlier, all outcomes data were obtained from Medicare claims data.[16,28]

Statistical Analysis

For descriptive analyses, the Pearson χ^2 and Wilcoxon rank-sum tests were used for prematch and the McNemar test and paired sample *t* test were used for postmatch comparisons. Cox proportional hazards

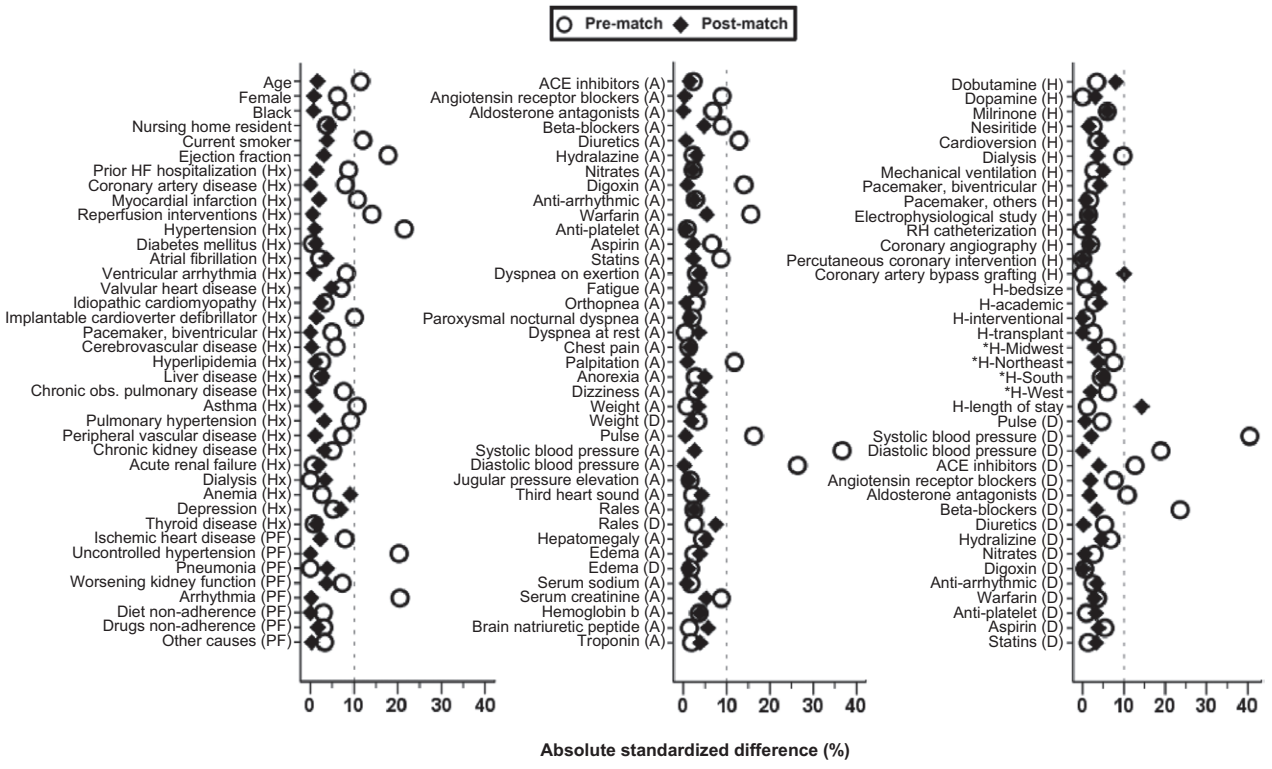

Figure 1. Love plot displaying absolute standardized differences comparing 114 baseline characteristics between older patients with heart failure and preserved ejection fraction, receiving a new discharge prescription of calcium channel blockers, before and after propensity score matching. A indicates admission; ACE, angiotensin-converting enzyme; D, discharge; H, in-hospital; Hx, medical history; PF, precipitating factor. *4 regions entered as single categorical variable in the model.

Table 1. Baseline Characteristics of Older Patients With Heart Failure and Preserved Ejection Fraction (HFpEF), by New Discharge Prescription of Calcium Channel Blockers (CCBs), Before and After Propensity Score Matching

Variables	Before Propensity Score Matching			After Propensity Score Matching		
	Use of CCB			Use of CCB		
Mean (±SD) or n (%)	No (n=6699)	Yes (n=815)	*P* Value	No (n=810)	Yes (n=810)	*P* Value
Age, y	81 (±8)	80 (±8)	0.002	80 (±8)	80 (±8)	0.75
Female	4169 (62)	531 (65)	0.10	526 (65)	529 (65)	0.92
Black	553 (8)	85 (10)	0.035	83 (10)	84 (10)	1.00
Left ventricular ejection fraction, %	55 (±9)	56 (±9)	<0.001	56 (±10)	56 (±9)	0.52
Medical history						
No prior heart failure hospitalization	891 (13)	134 (16)	0.014	130 (16)	134 (17)	0.85
Coronary artery disease	3154 (47)	351 (43)	0.030	350 (43)	350 (43)	1.00
Hypertension	4797 (72)	658 (81)	<0.001	657 (81)	654 (81)	0.90
Diabetes mellitus	2531 (38)	310 (38)	0.89	313 (39)	308 (38)	0.85
Atrial fibrillation	2442 (37)	306 (38)	0.54	317 (39)	302 (37)	0.47
Hyperlipidemia	2173 (32)	254 (31)	0.46	258 (32)	254 (31)	0.87
Chronic obstructive pulmonary disease	1938 (29)	264 (32)	0.040	259 (32)	262 (32)	0.92
Peripheral vascular disease	882 (13)	129 (16)	0.035	124 (15)	127 (16)	0.89
Chronic kidney disease	4328 (65)	546 (67)	0.18	554 (68)	542 (67)	0.56
Admission symptoms and signs						
Dyspnea on exertion	4169 (62)	519 (64)	0.42	500 (62)	515 (64)	0.47
Fatigue	1548 (23)	177 (22)	0.37	165 (20)	175 (22)	0.59
Orthopnea	1629 (24)	208 (26)	0.45	208 (26)	206 (25)	0.96
Paroxysmal nocturnal dyspnea	849 (13)	109 (13)	0.57	103 (13)	107 (13)	0.83
Dyspnea at rest	2929 (44)	358 (44)	0.91	340 (42)	355 (44)	0.48
Chest pain	1433 (21)	170 (21)	0.73	165 (20)	170 (21)	0.81
Pulse, beats/min	83 (±21)	87 (±26)	<0.001	87 (±23)	87 (±26)	0.92
Systolic blood pressure, mm Hg	147 (±31)	159 (±35)	<0.001	160 (±35)	159 (±35)	0.57
Diastolic blood pressure, mm Hg	75 (±18)	80 (±21)	<0.001	80 (±20)	80 (±21)	0.97
Jugular venous pressure elevation	1713 (26)	203 (25)	0.68	206 (25)	202 (25)	0.86
Third heart sound	380 (6)	42 (5)	0.54	35 (4)	42 (5)	0.48
Pulmonary râles	4326 (65)	536 (66)	0.50	523 (65)	533 (66)	0.64
Lower extremity edema	4405 (66)	546 (67)	0.48	528 (65)	543 (67)	0.47
Laboratory values						
Serum sodium, mEq/L	137 (±11)	137 (±11)	0.62	137 (±10)	137 (±11)	0.88
Serum creatinine, mg/dL	1.5 (±1.1)	1.6 (±1.4)	0.008	1.5 (±1.1)	1.6 (±1.4)	0.29
Serum hemoglobin, g/dL	11.9 (±2.3)	11.9 (±2.2)	0.35	12.0 (±2.3)	11.9 (±2.2)	0.45
Serum brain natriuretic peptide, pg/mL	954 (±867)	942 (±833)	0.70	897 (±806)	944 (±834)	0.26
Serum troponin elevation*	1010 (15)	129 (16)	0.57	116 (14)	127 (16)	0.48
Discharge medication						
Angiotensin-converting enzyme inhibitors	3223 (48)	341 (42)	0.001	326 (40)	341 (42)	0.47
Angiotensin receptor blockers	905 (14)	132 (16)	0.036	137 (17)	131 (16)	0.74
β-blockers	4227 (63)	420 (52)	<0.001	432 (53)	418 (52)	0.49
Aldosterone antagonists	580 (9)	48 (6)	0.007	51 (6)	48 (6)	0.83
Diuretics	5438 (81)	645 (79)	0.16	640 (79)	641 (79)	1.00
Digoxin	1469 (22)	177 (22)	0.89	174 (22)	175 (22)	1.00
Nitrates	1629 (24)	208 (26)	0.45	206 (25)	207 (26)	1.00
Antiarrhythmic drugs	727 (11)	95 (12)	0.49	103 (13)	94 (12)	0.54
Aspirin	3102 (46)	355 (44)	0.14	337 (42)	352 (44)	0.48
Statins	2103 (31)	251 (31)	0.73	236 (29)	248 (31)	0.55

(*Continued*)

Table 1. Continued

Variables	Before Propensity Score Matching			After Propensity Score Matching		
	Use of CCB			Use of CCB		
Mean (±SD) or n (%)	No (n=6699)	Yes (n=815)	*P* Value	No (n=810)	Yes (n=810)	*P* Value
Hospital characteristics						
Beds (number)	392 (±240)	394 (±250)	0.82	385 (±233)	394 (±251)	0.43
Academic	2781 (42)	350 (43)	0.43	330 (41)	346 (43)	0.45
Interventional	5118 (76)	626 (77)	0.79	622 (77)	622 (77)	1.00
Transplant	878 (13)	114 (14)	0.48	114 (14)	114 (14)	1.00
Hospital location by region						
Midwest	2129 (32)	237 (29)	0.039	224 (28)	235 (29)	0.57
Northeast	1144 (17)	163 (20)		150 (19)	162 (20)	
South	2034 (30)	265 (33)		280 (35)	263 (33)	
West	1392 (21)	150 (18)		156 (19)	150 (19)	

*Determined by local laboratories.

regression and Kaplan-Meier analyses were used to determine associations of discharge prescriptions of CCBs with outcomes. Subgroup analyses were conducted to determine homogeneity of associations between CCB use and the primary composite end point. A formal sensitivity analysis was planned to estimate the degree of hidden bias that could potentially explain away a significant association among matched patients.[29] We then repeated our analyses in the prematch cohort using (1) unadjusted; (2) multivariable-adjusted, using all 114 baseline characteristics; and (3) propensity score–adjusted Cox regression models. We then compared matched patients receiving amlodipine and nonamlodipine CCBs (versus no CCBs). We repeated an above process to assemble second propensity-matched cohort using EF cutoff 50%. All statistical tests were 2-tailed with a P value <0.05 considered significant. SPSS for Windows version 21 (IBM Corp, Armonk, NY) was used for data analyses.

Results

Baseline Characteristics

Matched patients (n=1620) had a mean (±SD) age of 80 (±8) years, mean (±SD) left ventricular EF of 56% (±9), 65% were women, and 10% were black. Before matching, patients receiving a new prescription for CCBs were more likely to be younger, blacks, and had high left ventricular EF and higher prevalence of comorbidities, such as hypertension, chronic obstructive pulmonary disease, and peripheral vascular disease. They were also less likely to receive angiotensin-converting enzyme inhibitors, β-blockers, and aldosterone antagonists. These and other prematch imbalances were balanced after matching (Table 1; Figure 1). Absolute standardized differences for most of the baseline characteristics between the 2 treatment groups were <10%, suggesting substantial bias reduction (Figure 1).

Prescriptions for CCBs and Outcomes

During 6 years of follow-up, the primary composite end point of all-cause mortality or HF hospitalization occurred in 82% (666/810) and 81% (655/810) of matched patients with HFpEF receiving and not receiving new discharge prescriptions for CCBs, respectively (hazard ratio when the use of CCBs was compared with their nonuse, 1.03; 95% confidence interval, 0.92–1.14; P=0.638; Figure 2; Table 2). Because this association was not statistically significant, a formal sensitivity test was not performed.[29] The association between CCB prescription and the primary composite end point was homogeneous across various subgroups of patients, with the exceptions of black patients and patients having coronary artery disease (Figure 3). CCB users had no significant association with individual end point components of all-cause mortality and hospitalization (Table 2). Similar associations were observed in matched cohorts of HFpEF patients, defined by EF cutoff 50%.

Among 7514 prematch patients, hazard ratios (95% confidence intervals) for unadjusted, multivariable-adjusted, and propensity-adjusted associations for primary composite end point of all-cause mortality or HF hospitalization with the use of CCBs were 0.96 (0.89–1.04; P=0.352), 1.03 (0.95–1.12; P=0.494), and 1.02 (0.94–1.11; P=0.671; Table 2), respectively. Similar associations were observed with individual end point components of all-cause mortality and hospitalization (Table 2).

Outcomes by CCB Class

Compared with matched patients not receiving CCBs, hazard ratios (95% confidence intervals) for the primary composite end point of all-cause mortality or HF hospitalization

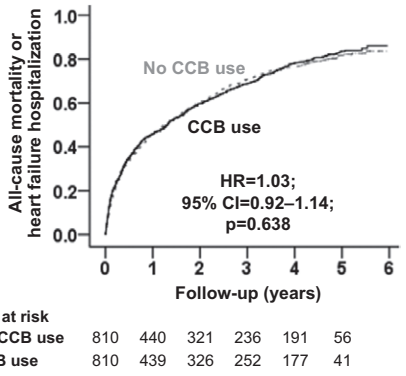

Figure 2. Kaplan-Meier plot for primary composite end point of all-cause mortality or heart failure hospitalization in a propensity-matched inception cohort of older patients with heart failure and preserved ejection fraction, receiving and not receiving a new discharge prescription for calcium channel blockers (CCB). CI indicates confidence interval; HR, hazard ratio.

Table 2. Association of a New Discharge Prescription of Calcium Channel Blockers (CCBs) With Outcomes in Inception Cohort of Hospitalized Older Patients With Heart Failure and Preserved Ejection Fraction (HFpEF)

Outcomes	% (Events/Total at Risk)		Hazard Ratio* (95% CI)	*P* Value
	Use of CCBs			
	No	Yes		
All-cause mortality or HF hospitalization				
Prematch unadjusted	83% (5547/6699)	82% (671/815)	0.96 (0.89–1.04)	0.35
Multivariable adjusted†			1.03 (0.95–1.12)	0.49
Propensity score adjusted‡			1.02 (0.94–1.11)	0.67
Propensity matched	81% (655/810)	82% (666/810)	1.03 (0.92–1.14)	0.64
All-cause mortality				
Prematch unadjusted	72% (4789/6699)	70% (574/815)	0.94 (0.87–1.03)	0.19
Multivariable adjusted†			1.03 (0.94–1.13)	0.55
Propensity score adjusted‡			1.00 (0.92–1.10)	0.95
Propensity matched	68% (550/810)	70% (569/810)	1.05 (0.94–1.18)	0.39
HF hospitalization				
Prematch unadjusted	44% (2955/6699)	45% (369/815)	1.00 (0.89–1.11)	0.94
Multivariable adjusted†			1.06 (0.94–1.18)	0.35
Propensity score adjusted‡			1.06 (0.95–1.19)	0.30
Propensity matched	44% (353/810)	45% (367/810)	1.05 (0.91–1.21)	0.53
All-cause hospitalization				
Prematch unadjusted	87% (5800/6699)	88% (713/815)	1.00 (0.93–1.09)	0.93
Multivariable adjusted†			1.03 (0.95–1.12)	0.50
Propensity score adjusted‡			1.02 (0.94–1.11)	0.58
Propensity matched	89% (719/810)	87% (708/810)	1.03 (0.93–1.14)	0.61

CI indicates confidence interval.

*Hazard ratios comparing patients receiving CCBs versus those not receiving these drugs.

†Adjusted for all 114 variables listed in Figure 1.

‡Adjusted for propensity score which was estimated for each patient in the prematch cohort using nonparsimonious logistic regression model.

associated with initiation of amlodipine (n=294) and nonamlodipine (n=510) CCBs use were 0.96 (0.82–1.11; *P*=0.543) and 1.08 (0.96–1.22; *P*=0.225), respectively (Table 3). Corresponding associations for total mortality, HF hospitalization, and all-cause hospitalization were displayed in Table 3.

Discussion

Findings from the current study demonstrate that in a wide spectrum of propensity-matched balanced cohort of older HFpEF patients, a new discharge prescription of CCBs had no association with the primary composite end point of all-cause mortality or HF hospitalization or with the secondary individual end points of all-cause mortality, HF hospitalization, and all-cause hospitalization. Furthermore, these associations were similar, regardless of whether the class of dihydropyridine (amlodipine) or nondihydropyridine (nonamlodipine) CCB was used. To the best of our knowledge, this is the first report examining the clinical effectiveness of CCBs in a nationally representative real-world population of HFpEF patients using a rigorously conducted propensity-matched design that provides insights into the role of CCBs in patients with HFpEF.

Hypertension is one of the leading causes of HFpEF in older adults, and CCB is one of the commonly prescribed antihypertensive drugs. Because there are currently no evidence-based guideline recommendations for the use of CCBs in HFpEF, these drugs were likely used for the control of BP and heart rate. These findings suggest that the negative inotropic and chronotropic effects of CCBs had no negative association with outcomes in HFpEF. CCBs have been shown to have variable effects on cardiovascular outcomes in HF patients.[30–34] In the small placebo-controlled crossover trials of older HFpEF patients, a nonamlodipine CCB, verapamil has been shown to improve exercise capacity, HF score, and LV diastolic function without any significant effect on BP and EF.[6,7] In addition, in patients with cardiomyopathy, verapamil and diltiazem had been shown to significantly improve symptoms by improvements in cardiac function and exercise tolerance.[35,36] In animal models, dihydropyridines prevent ischemia-induced increases in LV diastolic stiffness and improve diastolic performance in pacing-induced HF.[37]

According to AHA/ACC HF guidelines, most of the CCBs should be avoided in patients with heart failure and reduced ejection fraction (HFrEF) because of its negative inotropic effect and adverse cardiovascular events.[4] However, in the Prospective Randomized Amlodipine Survival Evaluation (PRAISE) trial, amlodipine had neutral effects on the long-term clinical outcomes in severe chronic HF patients.[32] Finding from the Survival and Ventricular Enlargement (SAVE) trial suggested that in postmyocardial infarction HFrEF patients,

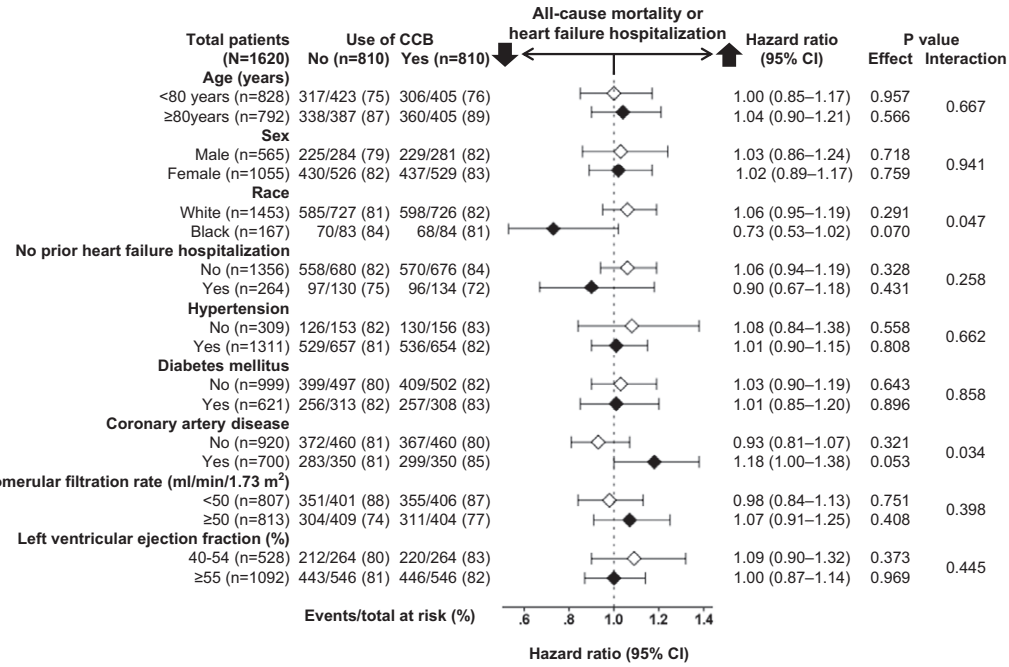

Figure 3. Association of a new discharge prescription for calcium channel blockers (CCB) with primary composite end point of all-cause mortality or heart failure hospitalization in subgroups of propensity-matched inception cohort of older patients with heart failure and preserved ejection fraction. CI indicates confidence interval.

nonrandomized use of CCBs had no association with subsequent cardiovascular outcome.[33] A subgroup analysis of the PRAISE trial, in contrast, demonstrated that amlodipine use was associated with 38% and 45% reduced risk of sudden death and pump failure death, respectively, in those with nonischemic HF.[31] However, the PRAISE II study demonstrated no improvement in clinical outcomes with amlodipine in patients with nonischemic HFrEF.[38] Taken together with findings from RCTs of CCBs in HFrEF, findings from the current study in HFpEF suggest that CCBs do not improve clinical outcomes in HF in general.

Table 3. Association of a New Discharge Prescription of Calcium Channel Blockers (CCBs) With Outcomes in Propensity-Matched Inception Cohort of Hospitalized Older Patients With Heart Failure and Preserved Ejection Fraction (HFpEF), by a Class of CCBs

	% (Events)			
	Use of CCBs		Hazard Ratio*	
Outcomes	No	Yes	(95% CI)	*P* Value
Amlodipine	(n=810)	(n=294)†		
All-cause mortality or HF hospitalization	81% (655)	81% (239)	0.96 (0.82–1.11)	0.54
All-cause mortality	68% (550)	66% (193)	0.92 (0.78–1.09)	0.34
HF hospitalization	44% (353)	47% (139)	1.03 (0.85–1.26)	0.74
All-cause hospitalization	89% (719)	89% (261)	0.99 (0.86–1.14)	0.87
Nonamlodipine	(n=810)	(n=510)†		
All-cause mortality or HF hospitalization	81% (655)	83% (424)	1.08 (0.96–1.22)	0.23
All-cause mortality	68% (550)	73% (373)	1.14 (1.00–1.30)	0.048
HF hospitalization	44% (353)	44% (226)	1.06 (0.90–1.26)	0.47
All-cause hospitalization	89% (719)	87% (442)	1.06 (0.94–1.19)	0.37

CI indicates confidence interval.
*Hazard ratios comparing patients receiving CCBs versus those not receiving CCBs.
†Excluded patients receiving both amlodipine and nonamlodipine CCBs.

Our study has several limitations. We acknowledge that the lack of information about the BP-lowering effect of CCBs in our data set is a limitation. If BP was lower in the CCB group during follow-up, then the equivalent outcome observed may have occurred despite a differential BP levels as BP has been shown to be associated with outcomes in patients with hypertension, although the association is less well established in patients with HF.[14,39,40] We had no data on dosages for individual drugs and postdischarge adherence. Substantial crossover during follow-up may result in potential regression dilution and underestimation of true associations, which may, in part, explain the null association observed in our study. However, findings from other studies suggest that the degree of such postdischarge crossover is generally modest and unlikely to completely nullify true associations.[41,42] As in any observational study, chance, bias, and confounding are potential alternate explanations, but unlikely given the observed null associations. Findings from this study are based on fee-for-service Medicare patients enrolled into OPTIMIZE-HF and may not be generalizable to all Medicare beneficiaries. However, Medicare-linked OPTIMIZE-HF patients have been shown to be characteristically and prognostically similar to HF patients in the general Medicare population.[28] Finally, the data for this study were collected from medical records and depended on the accuracy and completeness of clinical documentation.

In conclusion, in real-world hospitalized older HFpEF patients not receiving prior CCBs, a new discharge prescription for CCBs had no associations with the primary composite end point of total mortality or HF hospitalization and

individual end points of mortality or hospitalization, regardless of the class of CCBs.

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Disclosures

None.

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CLINICAL PERSPECTIVE

Approximately half of the estimated 6 million patients with heart failure (HF) in the United States have diastolic HF or HF with preserved ejection fraction (HFpEF). Small studies suggest that calcium channel blockers (CCBs) may improve HF score, exercise capacity, and diastolic function in HFpEF patients, although long-term effects are unknown. Therefore, in this current study, we examined the clinical outcomes associated with the use of CCBs in older patients with HFpEF. Of the 10 570 hospitalized HFpEF patients, aged ≥65 years, EF ≥40%, in the Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (OPTIMIZE-HF) registry (2003–2004), linked to Medicare data (through December 31, 2008), 7514 had no prior history of CCB use. Of these, 815 (11%) patients received new discharge prescriptions for CCBs. Propensity scores for CCBs use, calculated for each of the 7514 patients, were used to assemble a matched cohort of 1620 (810 pairs) patients (mean age, 80 years; mean EF, 56%; 65% women; 10% black) receiving and not receiving CCBs, balanced on 114 baseline characteristics. The primary composite end point of all-cause mortality or HF hospitalization occurred in 82% and 81% of patients receiving and not receiving CCBs (hazard ratio for CCBs, 1.03; 95% confidence interval, 0.92–1.14). Hazard ratios (95% confidence intervals) for all-cause mortality, HF readmission, and all-cause readmission were 1.05 (0.94–1.18), 1.05 (0.91–1.21), and 1.03 (0.93–1.14), respectively. Similar associations were observed when we categorized patients into those receiving amlodipine and nonamlodipine therapy. In conclusion, in real-world hospitalized older HFpEF patients, new discharge prescriptions for CCBs had no associations with the composite or individual end points of mortality or HF hospitalization, regardless of the class of CCBs.

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