BRIEF REPORT: β -Blocker Use Among Veterans with Systolic Heart Failure

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BACKGROUND: β -Blockers reduce mortality in patients with systolic chronic heart failure (CHF), yet prescription rates have remained low among primary care providers.

OBJECTIVE: To determine the β -blocker prescription rate among patients with systolic CHF at primary care Veterans Affairs (VA) clinics, its change over time; and to determine factors associated with nonprescription.

DESIGN: Retrospective chart review.

SUBJECTS: Seven hundred and forty-five patients with diagnostic codes for CHF followed in primary care clinics at 3 urban VA Medical Centers.

MEASUREMENTS: Rate of β -blocker prescription and comparison of patient characteristics between those prescribed versus those not prescribed β -blockers.

RESULTS: Only 368 (49%) had documented systolic CHF. Eighty-two percent (303/368) of these patients were prescribed a β -blocker. The prescription rate rose steadily over 3 consecutive 2-year time periods. Patients with more severely depressed ejection fractions were more likely to be on a β -blocker than patients with less severe disease. Independent predictors of nonprescription included chronic obstructive pulmonary disease, asthma, depression, and age. Patients under 65 years old were 12 times more likely to receive β -blockers than those over 85.

CONCLUSION: Primary care providers at VA Medical Centers achieved high rates of β -blocker prescription for CHF patients. Subgroups with relative contraindications had lower prescription rates and should be targeted for quality improvement initiatives.

KEY WORDS: heart failure; β -blockers; utilization; prescription rates; guideline adherence.

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Although many treatment advances in chronic heart failure (CHF) have been made over the past 2 decades, implementation into practice has been slow. Despite strong evidence for efficacy of β -blockers in reducing mortality in patients with systolic CHF since the mid-1990s¹⁻³ recent studies report utilization rates well below 50%.⁴⁻⁷

Initial resistance to using β -blockers was understandable, as it required a paradigm shift in the pathophysiology of CHF.⁸ However, nearly a decade after publication of large randomized

trials strongly recommending β -blocker therapy for stable CHF, it is unclear why use of these medications remains so low. Specialized heart failure clinics and cardiologists prescribed β -blockers for CHF patients more often than primary care physicians.^{4,9} Because most CHF patients are managed by primary care physicians, it is imperative to focus efforts on improving care in this population. Little is known about determinants of β -blocker prescription for patients with CHF. A few studies suggest that physicians are less likely to start β -blockers in elderly patients, patients with chronic obstructive pulmonary disease (COPD), and those with diabetes.^{7,10} This is despite evidence that many patients with diabetes and COPD can be safely treated with β -blockers.¹¹⁻¹³ Understanding determinants of β -blocker prescription in primary care will help target interventions at improving care for patients with CHF.

We sought to (1) determine the rate of β -blocker prescription among patients with systolic CHF at urban primary care VA clinics, and its change over time; and (2) determine factors associated with nonprescription of β -blockers in these patients.

METHODS

Study Sample

We conducted a retrospective chart review of primary care patients at 3 New York City VA Medical Centers. The Institutional Review Board at all 3 centers approved this study. We identified all patients with *International Classification of Disease, Ninth Revision* (ICD-9) codes for CHF (428.x) seen in primary care clinics between August, 2002 and August, 2004. Of the 2,320 patients, we excluded 1,082 patients who had <3 visits to their primary care provider over the study period or who had a diagnosis of diastolic heart failure alone (ICD-9 codes 428.30 to 428.33). From the remaining 1,238 eligible patients, we randomly selected 745 patients for study. With 745 patients we could estimate a prevalence of prescription of 80% with a 95% confidence interval (95% CI) of $\pm 5\%$ to ensure a sufficient sample to model up to 15 variables in the regression model.

Measurements

Two trained reviewers used the VA's electronic medical record to abstract predefined patient information. The primary outcome was β -blocker prescription status at the most recent visit, dichotomized as current versus not currently prescribed.

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Those not currently on a β -blocker were split into previously versus never prescribed. Reviewers collected demographic factors (e.g., age, gender, race, site of care), characteristics of care (number of visits, visit to cardiologist, current medications), number of comorbidities, and presence of adverse reactions or symptoms related to β -blockers. Ejection fraction (EF) was determined from reports of echocardiograms, radionuclide ventriculograms, or gated single photon emission tomograms. For patients in whom multiple evaluations were performed, the most recent EF result was used. Because 1 site reported EF categorically (as mild, moderate, or severe dysfunction), we summarized these categories for the entire sample as mild=41% to 45%, moderate=31% to 40%, and severe $\leq$ 30%. The type and dose of β -blocker were also noted. The β -blockers available for use included carvedilol, metoprolol, atenolol, and propranolol. No combination agents (e.g., β -blocker with diuretic) were available. Additionally, if previously prescribed during the study period, the reviewer sought documentation of reasons for discontinuation. Guidelines and training were provided to reviewers to standardize record abstraction. We also assessed β -blocker prescription rates during the previous two 2-year periods, 1998 to 2000, and 2000 to 2002. To allow us to detect a prevalence difference of 20% (e.g., 60% vs 80%), 100 patients were randomly selected from each period using the same inclusion and exclusion criteria as in the main study period.

Statistical Analysis

Clinical and demographic characteristics were compared between patients prescribed and not prescribed β -blockers using χ^2 tests and *t*-tests as appropriate. Change in prescription rates over time was assessed with χ^2 tests. Factors significantly associated with β -blocker prescription in bivariate analyses were entered in logistic regression models to determine independent predictors of prescription. We considered *P* values $< .05$ to be significant, without correction for multiple comparisons. Interrater agreement on β -blocker prescription status between the research assistants was assessed using the κ statistic on a 10% subset.¹⁴

Results

Seven hundred and forty-five patients were identified with an *International Classification of Diseases-Ninth Revision* (ICD-9) diagnosis of CHF and at least 3 primary care visits during the study period. Of these, 168 (23%) had no documented EF and 209 (28%) had preserved systolic function (EF $> 45\%$). The final study sample was therefore 368 established primary care patients with documented systolic CHF.

The average age of our sample was 72.9 years old, with 20% self-identified as African Americans. The overall β -blocker prescription rate was 82% (95% CI, 78.4% to 86.3%). The most commonly prescribed agents were carvedilol (43%), metoprolol (42%), and atenolol (15%). The average daily dose was 23 mg of carvedilol and 78 mg of metoprolol. Of the 65 patients not currently prescribed β -blockers, 49% had previously been prescribed one, and 52% had documented reasons for discontinuation or contraindication. The time-series analysis suggested a consistent improvement over 6 years. β -Blocker prescription rates rose from 45% in 1998 to 2000 to 64% in 2000 to 2002 to 82% in the current period, 2002 to 2004, $P < .001$. Complete

agreement between the 2 reviewers regarding prescription status was substantial (90%) with a κ of 0.71.

Table 1 shows characteristics of the sample by prescription status. β -Blockers were prescribed less often to older patients but were not associated with patient race, clinical site, physician specialty, cardiologist consultation, or number of visits during the study period. A number of clinical characteristics were associated with β -blocker prescription. Forty-three percent had a severely depressed EF and were more likely to be on β -blockers than those with only a mildly depressed EF. Patients currently prescribed β -blockers had a greater total number of prescribed medications and a lower total number of comorbidities. Patients with hypertension were more likely to be on β -blockers while patients with peripheral vascular disease, COPD, asthma, and any malignancy were less likely to be on β -blockers. Patients with depressive symptoms, symptomatic bradycardia, or any heart block were less likely to be on β -blockers. Patients on β -blockers were more likely to be prescribed ace-inhibitors, spironolactone, and statins.

In the logistic regression model (Table 2), β -blockers were increasingly less likely to be prescribed as patients got older, with 67% of patients over 85 years currently prescribed versus 84% of younger patients. Patients with severely depressed ventricular function (EF $\leq 30\%$) were 75% more likely to be on a β -blocker than patients with less severe disease. Patients with COPD, asthma, and depression were also less likely to receive a β -blocker prescription.

DISCUSSION

The prescription rate for β -blockers in our sample was 82%, approaching rates found in randomized-controlled trials^{1,2} and exceeding rates reported in observational studies.⁷ Although we excluded patients with an EF $> 45\%$, studies using similar EF cutoffs did not yield such high prescription rates.⁴ Nearly 25% of patients had no documented EF, and another quarter had an EF $> 45\%$. Including patients with EF $> 45\%$ would have lowered our prescription rates as these patients received fewer β -blockers in our study and others.⁵

Our findings contrast recent reports that patients treated by primary care physicians receive fewer β -blockers than those treated by cardiologists.^{5,15} Our study also countered previous studies, which found that patients with depressed EF generally receive fewer prescriptions.¹⁶ This is encouraging as this population tends to have higher mortality.¹⁷

Our rates were consistently higher at each time period than other studies.⁷ Improvement from passive dissemination of guidelines over time may also explain high prescription rates.¹⁸ Computerized clinical reminders for β -blockers in CHF were not in use during this study period.

Despite high prescription rates at our sites, patients with COPD, asthma, and the elderly still may have been underprescribed. Other investigators have identified these subgroups as less likely to receive β -blockers, despite a mortality benefit.^{6,11} As most patients with CHF and concomitant COPD without active wheezing can be safely maintained on cardioselective β -blockers, this is an area where physicians can improve CHF care.¹⁹ Elderly patients generally tolerate β -blockers well, and improvement for these patients is also possible.^{16,20}

In this retrospective chart review, it was not feasible to blind reviewers' assessment of β -blocker status to other

Table 1. Characteristics of the Sample Associated with β -blocker Prescription

	β -Blocker Prescription Status	
	Currently Prescribed (n=303)	Never/Previously Prescribed (n=65)
	N=303	N=65
Demographics		
Age (mean $\pm$ SE)*	72 $\pm$ 10.4	77 $\pm$ 8.4
Race		
% African American	20	20
% White	47	45
% Other/missing	33	35
Practice		
Clinical site		
% Manhattan	27	22
% Brooklyn	30	26
% Bronx	43	52
Primary provider specialty		
% Primary care	86	79
% Cardiology	7	9
% Other	7	12
% With cardiology consultation	67	59
Number of visits (mean $\pm$ SE)	5.6 $\pm$ 1.45	5.2 $\pm$ 1.55
Clinical		
% With ejection fraction**		
% Mild (41% to 45%)	16	32
% Moderate (31% to 40%)	38	35
% Severe ($\leq$ 30%)	46	32
Number of medications (mean $\pm$ SE)*	4.7 $\pm$ 1.37	4.2 $\pm$ 1.70
Cardiovascular comorbidities (%)		
Peripheral vascular disease*	18	31
Myocardial infarction	38	3
Cerebrovascular disease	13	18
Other comorbidities (%)		
Chronic obstructive pulmonary disease***	18	38
Asthma***	5	18
Hypertension*	78	66
Any malignancy*	20	31
Hyperlipidemia	68	60
Coronary artery disease	61	54
Diabetes	47	38
Atrial fibrillation	29	40
Renal disease	26	34
Permanent pacemaker/defibrillator	23	20
Rheumatologic conditions	15	12
Erectile dysfunction	14	15
Liver disease	11	11
Depression	8	14
Peptic ulcer disease	7	9
Dementia	5	6
Comorbidity score (mean total $\pm$ SD)*	4.8 $\pm$ 1.86	5.3 $\pm$ 2.02
% With symptoms documented:		
Depressive symptoms**	6	18
Symptomatic bradycardia (HR < 60)**	3	11
Any heart block*	3	9
Decompensated CHF	33	26
Dizziness	11	17
Hypotension (SBP < 85)	4	6
Fatigue	3	3
Rash	0	2
Bronchospasm	0	5

* $P < .05$; ** $P < .01$; *** $P < .001$.

CHF, chronic heart failure; SBP, systolic blood pressure; HR, heart rate.

Table 2. Multivariate Logistic Model of Factors Independently Associated with β -Blocker Prescription

Patient Characteristic	Adjusted Odds Ratio (95% CI)*	P-value
Age < 65	Reference	
Age 65 to 74	0.21 (0.06 to 0.80)	.022
Age 75 to 84	0.15 (0.04 to 0.53)	.003
Age 85+	0.08 (0.02 to 0.34)	< .0001
Severe EF	1.75 (0.94 to 3.26)	.079
COPD	0.39 (0.20 to 0.77)	.006
Asthma	0.21 (0.08 to 0.56)	.002
Depression	0.34 (0.13 to 0.89)	.028

*Model was adjusted for clinical practice site, race, and total number of medications.

CI, confidence interval; EF, ejection fraction; COPD, chronic obstructive pulmonary disease.

features of the patients. It is possible that simultaneously collecting information on predictors and prescription status may have modestly increased the prescription rate. Prescription status may not reflect medication adherence by patients. Documentation in charts may underestimate actual practice. Veterans in 3 New York City VA Medical Centers may not represent the general population.

Conclusion

Primary care providers at VA Medical Centers achieved high rates of β -blocker prescription (82%) for CHF patients, rates similar to those found in large clinical trials. These rates have steadily increased over the last 6 years, perhaps reflecting dissemination of evidence and guidelines among physicians and increasing attention to performance quality at VA nationally.²¹ Patients with the most severe systolic dysfunction received β -blockers at the highest rates. Common reasons for patients not being on β -blockers included advanced age, COPD, asthma, and depression. While these conditions have been viewed as relative contraindications to β -blocker use in the past, recent large trials suggest that benefits may outweigh risks in these patients. Additionally, half the patients with a CHF diagnosis lacked documentation of ventricular dysfunction, an area that warrants further study and improvement. Further research is necessary to determine the best strategies for improving care of CHF patients at other VA and non-VA settings.

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