Clinical Investigations

Use of Guideline-Recommended Therapies for Heart Failure in the Medicare Population

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ABSTRACT

Background: Most information about the use of guideline-recommended therapies for heart failure reflects what occurred at discharge after an inpatient stay.

Hypothesis: Using a nationally representative, community-dwelling sample of elderly Medicare beneficiaries, we examined how the use of angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), and β-blockers has changed and factors associated with their use.

Methods: Using data from the Medicare Current Beneficiary Survey cost and use files matched with Medicare claims data, we identified beneficiaries for whom a diagnosis of heart failure was reported between January 1, 2000, and December 31, 2004. Data on medications prescribed during the year of cohort entry were based on patient self-report. We used multivariable logistic regression to explore relationships between the use of ACE inhibitors/ARBs and β-blockers and patient demographic characteristics.

Results: From 2000 through 2004, the use of ARBs increased from 12% to 19%, and the use of β-blockers increased from 30% to 41%. The use of ACE inhibitors remained constant at 45%. Beneficiaries who reported having prescription drug insurance coverage were 32% more likely than other beneficiaries to have filled a prescription for an ACE inhibitor or ARB and 26% more likely to have filled a prescription for a β-blocker.

Conclusions: Although the use of guideline-recommended therapies for heart failure has increased, it remains suboptimal.

Introduction

The number of elderly persons with heart failure increased to more than 4 million in 2003,[1] and the care of these patients accounts for nearly $40 billion in health care costs.[2] Within 1 year of diagnosis, two-thirds of patients with heart failure will be readmitted and more than 1 in 3 will die.[3] Use of angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), and β-blockers reduces mortality and readmission rates among patients with heart failure.[3–5] Although guidelines from the American College of Cardiology and the American Heart Association recommend a combination of these therapies for the management of heart failure unless contraindicated,[5] the therapies are often underprescribed.[6,7] However, most information about the use of guideline-recommended therapies for heart failure is based on what occurs at discharge after an inpatient stay.[6,8–11]

The purpose of this study was to examine the use of recommended therapies for heart failure in a nationally representative, community-dwelling sample of elderly Medicare beneficiaries. Specifically, we examined how the use of ACE inhibitors, ARBs, and β-blockers has changed and factors associated with their use.

Methods

Data Sources

We used data from the cost and use files of the 2000–2004 Medicare Current Beneficiary Survey (MCBS) matched with Medicare claims data. The MCBS is a continuous, rotating panel survey of a nationally representative sample of approximately 12 000 elderly, disabled, and institutionalized Medicare beneficiaries conducted by the Centers for Medicare & Medicaid Services (CMS).[12] The MCBS contains information about beneficiaries' use of health care services and costs, health insurance coverage, sources of payment, functional status, and demographic characteristics. The data are obtained from participant self-report and CMS administrative data sources and include survey weights to allow for the calculation of national estimates. Matched Medicare Part A and Part B claims are available for all survey participants. Data are collected

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3 times per year from participants through computer-assisted personal interviews.

Study Population

The institutional review board of the Duke University Health System approved this study. We obtained the MCBS cost and use files and matched Medicare claims data from CMS for the period January 1, 2000, through December 31, 2004. Using the matched claims data, we identified community-dwelling beneficiaries for whom a primary or secondary diagnosis of heart failure (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] 428.xx, 402.x1, 404.x1, or 404.x3) was reported on a single inpatient claim or at least 2 outpatient or carrier claims between January 1, 2000, and December 31, 2004. The date of cohort entry, or index date, was defined as the earlier of the date of the first inpatient heart failure diagnosis or the date of the second outpatient or carrier diagnosis. We included only US residents age ≥65 years on the index date. Data on demographic characteristics and health care resource use were obtained for the survey year of the index date.

Data on medications prescribed during the year of cohort entry were obtained from patient self-report. Survey participants are asked to provide prescription containers to the interviewers at the time of the survey to ensure accurate recall of medication use and to minimize underreporting.[13,14] ACE inhibitors included benazepril, captopril, enalapril, fosinopril, lisinopril, moexipril, perindopril, quinapril, ramipril, and trandolapril. ARBs included candesartan, eprosartan, irbesartan, losartan, olmesartan, telmisartan, and valsartan. β-blockers included acebutolol, atenolol, betaxolol, bisoprolol, carteolol, carvedilol, esmolol, labetalol, metoprolol, nadolol, penbutolol, pindolol, propranolol, sotalol, and timolol.

Statistical Analysis

We used basic descriptive statistics to characterize the study population and to examine prescription medication use over time. We present categorical variables as unweighted frequencies with weighted percentages. We present continuous variables as means with standard errors. We used the CMS-reported race category "black" and combined all others and missing values as "nonblack."[15] We used multivariable logistic regression to explore relationships between the use of an ACE inhibitor/ARB or β-blocker and patient demographic characteristics, including age, sex race, geographic region, urban residence, household income, health and functional status, information about supplemental health insurance and prescription drug coverage, and year of cohort entry. We used SAS version 9.1.3 (SAS Institute Inc., Cary, NC) for all analyses.

Results

There were 2689 elderly, community-dwelling Medicare beneficiaries with heart failure identified between January 1, 2000, and December 31, 2004 (weighted, 8 288 306). Table 1 shows the characteristics of the study population. Mean age was 79 years, 44% were men, and 72% lived in an urban location. More than half (52%) of the beneficiaries with heart failure reported their general health as "good" or better as compared with others of the same age. However, 41% reported being unable to walk a quarter mile or 2 to 3 blocks, and 40% reported their health as "somewhat worse" or "much worse" than in the previous year.

Use of Prescription Medications

Overall, 43% of beneficiaries were prescribed an ACE inhibitor, 58% were prescribed an ACE inhibitor/ARB, and 35% were prescribed a β-blocker. The use of ARBs and β-blockers increased steadily during the study period, and the use of ACE inhibitors remained steady (Table 2).

In multivariable analysis, beneficiaries who reported having prescription drug insurance coverage were 32% more likely to have filled a prescription for an ACE inhibitor/ARB during the year in which the initial heart failure diagnosis was made (Table 3). Compared with beneficiaries diagnosed with heart failure in 2000, beneficiaries diagnosed in 2004 were 38% more likely to have filled a prescription for an ACE inhibitor/ARB. Beneficiaries who lived in the Midwest region were nearly 40% more likely to report receiving an ACE inhibitor/ARB than those who lived in the West.

Likewise, after adjustment for other variables, beneficiaries with any prescription drug insurance coverage were 26% more likely to have filled a prescription for a β-blocker. Compared with beneficiaries diagnosed with heart failure in 2000, those diagnosed in 2003 were 40% more likely and those diagnosed in 2004 were 62% more likely to have filled a prescription for a β-blocker. Beneficiaries with an income of $20 001 to $30 000 were 35% more likely to have filled a prescription for a β-blocker than those with household income ≥$30 000. Beneficiaries in the northeastern United States were 41% more likely to report receiving a β-blocker than those who lived in the western United States.

Discussion

We examined the use of guideline-recommended therapies for heart failure in a nationally representative, community-dwelling sample of elderly Medicare beneficiaries. Although the use of some guideline-recommended therapies, particularly β-blockers, increased substantially between 2000 and 2004, these therapies remain underprescribed. Overall rates of use were lower than what has been previously

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Table 1. Characteristics of the Study Population

Characteristic	Patients
No. of beneficiaries in MCBS (weighted)	57 233 (195 320 032)
No. of beneficiaries in MCBS with heart failure (weighted)	2689 (8 288 306)
Age, mean, y (SE)	79 (0.2)
Male, n (%)	1187 (44.4)
Race, n (%)	
Black	278 (9.9)
Nonblack	2411 (90.1)
US Census region, n (%)	
Midwest	668 (24.5)
Northeast	545 (21.4)
South	1076 (40.0)
West	400 (14.1)
Urban residence, n (%)	1828 (71.8)
Household income, n (%)	
≤$10 000	662 (23.3)
$10 001–$20 000	933 (34.4)
$20 001–$30 000	567 (26.7)
≥$30 001	527 (20.2)
General health compared with others of the same age, n (%)	
Excellent	141 (5.0)
Very good	410 (15.0)
Good	872 (32.1)
Fair	796 (29.6)
Poor	470 (18.3)
Health compared with 1 y ago, n (%)	
Much better	106 (4.5)
Somewhat better	350 (13.5)
About the same	1133 (41.7)
Somewhat worse	844 (30.9)
Much worse	256 (9.5)
Unable to walk 0.25 miles or 2 to 3 blocks, n (%)	1127 (40.5)
Medicaid coverage during y, n (%)	537 (19.4)
Managed care coverage during y, n (%)	244 (9.4)
Any prescription drug insurance coverage, n (%)	1936 (72.6)

Abbreviations: MCBS, Medicare Current Beneficiary Survey; n, number of patients; SE, standard error.

reported. We also found a strong association between having prescription drug insurance coverage and the use of guideline-recommended therapies for heart failure.

Just more than 40% of beneficiaries with heart failure used an ACE inhibitor, slightly more than half used an ACE inhibitor/ARB, and one-third used a β-blocker. These rates contrast starkly with reports from previous studies. For example, a study of the National Heart Care cohort to examine medications prescribed at discharge among Medicare beneficiaries hospitalized with heart failure from 2000 to 2001 showed that 53% of patients received an ACE inhibitor, 64% received an ACE inhibitor/ARB, and nearly 40% received a β-blocker.[11] Other studies have reported much higher rates of prescription of these medications, likely because they restricted the study population to patients with left ventricular systolic dysfunction and ejection fraction <40%.[8,16]

There are several possible explanations for the differences in rates of medication use we observed. First, most previous studies of ACE inhibitor/ARB and β-blocker use have relied on data from hospital discharge in the context of quality-improvement efforts. Documentation of medications prescribed at discharge and actual use of those medications after discharge may differ. Patients may receive several prescriptions when they leave the hospital but not actually fill those prescriptions.

Second, beneficiaries in our sample may have been unable to tolerate the medications or had contraindications for their use, and therefore did not fill prescriptions or may have stopped taking the medications. However, this is an unlikely explanation, given our finding that beneficiaries who reported their health status compared with 1 year ago as "much worse" were not less likely to use an ACE inhibitor/ARB or β-blocker than those who reported their health status as "much better."

Third, lack of prescription drug insurance may have contributed to the low rates of medication use we observed. Beneficiaries with prescription drug coverage were approximately 30% more likely to have used an ACE inhibitor/ARB or β-blocker. This finding is consistent with previous studies that have found an association between prescription drug coverage and the use of guideline-recommended therapies. For example, in a sample of

Table 2. Use of Prescription Medications, 2000–2004

Medication	Year					*P* Value[a]
	2000 (n = 725)	2001 (n = 502)	2002 (n = 501)	2003 (n = 540)	2004 (n = 421)	
No. of beneficiaries, weighted	2 081 397	1 560 445	1 564 915	1 692 113	1 389 436	
ACE inhibitor, n (weighted %)	329 (45.2)	211 (41.8)	207 (40.7)	227 (40.4)	192 (45.3)	<0.001
ARB, n (weighted %)	88 (12.1)	68 (14.0)	68 (13.4)	86 (16.4)	82 (19.2)	<0.001
β-Blocker, n (weighted %)	215 (30.2)	169 (34.9)	168 (32.2)	203 (37.0)	170 (40.5)	<0.001

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; n, number of patients.
[a] *P* values are from χ^2 tests.

Medicare beneficiaries with multiple chronic conditions enrolled in a health maintenance organization, those with drug coverage acquired medications in significantly more therapeutic classes than those without drug coverage.[17] In another study, Medicare beneficiaries with diabetes who had any drug coverage were more likely than those without drug coverage to use an ACE inhibitor/ARB and a statin.[18] Beneficiaries who lack prescription drug coverage may be less apt to obtain medications to avoid high out-of-pocket costs, or their physicians may not prescribe certain medications due to lack of coverage.[17,19]

The Medicare outpatient prescription drug benefit (Medicare Part D) was implemented in 2006 to offset high out-of-pocket costs and increase access to medications for Medicare beneficiaries. However, even after enactment of the Medicare Part D benefit, approximately 10% of beneficiaries remain without prescription drug coverage.[20] Among previously uninsured elderly beneficiaries, enrollment in Medicare Part D has resulted in increased use of medication7s,[21] but further research is needed to verify whether Medicare Part D has had an impact on the use of guideline-recommended medications for heart failure.

Although guideline-recommended therapies for heart failure remain underused, the use of β-blockers (10%) and ARBs (7%) has increased. This trend is consistent with other studies in outpatient settings. For example, Kramer et al[22] found a 30% increase in the annual prevalence of β-blocker use but found low rates of β-blocker use among North Carolina residents who were dually eligible for Medicare and Medicaid in the 30 days after discharge from a heart failure hospitalization.[23] The percentage of beneficiaries in this study who had supplemental Medicaid coverage (20%) was slightly higher than Medicare national estimates of dually eligible beneficiaries,[20] suggesting that our study population may have had poorer health.[24] Our findings extend previous studies showing that β-blockers are underused among dually eligible beneficiaries and highlight the need to develop strategies to increase use of guideline-recommended therapies.

Similarly, Setoguchi et al[4,25] examined 10-year trends in medication use among community-dwelling elderly patients in a pharmacy assistance program in New Jersey and Pennsylvania. They found an increase in the use of ARBs of nearly 20% after hospitalization for heart failure and a 33% increase in use of β-blockers after hospitalization for myocardial infarction. However, the use of ACE inhibitors did not increase. We also observed a lack of growth in ACE inhibitor use, which may be attributable to practice guidelines that recommend ARBs as an acceptable alternative to ACE inhibitors for heart failure.[5]

The rise in ARB and β-blocker use we observed likely reflects improved adherence to practice guidelines. After controlling for other factors, patients diagnosed with heart failure in 2003 or 2004 were more likely than those diagnosed in 2000 to be prescribed an ACE inhibitor/ARB or β-blocker, consistent with prior evidence that there is often a delay in the translation of efficacy findings from clinical research to adoption in clinical practice.[26]

This is the first study to assess the use of all 3 guideline-recommended therapies for heart failure in a large, nationally representative, community-dwelling sample of Medicare beneficiaries. Previous studies used geographically limited samples[4,23,27] or were based on managed care populations[17] and were thus unable to be generalized to the larger US population.

The study has some limitations. First, medication use was based on self-report, which may have resulted in underreporting.[28] However, steps were taken by the interviewers to ensure accurate recall. Second, the MCBS does not contain detailed clinical information. Thus, we were unable to assess contraindications to therapy, such as hyperkalemia for ACE inhibitors/ARBs or bronchospasm for β-blockers.[29] In addition, we did not have information on left ventricular systolic function as measured by ejection fraction, an important factor in the treatment of heart failure.[5] Third, because our findings were based on filled prescriptions, we did not have information on prescriptions patients received but did not fill or the extent to which physicians did not prescribe medications.[25,28]

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Table 3. Factors Associated With Medication Use

Variable	OR (95% CI) ACE Inhibitor/ARB	OR (95% CI) β-Blocker
Age	1.00 (0.97–1.01)	0.99 (0.98–1.00)
Male sex	0.96 (0.81–1.14)	1.06 (0.89–1.26)
Race		
Black	1.21 (0.92–1.59)	1.02 (0.76–1.37)
Nonblack	1.00 [Reference]	1.00 [Reference]
US Census region		
Midwest	1.38 (1.06–1.79)	1.30 (0.98–1.73)
Northeast	1.18 (0.90–1.55)	1.41 (1.05–1.90)
South	0.89 (0.70–1.13)	1.11 (0.85–1.46)
West	1.00 [Reference]	1.00 [Reference]
Urban residence	0.85 (0.71–1.02)	0.96 (0.79–1.16)
Household income		
≤$10 000	1.02 (0.75–1.37)	1.11 (0.81–1.52)
$10 001–$20 000	0.99 (0.78–1.26)	1.19 (0.93–1.53)
$20 001–$30 000	1.13 (0.87–1.46)	1.35 (1.04–1.76)
≥$30 001	1.00 [Reference]	1.00 [Reference]
Unable to walk 0.25 miles or 2 to 3 blocks	1.08 (0.90–1.29)	0.90 (0.74–1.08)
Health compared with 1 year ago		
Much better	1.00 [Reference]	1.00 [Reference]
Somewhat better	1.00 (0.62–1.61)	1.34 (0.81–2.22)
About the same	0.84 (0.54–1.31)	1.14 (0.72–1.82)
Somewhat worse	1.05 (0.67–1.64)	1.50 (0.94–2.40)
Much worse	0.81 (0.49–1.35)	1.59 (0.93–2.72)
Medicaid coverage during year	0.86 (0.66–1.10)	0.80 (0.61–1.05)
Managed care coverage during year	1.04 (0.79–1.36)	0.95 (0.70–1.28)
Any prescription drug insurance coverage	1.32 (1.09–1.60)	1.26 (1.04–1.54)
Cohort year		
2000	1.00 [Reference]	1.00 [Reference]
2001	1.04 (0.82–1.32)	1.22 (0.94–1.58)
2002	0.93 (0.73–1.19)	1.10 (0.85–1.43)
2003	1.00 (0.79–1.27)	1.40 (1.09–1.80)
2004	1.38 (1.07–1.80)	1.62 (1.24–2.13)

Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; CI, confidence interval; OR, odds ratio.

Conclusion

Although the use of guideline-recommended therapies for heart failure such as ARBs and β-blockers has increased over time, their use in community-dwelling elderly Medicare beneficiaries remains suboptimal. Moreover, beneficiaries with prescription drug coverage were more likely to use ACE inhibitors/ARBs and β-blockers, therapies that reduce mortality and the likelihood of costly readmissions among patients with heart failure.

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