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Underutilization of High-Intensity Statin Therapy After Hospitalization for Coronary Heart Disease

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ABSTRACT

BACKGROUND National guidelines recommend use of high-intensity statins after hospitalization for coronary heart disease (CHD) events.

OBJECTIVES This study sought to estimate the proportion of Medicare beneficiaries filling prescriptions for high-intensity statins after hospital discharge for a CHD event and to analyze whether statin intensity before hospitalization is associated with statin intensity after discharge.

METHODS We conducted a retrospective cohort study using a 5% random sample of Medicare beneficiaries between 65 and 74 years old. Beneficiaries were included in the analysis if they filled a statin prescription after a CHD event (myocardial infarction or coronary revascularization) in 2007, 2008, or 2009. High-intensity statins included atorvastatin 40 to 80 mg, rosuvastatin 20 to 40 mg, and simvastatin 80 mg.

RESULTS Among 8,762 Medicare beneficiaries filling a statin prescription after a CHD event, 27% of first post-discharge fills were for a high-intensity statin. The percent filling a high-intensity statin post-discharge was 23.1%, 9.4%, and 80.7%, for beneficiaries not taking statins pre-hospitalization, taking low/moderate-intensity statins, and taking high-intensity statins before their CHD event, respectively. Compared with beneficiaries not on statin therapy pre-hospitalization, multivariable adjusted risk ratios for filling a high-intensity statin were 4.01 (3.58–4.49) and 0.45 (0.40–0.52) for participants taking high-intensity and low/moderate-intensity statins before their CHD event, respectively. Only 11.5% of beneficiaries whose first post-discharge statin fill was for a low/moderate-intensity statin filled a high-intensity statin within 365 days of discharge.

CONCLUSIONS The majority of Medicare beneficiaries do not fill high-intensity statins after hospitalization for CHD. (J Am Coll Cardiol 2015;65:270–7) © 2015 by the American College of Cardiology Foundation.

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Among patients discharged after a hospitalization for coronary heart disease (CHD) or acute coronary syndrome (ACS), high-intensity atorvastatin therapy has been shown in randomized controlled trials to be more effective than either placebo or low/moderate-intensity therapy with pravastatin or atorvastatin in reducing recurrent cardiovascular disease events (1–3). Thus, the recent

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American College of Cardiology/American Heart Association (ACC/AHA) Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults recommends initiation of high-intensity statin therapy in CHD patients (4). This is particularly relevant for ACS patients in whom initiation of this therapy is recommended before hospital discharge (5).

Data from clinical registries suggest that more than 80% of patients are prescribed statins after a myocardial infarction (MI) or coronary revascularization (6,7). However, few prior studies have reported the percentage of patients who filled their prescriptions for high-intensity statins after CHD events. In the PREMIER (Prospective Registry Evaluating outcomes after Myocardial Infarctions: Events and Recovery) and TRIUMPH (Translational Research Investigating Underlying Disparities in Acute Myocardial Infarction Patients' Health status) registries, only one-third of patients filled a high-intensity statin prescription after hospitalization for MI (8). Factors associated with being discharged on a high-intensity statin were not reported, and at 365 days after discharge, the only variable associated with being on intensive statin therapy was the prescribed statin intensity at discharge.

One challenge that may contribute to underuse of high-intensity statins after CHD events remains a suboptimal hospital discharge process. This process should include medication reconciliation, yet in prior studies, many patients have not understood changes to the medications they were being administered pre-hospitalization or the reasons for these changes (9–13). Since most patients having a CHD event are on statins before the event, it is possible that many such patients may simply return to their previous schedule of medications.

The role of prior statins as determinants of post-discharge high-intensity statin use has not been well studied. The goal of the current study was to determine the percent of Medicare beneficiaries filling high-intensity statins as their first statin prescription fill, and within 365 days, after a CHD hospitalization. Further, we evaluated factors, including intensity of statin therapy before hospitalization, associated with filling prescriptions for high- versus low/moderate-intensity statin therapy after hospital discharge.

METHODS

We conducted a retrospective cohort study of Medicare beneficiaries using the 2006 to 2010 national 5% random sample from the Centers for Medicare and Medicaid Services (CMS). Medicare is a U.S. federal benefit program that provides health insurance to individuals 65 years of age and older, on disability, or who have end-stage renal disease (ESRD), through either individual fee-for-service claims or contracts with health care organizations. Specific data used for the current analyses include claims from Medicare fee-for-service Parts A (inpatient), B (outpatient), and D (prescription drug). Medicare claims and assessment data are linked by beneficiary across the continuum of care. The CMS and the institutional review board at the University of Alabama at Birmingham approved the study.

Medicare beneficiaries who experienced a CHD event, including hospitalization for acute MI or coronary revascularization (coronary artery bypass graft [CABG] surgery or percutaneous coronary intervention [PCI]) in 2007, 2008, or 2009 formed the base population for our analyses. We used International Classification of Diseases-Ninth Edition-Clinical Modification (ICD-9-CM) and current procedure terminology (CPT) codes to identify these events. Acute MI was defined using ICD-9-CM code 410.xx (except 410.x2, which indicates a subsequent episode of care) in any discharge diagnosis position on an inpatient file record. CABG was identified using CPT codes 33510 to 33536 or ICD-9-CM procedure codes 36.10 to 36.19, and PCI was identified using CPT codes 92980 to 92996 or ICD-9-CM procedure codes 00.66, 36.01 to 36.09.

To be eligible for this analysis, beneficiaries having CHD events needed to meet the following criteria: 1) 65 years of age or older 365 days before hospital admission for their CHD event (the "look-back" period); 2) hospitalization duration <30 days; 3) continuous "full coverage" for Medicare during the look-back period; 4) 90-day survival after hospital discharge with continuous full Medicare coverage; and 5) live in the United States and have valid birth/death dates. Because high-intensity statins are not universally recommended for patients ≥75 years of age with a CHD event, primary analyses also required beneficiaries to be <75 years of age. Full coverage was defined

ABBREVIATIONS AND ACRONYMS

ACS = acute coronary syndrome(s)

CABG = coronary artery bypass graft

CHD = coronary heart disease

CMS = Centers for Medicare and Medicaid Services

CPT = current procedure terminology

ESRD = end-stage renal disease

ICD-9-CM = International Classification of Diseases-Ninth Edition-Clinical Modification

LDL-C = low-density lipoprotein cholesterol

MI = myocardial infarction

PCI = percutaneous coronary intervention

as enrollment in traditional Medicare fee-for-service (Parts A and B) and Part D Medicare coverage and not enrolled in a Medicare Advantage plan.

Additionally, to analyze patterns of switching between low/moderate- and high-intensity statins in the 365 days after hospital discharge for the CHD event (the "post-discharge" period), we restricted our analyses to beneficiaries who remained alive with full Medicare coverage through 1 year after discharge for their CHD event. The look-back period was used to identify pre-CHD event statin use and beneficiary characteristics. The earliest event occurred on January 1, 2007, allowing for a 365-day look-back period whereas the last event occurred on December 31, 2009, allowing for 365 days of follow-up for the post-discharge period. A flow chart showing the inclusion and exclusion of Medicare beneficiaries for this analysis is provided in Online Figure 1.

STATIN USE. Statin prescription fills during the look-back period and through the post-discharge period were identified using Medicare Part D pharmacy claims. Six types of statins (simvastatin, atorvastatin, pravastatin, rosuvastatin, lovastatin, and fluvastatin) were identified using National Drug Codes. Our definition of high-intensity statin use included a prescription fill for simvastatin 80 mg, rosuvastatin 20 or 40 mg, or atorvastatin 40 or 80 mg. We based this definition on the similar percentage reduction in low-density lipoprotein cholesterol (LDL-C) with statins used in clinical outcome trials of ACS patients (1,14,15) and biomarker studies in ACS patients (16). With the exception of simvastatin 80 mg daily, these selections are consistent with the ACC/AHA statin guidelines (4). We included simvastatin 80 mg daily as this agent was generically available and other options may not have been available to all patients. All other statin prescription fills were considered low/moderate-intensity statins.

COVARIATES. A priori selected covariates were used to study factors associated with filling a high-intensity statin prescription. We obtained age on the date of the index CHD event, sex, race/ethnicity, and receipt of a low-income subsidy (i.e., a marker of poverty) from the Medicare beneficiary enrollment file. A history of diabetes and CHD, as well as Charlson score (derived from the Charlson Comorbidity Index) were defined using previously published algorithms and ICD-9-CM codes for claims during the look-back period (17,18). Additional factors including previous cardiologist care, the number of medications filled of different generic names, and the dose of the last statin filled before each beneficiary's CHD event were obtained using Medicare claims from the look-back period.

STATISTICAL ANALYSES. We initially examined the distribution of the type and dose of the first statin filled after each beneficiary's CHD event. Next, we calculated the percentage of beneficiaries who filled a high-intensity statin prescription and each high-intensity statin regimen (atorvastatin 40 or 80 mg, atorvastatin 80 mg, simvastatin 80 mg, or rosuvastatin 20 or 40 mg) as their first fill and as any fill during the 1-year post-discharge period.

Characteristics of beneficiaries (see covariates section in the preceding text) were calculated by intensity of the last statin filled before their index event: high, low/moderate, or none (no statin fill). The percentage of beneficiaries who filled a high-intensity statin prescription during the post-discharge period was calculated by beneficiary characteristics. Using Poisson regression with sandwich estimators, we calculated risk ratios (RRs) and 95% confidence intervals (CIs) for filling a high-intensity statin prescription as the first post-event fill and, separately, as any fill during the post-discharge period. Risk ratios were calculated in models that included all covariates simultaneously. In a sensitivity analysis we calculated the percentage of beneficiaries and RRs for filling high-intensity statins among Medicare beneficiaries who are ≥65 years of age. Additionally, results were repeated excluding Medicare beneficiaries with ESRD.

To determine whether patients who filled a low/moderate-intensity statin upon discharge received guideline concordant care in the year after discharge, we calculated the percentage of beneficiaries who switched from a low/moderate-intensity statin to a high-intensity statin within the post-discharge period. For comparison, we also calculated the percentage switching from a high-intensity to low/moderate-intensity statin within the post-discharge period. These percentages were limited to beneficiaries who had at least 2 statin fills after their CHD event. Multivariable-adjusted RRs associated with beneficiary characteristics for switching from a high- to a low/moderate-intensity statin and, separately, switching from a low/moderate- to a high-intensity statin during the post-discharge period were calculated. All data management and statistical analyses were conducted using SAS version 9.1 (SAS Institute, Cary, North Carolina).

RESULTS

There were 8,762 beneficiaries <75 years of age who met the inclusion criteria and filled a statin prescription within 90 days of discharge after their CHD event. Simvastatin was the most common statin

TABLE 1 Type and Dose of Statin Prescriptions Filled*

	Number of Beneficiaries
Atorvastatin	
Overall, mg	2,596 (29.6)
10	493 (5.6)
20	726 (8.3)
40	812 (9.3)
80	565 (6.5)
Simvastatin	
Overall, mg	4,260 (48.6)
5	10 (0.1)
10	210 (2.4)
20	1,304 (14.9)
40	2,052 (23.4)
80	684 (7.8)
Rosuvastatin	
Overall, mg	848 (9.7)
5	129 (1.5)
10	416 (4.8)
20	230 (2.6)
40	73 (0.8)
Pravastatin	
Overall, mg	595 (6.7)
10	30 (0.3)
20	145 (1.7)
40	348 (4.0)
80	72 (0.8)
Lovastatin	
Overall, mg	425 (4.8)
10	21 (0.2)
20	149 (1.7)
40	255 (2.9)
60	N/A
Other	
Any dose	35 (0.4)

Values are n (%). *After discharge for a coronary heart disease event among Medicare beneficiaries <75 years of age (N = 8,762).
N/A = Suppressed cell due to having fewer than 11 beneficiaries.

filled (48.6%) followed by atorvastatin (29.6%) (Table 1). Of beneficiaries who filled a statin prescription within 90 days of their CHD event, 27% filled a high-intensity statin: 15.7% filled atorvastatin 40 or 80 mg, 7.8% simvastatin 80 mg, and 3.5% rosuvastatin 20 or 40 mg (Table 2). Among the 8,019 beneficiaries with 365 days of follow-up, 35% filled a high-intensity statin at any time within the post-discharge period.

Before their index event, 16.8% of beneficiaries had filled a high-intensity statin prescription, 53.1% had filled a low/moderate-intensity statin, and 30.1% had no statin fills (Table 3). Compared with beneficiaries not taking statins before their events, those taking low/moderate- or high-intensity statins were less likely to have had an acute MI as their index CHD event. Those not taking statins before their CHD event were less likely to have diabetes or a history of CHD, have seen a cardiologist before their index event, or be taking ≥10 medications.

With the exception of beneficiaries whose last fill before their CHD event was for a high-intensity statin, fewer than 30% of beneficiaries in every sub-group had a first fill for a high-intensity statin after their CHD event (Table 4, left panel). Among participants whose last statin fill before their CHD event was a high-intensity statin, 80.7% filled a high-intensity statin after their CHD event. In comparison, 23.1% of beneficiaries not taking statins and 9.4% of those whose last statin fill before their CHD event was a low/moderate-intensity statin filled a high-intensity statin after their CHD event. After multivariable adjustment, when compared with beneficiaries not taking a statin before their CHD event, beneficiaries taking a high-intensity statin were 4.01 times more likely to have their first statin fill be for a high-intensity statin (multivariable adjusted RR: 4.01; 95% CI: 3.58 to 4.49). Also, after multivariable adjustment, beneficiaries taking low/moderate-intensity statins versus not taking statins during the look-back period and those who experienced a CABG or PCI versus acute MI were less likely to have a first fill after a CHD event for a high-intensity statin.

Overall, 35% of Medicare beneficiaries filled a high-intensity statin prescription within a year after hospital discharge (Table 4, right panel). Among participants not on a statin before their CHD event, 29.6% filled a high-intensity statin during the post-discharge period compared with 18.8% and 87.3% of participants taking low/moderate- and high-intensity statins during the look-back period, respectively. With the exception of those taking high-intensity statins during the look-back period, fewer than 40% of participants in all subgroups filled a high-intensity statin within the 365 days after hospital discharge. Results were similar when the analysis

TABLE 2 Percentage of Medicare Beneficiaries <75 Years Filling Prescriptions for High-Intensity Statins After a CHD Event

	First Fill After CHD Event (n = 8,762)	Any Statin Fill Within 365 Days (n = 8,019)
Any high-intensity statin	2,364 (27.0)	2,810 (35.0)
Atorvastatin 40 or 80 mg	1,377 (15.7)	1,499 (18.7)
Atorvastatin 80 mg	565 (6.4)	679 (8.5)
Simvastatin 80 mg	684 (7.8)	1,037 (12.9)
Rosuvastatin 20 or 40 mg	303 (3.5)	491 (6.1)

Values are n (%).
CHD = coronary heart disease.

TABLE 3 Characteristics of Medicare Beneficiaries Categorized by Prior Statin Use*

	Last Statin Fill Before CHD Event		
	No Prior Statin Fill (n = 2,638)	Low/Moderate Intensity (n = 4,656)	High Intensity (n = 1,468)
Case-qualifying event			
AMI	1,357 (51.4)	1,559 (33.5)	460 (31.3)
CABG	424 (16.1)	797 (17.1)	252 (17.2)
PCI	857 (32.5)	2,300 (49.4)	756 (51.5)
Age, yrs			
65-69	1,204 (45.6)	2,038 (43.8)	684 (46.6)
70-74	1,434 (54.4)	2,618 (56.2)	784 (53.4)
Sex			
Female	1,187 (45.0)	2,184 (46.9)	683 (46.2)
Male	1,451 (55.0)	2,472 (53.1)	785 (53.5)
Race/ethnicity			
White	2,327 (88.2)	3,982 (85.5)	1,264 (86.1)
Black	192 (7.3)	385 (8.3)	126 (8.6)
Hispanic	30 (1.1)	95 (2.0)	27 (1.8)
Asian	38 (1.4)	83 (1.8)	21 (1.4)
Other	51 (1.9)	111 (2.4)	30 (2.1)
Low income			
No	1,718 (65.1)	2,697 (57.9)	880 (59.9)
Yes	920 (34.9)	1,959 (42.1)	588 (40.1)
History of diabetes			
No	1,909 (72.4)	2,398 (51.5)	681 (46.4)
Yes	729 (27.3)	2,258 (48.5)	787 (53.6)
History of CHD			
No	1.841 (69.8)	1,601 (34.4)	346 (23.6)
Yes	797 (30.2)	3,055 (65.6)	1,122 (76.4)
Charlson score			
0	1,386 (52.5)	1,818 (39.1)	494 (33.6)
1-3	903 (34.2)	1,668 (35.8)	547 (37.3)
≥4	349 (13.2)	1,170 (25.1)	427 (29.1)
Cardiologist care before CHD hospitalization			
No	1,668 (63.2)	1,552 (33.3)	391 (26.6)
Yes	970 (36.8)	3,104 (66.7)	1,077 (73.4)
Number of medications			
<5	818 (31.0)	279 (6.0)	56 (3.8)
5-9	851 (32.3)	1,356 (29.1)	390 (26.6)
≥10	969 (36.7)	3,021 (64.9)	1,022 (69.6)

Values are n (%). *<75 years of age who experienced a CHD event.

AMI = acute myocardial infarction; CABG = coronary artery bypass graft surgery; CHD = coronary heart disease; PCI = percutaneous coronary intervention.

sample was not restricted to those <75 years of age (Online Table 1). Additionally, results were similar when Medicare beneficiaries with ESRD were excluded (data not shown).

Of beneficiaries whose first fill after discharge was a high-intensity statin, 18.8% switched to a low/moderate-intensity statin during the year after hospital discharge (Online Table 2). Beneficiaries taking a high-intensity statin before hospitalization were less likely to switch to a low/moderate-intensity statin. Conversely, of beneficiaries who filled a low/moderate-intensity prescription as their first statin post-discharge, 11.5% filled a high-intensity statin during the 365 days after hospital discharge. A higher percentage (34.6%) of beneficiaries who were taking a high-intensity statin during the look-back period switched from a low/moderate- to a high-intensity statin during the year after hospital discharge compared with beneficiaries not taking statins (9.7%) or taking low/moderate-intensity statins (10.5%) during the look-back period.

DISCUSSION

In the current study of Medicare beneficiaries, we found high-intensity statin therapy to be underused after hospital discharge for a CHD event. In this nationwide sample, only 27% of beneficiaries' first fill after discharge was for a high-intensity statin, a figure increasing to only 35% within 365 days of discharge. The strongest predictor of filling a high-intensity statin prescription after discharge for a CHD event was the intensity of statin being taken before the event. More than 80% of individuals taking a high-intensity statin before their CHD event filled a high-intensity statin upon discharge, compared with 23.1% of beneficiaries taking no statins and 9.4% taking low/moderate-intensity statins before hospitalization. In addition to the low use of high-intensity statins immediately after hospital discharge, only 11.5% of beneficiaries were titrated to high-intensity statins during the year after discharge (**Central Illustration**). The underutilization of high-intensity statin therapy observed in the current study should be interpreted in the context of data from multiple clinical trials and clinical practice guidelines recommending this practice. Randomized controlled trials have shown that high-intensity therapy with atorvastatin reduces cardiovascular events among patients presenting with an ACS (1,14). Among patients with stable CHD, atorvastatin 80 mg daily has been shown to be more effective than atorvastatin 10 mg daily in reducing rates of recurrent cardiovascular events for both participants age <65 and ≥65 years (19,20). On the basis of these clinical trials, the ACC/AHA guidelines for managing patients with ACS (5) and the secondary prevention of CHD (21) advocate initiation of atorvastatin 80 mg daily before hospital discharge for patients presenting with ACS. Similarly, the 2013 ACC/AHA Guideline on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults recommends high-intensity statin therapy for secondary prevention of cardiovascular disease in patients age ≤75 years (4).

A previous analysis of prescribing patterns after acute MI pooled results from 2 multicenter,

prospective cohort studies (8). At the time of hospital discharge in this study, 88% of patients were prescribed a statin of any dose. However, at hospital discharge, only one-third of acute MI patients were prescribed guideline-directed high-intensity statins, defined by the authors as ≥75% of the target dosage. In the 12 months after MI, dose titration occurred infrequently. These observations are similar to our findings. Our current study's results extend the prior results by examining both pre-hospitalization and post-discharge factors associated with receiving a high-intensity statin. We identified pre-hospital statin intensity as the key factor associated with the intensity of the statin regimen post-discharge. This association was present after adjusting for confounders and no other factors were strongly associated with statin intensity. Through 1-year post-discharge, a change in the intensity of the statin therapy was also influenced by the pre-event statin intensity.

Medicare claims do not contain data that would permit a systematic evaluation of the characteristics that may have influenced continuation of the pre-hospital statin regimen after hospital discharge. Potential factors that could account for this finding include on-treatment LDL-C level at or near goal on the basis of guidelines that existed at the time of our study (19–22); cost barriers, since atorvastatin became generic only after this time period; drug-drug interactions; and statin intolerance with higher statin dosages. The use of high-intensity statins is contraindicated in patients with comorbidities such as renal insufficiency, hepatic disease, and treatments for solid organ transplantation or acquired immunodeficiency syndrome. Post-hospital transitions in care, including transfers, occur commonly after CHD events and may result in patients not receiving high-intensity statin therapy post-discharge (23). According to prior studies, transitional factors that may be relevant include high rates of post-hospitalization prescribing errors, absence of patient follow-up for unresolved medical issues, and lack of patient understanding of discharge recommendations (24–26). For example, Moore et al. (27) reported that 36% of post-hospitalization work-ups are not completed. Additionally, in another study, one-half of the patients experienced medication and laboratory monitoring errors after hospital discharge (28). Future studies are necessary to assess the influence of suboptimal management of care transitions on the use of high-intensity statin after CHD-related hospitalizations.

Despite equal efficacy among older versus younger patients in ACS trials (19,20), high-intensity statin therapy was less frequently filled in Medicare beneficiaries ≥75 versus <75 years at either the first prescription fill or over the following year. Although high numbers of prescribed medications were associated with lower post-discharge high-intensity fill

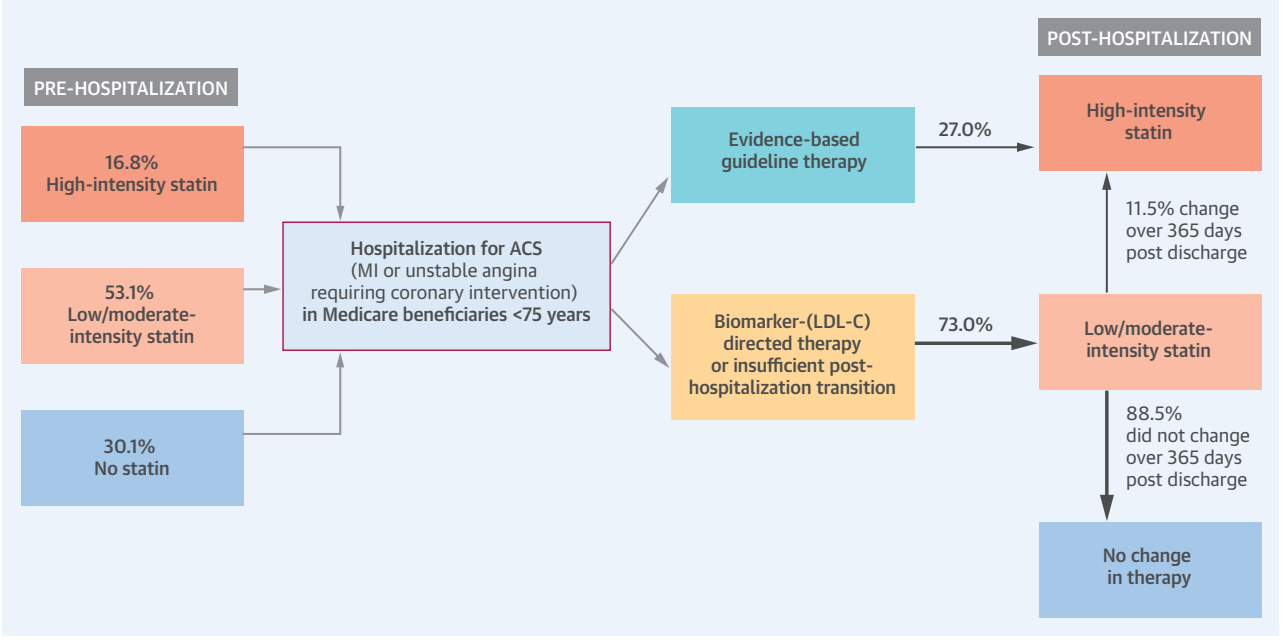
TABLE 4 Percentage of Patients and Risk Ratio for Filling a High-Intensity Statin*

	First Fill After CHD Event (N = 8,762)		Any Statin Fill Within 365 Days (N = 8,019)	
	n (%)	Risk Ratio (95% CI)	n (%)	Risk Ratio (95% CI)
Overall	2,364 (27.0)		2,810 (35.0)	
Statin use before CHD event				
No	609 (23.1)	1.00 (ref)	718 (29.6)	1.00 (ref)
Low/moderate intensity	420 (9.4)	0.45 (0.40–0.52)	769 (18.8)	0.70 (0.63–0.89)
High intensity	1,335 (80.7)	4.01 (3.58–4.49)	1,323 (87.3)	3.36 (3.12–3.73)
Case-qualifying event				
AMI	989 (29.3)	1.00 (ref)	1,081 (36.3)	1.00 (ref)
CABG	340 (23.1)	0.77 (0.68–0.88)	454 (32.4)	0.89 (0.79–1.00)
PCI	1,035 (26.5)	0.86 (0.78–0.95)	1,275 (35.1)	0.93 (0.85–1.02)
Age, yrs				
65-69	1,092 (27.8)	1.00 (ref)	1,325 (36.9)	1.00 (ref)
70-74	1,272 (26.3)	0.98 (0.90–1.06)	1,485 (33.5)	0.93 (0.87–1.00)
Sex				
Female	1,059 (26.1)	0.93 (0.85–1.01)	1,279 (34.6)	0.97 (0.90–1.05)
Male	1,305 (27.7)	1.00 (ref)	1,531 (35.4)	1.00 (ref)
Race/ethnicity				
White	2,048 (27.0)	1.00 (ref)	2,441 (35.0)	1.00 (ref)
Black	191 (27.2)	0.99 (0.85–1.16)	217 (35.7)	1.01 (0.88–1.17)
Hispanic	42 (27.6)	1.03 (0.75–1.41)	49 (36.3)	1.02 (0.76–1.36)
Asian	39 (27.5)	1.01 (0.73–1.39)	47 (36.4)	1.04 (0.78–1.40)
Other	44 (22.9)	0.86 (0.63–1.16)	56 (31.1)	0.87 (0.67–1.14)
Low income				
No	1,430 (27.0)	1.00 (ref)	1,732 (34.9)	1.00 (ref)
Yes	934 (26.9)	1.02 (0.93–1.12)	1,078 (35.3)	1.03 (0.95–1.12)
History of diabetes				
No	4,988 (26.3)	1.00 (ref)	1,612 (34.8)	1.00 (ref)
Yes	3,774 (27.9)	0.94 (0.86–1.03)	1,198 (35.4)	0.92 (0.85–1.00)
History of CHD				
No	953 (25.2)	1.00 (ref)	1,146 (33.1)	1 (ref)
Yes	1,411 (28.4)	0.95 (0.86–1.03)	1,664 (36.5)	0.97 (0.88–1.07)
Charlson score				
0	973 (26.3)	1 (ref)	1,210 (34.9)	1 (ref)
1–3	839 (26.9)	0.96 (0.83–1.06)	992 (34.6)	0.95 (0.87–1.03)
≥ 4	552 (28.4)	0.94 (0.83–1.06)	608 (36.3)	0.94 (0.84–1.06)
Cardiologist care before CHD hospitalization				
No	970 (26.9)	1.00 (ref)	1,136 (35.0)	1.00 (ref)
Yes	1,394 (27.1)	0.91 (0.82–1.01)	1,674 (35.1)	0.90 (0.82–0.99)
Number of medications				
<5	289 (25.1)	1.00 (ref)	362 (33.6)	1.00 (ref)
5-9	685 (26.4)	0.99 (0.85–1.14)	831 (34.3)	0.95 (0.84–1.09)
≥10	1,390 (27.7)	0.94 (0.81–1.10)	1,617 (35.8)	0.92 (0.80–1.05)

Characteristics are presented for all people who filled a statin after CHD hospitalization. Risk ratios are adjusted for all variables in this table simultaneously. *By percentage of Medicare beneficiaries <75 years of age filling prescriptions for high-intensity statins after a CHD event.

Abbreviations as in Tables 2 and 3.

CENTRAL ILLUSTRATION **Change in Statin Intensity Pre- and Post-Hospitalization for Acute Coronary Syndrome**



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Despite experiencing an acute coronary syndrome (ACS), the majority of Medicare beneficiaries do not fill high-intensity statin prescriptions after hospitalization for their event. LDL-C = low-density lipoprotein cholesterol; MI = myocardial infarction.

rates, there was no difference in prescription fill rates by sex, race/ethnicity, or illness burden as reflected in the Charlson score. More beneficiaries received high-intensity statin therapy when they presented with an acute MI compared with hospitalization for CABG or PCI.

STUDY LIMITATIONS. Medicare data do not contain information on in-hospital medications and prescriptions written to patients upon discharge. Thus, we relied on pharmacy claims at the time of the first fill and within 1 year after hospital discharge. Certain comorbid conditions and potential drug-drug interactions and intolerance to statins may have resulted in appropriate use of low/moderate-intensity statins; however, we are unable to address these issues. Medicare mostly provides insurance for older adults. The generalizability of our findings to younger populations must be studied. Finally, data from this study were derived for patients having CHD events during the period from 2007 through 2009. The use of high-intensity statins may have increased more recently as generic atorvastatin is now available.

Despite these limitations, the current study has several strengths including the large sample size of U.S. adults having CHD events, the ability to evaluate information on patients before and after their CHD events, and the use of the Medicare 5% national sample, providing a high degree of generalizability to U.S. adults 65 years of age or older.

CONCLUSIONS

Despite clinical trial evidence and clinical practice guidelines, most Medicare beneficiaries were not prescribed high-intensity statin therapy after hospitalization for a CHD event. A major influence on filling of high-intensity statins post-discharge was the intensity of the statin use before the hospitalization. Future efforts are needed to better understand the causes of this pattern so that interventions can be designed to improve evidence-based care.

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PERSPECTIVES

COMPETENCY IN PATIENT CARE: Most patients discharged from the hospital after an acute coronary event continue their pre-admission statin regimen and are not prescribed high-intensity therapy. This represents an opportunity for more intensive, evidence-based secondary prevention therapy.

TRANSLATIONAL OUTLOOK: Future studies should evaluate whether structured processes for discharge planning and reminders embedded in electronic medical records can increase prescribing of high-intensity therapy for patients with coronary atherosclerotic disease.

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KEY WORDS coronary artery disease, drug use, hydroxymethylglutaryl-CoA reductase inhibitors, secondary prevention

APPENDIX For supplemental tables and figure, please see the online version of this article.