Persistence With Lipid-Lowering Therapy: Influence of the Type of Lipid-Lowering Agent and Drug Benefit Plan Option in Elderly Patients

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ABSTRACT

OBJECTIVE: To determine the effects of lipid-lowering agent (LLA) class and drug plan design option on persistence with LLAs among elderly patients enrolled in a managed care plan.

METHODS: A retrospective cohort study was conducted among 310 older adult members enrolled in a health maintenance organization operating in New England who were dispensed an LLA between July 1, 1994, and June 30, 1996. Survival analysis was used to examine differences in discontinuation of LLAs between different classes of LLAs and drug benefit plans as well as patient sex, age, prior hospitalization for coronary heart disease (CHD), hypertension, diabetes mellitus, and the number of other medications.

RESULTS: The overall LLA discontinuation rate increased with time from 18% (95% confidence interval [CI], 13.8%-22.4%) at 6 months to 46% (95% CI, 39.7%-52.5%) at 12 months and 66% (95% CI, 59.2%-73.0%) at 18 months. The likelihood of discontinuation increased from 54% (95% CI, 44.8%-63.6%) at 12 months to 77% (95% CI, 67.5%-85.5%) at 18 months in nonstatin users and from 39% (95% CI, 30.4%-47.6%) at 12 months to 57% (95% CI, 47.3%-66.9%) at 18 months in statin users ($P = 0.001$). Among patients prescribed a statin at initial prescription ($n = 182$), the 12-month discontinuation rates were 33% (95% CI, 23.0%-43.6%) for those with full drug benefit coverage and 50% (95% CI, 34.8%-65.1%) for those with \$1,000 per year maximum coverage, while the 21-month discontinuation rates were 60% (95% CI, 46.3%-72.9%) for those with full coverage and 86% (95% CI, 73.7%-98.7%) for those with \$1,000 per year maximum coverage ($P = 0.023$). Adjusting for plan design and hypertension, statin users were less likely to discontinue compared with users of other LLAs (rate ratio [RR] = 0.58; 95% CI, 0.40-0.82; $P = 0.002$). Among patients dispensed a statin, full-coverage members were less likely to discontinue compared with members having an annual \$1,000 maximum drug coverage, adjusting for diabetes and hypertension (RR = 0.58; 95% CI, 0.34-0.98; $P = 0.041$). This finding was among a small sample after subanalyses, and further research is warranted. Plan design was not determined to be significantly associated with discontinuation of other LLAs.

CONCLUSIONS: Our findings suggest that persistence with LLAs is low among older patients regardless of scope of drug benefit coverage or the drug class. Addressing the challenges of maintaining adherence to prescribed therapeutic regimens in the elderly will require a multifaceted approach; deficiencies will not be eliminated simply through the provision of prescription drug benefit coverage.

KEYWORDS: Persistence, Lipid-lowering agents, Statins, Elderly, Drug benefit plans, Managed care

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The cost of pharmaceuticals is among the fastest-rising components of health care costs.¹ Policy responses have included limits on prescription costs, restriction on the supply of health care, and shifting of the financial risk to providers and beneficiaries.²⁻⁴ Patient cost sharing through deductibles, coinsurance, and copayments is one technique increasingly being used to contain medical costs in general, and prescription costs in particular, to deter patients from unnecessary use.²⁻⁴ There is, however, a concern that necessary utilization could be reduced, which may, in turn, increase the risk of adverse health consequences and resulting costs.¹⁻⁸

Utilization for services related to the treatment and prevention of coronary heart disease (CHD) is important to consider because CHD continues to be the leading cause of death in the U.S. population.⁹ Cardiovascular disease accounts for 950,000 deaths annually in the United States, including 460,000 from CHD, and 85% of those who die from CHD are aged 65 years or older.⁹ The prevalence of nonfatal CHD among U.S. adults aged 40 years and above was reported to be 11.8%.¹⁰ It remains an important disease with significant burden. Estimated yearly costs for medical treatment of CHD and lost wages in the United States range from \$50 billion to \$100 billion.^{9,11}

Adherence to lipid-lowering agents (LLAs) is often problematic,¹² especially since hyperlipidemia may be a chronic condition perceived by the patient as not having deleterious health consequences until far into the future.¹³ Reported 1-year adherence rates for LLAs range from 25% to 85%.¹⁴⁻²⁰ The public health importance of adherence to LLAs is evidenced by the efficacy of these drugs in obtaining benefits in both primary²¹⁻²⁴ and secondary²⁵⁻²⁷ prevention of CHD.

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Little is known about policy effects on persistence to lipid-lowering therapy among older adults. Our objectives were to explore the effects of LLA class as well as drug benefit plan options on persistence to LLAs and to identify other characteristics that predict poor persistence among older patients.

Methods

Study Population and Design

A retrospective cohort study was conducted among elderly enrollees (Medicare beneficiaries) of a 168,000-member health maintenance organization (HMO) operating in New England with approximately 17,000 members aged 65 years or older. We identified members aged 65 years or older who were continuously enrolled in the plan during the period from July 1, 1993, through June 30, 1996, and were prescribed an LLA. These members were able to choose among 3 drug benefit options starting January 1, 1994: full coverage for prescription drugs, a maximum of \$1,000 per year in coverage, or no drug coverage. There was a nominal copayment per prescription of \$5 or less that was the same for all members. Those members who selected full drug coverage paid an additional premium of \$72.50 per month (\$870 per year). Those with \$1,000 annual maximum coverage for drugs paid an additional \$39.16 per month (\$469.92 per year). Those without drug coverage paid no additional premium.

New users of LLAs were identified by selecting patients with a prescription of an LLA between July 1, 1994, and June 30, 1996, among individuals with no prior dispensing for an LLA during the previous 12 months. The automated health plan databases were used to identify information on demographic characteristics, drug benefit plan type, prescriptions dispensed, hospitalizations, and diagnoses.

Members with greater than a 6-month period (180 days) between refills or between the last refill and the end of the study period were considered to have discontinued the drug. Switching to another type of LLA was not considered as a discontinuation. In previous research, Andrade et al.¹⁴ used a 6-month period (180 days) or more between refills to flag potential discontinuation. Jackevicius et al.¹⁸ used having a prescription every 120 days to define adherence and used 180 days for a sensitivity analysis, while Simons et al.¹⁶ used a 4-week period without collecting a prescription to define discontinuation.

The patient characteristics that we assessed included class of LLA (statin, including pravastatin, lovastatin, and fluvastatin, versus other LLAs, including bile acid sequestrants, fibrates, and niacin); drug benefit plan type (full coverage versus maximum \$1,000 per year in coverage); gender; age (below 70 and 70 years or older, based on the mean age of 70 years and frequency distribution); comorbidities, including CHD (ICD-9-CM code = 410-414.X), diabetes (ICD-9-CM code = 250.X), and hypertension (ICD-9-CM code = 401-405.X); and number of other medi-

TABLE 1 Characteristics of New Users of Lipid-Lowering Agents in an Elderly Population Enrolled in a Medicare Managed Care Health Plan (N = 310)

Characteristic	Number (%)
Gender:	
Female	181 (58.4)
Male	129 (41.6)
Age (years):	
Mean 70.5	
SD 4.5	
≥70	155 (50)
<70	155 (50)
Plan type:	
Full coverage	202 (65.2)
\$1,000 maximum/year	108 (34.8)
Initial type of lipid-lowering agent dispensed:	
Statin	182 (58.7)
Nonstatin:	
Niacin	32 (10.3)
Fibrate	24 (7.7)
Bile acid sequestrant	72 (23.2)
Nonstatin total	128 (41.2)
CHD diagnosis prior to prescription:	
CHD diagnosis	154 (49.7)
No CHD diagnosis	156 (50.3)
DM diagnosis prior to prescription:	
DM diagnosis	70 (22.6)
No DM diagnosis	240 (77.4)
HTN diagnosis prior to prescription:	
HTN diagnosis	227 (73.2)
No HTN diagnosis	83 (26.8)
Number of other medications dispensed in the 45 days prior:	
Mean 2.5	
SD 2.1	
≥3	123 (39.7)
<3	187 (60.3)

SD = standard deviation; CHD = coronary heart disease; DM = diabetes mellitus; HTN = hypertension.

cations dispensed in the 45-day period prior to the initial dispensing (0 to 2 other medications or 3 and more).

Statistical Analyses

Descriptive statistics were used to determine the frequencies of various patient characteristics. Survival analysis was used to assess the effect of drug benefit options, LLA class, and other patient characteristics on the discontinuation of LLAs.

Kaplan-Meier curves were independently constructed for each of the predictor variables, and the log-rank statistic was used to evaluate group differences. Assessment of the proportional

TABLE 2 Discontinuation Rates of New Users of Lipid-Lowering Agents at 12 months and 18 Months According to Patient Characteristics in an Elderly Population Enrolled in a Medicare Managed Care Health Plan (N = 310)

Characteristic	Discontinued at 12 months		Discontinued at 18 months		Log Rank Probability
	%	95% Confidence Interval	%	95% Confidence Interval	
Total population	46.1	39.7-52.5	66.1	59.2-73.0	
Gender:					0.020*
Female	49.3	41.1-57.5	72.6	64.4-80.8	
Male	40.7	30.3-51.1	55.7	44.1-67.3	
Age (years):					0.358
≥70	49.1	39.9-58.3	68.1	58.7-77.5	
<70	43.1	34.1-51.1	64.0	54.0-74.0	
Plan type:					0.242
Full coverage	43.1	35.2-51.0	63.0	54.3-71.7	
\$1,000 maximum/year	51.9	40.9-62.9	71.9	60.9-82.9	
Class of initial LLA:					0.001*
Statin	39.0	30.4-47.6	57.1	47.3-66.9	
Nonstatin LLA	54.2	44.8-63.6	76.5	67.5-85.5	
CHD diagnosis prior to prescription:					0.082
CHD diagnosis	41.7	32.4-51.0	59.8	49.5-70.1	
No CHD diagnosis	50.0	41.1-58.9	71.9	62.9-80.9	
DM diagnosis prior to prescription:					0.105
DM diagnosis	39.1	25.0-53.2	58.8	42.3-75.3	
No DM diagnosis	47.8	40.6-55.0	67.8	60.3-75.3	
HTN diagnosis prior to prescription:					0.272
HTN diagnosis	46.9	39.5-54.3	66.9	59.2-74.6	
No HTN diagnosis	43.6	30.5-56.7	63.4	48.7-78.1	
Number of other medications dispensed in the 45 days prior:					0.443
≥3	48.9	38.7-59.1	68.5	57.8-79.2	
0-2	44.2	35.9-52.5	64.5	55.6-73.4	

* Significant result $P < 0.05$. LLA = lipid-lowering agent; CHD = coronary heart disease; DM = diabetes mellitus; HTN = hypertension.

hazards assumption for each of the predictor variables was carried out, and stratification was used for hypertension where this assumption was violated.

Cox proportional hazards models were used to estimate rate ratios (RR) and 95% confidence intervals (CI) for the association between patient characteristics and LLA discontinuation. Persistence to LLAs has been previously examined using Cox proportional hazards models.^{16,18} Backward elimination was used to construct the final models that included the variable plan type and any other significant variables. All statistical analyses were performed using SAS statistical package version 8.01.

Results

A total of 2,229 patients, which was approximately 13% of the elderly health plan members, were continuously enrolled between July 1, 1993, and June 30, 1996, and received an LLA prescription during this time period. Of those patients, 1,793

(80.4%) had an LLA prescription between July 1, 1994, and June 30, 1996. We identified 475 new users of LLAs (21.3% of the total) by omitting patients with an LLA prescription in the previous year (between July 1, 1993, and June 30, 1994). We omitted 153 patients with the initial LLA prescription after January 1, 1996, in order to have a 6-month or longer observation period for all subjects. Thus, a total of 322 patients met our inclusion criteria. We omitted 12 patients having no drug coverage because of the low number in this category. The final study population was composed of 310 patients. Baseline characteristics are presented in Table 1. The mean age of these patients was 70.5 years and 58% were female. There were more subjects in the full coverage drug benefit plan (n = 202, 65.2%) than in the plan with \$1,000 annual maximum drug coverage (n = 108, 34.8%).

Statins were the most widely dispensed LLA, with 59% of patients dispensed a statin as the initial LLA. Approximately

half of the patient population was hospitalized for CHD prior to the initial LLA prescription ($n = 154$, 49.7%).

Table 2 presents the discontinuation rates at 12 months and 18 months, overall and according to patient characteristics. Overall discontinuation increased with time from 18.1% (95% CI, 13.8%-22.4%) at 6 months to 46.1% (95% CI, 39.7%-52.5%) at 12 months and 66.1% (95% CI, 59.2%-73.0%) at 18 months. Drug plan type was not associated with discontinuation ($P = 0.242$) (Figure 1). Females were more likely to discontinue than males ($P = 0.020$). A significant difference also existed between statin and nonstatin LLA users ($P = 0.001$). The likelihood of discontinuation increased from 22.7% (95% CI, 15.4%-29.9%) at 6 months to 54.2% (95% CI, 44.8%-63.6%) at 12 months and 76.5% (95% CI, 67.5%-85.5%) at 18 months in nonstatin users and from 14.8% (95% CI, 9.6%-20.0%) at 6 months to 39.0% (95% CI, 30.4%-47.6%) at 12 months and 57.1% (95% CI, 47.3%-66.9%) at 18 months in statin users.

Among patients prescribed a statin at initial prescription ($n = 182$), the 6 month discontinuation rates were 11.5% (95% CI, 5.8%-17.1%) for full coverage plan members (with no annual maximum) and 21.7% (95% CI, 11.3%-32.1%) for the members with annual \$1,000 maximum coverage, while the 12-month discontinuation rates were 33.3% (95% CI, 23.0%-43.6%) for those with full coverage and 50.0% (95% CI, 34.8%-65.1%) for those with a maximum of \$1,000 per year coverage. These rates increased to 49.2% (95% CI, 36.9%-61.6%) at 18 months and to 59.6% (95% CI, 46.3%-72.9%) at 21 months for those with full coverage, compared with 71.4% (95% CI, 56.4%-86.4%) at 18 months and 86.2% (95% CI, 73.7%-98.7%) at 21 months for those with a \$1,000 per year maximum coverage (Figure 2). The difference was statistically significant ($P = 0.023$).

For patients prescribed nonstatin lipid-lowering agents at initial prescription, the discontinuation rates were 21.3% (95% CI, 12.3%-30.2%) at 6 months, 54.3% (95% CI, 42.6%-66.0%) at 12 months, and 78.6% (95% CI, 67.8%-89.3%) at 18 months among full-coverage patients. These rates were 25% (95% CI, 12.8%-37.3%) at 6 months, 54.1% (95% CI, 38.0%-70.1%) at 12 months, and 72.4% (95% CI, 56.1%-88.7%) at 18 months among those with an annual maximum of \$1,000 coverage. The difference was not statistically significant ($P = 0.467$).

In the final models, those dispensed statin LLAs were less likely to discontinue as compared with users of nonstatin LLAs, adjusting for plan type and hypertension ($RR = 0.58$; 95% CI, 0.40-0.82; $P = 0.002$). Among patients dispensed a statin at initial prescription, full-coverage members were less likely to discontinue compared with members with annual \$1,000 maximum coverage, adjusted for diabetes and hypertension ($RR = 0.58$; 95% CI, 0.34-0.98; $P = 0.041$). Those with diabetes were less likely to discontinue than those without diabetes ($RR = 0.37$; 95% CI, 0.16-0.86; $P = 0.020$).

Plan type was not determined to be significantly associated

FIGURE 1 Survival Curves for Members of the Full Coverage Drug Benefit Plan and Members of the \$1,000 Maximum/Year Coverage Plan in an Elderly Population of New Users of Lipid-Lowering Agents Enrolled in a Medicare Managed Care Health Plan (N = 310)

a = full coverage plan members (no annual maximum).
b = \$1,000 maximum/year-coverage plan members.

FIGURE 2 Survival Curves for Members of the Full Coverage Drug Benefit Plan and Members of the \$1,000 Maximum/Year Coverage Plan According to Type of Initial Lipid-Lowering Agent (LLA) Prescription in an Elderly Population of New Users of LLAs Enrolled in a Medicare Managed Care Health Plan (N = 310)

a = full coverage (no annual maximum) plan members dispensed a statin at initial prescription.
b = \$1,000 maximum/year-coverage plan members dispensed a statin at initial prescription.
c = \$1,000 maximum/year-coverage plan members dispensed other LLAs at initial prescription.
d = full coverage (no annual maximum) plan members dispensed other LLAs at initial prescription.

TABLE 3 Relationship Between Prescription Drug Plan and Therapy Discontinuation Among New Users of Medication for Dyslipidemia, Adjusted for Diabetes Mellitus Status (New Users of Statins) and Drug Class (New Users of Statins or Nonstatins) Stratified by Hypertension

	Rate Ratio	95% Confidence Interval
New users of statin (n = 182)		
Plan type: \$1,000 maximum/year	1.0 (ref)	
Plan type: full coverage	0.58	0.34-0.98*
Diabetes mellitus status: no	1.0 (ref)	
Diabetes mellitus status: yes	0.37	0.16-0.86*
New users of nonstatin drug (n = 128)		
Plan type: \$1,000 maximum/year	1.0 (ref)	
Plan type: full coverage	1.21	0.71-2.04
New users of drug therapy for dyslipidemia (statin or nonstatin (n = 310)		
Plan type: \$1,000 maximum/year	1.0 (ref)	
Plan type: full coverage	0.83	0.57-1.20
Drug class: nonstatin	1.0 (ref)	
Drug class: statin	0.58	0.40-0.82*

* Significant difference (chi-square probability <0.05).

Ref = reference group.

with discontinuation of other LLAs. No significant differences in persistence rate existed with gender, age, CHD, diabetes, and number of medications. These results are presented in Table 3.

Discussion

Our findings suggest that discontinuation rates for LLAs are high, as previously reported,^{14,16,18-20} and indicate better persistence with statins as compared with other types of LLAs. Among members dispensed a statin at initial prescription, those with full drug benefit coverage were less likely to discontinue than members with an annual maximum drug benefit coverage of \$1,000. We did not find the level of pharmacy benefit selected by enrollees to be associated with the likelihood of discontinuing nonstatin LLA drug therapy.

The study documented a 1-year LLA discontinuation rate of 46%, which was higher than the discontinuation rates reported in clinical trials (ranging from 4% to 15%) and by Andrade et al. (32%).¹⁴ In an Australian practice setting, a 60% discontinuation rate over 1 year was reported.¹⁶ For statins, the 1-year discontinuation rate was found to be 39%, higher than that reported by

Andrade et al. (15% for lovastatin)¹⁴ and lower than that reported in other studies, which ranged from 52% to 61%.^{16,19,20}

We found that discontinuation increased progressively with duration of treatment, consistent with the findings from other studies.^{12,18,19} We noticed that the increase in discontinuation slowed after the first year.

The cost of medications has been cited among factors contributing to nonadherence in the elderly.²⁸ Medicare patients who do not have prescription drug coverage are reported to face higher out-of-pocket expenditures and are more likely to let prescriptions go unfilled.²⁹ Elderly Medicare beneficiaries with CHD who lack drug coverage were shown to have significantly lower rates of statin drug use (4.1%) compared with those with drug coverage (27.4%) in a nationally representative sample of Medicare beneficiaries.³⁰ Furthermore, Medicare beneficiaries with capped dollar amounts on prescriptions have been reported to take steps to decrease their out-of-pocket prescription costs, including discontinuing the prescribed medication.³¹ In a national survey of 4,896 older adults aged 70 years or older who regularly took prescribed medications, medication restriction was reported in 8% of subjects with no coverage, 3% of those with partial coverage and, 2% with full coverage ($P < 0.01$ for trend).⁶ At the same time, there appears to be no consensus regarding the impact of patient copayments on therapy persistence,^{32,33} and evidence that higher copayments for prescription medications result in clinically significant discontinuation rates is currently lacking.^{34,35}

In our study, the drug benefit plan option (design) was found to be associated with persistence among statin users. A possible explanation for this finding is that some patients with the limited drug benefit option discontinued statin medications once their benefit limit was met. This finding, however, was among a small sample after subanalyses, thus further research is needed to evaluate the effect of drug benefits on persistence. No association was found between drug benefit plan design and persistence among users of other (nonstatin) LLAs.

Medication adherence in older adult patients, in general, is of particular concern because they may exhibit an increased susceptibility to adverse events³⁶ due to deficits in physical dexterity, cognitive skills, and memory and the large number of medications they are prescribed.³⁷ Previous research on elderly patients taking LLAs specifically has shown high discontinuation rates in patients with drug coverage.^{15,18,19} Benner et al.¹⁹ found a 43% persistence of statin therapy in 6 months, and only 1 in 4 patients were adherent in 5 years. Jackevicius et al. found a 2-year adherence rate of 36.1% in patients with coronary artery disease and 25.4% in patients of primary prevention (without CHD). Avorn et al.¹⁵ found that patients failed to fill their LLA prescriptions about 40% of the time over 1 year. In addition, a study in British Columbia, where there are various levels of coverage provided by the provincial government, found no significant difference between adherent and nonadherent

patients with respect to type of provincial drug benefit coverage.³⁸ Our findings suggest that drug benefit cost subsidized through a drug benefit plan is not enough to guarantee persistence since we found high discontinuation rates regardless of the type of coverage.

Statin use was associated with better persistence compared with nonstatin LLAs. Adherence to lipid-lowering therapy has been previously associated with receiving a statin^{15,16,18} because statins are generally more tolerable than other LLAs³⁹ and side effects have been commonly cited as reasons for noncompliance.¹⁴

The gender of the patient was not associated with discontinuation after adjustment for other patient characteristics. Results in previous studies have been inconsistent with regard to gender effects on adherence.²⁸ Our results indicate no association even though a trend of better persistence among males was suggested by the data.

Previous hospitalization for CHD was not associated with discontinuation. Although studies have indicated better adherence to lipid-lowering drugs in secondary prevention compared with primary prevention,^{12,15,18,40} a number of these studies did not examine financial effects since patients were covered for the price of the drug except for a small copayment in some cases.^{15,18,19} Furthermore, research has shown that targeting patients during a hospitalization for an acute event or intervention procedure can improve persistence,⁴¹⁻⁴³ and current National Cholesterol Education Program (NCEP) Adult Treatment Panel III guidelines recommend initiating lipid-lowering drug therapy at hospital discharge.^{41,44} In our study, we looked for a previous hospitalization prior to the prescription date, but we could not tell if the prescription was given while the patients were in the hospital or some time after discharge. Studies have, however, indicated that compliance with NCEP guidelines is frequently suboptimal.⁴⁵⁻⁴⁷

The presence of diabetes and hypertension has been previously associated with better persistence among patients with dyslipidemia.^{15, 18, 19} Lower compliance with comorbidities has also been reported, possibly related to a more complex drug regimen that may be associated with comorbidities.⁴⁸ The asymptomatic nature of hyperlipidemia may also contribute to the lower adherence to LLAs when a symptomatic comorbidity like diabetes exists.⁴⁸ We did not find such associations between LLA discontinuation and these comorbidities overall. However, among patients prescribed a statin at initial prescription, we observed better persistence among diabetic patients compared with nondiabetic patients, consistent with previous reports.^{18,19}

Previous studies have been inconsistent with regard to the effect of the number of medications^{15,18,19,49} and age^{18,19,38,48} on persistence. Some have even reported lower adherence with fewer medications,³⁸ possibly because patients prescribed a greater number of medications are presumed to be less healthy and may be more attentive to taking their drug therapy.³⁸ We did not find a significant association between the number of other medications and persistence to LLAs.

Limitations

Several limitations to this study can be described. Regarding the data set used, patients may fill their prescriptions from pharmacies outside the HMO network, and these prescriptions will not be captured. This, however, is unlikely since the drugs were provided at discounted prices for patients in these pharmacies, and the assumption that patients fill most prescriptions within the pharmacy system under study has been confirmed in 1 HMO and 2 Veterans Affairs medical centers.⁴⁹ Also, filling the prescription does not ensure that the medication is actually consumed. Yet, patterns of prescription filling represent the most feasible way of estimating actual medication use in large populations.¹⁵ We were unable to account for non-prescription drug use. For example, niacin could be obtained without a prescription. We were also unable to conduct medical chart reviews to validate information obtained from computerized data.

Other limitations include lack of comprehensive clinical data, including lipid levels and exact reasons for LLA discontinuation. We were unable to control for some potential confounders that have been reported to affect adherence such as race,^{19,28} regimen complexity,⁴⁸ side effects,¹⁴ and perceived health.¹⁵ We also do not have information on income levels, coinsurance, or education levels for our population cohort. We could not account for use of samples or hospitalizations during a follow-up period. However, we believe that our criterion of 6 months without a prescription being dispensed to be classified as nonpersistent mitigates the potential influence of these factors because it would be difficult to obtain drug samples that cover such a long period of time and it is a long period for a continuous hospitalization.

Conclusions

We found high rates of discontinuation among users of LLAs regardless of type of LLA (statin or other) or drug benefit plan design. These findings emphasize the importance of research and the development of interventions to improve persistence to these medications. With the recent enactment of a voluntary Medicare "Part D" benefit providing some coverage for prescription drugs, one goal of which is to reduce financial barriers that might prevent beneficiaries from obtaining needed drugs,⁵¹ one must consider that many patients will still discontinue their medication. Improving patient understanding of cardiovascular risk, medication regimens, and the benefits of persistence is expected to enhance adherence to LLAs.¹² To achieve the desired benefit of drug therapy, long-term commitment to patient education, monitoring, and reinforcement with a multidisciplinary approach, including pharmacists, nurses, physicians and dieticians, is warranted.^{12,19,50}

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