RESEARCH

Moving Branded Statins to Lowest Copay Tier Improves Patient Adherence

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ABSTRACT

BACKGROUND: Statins are efficacious in reducing the risk of major cardiovascular events for both primary and secondary prevention, yet long-term adherence is poor. Their effectiveness could be compromised in actual practice when patients are not adherent to the treatments. Higher copayments have been shown to be associated with lower adherence to statins.

OBJECTIVE: To assess the effect on patient adherence of moving branded atorvastatin and rosuvastatin from the second to the first tier by a Medicare Part D plan sponsor.

METHODS: Pharmacy claims and eligibility records between July 1, 2009, and July 31, 2011, of Medicare Part D members not receiving the low-income subsidy were analyzed. New atorvastatin and rosuvastatin users in January 2010 (2010 cohort) were compared with those in January 2011 (2011 cohort) after this formulary tier change (tier-reduction group). Adherence was defined by the proportion of days covered (PDC) over 6 months. The impact of tier reduction on adherence was evaluated via logistic regression for binary outcome (PDC≥0.8) and generalized linear regression for continuous PDC by comparing the 2011 cohort with the 2010 cohort, adjusting for demographic and clinical characteristics. Other statin users (97% on generic statins) were also analyzed, serving as a nontier-reduction comparator group.

RESULTS: We identified 12,437 members in the tier-reduction group. Between the 2010 and 2011 cohorts, mean PDC increased from 0.77 to 0.83, and the proportion of members with high adherence increased from 62.0% to 72.9% (both $P<0.001$). After regression adjustment, members in the 2011 cohort were more likely to be adherent (OR=1.68; 95% CI=1.55-1.82) and had a 5.9% increase in PDC ($P<0.05$). There was no significant increase in adherence observed in the comparator nontier-reduction group.

CONCLUSION: Findings from this study suggest that financial incentives may improve medication adherence. Future studies should evaluate whether such formulary strategies improve long-term adherence and patient outcomes.

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What is already known about this subject

- Statins are efficacious in reducing the risk of major cardiovascular events for both primary and secondary prevention, yet long-term adherence is poor.
- Statin effectiveness could be compromised in actual practice when patients are not adherent to the treatments.
- Higher copayments have been shown to be associated with lower adherence to statins.

What this study adds

- This study examined the impact of moving branded statins to the lowest copay tier in a Medicare Part D plan sponsor on patient adherence.
- After implementation, the adherence rate, defined as proportion of days covered (PDC) ≥ 80% over a 6-month period, increased from 62.0% to 72.9%, with an adjusted odds ratio of 1.68 (95% CI = 1.55-1.82).
- There was a 5.9% increase in PDC after adjusting for patient characteristics.
- Our findings concerning Medicare Part D beneficiaries not receiving the low-income subsidy add to the existing evidence derived from commercially insured populations demonstrating that lower copayment improves adherence to essential medications.

Evidence from randomized clinical trials suggests that statins are efficacious in reducing the risk of major cardiovascular events for both primary and secondary prevention,[1-4] yet long-term adherence is poor.[5-9] Several studies also reported suboptimal short-term adherence to statins, within 1 year of treatment initiation.[9-14] Their effectiveness could be compromised in actual practice when patients are not adherent to the treatments.[15-17] Past studies have found that among statin users, statins were less effective in preventing subsequent cardiovascular events among those with poor adherence.[12,18,19] Statin users with poor adherence also incurred higher health care resource use and costs.[11,20] Given that higher copayments have been shown to be associated with lower adherence to statins,[21-24] greater patient cost-sharing may unintentionally and adversely impact the use of and adherence to essential medications, such as statins.[25]

Effective on January 1, 2011, a large Medicare Part D plan sponsor, serving both low-income subsidy (LIS) members and non-LIS members, moved branded atorvastatin and rosuvastatin from the second tier (preferred brand tier) to the first tier (generic tier). With this formulary change, the out-of-pocket payments for those 2 statins shifted from a 25%-30% coinsurance or $35 copayment to a $0-$4 copayment for a 30-day supply with variation in copayment contingent on benefit region and plan design after meeting the deductible limit.

It is not common for health plans to place a branded product on the lowest tier where generic class medications exist. While

it is natural to have a significant cost-sharing reduction when the patent expires and generics are introduced, this change to branded atorvastatin and rosuvastatin provided an opportunity to understand the association between lowering prescription copayments and adherence to branded products, which may help to inform formulary design when no generic equivalents are available. Unlike cost-sharing reductions caused by the availability of generic substitutes, which can only occur upon patent expiration, health plans could make a decision to reduce branded copayments at any time. In addition, although there are studies evaluating the impact of lowering copayment statin medication adherence,[26-29] published data are limited in elderly patients. While two-thirds of cardiovascular events and more than 80% of cardiovascular mortality occur in the elderly population,[30,31] statin adherence rates in this group, depending on baseline risk, have been reported at 25%-40% over the course of 2 years.[8] It is, therefore, not surprising that only half of patients treated with lipid-lowering medication meet their low-density lipoprotein (LDL) treatment goal.[32] Furthermore, this population usually has a lower disposable income and potentially different price (e.g. copayment) elasticity of demand than adults of working age.[33] Hence, from a policy perspective, it is important to understand to what extent this population's adherence behavior responds to financial incentive, which may help inform the management of modifiable cardiovascular risk factors and improve the quality of care.

With a naturalistic quasi-experimental design involving users of other statins not subject to such change as a comparator group, the objective of this study was to assess the impact of moving branded statins to the lowest copay tier, therefore lowering copayments, on patient adherence in non-LIS Medicare Part D beneficiaries. Since hypercholesterolemia is one of many asymptomatic conditions that are often associated with poor adherence,[8] findings from this study may be useful for health plan administrators and policy makers to inform the design of strategies to improve outcomes and health management in the long run for patients and payers.

Methods

Data Source

We analyzed pharmacy claims and eligibility records from July 1, 2009, to July 31, 2011, from a Medicare Part D plan sponsor that provided prescription drug benefits to more than 1.9 million members in 2011. Data were encrypted and compliant with the Health Insurance Portability and Accountability Act, and the study was exempted from institutional review board review. The members were served by a pharmacy network consisting of both chain and independent pharmacies. The eligibility records contained information on monthly eligibility indicators, age, gender, and geographic region of residence. Pharmacy claims recorded medication name, National Drug Code, LIS status, dispense date, quantity and days supplied, dosage, and plan and patient paid amounts.

Study Design and Sample Selection

This study used a cross-sectional pre- and postdesign based on January 1, 2011—the date when the formulary change became effective (Figure 1). The population for evaluation consisted of new users of branded atorvastatin and rosuvastatin who were subject to this formulary change of tier reduction. To understand the impact of this change, new branded atorvastatin and rosuvastatin users prior to January 1, 2011 (2010 cohort), were compared with new branded atorvastatin and rosuvastatin users after January 1, 2011 (2011 cohort). To assess whether there might be unobservable changes between the 2 time periods, we also evaluated new users of other statins (i.e., simvastatin, lovastatin, pravastatin, fluvastatin, pitavastatin, simvastatin/ezetimibe, simvastatin/niacin, and lovastatin/niacin) and compared users prior to January 1, 2011 (2010 cohort), and users after January 1, 2011 (2011 cohort), as a comparator (nontier-reduction group).

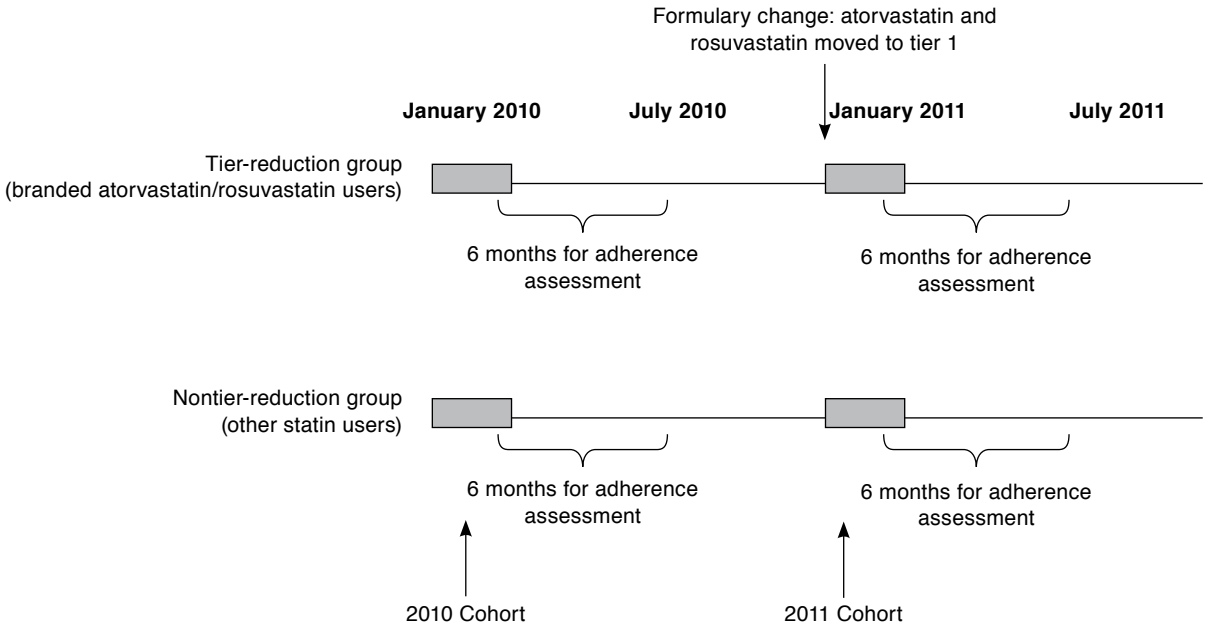
We selected members aged 18 years or older if they had any statin prescription (simvastatin, lovastatin, pravastatin, fluvastatin, atorvastatin, rosuvastatin, pitavastatin, simvastatin/ezetimibe, simvastatin/niacin, and lovastatin/niacin) between January 1, 2010, and January 31, 2010, for the 2010 cohort and between January 1, 2011, and January 31, 2011, as the 2011 cohort. The dispense date of the first observed statin prescription was denoted as the index date. Members were included if they had continuous enrollment 6 months prior to and after the index date. We excluded members with prescriptions for statins during the 6 months prior to the index date to ensure only new users of statins were selected into the study. Since the impact of the tier reduction on copayments is much smaller for LIS-eligible members, we also excluded members who received LIS on their statin prescriptions. Members were then stratified based on whether they received the branded statins that would be subject to the tier reduction of lowering copayment or not.

Study Measures

Medication adherence was examined using the proportion of days covered (PDC).[19] Adherence was evaluated from the time the first statin prescription was filled (index date). PDC was calculated as the sum of the days-of-supply from prescription claims of the index statin product during 6 months post-index divided by 180 days. High adherence was defined as PDC $\geq$ 0.8. Prescription supply covering days beyond 180 days was discarded. PDC was truncated at a maximum value of 1. Patients who switched to other statin products were considered discontinuing the index statin.

Demographic characteristics including patient age, gender, and geographic region of residence were determined on the index date of statin initiation. To understand the health status, we calculated RxRisk score as a proxy. RxRisk score is a risk adjustment algorithm to predict health care costs based on automated pharmacy claims developed by Fishman et al.

FIGURE 1 *Study Design*



Process for selecting the tier-reduction group of branded atorvastatin and rosuvastatin users who initiated treatment between January 1 and January 31. We compared their 6-month adherence prior to and after the formulary change. We also selected a nontier-reduction group as comparator.

(2003).[34] Disease-specific weights were assigned according to the therapeutic agents used, as identified from pharmacy claims during 6 months prior to the index date. Patients were categorized into quartiles (RxRisk levels 1-4) based on their estimated RxRisk score, where the lowest quartile (RxRisk level 1) represented the lowest level of predicted costs. We calculated average 30-day copayments of statin prescription over the 6-month study follow-up period. Proportion of members reaching donut hole ($2,830 for 2010 and $2,840 for 2011) at the 6-month follow-up period was also examined.

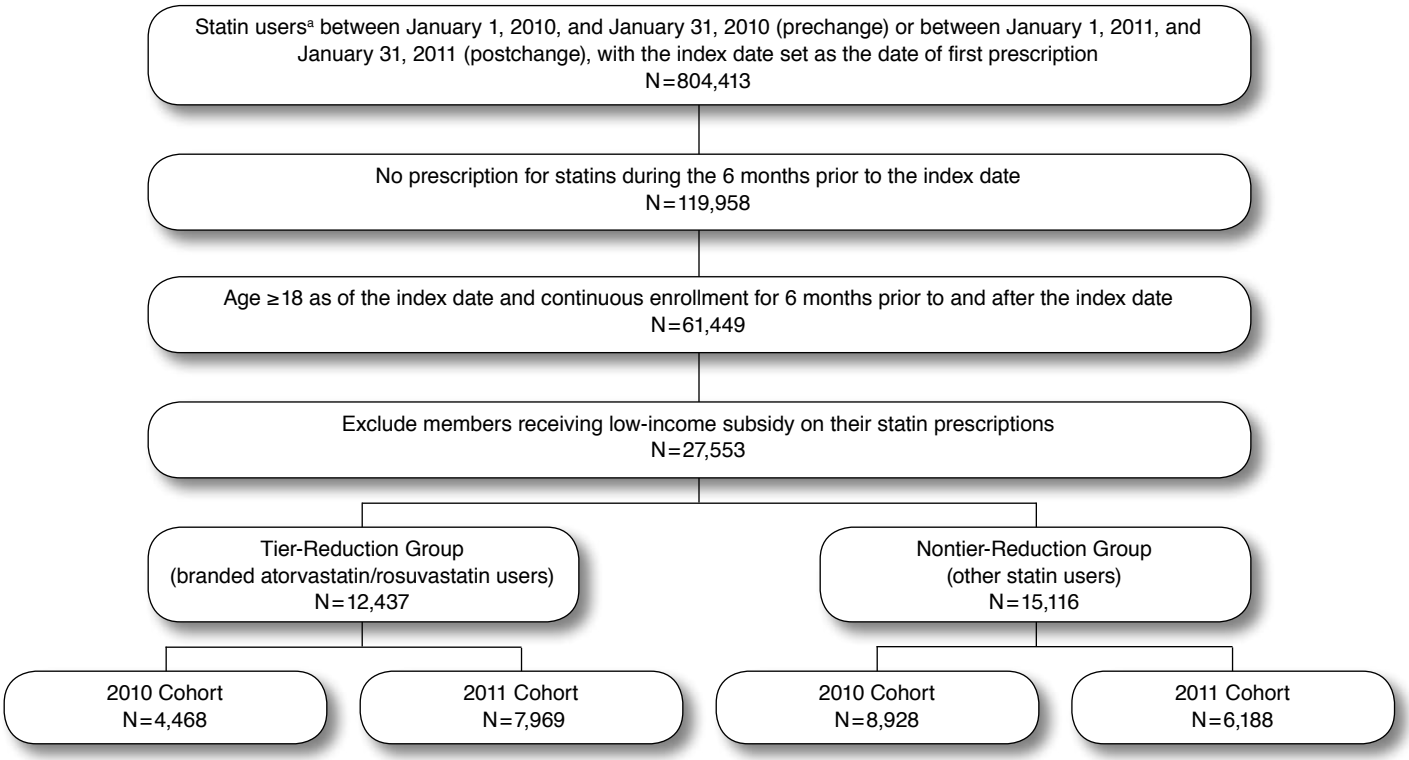
Statistical Analysis

Descriptive analyses for study measures were performed by comparing the 2010 cohort with the 2011 cohort for the tier-reduction group and the comparator group, respectively. Percentages were reported for categorical variables, and statistical differences were assessed using chi-square tests. Mean and standard deviations were reported for continuous variables, and statistical differences between the 2010 cohort and 2011 cohort were assessed using Student's t-tests.

We pooled branded atorvastatin and rosuvastatin users from 2010 and 2011 to assess whether there was an impact of tier reduction on statin adherence. We hypothesized that adherence in the 2011 cohort would be higher than the 2010 cohort if tier reduction had an impact on patient adherence. Logistic regression models were used to examine the association between tier reduction and high adherence with a binary variable PDC ≥ 0.8 as 1 and PDC < 0.8 as 0. In addition to evaluating adherence as a binary outcome, we also assessed it using PDC as a continuous variable. An ordinary linear regression model was fitted. All regression models were adjusted for patient age, gender, region, RxRisk score category, and percentage of patients with a supply of statin prescriptions for at least 90 days. For comparison purposes, similar regression analyses were conducted for the new users in the nontier-reduction group.

To ensure the estimates were robust, we conducted 2 sensitivity analyses regarding potential biases caused by the measurement approach and the data source. In the first sensitivity analysis, we excluded members who had statin prescriptions with a supply of 90 days or more. Since we assessed adherence using a 6-month period, having prescriptions with long days-of-supply decreased the chance to observe refill patterns to measure adherence. In the second sensitivity analysis, we excluded members with any statin prescription filled outside of retail, home, or outpatient settings (e.g., nursing home) in order to focus on patient behavior-related adherence. Members who filled the prescriptions in those settings may have been given the medications directly by health care providers, in which case we would not be assessing patient behavior-related adherence.

FIGURE 2 Sample Selection



[a]*Products containing branded atorvastatin, fluvastatin, lovastatin, pravastatin, branded rosuvastatin, simvastatin, branded simvastatin/ezetimibe, branded simvastatin/niacin, or branded lovastatin/niacin.*

Results

Member Characteristics

This study identified 12,437 members in the tier-reduction group with 4,468 from 2010 and 7,969 from 2011 using branded atorvastatin and rosuvastatin (Figure 2). We also identified 15,116 members in the comparator nontier-reduction group with 8,928 from 2010 and 6,188 from 2011 using other statins. Most of the members (97%) from the nontier-reduction group used generic statins.

The study population had a mean age of approximately 72 years, with a slightly older 2010 cohort (Table 1). Females accounted for approximately 64% of the study population. A great number of patients lived in the southern region, ranging from 38.1% to 48.3%. In the tier-reduction group, the 2011 cohort showed a lower level of RxRisk score distribution compared with the 2010 cohort ($P<0.0001$). A smaller proportion of the 2011 cohort hit the donut hole compared with the 2010 cohort (36.4% vs. 41.0%; $P<0.0001$). On the other hand, in the nontier-reduction group, the 2011 cohort appeared to be slightly more ill, indicated by a distribution of RxRisk toward higher levels and $56.65 to $35.81 of members hitting the donut hole compared with the 2010 cohort. Across all groups, a higher proportion of members in the 2011 cohort had statin prescriptions with a 90-day supply. Over the 6-month observation period, the tier-reduction group experienced a substantial reduction in average 30-day statin copayment from $56.65 to $35.81 ($P<0.0001$). Meanwhile, since there was no tier change, the 2011 cohort in the nontier-reduction group had a small absolute change ($7.89 vs. $8.48; $P=0.0263$), though statistically significant, for average 30-day statin copayments as expected.

Statin Adherence

In the tier-reduction group, the mean PDC over the 6-month study follow-up period increased from 0.77 to 0.83 ($P<0.001$), and the proportion of members with high adherence (PDC ≥ 0.8) increased from 62.0% to 72.9% ($P<0.001$) from the 2010 cohort to 2011 cohort (Figure 3). The nontier-reduction group had no significant change in mean PDC (0.77 to 0.78; $P=0.326$) and proportion of members with high adherence (65.1% to 65.7%; $P=0.477$) between the 2 cohorts.

After adjusting for patient characteristics via logistic regressions, members from the 2011 cohort were more likely to have

TABLE 1 Member Characteristics

	Tier-Reduction Group (Atorvastatin/Rosuvastatin Users)			Nontier-Reduction Group (Other Statin Users)		
	2010 Cohort	2011 Cohort	*P* Value	2010 Cohort	2011 Cohort	*P* Value
Number of members	4,468	7,969		8,928	6,188	
Age in years (%)			<0.001			0.002
<65	13.7	16.6		16.4	19.0	
65-69	13.6	18.1		14.4	14.2	
70-74	19.9	23.4		20.2	19.5	
75-79	17.6	17.3		17.2	17.3	
80-84	16.1	12.0		15.2	14.5	
85+	19.2	12.6		16.7	15.5	
Age in years (mean [SD])	74.0 [12.9]	71.6 [13.1]	<0.001	73.0 [13.4]	72.1 [13.7]	<0.001
Gender (%)			0.002			0.002
Male	34.7	37.4		34.8	37.2	
Female	65.3	62.6		65.2	62.8	
Region (%)			<0.001			<0.001
Northeast	38.9	20.0		26.0	25.3	
Midwest	17.4	28.4		23.3	21.4	
South	38.1	45.6		44.4	48.3	
West	5.6	6.1		6.3	5.0	
RxRisk score distribution (%)			<0.001			<0.001
Level 1	22.1	28.3		22.5	21.2	
Level 2	34.1	33.8		32.4	27.7	
Level 3	23.5	21.8		23.8	24.2	
Level 4	20.3	16.0		21.4	26.8	
Proportion of patients reaching donut hole at 6 months post-index (%)	41.0	36.4	<0.001	38.8	45.2	<0.001
Statin prescription with 90-day supply (%)	16.1	25.7	<0.001	22.0	26.4	<0.001
Average 30-day out-of-pocket payment for statin prescriptions (mean [SD])	$56.70 [23.90]	$35.80 [29.00]	<0.001	$8.50 [15.30]	$7.90 [4.70]	0.026

SD = standard deviation.

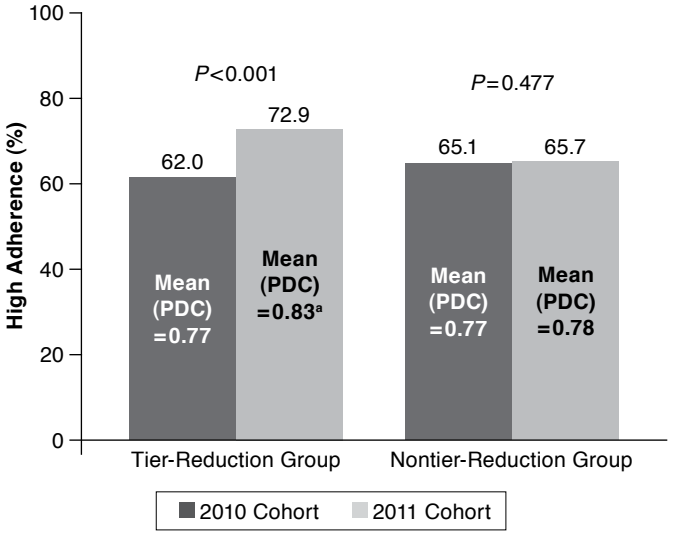
high adherence to statins than those in the 2010 cohort (odds ratio [OR] = 1.68; 95% confidence interval [CI] = 1.55-1.82) in the tier-reduction group (Table 2). We estimated the marginal probability to be a 5.3% increase from the predicted probability of 67.6% in the 2010 cohort to 72.9% in the 2011 cohort. No statistically significant changes were observed in the comparator nontier-reduction group (OR = 1.05; 95% CI = 0.98-1.12). Across the models, older age was associated with higher odds of high adherence to statin therapy while poor health status, demonstrated by a higher level of RxRisk score, was associated with lower odds of high adherence. As expected, members receiving statin prescriptions with 90-day or more supply had higher odds of being adherent.

After fitting the continuous PDC with a generalized linear regression adjusting for patient characteristics, the adjusted difference in mean PDC between the 2011 cohort and 2010 cohort was estimated to be 5.9% ($P < 0.05$) in the tier-reduction group (Figure 4). No change in the comparator nontier-reduction group was observed. The sensitivity analyses, similar analyses but excluding members with 90-day or greater supply of statin prescription and members who filled their statin prescription outside of retail, home, and outpatient settings, affirmed similar findings (Appendices A and B, available in online article).

Discussion

In 2011, a large Medicare Part D sponsor moved branded atorvastatin and rosuvastatin to the lowest tier. This retrospective cohort study examined the impact of this tier reduction on patient adherence using pharmacy claims data. In this sample of Medicare beneficiaries, we found a mean PDC of 0.78 over 6 months since treatment initiation and approximately 65% of patients with high adherence using PDC ≥ 0.8 as the threshold. Two prior studies reported adherence to statins among new users over a 1-year period using the identical PDC measure. Yeaw et al. (2009) found a mean PDC of 0.61.[10] Vinker et al. (2013) found 38.9% of their statin initiators had PDC ≥ 0.8.[9] It is not surprising that we found a higher mean PDC and a greater proportion of high adherent patients, since our evaluation period was shorter, and adherence has been found to decline over time.[6]

FIGURE 3 Proportion of Patients with High Adherence (PDC ≥ 0.8)



aP < 0.05 between 2010 and 2011 cohorts.
PDC = proportion of days covered.

Findings from this study suggest that this tier reduction associated with lower copayments had a positive effect on patient adherence. When evaluated in a dichotomous way (defined as PDC ≥ 0.8), we observed an increase in adherence rate from 62.0% in 2010 to 72.9% in 2011, representing a 68% increase in odds (OR = 1.68; 95% CI = 1.55-1.82). When evaluated as a continuous PDC measure, we observed an increase of 5.9%. To understand whether there might be a time trend, this association was assessed in the nontier-reduction comparator group who experienced no reduction in copayments. We found no significant improvement in adherence over time in the comparator group. The design of this pre/post analysis with a comparator group strengthened the internal validity of our study.

Our findings are consistent with previous studies that demonstrated the association of reduced cost-sharing with better adherence to the medications.[26-29,35,36] A 5.9% increase in PDC mirrors the reported data for statins from 3 previous studies.[26,27,29] A study by Choudhry et al. (2010) showed copayment reduction according to a value-based insurance design (VBID) was associated with an immediate 2.8% increase in adherence to statins measured monthly using PDC.[27] Chernew et al. (2008) also found a significant increase in medication possession ratio (MPR) of 3.39% MPR points to statins measured quarterly in participants of a VBID.[26] Also using MPR over a 1-year period, Maciejewski et al. (2010) found an adjusted increase of MPR to be 2.56% in VBID participants.[29]

However, these studies mainly examined commercially insured populations that consisted of working adults and their dependants. To the best of our knowledge, this study is the first to assess the impact of reduced copayment on patient adherence in a Medicare population. More than 10 million elderly patients are estimated to be receiving statin therapy in the United States,[32] and it is important to understand whether they bear the same price response. Cost-sharing strategies such as higher copayments, deductibles, and coinsurance based on tiers are often implemented by health plans to deter inappropriate or overuse of medications to control rising drug costs.[37] These strategies may unintentionally and adversely impact the use and adherence to essential medications for chronic diseases.[25] Medication adherence might be more challenging for the elderly population because of unique barriers such as multiple comorbidities, polypharmacy, and compromised physical and cognitive health.[38] Nonadherence takes a greater toll on the elderly population with more serious consequences such as risk of complications, institutionalizations, or premature death from poor disease control. Our findings suggest that alleviating the financial barrier could be considered as a strategy to improve medication adherence in the elderly population.

In recent years, VBID has become popular to ensure that copayments are based on potential clinical benefits.[39] Since legislation allowing Medicare to test VBID has been introduced, and VBID has been included in the Patient Protection and Affordable Care Act,[40,41] empirical data are needed to understand the association between lower copayment and patient adherence. Although in our study the design of this tier reduction was not VBID, the tier reduction that resulted in decreased out-of-pocket expenses aligns with the principle of VBID, and findings suggest that elderly patients are also sensitive to the financial barrier to essential medications. Our study contributes to the growing evidence related to copayment and patient adherence, especially in the elderly population. In particular, this study is a unique addition to the body of evidence showing the association of lower copayments with increased adherence, since it specifically examined the effect of moving branded products to the lowest tier prior to patient expiration. This change exhibits the largest copayment reduction, as most of the VBID either eliminates the already low tier 1 copayment, or reduces the tier 2 copayment, but not quite to the tier 1 level. This reduction might explain the larger percentage point increase in adherence (5.91%) compared with the prior studies (2.56%-3.39%).

Limitations

The most important limitation of this study is selection bias. Although we examined existing members who were new users, patients who chose to continue to enroll in the health plan after the implementation of tier reduction in 2011 might be self-selected and different from those who decided to continue in 2010. For example, patients who chose to remain in the plan

TABLE 2 Factors Associated with High Statin Adherence (PDC ≥ 0.8)

	Tier-Reduction Group (Atorvastatin/Rosuvastatin Users) N = 12,437		Nontier-Reduction Group (Other Statin Users) N = 15,116	
	Odds Ratio	95% CI	Odds Ratio	95% CI
2011 cohort	1.68[a]	(1.55-1.82)[a]	1.05	(0.98-1.12)
2010 cohort	Reference		Reference	
Age in years				
18-54	0.79[a]	(0.69-0.91)[a]	0.89	(0.79-1.01)
55-64	0.76[a]	(0.64-0.90)[a]	0.90	(0.78-1.04)
65-74	Reference		Reference	
75-84	1.13[a]	(1.01-1.25)[a]	1.21[a]	(1.11-1.33)[a]
85+	1.18[a]	(1.03-1.34)[a]	1.09	(0.97-1.22)
Female	0.82[a]	(0.75-0.90)[a]	0.97	(0.90-1.04)
Region				
Midwest	1.30[a]	(1.18-1.44)[a]	1.37[a]	(1.26-1.50)[a]
Northeast	1.57[a]	(1.42-1.74)[a]	1.44[a]	(1.32-1.57)[a]
South	Reference		Reference	
West	1.42[a]	(1.19-1.69)[a]	1.05	(0.9-1.22)
RxRisk score				
Level 1	Reference		Reference	
Level 2	0.91	(0.81-1.04)	0.85[a]	(0.76-0.95)[a]
Level 3	0.71[a]	(0.62-0.82)[a]	0.77[a]	(0.68-0.86)[a]
Level 4	0.49[a]	(0.43-0.56)[a]	0.58[a]	(0.52-0.65)[a]
Statin prescription with 90-day supply (%)	1.42[a]	(1.29-1.57)[a]	1.49[a]	(1.37-1.62)[a]

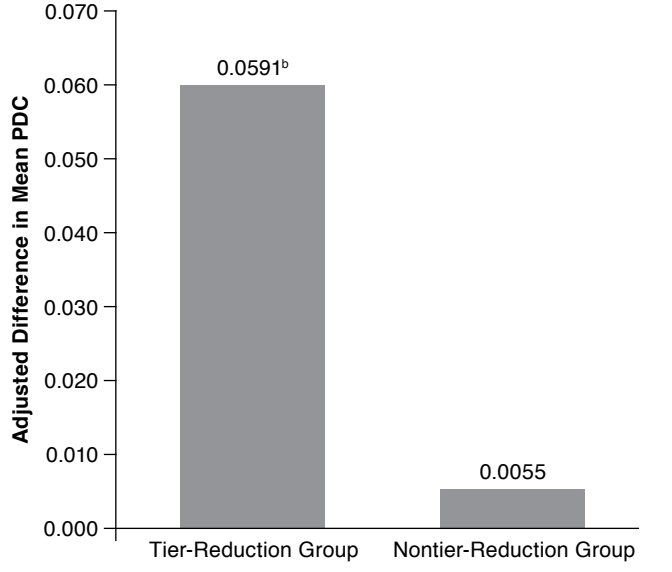
[a]*Indicates significant results.*
CI = confidence interval; PDC = proportion of days covered.

after tier reduction were younger and appeared to be healthier with lower levels of RxRisk score and a lower out-of-pocket prescription drug spending, resulting in fewer patients reaching the donut hole at the end of the 6-month study follow-up. In addition, more patients apparently initiated the 2 branded statins after tier reduction (56% of all statin users) than before (33%). Not having access to medical claims limited our ability to control for several health-related characteristics, and unobservable confounders may still exist and lead to biased estimates of the impact of tier reduction on adherence. For this reason, causality between tier reduction and adherence to statins cannot be drawn.

Several other limitations must be noted when interpreting the study results. Pharmacy claims might not reflect actual prescription consumption. Adherence patterns were evaluated for 6 months and might not be extrapolated to longer time periods. Because our study sample in the 2011 cohort was also enrolled in the previous year, our findings could not be generalizable to those new enrollees who switched from other plans. Similarly, we examined the impact of copayment reduction on members who newly initiated statins; the impact of copayment reduction on members continuing statin treatment was not evaluated. There are other financial factors that this study could not account for. Members may have different deductible thresholds that they need to meet, according to the plan they enrolled in, before they could receive the branded statins with lower copayment. Members may also have reached the donut hole (i.e., Medicare Part D coverage gap) at different times. It has been found that medication adherence decreases during the coverage gap period.[42-44] In addition, patients may be on other medications that made them meet the deductable or reach the donut hole at different rates. Finally, we only evaluated Medicare beneficiaries who were enrolled in Medicare Part D plans, and the findings might not be generalizable to the Medicare beneficiaries who have private drug coverage.

As considerations of basing out-of-pocket costs on possible health benefits become more common in health plans, it is important to continue evaluating their effectiveness using empirical data.[45] Future research should aim at assessing whether the effect will be sustainable in the long term and if the impact could be magnified by greater copayment reductions or even elimination of copayments. It would be particularly interesting to examine whether improved adherence to evidence-based medications could translate into better patient outcomes such as cholesterol control or reductions in hospitalizations for cardiovascular events. Our statin-specific findings provide an example that can be further researched in other therapeutic areas that have a low share of generics such as specialty medicine, human immunodeficiency virus infection, and certain rare diseases. In addition, it would be interesting to

FIGURE 4 Adjusted Differences in Mean PDC Comparing 2011 Cohort with 2010 Cohort[a]



[a]*Model adjusted for age, gender, region, RxRisk score category, and statin prescription with 90-day supply.*

[b]*P < 0.05 between 2010 and 2011 cohorts.*

PDC = proportion of days covered.

assess whether reducing or eliminating copays would have any impact on adherence within the context of the emerging health insurance exchange offerings.

Conclusion

Tier reduction resulting in lower copayments was associated with higher odds of branded statin adherence. Findings from this quasi-experimental study suggest that formulary strategies may improve medication adherence.

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DISCLOSURES

This study was sponsored by Pfizer Inc. Chen, Lee, and Boulanger are employees of Evidera, which provides consulting and other research services to pharmaceutical, device, government, and nongovernmental organizations. In salaried positions, Evidera employees work with a variety of companies and organizations and are precluded from receiving payment or honoraria directly from these organizations for services rendered. Shah, Mardekian, and Kuznik are employees of Pfizer Inc. with ownership of stock in Pfizer Inc.

Study concept and design were contributed by Chen, Shah, and Kuznik. Data collection was the responsibility of Chen, Lee, Boulanger, and Mardekian, and data interpretation was performed by Chen and Kuznik, with the assistance of Shah, Lee, Boulanger, and Mardekian. The manuscript was written by Chen and Kuznik, with the assistance of Shah, Boulanger, Lee, and Mardekian, and revised by Chen, Shah, and Kuznik, with the assistance of Boulanger, Lee, and Mardekian.

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APPENDIX A Sensitivity Analysis of Factors Associated with High Statin Adherence (PDC ≥ 0.8) by Excluding Members Receiving 90-Day Supply

	Tier-Reduction Group (Atorvastatin/Rosuvastatin Users) N = 9,670		Nontier-Reduction Group (Other Statin Users) N = 11,521	
	Odds Ratio	95% CI	Odds Ratio	95% CI
2011 cohort	1.61[a]	(1.47-1.76)[a]	1.03	(0.95-1.12)
2010 cohort	Reference		Reference	
Age in years				
18-54	0.83[a]	(0.71-0.97)[a]	0.88	(0.76-1.01)
55-64	0.80[a]	(0.66–0.97)[a]	0.88	(0.75-1.03)
65-74	Reference		Reference	
75-84	1.17[a]	(1.04-1.32)[a]	1.19[a]	(1.07-1.32)[a]
85+	1.21[a]	(1.04-1.40)[a]	1.09	(0.96-1.23)
Female	0.82[a]	(0.74-0.90)[a]	0.96	(0.88-1.05)
Region				
Midwest	1.34[a]	(1.19-1.50)[a]	1.43[a]	(1.29-1.59)[a]
Northeast	1.62[a]	(1.45-1.81)[a]	1.51[a]	(1.38-1.67)[a]
South	Reference		Reference	
West	1.42[a]	(1.17-1.74)[a]	1.13	(0.95-1.34)
RxRisk score				
Level 1	Reference		Reference	
Level 2	0.94	(0.82-1.08)	0.87[a]	(0.77-0.99)[a]
Level 3	0.79[a]	(0.68-0.93)[a]	0.80[a]	(0.70-0.92)[a]
Level 4	0.53[a]	(0.45-0.62)[a]	0.60[a]	(0.53-0.69)[a]

[a]*Indicates significant results.*

CI = confidence interval; PDC = proportion of days covered.

APPENDIX B Sensitivity Analysis of Factors Associated with High Statin Adherence (PDC ≥ 0.8) by Excluding Patients with Statin Prescription Filled Outside of Retail, Home, or Outpatient Settings

	Tier-Reduction Group (Atorvastatin/Rosuvastatin Users) N = 12,242		Nontier-Reduction Group (Other Statin Users) N = 14,573	
	Odds Ratio	95% CI	Odds Ratio	95% CI
2011 cohort	1.68[a]	(1.55-1.83)[a]	1.06	(0.98-1.13)
2010 cohort	Reference		Reference	
Age in years				
18-54	0.79[a]	(0.68-0.91)[a]	0.90	(0.79-1.01)
55-64	0.76[a]	(0.64-0.90)[a]	0.90	(0.79-1.04)
65-74	Reference		Reference	
75-84	1.12[a]	(1.01-1.25)[a]	1.22[a]	(1.11-1.34)[a]
85+	1.18[a]	(1.03-1.35)[a]	1.08	(0.97-1.21)
Female	0.82[a]	(0.75-0.90)[a]	0.96	(0.89-1.04)
Region				
Midwest	1.31[a]	(1.19-1.45)[a]	1.38[a]	(1.26-1.51)[a]
Northeast	1.57[a]	(1.42-1.74)[a]	1.44[a]	(1.32-1.58)[a]
South	Reference		Reference	
West	1.42[a]	(1.19-1.69)[a]	1.04	(0.89-1.20)
RxRisk score				
Level 1	Reference		Reference	
Level 2	0.92	(0.81-1.05)	0.86[a]	(0.77-0.97)[a]
Level 3	0.71[a]	(0.62-0.82)[a]	0.77[a]	(0.68-0.87)[a]
Level 4	0.48[a]	(0.42-0.55)[a]	0.58[a]	(0.52-0.65)[a]
Received any statin claims with 90-day supply	1.42[a]	(1.29-1.57)[a]	1.49[a]	(1.37-1.62)[a]

[a]*Indicates significant results.*

CI = confidence interval; PDC = proportion of days covered.