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At Pitney Bowes, Value-Based Insurance Design Cut Copayments And Increased Drug Adherence

ABSTRACT To date, there has been little empirical evidence to support the broader use of value-based insurance design, which lowers copayments for services with high value relative to their costs. To address this lack of data, we evaluated the impact of the value-based insurance program of a US corporation, Pitney Bowes. The program eliminated copayments for cholesterol-lowering statins and reduced them for clopidogrel, a blood clot inhibitor. We found that the policy was associated with an immediate 2.8 percent increase in adherence to statins relative to controls, which was maintained for the subsequent year. For clopidogrel, the policy was associated with an immediate stabilizing of the adherence rate and a four-percentage-point difference between intervention and control subjects a year later. Our study thus provides an empirical basis for the use of this approach to improve the quality of health care.

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Many employers expend considerable resources to provide their employees with health benefits, and they seek to maximize the value of that coverage.[1] For prescription medications, these strategies frequently include efforts to minimize medication use that is of limited health benefit, most often by increasing patients' share of the cost of these therapies.

Although increased cost sharing effectively reduces drug spending for the employer, this approach also leads to reductions in essential medication use, especially among patients with chronic illnesses.[2,3] Paradoxically, the cost of preventable care arising from the underuse of highly effective medications may be greater than the cost savings resulting from increased copayments.[4,5]

An alternative approach is to reduce the patient's share of costs for medications that provide high benefits relative to their costs. An example is statin drugs in patients who have experienced a myocardial infarction, or heart attack.[6] This strategy is known as evidence-based plan design or value-based insurance design. It has attracted much attention as a means to simultaneously improve health care quality and reduce the growth of overall health care spending.[7,8]

Despite the enthusiasm for value-based insurance design, there is limited evidence to support the notion that reduced copayments will improve the use of essential medications.[9] In the only prospective study published to date, a large employer eliminated copayments for generics and reduced them by 50 percent for brand-name drugs in five classes.[10] In comparison to a control employer, statistically significant increases in adherence—the long-term, consistent use of medications in accordance with a prescriber's recommendations—of three to four percentage points occurred in four of the five studied drug classes.[10]

Unfortunately, the patients for whom copayments were reduced had different rates of medication adherence than the patients to whom they were compared prior to the policy's introduction. In addition, the analysis did not account for clinical factors that could have influenced the

results.[11]

Effective January 1, 2007, a large Fortune 500 company, Pitney Bowes, eliminated copayments for statins for its employees and beneficiaries with diabetes or vascular disease and lowered copayments for all employees and beneficiaries prescribed the clot-inhibiting drug clopidogrel. These benefit changes constitute a natural experiment to evaluate the impact of cost-sharing reductions on the use of essential cardiovascular medications.

Study Data And Methods

Our methods are described in more detail in the online Technical Appendix.[12]

SETTING AND DESIGN We evaluated the effect of reducing copayments on medication adherence using an interrupted time series with concurrent control group design. This method compares actual outcomes after a policy change with those that would have been expected if outcomes before the policy change were extrapolated into the future. The analysis also adjusts for trends in outcomes in a comparison population for whom copayments were not changed.

Our intervention cohort—the group for whom copayments were reduced—was drawn from beneficiaries of Pitney Bowes. Pitney Bowes provides pharmacy coverage in a three-tier coinsurance plan. Beneficiaries can also opt to participate in a voluntary disease management program. These individuals were compared to commercially insured beneficiaries of Horizon Blue Cross Blue Shield of New Jersey. Pitney Bowes and Horizon both use the same pharmacy benefit manager.

COHORT ELIGIBILITY We created separate cohorts to study copayment reductions for statins and clopidogrel. The statin cohort (see Appendix Exhibit A)[12] consisted of patients who filled a prescription for a statin between January 1, 2006, and December 31, 2007. Only patients with diabetes or vascular disease were included, to replicate the criteria used by Pitney Bowes.

The clopidogrel cohort consisted of patients who filled a prescription for this drug during the time period specified above. Because copayments for clopidogrel were reduced for all patients prescribed the drug, and not only those who fulfilled specific clinical criteria, no additional inclusion or exclusion criteria were applied to these patients.

Our cohorts consisted of 2,830 people eligible for copayment reductions ($n = 2,051$ statin users and $n = 779$ clopidogrel users) and 49,801 controls ($n = 38,174$ statin users and $n = 11,627$ clopidogrel users). Exhibit 1 presents the baseline characteristics of these patients.

Compared with controls, patients in the cohort with reduced statin copayments were older and were more likely to be men. They also had lower incomes and were less likely to have hypertension, but otherwise they were similar.

Differences between the cohort that paid more for clopidogrel and the control cohort were more marked. Intervention patients were older; were more likely to be female; were more likely to be white; were more likely to have coronary artery disease, diabetes, and hypertension; and used more medications in the year prior to cohort inclusion. Otherwise, the characteristics of the two groups were similar.

MEDICATION ADHERENCE We measured medication adherence by estimating the number of days of medication available to each patient or the "proportion of days covered" in each month between January 2006 and December 2007.[13]

STATISTICAL ANALYSIS We plotted monthly adherence proportions for the intervention and control cohorts before and after copayments were reduced. We then used regression modeling to determine whether Pitney Bowes' copayment policy influenced medication adherence immediately (that is, by changing the "level" of the trend in adherence) or over the longer term (that is, by changing the "slope" of the trend) compared to the control group.

Our model adjusted for the fact that multiple observations were being made on each patient (called correlated error terms). We also repeated our analysis adjusting for important clinical characteristics. Because our outcome of interest (proportion of days covered) was not normally distributed, we repeated our analysis by evaluating the proportion of patients who were "fully adherent" to therapy, defined as a proportion of days covered greater than or equal to 80 percent.

We also sought to evaluate the effect of the copayment policy on adherence in the subgroup of patients who had begun statin or clopidogrel therapy before the new policy went into effect—in other words, those who did not initiate therapy in response to the lowered copayments. As a result, we repeated our analysis after excluding those patients whose first eligible prescription fills were after January 1, 2007.

Finally, we matched intervention and control patients to better balance differences between the two cohorts and create more equivalent study groups. Because adherence rates are known to decline over time, we matched the two groups on when they first filled an eligible prescription in the study time frame. We also matched them according to the copayment of this first fill.

POTENTIAL LIMITATIONS Our findings should be interpreted in light of several limitations. Our analytic approach used time-series methods,

EXHIBIT 1

Baseline Characteristics Of Patients In The Adherence Analysis

	Statin users		Clopidogrel users	
Characteristic	Reduced-copayment cohort (*n* = 2,051)	Control (*n* = 38,174)	Reduced-copayment cohort (*n* = 779)	Control (*n* = 11,627)
DEMOGRAPHICS				
Mean age, years	58.8	53.8**	67.5	54.5**
Percent female	36.1%	39.8%[a] **	37.6%	28.8%**
Income, mean	$56,625	$58,263**	$54,715	$57,286**
Percent black race	11.5%	11.9%	10.2%	12.3%**
COMORBID CONDITIONS				
Coronary artery disease	26.3%	25.3%	60.6%	43.8%**
Congestive heart failure	1.8%	1.8%	1.8%	2.4%
Hypertension	50.0%	59.5%**	55.5%	46.4%**
Diabetes	36.2%	34.5%	12.6%	9.9%**
Charlson comorbidity score	1.0	1.0	3.3	3.3[a]
MEDICATION USE IN PRIOR YEAR				
Mean number	9.0	9.1	12.6	10.3**
HOSPITAL USE IN PRIOR YEAR				
Mean number of hospitalizations	0.2	0.2**	0.4	0.3**
MONTHLY DRUG COPAYS FOR STUDY CLASS, MEAN[b]				
Year prior to copay reduction	$24.18	$11.80**	$17.22	$10.65**
Year after copay reduction	$0.60	$11.95**	$8.86	$14.43**

SOURCE Authors' analyses. [a]Statistically significant differences in these covariates became nonsignificant in the matched analysis [b]Statins or clopidogrel, as appropriate. **$p < 0.05$

which make repeated measures of outcomes over time and which are considered the strongest approach for evaluating time-delimited interventions.[14] Nevertheless, our analysis is subject to the possibility that the changes in adherence we observed were due to other events that occurred simultaneously with the reduced copayments. We are unaware of such events among statin users. Clopidogrel copayments increased among the control group, although to a smaller extent than copayments were reduced in the intervention cohort.

We were unable to account for factors such as participation in the disease management programs or for unobserved patient characteristics, such as education, which could alter the likelihood that patients responded to cost-sharing reductions. These factors would have influenced our results only if they occurred to a different extent in the two cohorts.

Administrative data do not contain detailed clinical information such as cholesterol levels. It is possible that patients who discontinued their medications were nonadherent for clinically appropriate reasons. Our results would have been affected only if this occurred more frequently in intervention than control patients.

Study Results

COPAYMENT CHANGES In 2006 statin and clopidogrel copayments were higher for the intervention cohort than for the control group. The mean monthly statin copayment for the intervention cohort was $24.18, versus $11.80 for the control group. The mean monthly clopidogrel copayment for the intervention cohort was $17.22, versus $10.65 for the control group (Exhibit 1).

The policy change was associated with substantial reductions in copayments in the intervention cohort (mean monthly statin copayment, $0.60; mean monthly clopidogrel copayment, $8.86). Copayments for the control group increased slightly for statins ($0.15) and more substantially for clopidogrel ($3.78) (Exhibit 1).

The new copayment policy should have eliminated copayments altogether for statins. However, copayments were still charged in error on 3 percent of eligible claims. This occurred most often when there was a delay between the date of medication dispensing and payment—for example, when claims were submitted for reimbursement by mail rather than by electronic adjudication from a pharmacy.

STATIN ADHERENCE Monthly rates of adher-

ence to statins before and after copayments were reduced are shown in Exhibit 2. In 2006 adherence declined by similar rates in both cohorts, but the implementation of the new policy on January 1, 2007, was associated with a stabilizing of adherence in the intervention cohorts, with continued decline among controls. As a result, adherence in the intervention cohort was 2.8 percent higher than among controls immediately after the new policy was implemented.

In models adjusted for differences in comorbidity and demographic characteristics, the elimination of statin copayments was associated with an immediate 3.1 percent increase in monthly adherence but no subsequent change in adherence relative to controls (Exhibit 3). Analyses using the proportion of patients who were fully adherent to therapy each month (that is, a binary outcome) yielded similar results (Exhibit 3). Eliminating statin copayments was associated with a 17.0 percent immediate increase but no subsequent change in the odds that patients were fully adherent.

The observed changes were similar when we restricted the cohort to patients who had filled a statin prescription before the new copayment policy had started—in other words, those patients who did not initiate therapy in response to the lowered copayments (Exhibit 3). Further, when intervention and control patients were matched on the basis of the copayment of their first prescription and the calendar quarter when they entered the study, the results were slightly smaller in magnitude but qualitatively very similar (Exhibit 3).

Comparing the intervention cohort with statin users from the same company who were not eligible for the copayment reduction produced consistent results, although with a different pattern than observed previously: There was no significant change in adherence levels, but the rate of change of subsequent adherence increased significantly at 0.4 percent per month. The observed 5 percent difference in adherence between intervention and control subjects after twelve months was consistent with the results of our other analyses.

CLOPIDOGREL ADHERENCE Trends in clopidogrel adherence were similar to those observed for statins (Exhibit 4). The policy was associated with an immediate stabilizing of adherence rate but no subsequent change, resulting in a four-percentage-point difference in the crude monthly clopidogrel adherence rates between intervention and control subjects twelve months after the policy was introduced.

Multivariable modeling confirmed these results (Exhibit 3). The new copayment policy was associated with an immediate 4.2-percentage-point increase in monthly adherence and no change in the monthly adherence slope. Analyses of the change in the proportion of patients who were fully adherent to therapy each month yielded similar results as did restricting our cohort to patients who had filled a prescription for clopidogrel before January 1, 2007 (Exhibit 3).

When intervention and control subjects were matched, the magnitude of the results increased. However, the point estimates of the matched results are contained within the 95 percent con-

EXHIBIT 2

Changes In Monthly Statin Adherence In The Reduced-Copayment Cohort Compared With Control
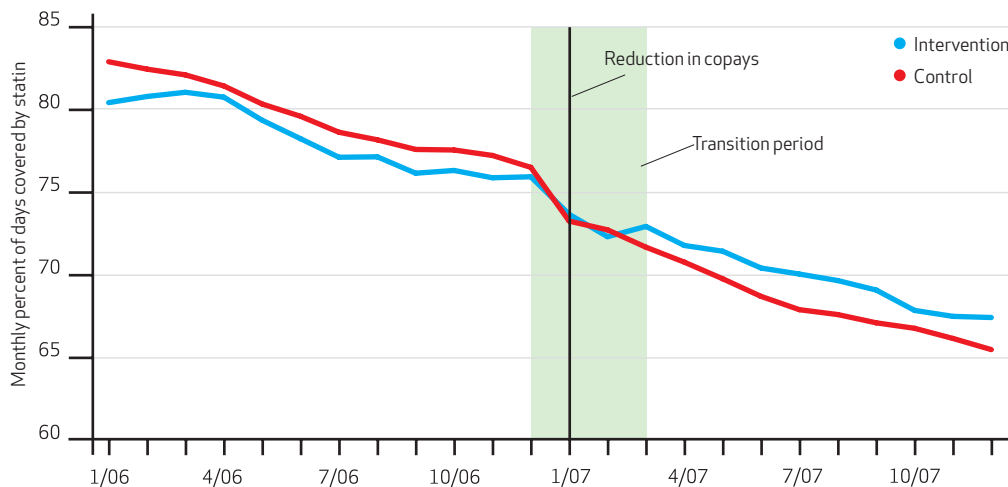
SOURCE Authors' analyses. **NOTES** The blue and red lines represent crude monthly adherence rates for the cohort for whom copayments were reduced and for controls, respectively.

EXHIBIT 3

Impact Of Copayment Reductions On Statin And Clopidogrel Adherence, Adjusted For Differences In Comorbidity And Demographic Characteristics

Outcome	Impact of copayment reduction	All patients (%)	Patients entering cohort before 1/1/07 (%)	Matched analysis (%)
STATIN COHORT				
Proportion of days covered (monthly)	Change in level	3.1**	2.8**	2.6**
	Change in slope	0.1	0.1**	0.1
Odds of being fully adherent (monthly)	Change in level	17.0**	15.9**	15.1**
	Change in slope	0.4	0.2	0.4
CLOPIDOGREL COHORT				
Proportion of days covered (monthly)	Change in level	4.2**	3.8**	6.6**
	Change in slope	−0.2	0.3**	−0.1
Odds of being fully adherent (monthly)	Change in level	19.9**	18.9**	33.9**
	Change in slope	−0.9	0.8	−0.3

SOURCE Authors' analyses. **NOTES** All models are multivariable adjusted. "Level" refers to the immediate impact of the copayment policy on medication adherence (change in "level" of the trend in adherence). "Slope" refers to the subsequent rate of change in adherence resulting from the copayment policy (change in the "slope" of the trend). **$p < 0.05$

fidence intervals of the unmatched results, which suggests that these two results are very similar. Matching may have increased important but unobservable differences between intervention and control subjects. Consequently, the matched results may overestimate the true impact of the new copayment policy. Conversely, matching may have reduced the influence of factors that underestimated the policy's effect in the unmatched analyses.

Discussion

Reducing patient cost sharing for essential chronic medications has been widely advocated as a potentially attractive mechanism to use in improving the value of health benefit plans. Although this strategy has an intuitive appeal, the actual effect of value-based insurance design on medication use has been subject to very little formal evaluation.

Our analysis demonstrates that reducing or eliminating copayments can improve adherence.

EXHIBIT 4

Changes In Monthly Clopidogrel Adherence In The Reduced-Copayment Cohort Compared With Control
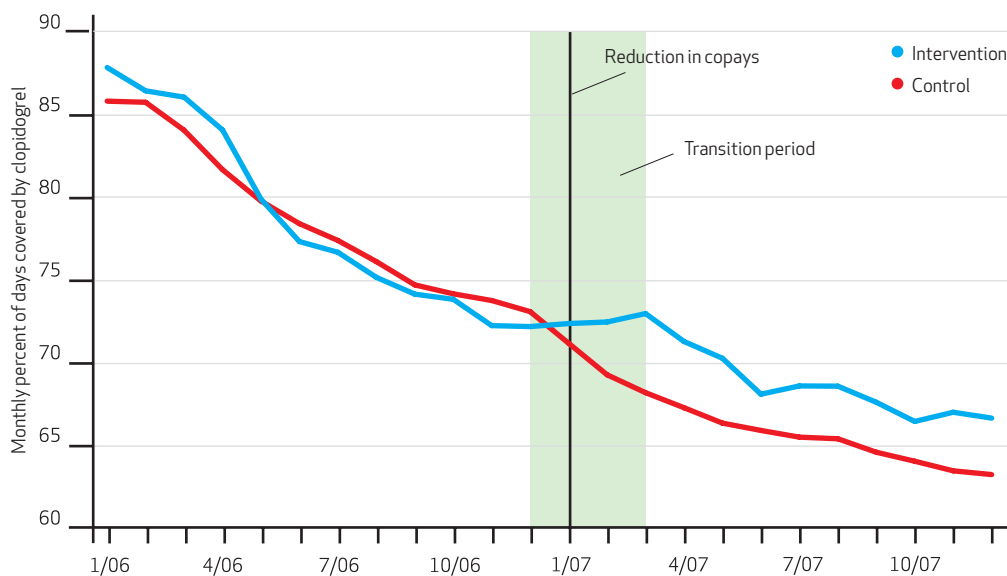
SOURCE Authors' analyses. **NOTES** The blue and red lines represent crude monthly adherence rates for the cohort for whom copayments reduced and controls, respectively.

Our findings support the adoption of this strategy by a large number of third-party payers throughout the United States.[8] Furthermore, our results may suggest an alternative to the current trend of rising cost sharing faced by the majority of commercially insured patients.[15]

The most robust published data on the impact of value-based insurance design come from a cohort study conducted by Michael Chernew and colleagues, in which a large employer eliminated copayments for generic drugs and reduced copays by 50 percent for brand-name drugs in several classes of chronic medications, including statins.[10] In comparison to an employer that did not change copayments over this time period, statistically significant increases in adherence of three to four percentage points were seen for four of the five studied classes. In that study, the cost-sharing reduction for brand-name drugs was relatively modest, and all patients prescribed the study medications—regardless of what they were being treated for—were entitled to the enhanced benefit.

Although we evaluated an intervention that, in the case of statins, eliminated copayments altogether and targeted these reductions to high-risk patients, we found changes in adherence that were consistent with those of Chernew and colleagues.[10] It substantiates our findings that our results were robust to adjustment for clinically important covariates. Our results were unchanged when we restricted the cohort to patients who had initiated therapy before the new policy went into effect. They were also unchanged when we matched intervention and control subjects on factors that, if substantially imbalanced between the two groups, could have influenced our results.

Our analysis and the existing literature cannot address whether value-based insurance design will ultimately reduce health services use and overall health spending. The link between improved adherence and cost savings is supported by observational studies[4,16] and economic models.[17,18] Consider an economic model based on the study by Chernew and colleagues. The model suggests that if the observed improvements in adherence reduced nondrug spending by 17 percent, the resulting cost savings would be equivalent to the added costs of eliminating medication copayments.[19]

However, the actual return on investment from copayment reductions will need to be established more conclusively in future studies that are specifically designed to evaluate the impact of value-based insurance design on costs. These could include quasi-experimental analyses that are similar to the study we report here but that measure resource use or overall spending. They could also include a randomized evaluation, such as the soon-to-be-completed Post-MI Free Rx Event and Economic Evaluation (FREEE) trial, which is evaluating the impact of eliminating copayments for cardiovascular medications in patients discharged from the hospital after suffering a heart attack.[20]

We observed improvements in adherence that were relatively modest in scale and that are consistent with the findings of other investigators.[21–24] This highlights the various factors involved in nonadherence.[6,25] Thus, the ability of benefit design and patient financial incentives to address this complex problem completely should not be overestimated. Rather, it will also be necessary to address the many other reasons why health care use is suboptimal. Value-based insurance design may be linked to efforts to address these issues and may be used to identify for patients those services that are of high value (rather than high cost). For example, several recently initiated value-based insurance design plans require patients to participate in disease management programs in order to receive drug copayment waivers.[8]

Our study provides rigorous empirical data on the effects of a novel quality improvement strategy that has attracted attention among employers and payers.[8] The impact of this strategy on health outcomes and costs remains to be conclusively established. However, reducing copayments for high-value services may provide an alternative to the more common practice of simply increasing patient cost sharing. ∎

NOTES

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12 To access the Appendix, click on the Appendix link in the box to the right of the article online.

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