Utilization and Treatment

The Influence of Targeted Education on Medication Persistence and Generic Substitution among Consumer-Directed Health Care Enrollees

Rebecca L. Sedjo and Emily R. Cox

Objective. To evaluate an educational outreach among consumer-directed health plan (CDHP) enrollees on medication persistence and lower-cost generic substitution within four chronic medication therapies.

Study Setting. A cross-sectional analysis using pharmacy claims data from a national employer group that began offering a CDHP in 2006 and implemented an educational outreach to some CDHP enrollees in 2007 was used.

Methods. The intervention group was comprised of CDHP enrollees who received education outreach and was compared with CDHP enrollees without the educational outreach. Adjusted and unadjusted medication persistence and lower-cost generic substitutions were compared between groups.

Principal Findings. There was no difference in medication persistence between groups. CDHP enrollees with the educational outreach were more likely to have converted to lower-cost generic alternative antihypertensive medication compared with CDHP enrollees without the educational outreach ($OR_{adj} = 29.82$, 95 percent CI = 4.41–201.93).

Conclusion. Educational outreach directed to CDHP enrollees was associated with increases in lower-cost generic alternatives with no change in patients' chronic medication use. However, considerable opportunity exists to assist CDHP enrollees in making sound health care decisions.

Key Words. Consumer-directed health plan, education, medication persistence, medication substitution

In 2008, approximately 8 percent (~ 5.5 million) of individuals with commercial insurance were enrolled in consumer-directed health plans (CDHPs) (Claxton et al. 2008). These “high-deductible” health insurance plans encourage contributions by the employer and/or employee into tax-favorable accounts. These accounts are then used for health care-related expenses

and, unlike medical savings accounts, unused funds in 1 year can be rolled over for future health care expenditures. Once the account is exhausted, the employee must pay any health expenditures out of pocket until an annual deductible is met. Upon satisfying the annual deductible, standard health coverage with copays and/or coinsurance becomes available. The CDHP insurance model relies on member involvement in health care utilization/cost decisions to manage health care expenditures (Buntin et al. 2006).

Concerns have been raised that CDHPs may discourage patients from obtaining essential medical care and/or chronic medications in order to avoid out-of-pocket expenditures (Buntin et al. 2006; Ross 2006; Wilensky 2006; Hibbard, Greene, and Tusler 2008). The evidence to date has been mixed. Parente, Feldman, and Christianson (2004) compared pharmacy and medical claims between enrollees in a CDHP (the majority with individual and family deductibles of U.S.\$1,500 and U.S.\$3,000, respectively), health maintenance organization (HMO), and preferred provider organization (PPO) health plans. One year after introduction of the CDHP, enrollees in the CDHP had higher adjusted mean rates of prescriptions filled and physician office visits compared with PPO but lower rates compared with HMO enrollees. On the other hand, a retrospective analysis of medical and pharmacy claims data reported a reduction in total medical office visits in the first year for enrollees of a "high-deductible" CDHP (annual individual deductible U.S.\$1,500) compared with enrollees of a PPO health plan (Hibbard, Greene, and Tusler 2008). This decline occurred indiscriminately for both low- and high-priority medical office visits. Conversely, emergency department visits declined after enrollment into a high-deductible health plan (annual deductibles ranging from U.S.\$500 to U.S.\$2,000 for individual and U.S.\$1,000 to U.S.\$4,000 for families) as compared with enrollees of traditional HMO plans (Wharam et al. 2007). While there was no difference in the initial emergency visit, reduction in subsequent low-severity emergency visits occurred after enrollment into a high-deductible health plan. A retrospective analysis of employees and their dependents enrolled in a high-deductible CDHP (annual family deductible U.S.\$3,000 with an employer-funded account of U.S.\$1,500) reported that compared with enrollees with a PPO health plan, the CDHP enrollees were more likely to discontinue antihypertensive and lipid-lowering pharmaco-

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therapy after implementation of the CDHP (Greene et al. 2008a). Furthermore, no difference in adherence was observed by plan type among employees who continued with their chronic medication therapy or no change in generic utilization, suggesting that additional resources are needed to encourage CDHP enrollees to make beneficial health care decisions.

Navigating the CDHP insurance model for the patient involves multifaceted health care decision making while weighing personal expenditures (Goodman 2004; Greene et al. 2008b). In lieu of the complexity of this decision making, educational programs may assist CDHP enrollees in becoming more informed health care consumers and decision makers. While patient education programs have been demonstrated to influence medication use (Cormack et al. 1994; Grace et al. 2002; Delate and Henderson 2005; Meissner et al. 2006; Tran and Billups 2008), no information is available on the effect of enrollee education programs in CDHPs. The purpose of this study was to assess the impact of a multifaceted educational intervention on medication decision making by comparing the rates of chronic medication persistence and lower-cost medication substitution between CDHP enrollees without an educational outreach and CDHP enrollees with the medication educational outreach in a single national employer.

METHODS

Study Setting

A pharmacy benefit manager collaborated with a national employer to evaluate a comprehensive educational program for their CDHP enrollees. The employer offered employees a traditional copayment-based health and pharmacy benefit before 2006. In 2006, the employer initially offered the choice between this traditional plan with a three-tiered pharmacy benefit and a CDHP with the goal of completely replacing the traditional plan with CDHP in January 1, 2009. For the CDHP, there were U.S.\$2,500 individual and U.S.\$5,000 family deductible with a health savings account in which enrollees could contribute up to U.S.\$500 for an individual and U.S.\$1,000 for a family with 100 percent matching of funds by the employer (Table 1). Enrollees were responsible for a gap of U.S.\$1,500 individual and U.S.\$3,000 family from when the HSA was exhausted until 100 percent coverage after the deductible was met. In 2006, 51 percent and 49 percent of employees were enrolled in the CDHP and traditional plans, respectively. In 2007, the employer continued to offer the traditional plan along with two separate CDHPs (the same medical

Table 1: Plan Design of Employment Group in 2006 and 2007

		<i>Years</i>	
		<i>2006</i>	<i>2007</i>
CDHP	Deductibles: U.S.\$2,500 individual/ U.S.\$5,000 family Retail: Generics 10% (U.S.\$5 minimum) Brands: 35% (U.S.\$20 minimum) Out-of-pocket maximum: U.S.\$3,500 individual/U.S.\$7,000 family Health savings account: 100% match (U.S.\$500 individual/U.S.\$1,000 family)	Same as 2006 except copayment reduced to U.S.\$0	
CDHP with educational outreach	Deductibles: U.S.\$2,500 individual/ U.S.\$5,000 family Retail: Generics 10% (U.S.\$5 minimum) Brands: 35% (U.S.\$20 minimum) Out-of-pocket maximum: U.S.\$3,500 individual/U.S.\$7,000 family Health savings account: 100% match (\$500 individual/\$1,000 family)	Added Educational Outreach Program Same as 2006 except copayment reduced to U.S.\$0	

CDHP, consumer-directed health plan.

and pharmacy benefit design with the same deductibles and health savings account arrangement as in 2006) from different insurance carriers. Within one CDHP, a comprehensive program was implemented to educate enrollees about cost-saving opportunities and encourage compliance with chronic medications. In 2007, enrollment into the CDHPs increased to 76 percent of employees while enrollment in the traditional plan was 24 percent. This research was performed in compliance with all regulations related to the Health Insurance Portability and Accountability Act regarding the use of personal health information for health care operations.

Study Design

This analysis was a cross-sectional evaluation of persistence and substitution between two cohorts. The intervention group included employees and their dependents enrolled in a CDHP who received targeted messaging designed to encourage compliance with chronic medication and to raise awareness regarding lower-cost generic alternatives along with general information on CDHP in their benefit packets that included online comparative drug pricing. The control group included employees and dependents enrolled in a CDHP health plan that received the same information on CDHP in their benefit

packets as the intervention group but did not receive the educational outreach. Pharmacy claims data were extracted from the administrative database using generic product identifier codes (*Medi-Span Master Drug Database [MDDDB]*[®] v. 2.5, Wolters Kluwer Health Inc., Indianapolis, IN).

This study assessed the difference in adherence to medication therapy and substitution from a higher-cost branded medication to a lower-cost, therapeutically equivalent generic medication. To assess differences in adherence to medication therapy, the dichotomous medication persistence value was determined using a modification of the method described previously (Conlin, Gerth, and Fox 2001). It was operationalized as having had at least one purchase of one or more medications in a therapy class in the first 6 months of 2006 and at least one purchase for a medication in the same drug group at any time in the fourth quarter of 2007. Then, persistence rates were calculated by dividing the count of persistent medications in the therapy class by the total medications in that therapy class. Persistence rates among antihypertensive, antihyperlipidemic, and antidepressant medications were compared between the study groups. To assess differences in the substitution of brand medications with lower-cost, therapeutically equivalent generic alternatives, a substitution variable was operationalized as a purchase of a higher-cost brand medication in the first quarter of 2007 but the purchase of a lower-cost generic alternative based upon the last purchase in 2007. The substitution rate was, then, calculated by dividing the count of substituted medications in the therapy class by the total medications available for substitution in that therapy class. Substitution rates were compared within the angiotensive-converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARB), antihyperlipidemic, antidepressant, and proton pump inhibitor (PPIs) therapy classes.

Intervention

The intervention provided education on medication optimization that was designed to encourage use of lower-cost generic medication and chronic medication persistence. Only the intervention group received the educational outreach. Beginning on March 1, 2007, enrollees were identified after each purchase in retail of a 2007 selected brand medication, and information on lower-cost, equally effective generic alternatives specific to their recent purchase was mailed. Enrollees filling these same high-cost brand prescriptions through the home delivery pharmacy channel received a telephone call to encourage generic alternatives before filling the prescription. Subsequently, quarterly letters were sent to enrollees who purchased any of the 2007 selected

brand medications in either retail or home delivery summarizing any savings opportunities over the past quarter. In addition, enrollees with gaps in their purchases of chronic medication, identified through claims data as <60 percent adherent over the past 270-day period measure by medication possession ratio (MPR) (Fairman and Motheral 2000) were mailed an educational message that highlighted the importance of medication adherence. Furthermore, a similar letter was sent to these same enrollees' physician offices along with the MPR measure. These adherence letters were sent quarterly for antihypertensive and antihyperlipidemic medications and weekly for the antidepressive medications. No pretesting of the educational letters was conducted.

Study Population

Two subpopulations of enrollees were used to evaluate the educational outreach. The subpopulation included in the analysis of medication persistence included enrollees ≥ 18 years of age who were continuously eligible in the CDHP plan design in 2006 and 2007, and had purchased at least one chronic disease medication for an antihypertensive, antihyperlipidemic, or antidepressant in the first 6 months of 2006. The analysis of lower-cost substitution included enrollees ≥ 18 years of age who had purchased a branded ACEs/ARBs, antihyperlipidemic, antidepressant, or PPI medication where an available lower-cost generic alternative was available during the first quarter of 2007.

Data Analyses

Covariates assessed in the analyses included the total number of classes of chronic maintenance medication as determined using *MDDB*[®] v. 2.5 (categorized as 1 or ≥ 2 classes) and a dichotomous ever/never variable for use of home delivery for prescription drugs in 2007. Age was calculated as of January 1, 2007. For the substitution analysis, a dichotomous yes/no variable was created to indicate continuous eligibility during all of 2007.

Individual enrollee baseline differences between the study groups in 2007 were assessed. χ^2 -tests of association were conducted to compare proportions between study groups. Analyses of variance were performed when comparing continuous normally distributed variables. The Kruskal–Wallis test was used for continuous nonnormally distributed variables. Post hoc analyses were conducted between the CDHP with education group and the control group.

The associations between persistence in each therapy class and the study groups as well as the associations between medication substitution in each therapy class and the study groups were evaluated cross-sectionally using multivariate logistic regression modeling. These analyses were performed at the therapy class level since enrollees could have purchased more than one medication in a therapy class.

Adjustment in the logistic models were made for age, sex, home delivery for prescription drugs, continuously eligible (substitution analysis only), and count of maintenance medications in 2007 as well as the intra-correlations of enrollees who had purchased multiple medications in a therapy class. Unadjusted and adjusted odds ratios (OR_{adj}) along with 95 percent confidence intervals (95 percent CI) were reported for each therapy class with the referent category being the CDHP without education group. Statistical analyses were performed in *STATA/SE* v. 8.0 (*Stata Statistical Software*: Release 8, StataCorp LP, College Station, TX) using two-sided statistical tests with an α -level of 0.05.

RESULTS

CDHP enrollees with and without education were comparable in regard to age, the percentage of females, the median count of unique maintenance drugs, and continuously eligible (Table 2). However, CDHP enrollees with education were less likely to use home delivery as compared with CDHP enrollees without education.

There were 975, 835, and 638 medications evaluated for therapy persistence of antihypertensive, antidepressant, and antihyperlipidemic medications, respectively (Table 3). Persistence was similar across study groups with rates ranging from 67 percent to 71 percent for antihypertensives, 74–77 percent for antihyperlipidemics, and approximately 60 percent for antidepressants. After adjustment, no persistence rate differences were identified between CDHP enrollees with or without the educational outreach.

There were 503, 373, 623, and 432 chronic medications targeted for substitution among the antihypertensive, antidepressants, antihyperlipidemic, and PPI therapy classes, respectively (Table 4). Substitution rates generally were low (≤ 12 percent). For the CDHP enrollees who receive the educational outreach, they were more likely to have converted to lower-cost generic alternative antihypertensive medication compared with enrollees in the CDHP who did not received the educational outreach ($OR_{adj} = 29.82$, 95 percent CI = 4.41–201.93). While increases in lower-cost generic alternative

Table 2: Enrollee Baseline Demographics and Medication Utilization by Study Group and Analysis Type

<i>Characteristics</i>	<i>Study Group (Persistence Analysis)</i>		<i>Study Group (Lower-Cost Substitution Analysis)</i>	
	<i>CDHP without Education</i>	<i>CDHP with Education</i>	<i>CDHP without Education</i>	<i>CDHP with Education</i>
Enrollees (<i>n</i>)	1,018	693	1,409	904
Mean age as of Jan. 1, 2007* (SD)	47.8 (11.0)	47.3 (11.2)	48.7 (10.5)	49.4 (10.4)
Female [†] (%)	47.8	51.8	50.3	49.6
Any use of home delivery for prescription drugs in 2007 [‡] (%)	40.8	33.5 ^d	43.2	35.6 ^e
Median count of unique maintenance drugs in 2007 [‡] (IQR)	3 (1–4)	3 (2–4)	4 (2–6)	4 (2–6)
Median count of unique maintenance drugs in 2006 [‡] (IQR)	3 (2–4)	3 (2–4)	—	—
Continuously eligible in 2007 [‡] (%)	100	100	93.7	93.4

*Analysis of variance.

[†]Pearson's χ^2 .

[‡]Kruskal–Wallis test.

^d $p < .01$.

^e $p < .001$.

CDHP, consumer-directed health plan; IQR, inter-quartile range (25%, 75%).

medications were observed for antidepressive, antihyperlipidemic, and PPI therapy classes, none were statistically significant. Of note, no difference (unadjusted $p = .50$) among enrollees who discontinued PPI therapy (possibly due to conversion to over the counter alternatives) was observed across study groups.

DISCUSSION

This retrospective cross-sectional study with control group provides evidence on the impact of educational outreach program among CDHP enrollees. We found that the outreach intervention did not increase medication persistence but substantially increased medication substitution to lower-cost generic medication therapy.

Table 3: Therapy Persistence for Antihypertensive, Antidepressive, and Antihyperlipidemic Therapy Classes by Study Group

Therapy Class	Study Group			
	CDHP without Education (Referent)	CDHP with Education		
	Persistent, n/N (%)	Persistent, n/N (%)	OR (95% CI)	Adjusted OR* (95% CI)
Antihypertensive	415/619 (67.0)	253/356 (71.1)	1.21 (0.90–1.63)	1.18 (0.87–1.60)
Antidepressive	277/464 (59.7)	219/371 (59.0)	0.97 (0.73–1.29)	1.06 (0.79–1.42)
Antihyperlipidemic	306/399 (76.7)	177/239 (74.1)	0.87 (0.60–1.26)	0.84 (0.57–1.24)

*Adjusted for age, sex, use of home delivery for prescription drugs in 2007, and count of maintenance medications in 2007.

CDHP, consumer-directed health plan; CI, confidence interval; OR, odds ratio.

Findings from this study suggest that the educational messaging was not successful in increasing adherence rates for chronic medication therapy. Our results in the second year of CDHP implementation are consistent with Greene et al. (2008a) first year results that identified no difference in medication persistence by health plan among those patients who continued purchasing medications after CDHP implementation. Similar to our findings, a randomized control trial of mailed educational videos for prescribed medi-

Table 4: Substitution for Lower-Cost Medication Therapeutic Alternative by Study Group

Therapy Class	Study Group			
	CDHP without Education (Referent)	CDHP with Education		
	Substitution, n/N (%)	Substitution, n/N (%)	OR (95% CI)	Adjusted OR* (95% CI)
ACEs/ARBs	1/299 (0.3)	19/204 (9.3)	30.61 (4.06–230.98)	29.82 (4.41–201.93)
Antidepressive	13/215 (6.1)	17/158 (10.7)	1.87 (0.88–3.98)	1.83 (0.85–3.92)
Antihyperlipidemic	28/382 (7.3)	29/241 (12.0)	1.73 (1.00–3.00)	1.68 (0.95–2.98)
PPI	8/253 (3.2)	10/179 (5.6)	1.81 (0.70–4.69)	2.02 (0.78–5.25)

*Adjusted for age, sex, use of home delivery for prescription drugs use in 2007, continuously eligible, and count of maintenance medications in 2007.

CDHP, consumer-directed health plan; CI, confidence interval; OR, odds ratio, PPI, proton pump inhibitor.

cations (benazepril, metoprolol, simvastatin, and transdermal estrogen) among managed care patients on therapies to reduce cardiac risk were found to be ineffective in increasing medication adherence (Powell and Edgren 1995). Furthermore, reviews of the literature have shown that educational material alone is ineffective on various health outcome measures (Pearson et al. 2003; Lu et al. 2008). Given the numerous factors that contribute to a patient's compliance to medication (Osterberg and Blaschke 2005), the lack of an effect of our education outreach program on medication persistence is not surprising. Previous research suggests that CDHP enrollees naturally may not take advantage of medication cost-lowering opportunities. CDHP enrollment was associated with lower generic medication utilization rates when compared with enrollees in a traditional health plan (Parente, Feldman, and Chen 2008). Another analysis of CDHP enrollees (annual family deductible U.S.\$3,000 with an employer-funded account of U.S.\$1,500) reported that their generic medication utilization rate did not increase after implementation of the CDHP (Greene et al. 2008a). As a result of our educational outreach, significant increases in substitution were detected among enrollees in the CDHP with the educational outreach. CDHP enrollees with the education outreach were more likely to convert to lower-cost ACE/ARB alternatives than CDHP enrollees without the outreach. Other educational interventions have been reported to positively impact chronic medication use (Cormack et al. 1994; Grace et al. 2002; Delate and Henderson 2005; Meissner et al. 2006; Tran and Billups 2008). However, none of these studies have been conducted in the framework of a CDHP and only one has specifically investigated the effect of education on switching to an alternate medication (Delate and Henderson 2005). In their randomized clinical trial, Delate and Henderson (2005) report a 33 percent increase in formulary alternative substitution rates among patients who received a targeted mailed intervention compared with patients who did not receive the intervention. While our substitution rates were substantially higher, the studies vary dramatically in the application of the educational intervention (i.e., formulary change versus CDHP), which does not allow for accurate comparisons.

This study is not without limitations. All enrollees in our study self-selected into one of two CDHP that had the same benefits through different benefit carriers and thereby a selection bias is unlikely. Enrollees were in the second year of their CDHP and already may have developed cost-sensitive behaviors. This may have moderated the effects observed between enrollees in the CDHP with education outreach as compared with enrollees in the CDHP without education outreach. Implementation of an education outreach

during the first year of enrollment in a CDHP may result in improved medication-taking behaviors. Medication persistence was evaluated at one point in time instead of using a continuous measure of adherence. Thus, these results only provide information on whether the patients were continuing to take their medication and not on whether the patients were consuming their medications as prescribed as well as did not account for new users of therapy. The numbers of enrollees purchasing chronic medications were relatively small and thus our ability to detect small statistically significant differences was low. Furthermore, we used retrospective claims data and, therefore, only adjusted for those factors with available data. Other factors such as income, which has been shown to influence conversion to lower-cost alternatives (Cox, Kulkarni, and Henderson 2007), and utilization (Schneeweiss et al. 2002) were not controlled in these analyses. Prescription claims data from a single employer group were utilized; thus, findings from this study may not be generalizable to other employer groups. Additionally, it is unknown whether the effectiveness of the intervention for generic substitution can be attributed primarily to enrollees of a CDHP or whether similar findings would also be observed among enrollees of health plans other than CDHPs. Consequently, future research to disentangle these effects is warranted.

Given that only 15 percent of patients initially started on a branded medication will switch to an available generic alternative in the following year (Shrank et al. 2007) and lower generic utilization rates specifically among CDHP enrollees (Parente, Feldman, and Chen 2008) have been observed, these data suggest that CDHP enrollees naturally would not increase utilization of generic medications, a key component for maintaining quality of care and simultaneously controlling drug costs. An intervention to encourage CDHP enrollees to utilize lower-cost alternatives is necessary. Despite increases in the utilization of generic medications by CDHP enrollees receiving this educational outreach that provided information and encouragement to request substitution with lower-cost, alternative generic medication(s), there is considerable opportunity to further influence enrollees to make sound health care decisions, including the utilization of lower-cost generic alternatives. One method to more effectively communicate with enrollees about utilizing lower-cost generic alternative may be through the behavioral economics principle of loss aversion (Rabin 1998). Under this theory, enrollees have a more pronounced response to loss when required to increase their contribution as opposed to when they pay less than their usual cost. Implementing these and other such principals within targeted educational messages specifically directed to CDHP enrollees either with or without providing financial incentives

may increase awareness of medication quality and cost considerations in CDHP enrollees so that they depart from typical medication-using behavior and increase their use of generic medications.

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