Patient, Physician, Pharmacy, and Pharmacy Benefit Design Factors Related to Generic Medication Use

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BACKGROUND: Increased use of generic medications conserves insurer and patient financial resources and may increase patient adherence.

OBJECTIVE: The objective of the study is to evaluate whether physician, patient, pharmacy benefit design, or pharmacy characteristics influence the likelihood that patients will use generic drugs

DESIGN, SETTING, AND PARTICIPANTS: Observational analysis of 2001–2003 pharmacy claims from a large health plan in the Western United States. We evaluated claims for 5,399 patients who filled a new prescription in at least 1 of 5 classes of chronic medications with generic alternatives. We identified patients initiated on generic drugs and those started on branded medications who switched to generic drugs in the subsequent year. We used generalized estimating equations to perform separate analyses assessing the relationship between independent variables and the probability that patients were initiated on or switched to generic drugs.

RESULTS: Of the 5,399 new prescriptions filled, 1,262 (23.4%) were generics. Of those initiated on branded medications, 606 (14.9%) switched to a generic drug in the same class in the subsequent year. After regression adjustment, patients residing in high-income zip codes were more likely to initiate treatment with a generic than patients in low-income regions (RR=1.29; 95% C.I. 1.04–1.60); medical subspecialists (RR=0.82; 0.69–0.95) and obstetrician/gynecologists (RR=0.81; 0.69–0.98) were less likely than generalist physicians to initiate generics. Pharmacy benefit design and pharmacy type were not associated with initiation of generic medications. However, patients were over 2.5 times more likely to switch from branded to generic medications if they were enrolled in 3-tier pharmacy plans (95% C.I. 1.12–6.09), and patients who used mail-order pharmacies were 60% more likely to switch to a generic (95% C.I.

1.18–2.30) after initiating treatment with a branded drug.

CONCLUSIONS: Physician and patient factors have an important influence on generic drug initiation, with the patients who live in the poorest zip codes paradoxically receiving generic drugs least often. While tiered pharmacy benefit designs and mail-order pharmacies helped steer patients towards generic medications once the first prescription has been filled, they had little effect on initial prescriptions. Providing patients and physicians with information about generic alternatives may reduce costs and lead to more equitable care.

KEY WORDS: patient; physician; pharmacy; pharmacy benefit; design; generic medications; medication costs.

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INTRODUCTION

In 2005, spending for prescription drugs in the United States exceeded \$250 billion.¹ The growth of prescription drug spending has outpaced spending in all other sectors of the health care system in the last decade² and is predicted to continue to do so.³ Increased generic drug use is an important means of controlling drug costs without compromising quality of care,^{4–6} and research suggests that overall drug spending could be reduced by over 10% by using generics when available.⁷

In addition to reducing total expenditures for prescription drugs, generic prescribing can have a substantial effect on patients' out-of-pocket costs and even adherence. In 2004, approximately 68% of patients with prescription drug coverage were enrolled in plans that required at least 3 tiers of copayments.⁸ Such plans generally require patients to pay greater copayments for branded drugs than for generic drugs. A recent study found that patients enrolled in tiered pharmacy benefit plans are more adherent to chronic therapy when they are initiated on generic medications than when they are initiated on branded medications, suggesting that prescribing generic drugs can improve medication-taking behavior while reducing costs.⁹

Many factors may influence whether patients receive generic medications. Physicians write prescriptions and substantially

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influence the medication choice.¹⁰ Patients may request generic medications at the point of the clinical encounter or upon receipt of the medication at the pharmacy, and patient characteristics may influence generic drug use.¹¹ Insurers use pharmacy benefit designs and tiered copayment requirements to steer patients towards less costly generic medications. Finally, pharmacy characteristics may influence medication choice by influencing rates that patients communicate about medication costs or by using protocols to increase generic medication use.

We linked pharmacy claims from a large health plan to physicians and pharmacies and evaluated the relationship between these factors and the likelihood that patients initiate therapy on a generic drug as well as the likelihood that a patient initiated on a branded drug will subsequently switch to a generic within the same drug class. Considering that physicians and patients are often unaware of the patient's out-of-pocket cost requirements when new prescriptions are written,¹²⁻¹⁴ we explored whether the factors that influence generic drug use were different when initiating medication therapy or when deciding to switch to a generic drug after a branded prescription has initially been filled. A better understanding of factors associated with generic drug use may offer targets to intervene to reduce unnecessary drug costs.

METHODS

Data Source. Pharmacy data were supplied by Anthem Blue Cross and Blue Shield (ABCBS) and Anthem Prescription Management. ABCBS is a large managed care plan providing health insurance coverage to patients in Colorado and Nevada. Large Group, Small Group, Individual, and State accounts were included in this analysis, while Medicare Supplemental and National accounts were excluded due to difficulty accessing complete pharmacy records. The average enrolled membership of patients included in this study over the 2-year time period was 270,137 members per month.

Identification of Study Subjects. After excluding patients who were not continuously enrolled in the plan during the entire study period, we identified all patients who filled a new prescription in 1 of 6 drug classes: calcium channel blockers (CCBs), HMG CoA reductase inhibitors (statins), oral contraceptives (OCs), angiotensin converting enzyme inhibitors (ACE-Is), histamine 2 receptor antagonists (H2RA), and proton pump inhibitors (PPIs). These classes of medications were selected because they are all commonly prescribed, include multiple branded options with similar clinical efficacy,¹⁵ are typically prescribed for chronic use, and each class includes a generic option. H2RAs and PPIs were combined because they are both used to treat the same conditions, generic options were available only for H2RAs during the study period, and the health plan considered them to be substitutes with efforts to use greater H2RAs when appropriate.

Outcome Measures. We first identified new users of the specified classes of medications and those who filled prescriptions for generic medications. New users were captured by identifying all prescriptions filled in the specified

classes between October 1, 2001 and October 1, 2002. Index, or new, prescriptions were those filled by patients who had filled no prescriptions in the same class in the previous 6 months.¹⁶ Index prescriptions were identified as either generic or branded medications.

We then identified all patients who switched from a branded medication to a generic medication within the class. We identified all prescriptions filled in the same class in the 365 days after the index claim. For all patients who were begun on a branded medication, we identified patients who filled a claim for a generic medication within the class in the subsequent year. In multivariable analyses, we used data associated with the first generic prescription filled as independent predictors. A small number of patients (75) were dropped from the switching analysis because data was missing from subsequent claims limiting interpretability.

Predictors of Generic Drug Use. Independent variables described patient, physician, pharmacy benefit design, and pharmacy characteristics. Patient variables included age, gender, and income. Income was estimated by linking median household income in zip code tabulation areas from the 2000 U.S. census data with patient zip codes in the claims. Although this is an imperfect proxy for individual-level income,^{17,18} its use is common in health services research due to the lack of alternatives with claims data analyses. An average income of less than \$30,000 in the zip code of residence was considered "low income," income from \$30,000 - \$60,000 was categorized as "middle income" and income greater than \$60,000 was categorized as "high income." We included average number of "other" prescriptions filled as a marker to control for comorbidities.¹⁹

Using Drug Enforcement Administration (DEA) identifiers, we linked pharmacy claims to prescribing physician information in the American Medical Association Physician Masterfile. We identified physician age, gender, and specialty, which was categorized as Generalist (including Family Practice and Internal Medicine physicians), Medical Subspecialist (excluding Cardiologists), Cardiologist, Obstetrician/Gynecologist, or other (Psychiatrist, Emergency Room physician, or Surgeon). Doctors of osteopathy and physicians' assistants were included in this analysis and categorized by specialty as well. Several studies have validated the use of this data source for physician-level variables.^{20,21} DEA numbers were unavailable for approximately 20% of prescription claims filled, and patients who filled those prescriptions were dropped from the analysis. Sensitivity analyses including those patients, but excluding physician level variables, did not substantively influence relationships between other independent variables and outcome variables.

Pharmacy benefit design was categorized by copayment arrangement. Patients with no copayments were categorized as being enrolled in plans with no tiers. Patients in plans with a single copayment for all drugs or 2 copayment tiers were categorized together due to small sample size. Patients with 3 or 4 tiers of copayments were also categorized together because none of the drug classes evaluated in this study placed any brands into the fourth tier, so only the first 3 tiers were relevant for this study. Patients in 3- and 4-tier plans were categorized into plans that required lower copayment requirements (\$5/\$15/\$30, \$10/\$20/\$30, \$10/\$20/\$35, for generic, preferred and non-preferred medications, respectively) and higher copay-

ment plans (\$10/\$30/\$50, \$15/\$25/\$40, 20\$/\$35/\$50, or \$15/\$40/\$60). We did not attempt to account for other administrative strategies to increase generic drug use such as prior authorization. Such practices were utilized broadly, and failure to examine them was unlikely to introduce bias to our analysis.

Pharmacies were categorized as either chain pharmacies, independent pharmacies, mail-order pharmacies, or, rarely, "other" pharmacies (i.e., clinic or hospital pharmacies). In addition, we included drug class as a predictor in our multivariable models to control for different prescribing patterns in different drug classes. As a sensitivity analysis, we performed stratified multivariable analyses by drug class and found that the direction of the relationships between independent variables and outcome variables was consistent between drug classes.

Statistical Methods. To assess factors that influence generic medication use, we used 2 generalized estimating equation models to control for clustering at the physician level, assuming an exchangeable variance/covariance matrix. In the first model, the dichotomous outcome variable identified whether or not a patient was initiated on a generic medication. The second dichotomous outcome variable, estimated using only the subsample of patients initiated on a branded drug, identified whether or not patients switched to a generic medication within the class in the subsequent year. We used the log link function to estimate relative risks of generic drug use for independent variables, adjusting for all other independent variables included in the model (including drug class), and predictors were considered significant at the $p < .05$ level. We included covariates related to patient, physician, pharmacy, and benefit design characteristics in both models because we had a priori hypotheses regarding each and wanted to control for variables related to each of these domains. We tested numerous interaction terms and included the interaction of patient age and gender in our final models because we found that patients behaved differently as they aged depending on their gender. No other interaction terms were significant and were not included. In some cases, patients initiated more than 1 drug class during the study period and occurred more than once in the database. To provide equal weight to each patient in our database, we randomly selected 1 class of medication to evaluate for each patient who began on more than 1 of the classes we evaluated and used individual patients as the unit of analysis. A sensitivity analysis including all classes initiated by each patient in our sample produced qualitatively similar results. In addition, we performed sensitivity analyses stratifying by drug class and found relationships between independent variables and outcomes to be consistent across drug classes. All statistical procedures were performed using SAS version 8.2. (SAS Institute, Cary, NC).

RESULTS

Population Characteristics. A total of 5,399 patients were identified as new users of at least 1 of the drug classes we evaluated (Table 1). Almost 40% were male, 67.5% were between 36 and 55 years old, and 67.4% filled an average of between 1 and 3 prescriptions a month (including those from

Table 1. Sample Characteristics

Patient characteristics (n=5,399)	Percentage
Male	39.6
Age	
<25	10.6
25–39	23.0
40–55	44.5
>55	21.9
Median household income in zip code	
<\$30,000	9.3
\$30–60,000	69.5
> \$60,000	21.2
Avg. number of prescriptions per month*	
< 1	3.1
1–3	67.4
> 3	29.6
Pharmacy characteristics	
Independent/other pharmacy	13.0
Chain pharmacy	84.1
Mail-order pharmacy	2.9
Pharmacy benefit design characteristics	
No copayments	2.9
1 or 2 tiers of copayments	3.7
3 or 4 tiers with lower copayments	30.4
3 or 4 tiers with higher copayments	63.1
Provider characteristics (n=2,282)	
Age	
<45	31.2
46–55	39.4
>55	29.4
Male	72.4
Physicians assistants or doctors of Osteopathy	11.2
Specialty	
Generalist	66.5
Medical subspecialist	12.0
Cardiologist	2.7
Obstetrics–Gynecology	14.2
Psychiatry	0.4
Surgery	2.9
Emergency Room	1.3

*Average number of prescriptions filled per month over the entire study period, including prescriptions for medications that were not in one of the classes evaluated in this study

classes not evaluated here). These prescriptions were written by 2,282 physicians from a broad age range and representing numerous specialties. Over 84% of initial prescriptions were filled in chain pharmacies, and over 93% of patients were enrolled in pharmacy benefit plans with at least 3 tiers of copayments, with 63.1% enrolled in higher copayment plans and 30.4% enrolled in lower copayment plans.

Medication Choices. Of the 5,399 index prescriptions included in this analysis, 23.4% were generic medications (Table 2). Of those initiated on branded medications, almost 15% switched to a generic medication in the same drug class in the subsequent year.

Factors Influencing Whether Patients Initially Filled Prescriptions for a Generic Medication. In our multivariable regression analysis, several patient and physician characteristics were associated with generic prescription drug initiation (Table 3). Patients living in the lowest-income zip codes were least likely to fill prescriptions for generic medications. Patients living in middle income zip codes were 28% more likely to be initiated

Table 2. Percentage of New Prescriptions that were Generic Medications and Percent that Switched to Generics in the Subsequent Year

Drug class	Index prescriptions		Subsequent prescriptions
	Number of patients initiated on any drug in the class	Percent that were initiated on a generic	Percent who switched to generics after an initial branded prescription*
Oral contraceptives	1,294	34.2	21.6
Calcium channel blockers	357	41.2	5.3
ACE-inhibitors	1,052	16.4	34.3
PPI/H2 blockers	1,742	28.0	1.8
Statins	954	1.4	8.4
TOTAL	5,399	23.4	14.9

*n=4,062 patients

on therapy with a generic medication ($p=0.01$), and patients living in the most wealthy zip codes had a 29% greater likelihood of being initiated on therapy with a generic medication ($p=0.02$). Among male patients, older patients were less likely to initiate medication use with a generic medication than younger ones. Among females, patients age 25–39 were 36% more likely to initiate therapy with a generic medication than patients less than 25 years old ($p<0.001$).

We found that Medical Subspecialists were 18% less likely ($p=0.03$) and Obstetrician/Gynecologists were 19% less likely ($p=0.01$) than Generalists to initiate patients on generic medications. The patient's pharmacy benefit design or the type of pharmacy where the prescription was filled was not related to medication choice when initiating therapy.

Factors Influencing Switching to a Generic Medication.

Different variables were associated with switching to a generic drug than initiating a generic drug (Table 4). Older patients were more likely to switch to generic drugs from branded drugs than younger patients. Males age greater than 55 were over 7.5 times more likely to switch to generic drugs than males less than 25 years old ($p=0.04$). Older females were from 2 to almost 3 times more likely to switch to a generic medication compared to females less than 25 years old ($p<0.001$ for all). Patients of Obstetrician/Gynecologists were 27% less likely to switch to generics than those seen by generalists ($p=0.01$).

Patients who refilled their medications in mail-order pharmacies were 65% more likely to switch to a generic medication than patients who refilled their medications in an independent pharmacy ($p=0.003$), while no significant differences were seen between patients who refilled their medication in independent versus chain pharmacies.

Pharmacy benefit design had a substantial association with switching rates. Patients in plans with 3 tiers of copayments but relatively low copayment requirements were 2.61 times more likely to switch to a generic drug than patients who were enrolled in a 1- or 2-tier plan ($p=0.03$). Patients in plans with 3 or 4 tiers of copayments and higher copayment requirements were almost 4 times more likely to switch to a generic drug ($p=0.001$).

DISCUSSION

As in previous studies, we found that patients are frequently prescribed branded medications when similarly effective generic medications are available.⁷ Unlike previous studies, our study also points to targets for changing prescribing patterns. Residents of poor zip codes, those least likely to be able to afford expensive medications, were over 25% more likely to receive branded medications. Consistent with previous findings, Specialists, and Obstetricians were more likely to prescribe branded drugs than Generalists.¹⁰ Efforts to provide information to patients and physicians about generic alternatives could focus on these patient and provider groups. Within the single insurer we studied, pharmacy benefit design and type of pharmacy did not significantly influence generic drug use when initial prescriptions are filled. This suggests

Table 3. Factors that Influence Whether Patients are Initiated on Generic Medications

Patient characteristics	Relative risk	95% C.I. lower limit	95% C.I. upper limit	p-value
Males age*				
25–39	0.50	0.37	0.67	<0.001
40–55	0.49	0.39	0.63	<0.001
>55	0.57	0.43	0.75	<0.001
Females age†				
25–39	1.36	1.15	1.61	<0.001
40–55	1.12	0.91	1.36	0.29
>55	1.08	0.84	1.39	0.55
Median household income in zip code‡				
\$30–60,000	1.28	1.06	1.56	0.01
>\$60,000	1.29	1.04	1.60	0.02
Avg. number of prescriptions per month§				
1–3	1.17	0.86	1.59	0.32
>3	1.27	0.93	1.74	0.14
Pharmacy characteristics//				
Chain pharmacy	1.09	0.94	1.26	0.28
Mail-order pharmacy	1.24	0.92	1.67	0.16
Pharmacy benefit design characteristics¶				
No copayments	0.65	0.39	1.06	0.08
3 or 4 tiers with lower copayments	0.97	0.75	1.26	0.83
3 or 4 tiers with higher copayments	1.03	0.80	1.32	0.86
Physician characteristics				
Age#				
46–55	1.07	0.96	1.21	0.20
>55	0.99	0.87	1.14	0.90
Male	1.03	0.92	1.16	0.58
Specialty**				
Medical Subspecialist	0.82	0.69	0.98	0.03
Cardiologist	0.92	0.64	1.32	0.65
Obstetrics–Gynecology	0.81	0.69	0.95	0.01
Other	0.95	0.76	1.18	0.63

Results of generalized estimating equations; n=5,399; controlling for drug class

*Males age <25

†Females age <25

‡Income <\$30,000

§1 or less avg. prescription filled per month

//Independent pharmacy

¶1 or 2 tier of copayment benefit design;

#Physician age 45 or less

**Generalist physician

Table 4. Factors that Influence Whether Patients Switch to Generic Medications

Patient characteristics	Relative risk	95% C.I. lower limit	95% C.I. upper limit	p-value
Males age*				
25-39	5.92	0.87	40.01	0.07
40-55	4.96	0.74	33.16	0.10
>55	7.56	1.13	50.54	0.04
Females age†				
25-39	1.97	1.39	2.80	0.002
40-55	2.72	1.86	3.97	<0.001
>55	2.88	1.84	4.50	<0.001
Median household income in zip code‡				
\$30-60,000	0.99	0.77	1.27	0.93
> \$60,000	1.08	0.81	1.43	0.61
Avg. number of prescriptions per month§				
1-3	0.79	0.53	1.17	0.23
>3	0.90	0.61	1.35	0.62
Pharmacy characteristics//				
Chain pharmacy	1.17	0.93	1.48	0.19
Mail-order pharmacy	1.65	1.18	2.30	0.003
Pharmacy benefit design characteristics¶				
No copayments	1.47	0.49	4.43	0.50
3 or 4 tiers with lower copayments	2.61	1.12	6.09	0.03
3 or 4 tiers with higher copayments	3.95	1.72	9.11	0.001
Physician characteristics				
Age#				
46-55	0.85	0.72	1.00	0.06
>55	1.00	0.84	1.19	0.96
Male	1.17	0.999	1.39	0.051
Specialty**				
Medical subspecialist	1.06	0.84	1.34	0.33
Cardiologist	1.09	0.75	1.59	0.63
Obstetrics-Gynecology	0.73	0.56	0.94	0.01
Other	1.04	0.72	1.52	0.80

Results of generalized estimating equations; n=4,062; controlling for drug class

*Males age <25

†Females age <25

‡Income < \$30,000

§1 or less avg. prescription filled per month

//Independent or "other" pharmacy

¶1- or 2-tier of copayment benefit design

Physician age 45 or less

**Generalist physician

that benefit design incentives for generic drug use are often not apparent to patients and physicians when medications are initiated.

Few studies have evaluated switches to generic drugs when prescriptions are refilled. In the classes we evaluated, only 1 in 7 patients started on a branded drug changed to a generic in the subsequent year, underscoring the importance of the initial prescription choice. When change did occur, enrollment in tiered pharmacy benefit plans and use of mail-order pharmacies were strongly associated with switching to generic medications. Our findings are consistent with previous research that has shown that tiered pharmacy benefit designs steer patients toward less expensive formulary alternatives,²²⁻²⁵ although the literature is mixed as to generic use.²⁶⁻²⁹ The fact that pharmacy benefit design had no significant impact on

the initial receipt of generic medications adds fuel to the growing concern that patients and physicians do not possess the necessary information about out-of-pocket costs at the time of prescribing to make objective cost-benefit decisions about their medications.³⁰ Patients who are charged higher copayments in tiered plans are more likely to switch to generics, suggesting that higher copayments stimulate requests for less expensive medications. Studies linking generic medication initiation to improved adherence to chronic therapy⁸ highlight the importance of making thoughtful cost-benefit decisions at the point of initiation.

Mail-order pharmacies may dispense more generics because of different protocols for medication switching, fewer time-constraints when contacting physicians to adjust prescriptions, or because use of insurer's websites to refill prescriptions by mail-order may educate patients about generic options. Few patients in this sample received their initial prescriptions from mail-order pharmacies, but many more used these pharmacies to refill. While previous findings suggest that mail-order pharmacies are associated with improved medication adherence,³¹ recent trends towards more frequent mail-order pharmacy use³² and use of financial incentives for patients to use them may increase generic drug use.

Patients from lower-income zip codes were less likely to initiate therapy with generic medications and switched to generic drugs at similar rates to those who live in high-income zip codes. Our findings conflict with a recent study of Medicare beneficiaries taking medication for hypertension that found a modest relationship between income and generic drug use, with lower-income seniors using slightly more generic medications.¹¹ Our study looked at a younger population, all of whom were commercially insured, and they may behave differently than seniors. There are several possible explanations for decreased generic drug use in lower income patients. Low-income patients may be less able or inclined to navigate tiered formularies and select cost-effective options when expensive medications are prescribed. Alternatively, physicians may offer more free samples to lower-income patients, steering them towards more expensive branded drugs, or low-income patients may have stronger preferences about using branded rather than generic medications. We were unable to control for the location of the pharmacy or the clinical encounter, which may have influenced these factors. Further research is necessary to evaluate why lower-income patients are less likely to begin chronic therapy with generic medications, and why these findings may not apply to seniors.

Although our patient sample was relatively young, we found that older patients were more likely to use generic medications, even after controlling for the overall number of prescriptions filled. Older patients may be more experienced medication consumers and more knowledgeable about purchasing options. Nonetheless, further study is needed in a senior population before generalizing these findings to Medicare Part D beneficiaries as the cognitive challenges and financial constraints may lead to different choices.

The limitations inherent in our use of pharmacy claims data may have introduced some bias. We are unable to identify prescriptions written, only prescriptions filled. Some patients, when informed of a high copayment at the pharmacy, may experience "sticker shock" and choose not to fill the initial prescription; others may switch prescriptions before the first prescription is filled. Prescriptions that are switched before the

initial fill or that are abandoned at the pharmacy because of cost may lead to some misclassification at the physician level. In addition, low-income patients may be less likely to fill high copayment prescriptions, leading to inflated estimates of the proportion of generic prescriptions written. As a result, low-income patients may be even less likely to receive prescriptions for generic drugs than these findings would suggest. We also are unable to monitor use of free drug samples, which may have led some patients to subsequently fill prescriptions for more expensive medications.³³ In addition, we could not account for perceived efficacy of branded versus generic drugs and could not evaluate how those perceptions influenced use.

Our study was also limited by the quality of physician identifier information from pharmacy claims. While scant literature exists to define the accuracy of DEA numbers in claims data, approximately 20% of our claims did not include a DEA number, and some may have been incorrect. It is unclear how this may have biased our study, but all other findings in this study were robust to removal of the physician variables and inclusion of claims with missing DEA numbers, so this limitation did not appear to qualitatively influence our results. Moreover, sensitivity analyses controlling for type of degree (medical doctor vs doctor of osteopathy or physicians assistant) did not indicate significant differences in generic prescribing between groups. In addition, we did not control for individual drug level characteristics, which may have influenced prescribing choices. However, we did control for drug class so individual drug characteristics were unlikely to bias the findings across classes.

Overall, these findings suggest that tiered pharmacy benefit plans and mail-order pharmacies steer patients towards generic drug use after initial brand name prescriptions are filled. However, the initial choice of prescriptions is the strongest determinant of subsequent use, and patients living in the poorest zip codes were least likely to initiate treatment on generic drugs. Efforts to influence patients and physicians to choose similarly effective generics should focus on this initial decision. As the nation struggles with increasing pharmaceutical costs, providing patients and physicians with information about generic alternatives at the time of prescribing may help patients and the nation get the most of out of their drug expenditures.

Conflicts of interest: None disclosed.

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