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An Insurer's Program To Incentivize Generic Oncology Drugs Did Not Alter Treatment Patterns Or Spending On Care

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ABSTRACT **The high and rising costs of anticancer drugs have received national attention. The prices of brand-name anticancer drugs often dwarf those of established generic drugs with similar efficacy. In 2007–16 UnitedHealthcare sought to encourage the use of several common low-cost generic anticancer drugs by offering providers a voluntary incentivized fee schedule with substantially higher generic drug payments (and profit margins), thereby increasing financial equivalence for providers in the choice between generic and brand-name drugs and regimens. We evaluated how this voluntary payment intervention affected treatment patterns and health care spending among enrollees with breast, lung, or colorectal cancer. We found that the incentivized fee schedule had neither significant nor meaningful effects on the use of incentivized generic drugs or on spending. Practices that adopted the incentivized fee schedule already had higher rates of generic anticancer drug use before switching, which demonstrates selection bias in take-up. Our study provides cautionary evidence of the limitations of voluntary payment reform initiatives in meaningfully affecting health care practice and spending.**

Spending on cancer in the United States represents a substantial proportion of all health care spending, is second only to spending on heart disease, and is rising faster than spending in other sectors of medicine.[1] The high and rising costs of anticancer drugs are of particular concern.[2,3] The prices of brand-name anticancer drugs often dwarf those of established drugs with similar efficacy that are available in generic forms.[4]

The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 set Medicare reimbursement rates for anticancer drugs at 6 percent above their average sales price.[5] Oncologists purchase drugs at one price and bill at a higher markup price, which creates potentially perverse financial incentives to prescribe higher-price anticancer drugs irrespective of their efficacy or toxicity because profit margins track with drug prices.[6,7] The Medicare Modernization Act reimbursement changes were associated with a switch toward higher-price brand-name drugs.[8–11] For example, in lung cancer, researchers have shown that after the act's reimbursement changes, the share of patients treated with chemotherapy who received a generic anticancer drug declined by 14 percent, and the share who received brand-name alternatives increased by as much as 20 percent.[9] These incentives may be even more prominent for commercially insured patients, for whom insurers may reimburse oncologists the average sales price plus 10–20 percent or even more per anticancer drug.[12]

As the effects of the Medicare Modernization

Act became apparent, UnitedHealthcare, the largest commercial health insurer in the United States, sought to encourage the use of several common low-cost generic anticancer drugs by making available to providers a voluntary incentivized fee schedule that increased generic drug payments (and profit margins), thereby creating high-margin generic alternatives to brand-name drugs. In this study we investigated the effect of the incentivized fee schedule on the use of anticancer drugs and spending. We used quasi-experimental difference-in-differences analyses to address the potential for selection bias—that is, the possibility that practices more likely to prescribe incentivized generic drugs would be more likely to contract with UnitedHealthcare under the new fee schedule.

Study Data And Methods

PROGRAM DESCRIPTION AND CONTEXT The data in this study were provided by UnitedHealthcare to evaluate the effects of its voluntary incentivized fee schedule for anticancer drugs, which was rolled out in the period 2007–16. Understanding of the structure and implementation of the program was informed by extensive discussion with UnitedHealthcare. The main goal of the program was to promote the use of generic anticancer drugs without creating perverse financial incentives, while preserving the ability of oncologists and patients to access any available cancer therapies. In this program, the percentage markup on the average sales price for twelve generic anticancer drugs was increased. However, the total reimbursement for incentivized drugs remained lower than that for brand-name drugs, even with the larger markup.

The program's comparative financial incentives for prescribing physicians varied depending on the available drug choices. In some cases, the incentivized fee schedule made generic drugs or regimens financially attractive to prescribing physicians because it increased the margins of generic drugs to be similar to those of available brand-name drugs—in turn creating financial equivalence for the providers in the choice between generic and brand-name drugs and regimens. In other cases, the new fee schedule made generic drugs or regimens financially less unattractive because the margins for generic drugs were increased but were still less than for brand-name alternatives.

For example, generic paclitaxel was made financially less unattractive in comparison to brand-name albumin-bound paclitaxel. To illustrate how this was done, we take the clinical setting of metastatic lung cancer and a hypothetical 20 percent buy-and-bill markup on brand-name drugs and a 900 percent incentivized fee schedule markup on generic drugs (the actual UnitedHealthcare pricing markups are not given in this article). In this setting, the 2012 average sales prices per standardized monthly dose were approximately $7,200 for brand-name albumin-bound paclitaxel and $60 for generic paclitaxel. The UnitedHealthcare program retained the 20 percent buy-and-bill markup on brand-name albumin-bound paclitaxel (a margin of about $1,400) but increased the markup on generic paclitaxel from 20 percent (about $12) to 900 percent (about $500).

As an example of financial equivalence for a provider's choice of drugs, the margin on the standardized monthly dose of combination carboplatin and paclitaxel—a commonly prescribed and clinically appropriate generic drug regimen—was increased more than sixtyfold to be similar to that for the brand-name drug pemetrexed with or without cisplatin (each of these regimens were among the top ten prescribed for metastatic lung cancer among UnitedHealthcare enrollees).

The program had the potential to meaningfully reduce overall costs of anticancer drug therapy. For example, in lung cancer, a switch from brand-name drugs to clinically acceptable generic alternatives would lead to a nearly two-thirds reduction in anticancer drug spending by the insurer, even with increased margins for the providers prescribing the generics.

UnitedHealthcare rolled out the program in a voluntary manner in the period 2007–16 across physician practices as their contracts came up for renewal. The timing of the rollout was determined by practice contract renewal dates and was unrelated to practice treatment patterns or contracting preferences.

STUDY POPULATION We identified UnitedHealthcare enrollees ages eighteen and older with diagnosis codes indicating breast, colorectal, or lung cancer and procedure codes indicating the provision of anticancer drugs in the period 2007–16. We focused on index anticancer drugs prescribed during the first treatment cycle.[5] We identified index anticancer drug regimens according to the combination of anticancer drugs found in medical claims between the start and end dates of the first treatment cycle.[13,14] For a patient's anticancer drug regimen to be considered an index course of therapy, he or she had to have had at least six months of continuous health insurance coverage before the initial anticancer drug claim, with no other anticancer drug prescribed during this time.[13] To assess the full index anticancer drug regimen and associated spending, an additional month of continuous coverage after the index treatment

was required.

This research was approved by the University of Pennsylvania Institutional Review Board.

EXPOSURE We identified oncology practices by Taxpayer Identification Number. Using UnitedHealthcare data, we determined whether a practice ever switched to the incentivized fee schedule and if so, the date on which it switched.[15] We then defined the main exposure at the patient level, based on whether the patient was treated by an oncology practice that had already switched to the new fee schedule. Patients were attributed to practices based on the most prevalent Taxpayer Identification Number on claims for anticancer drugs provided during the first thirty days after their index claim.[16–18] Because of the voluntary and staggered nature of the implementation of the incentivized fee schedule, not every oncology practice switched to the incentivized fee schedule during the study period.

OUTCOMES

▶ **ANTICANCER DRUGS:** The twelve generic anticancer drugs included on the incentivized fee schedule were 5-fluorouracil, cisplatin, docetaxel, doxorubicin, gemcitabine, irinotecan, oxaliplatin, topotecan, vinorelbine, paclitaxel, etoposide, and carboplatin. For each patient, the primary outcome consisted of whether their index drug regimen included at least one of these incentivized drugs. The proportion of a patient's drugs that was incentivized was explored as an alternative outcome in sensitivity analyses.

▶ **SPENDING:** We evaluated two different categories of episode spending, each measured within the first thirty days after the index drug claim. We measured anticancer drug spending (defined as the sum of amounts determined by the *Current Procedural Terminology* code present on claims for anticancer drugs) and total spending (defined as aggregated amounts across all health care services claims). In addition, we report out-of-pocket spending for patients over the episode. All spending measures were adjusted for inflation to 2016 dollars, using the Consumer Price Index.

COVARIATES AT THE PATIENT, PRACTICE, AND MARKET LEVELS Patient-level covariates included age, sex, and Elixhauser comorbidities identified from the claims in the six months before the index regimen. We also developed two measures of heterogeneity in response to the program. First, because a practice's baseline probability of prescribing incentivized drugs could affect its response to the incentivized fee schedule, we calculated the practice-level probability of prescribing at least one incentivized drug for patients treated before the practice switched into the program. Second, because the relative share of a practice's patients covered by UnitedHealthcare (versus other payers) could affect its response to the incentivized fee schedule (but no publicly available data sets permitted such a calculation at the oncology practice level), we determined the market share of UnitedHealthcare in each practice's state as a proxy.[19]

STATISTICAL ANALYSES We conducted a series of difference-in-differences analyses to assess the effects on the use of anticancer drugs and spending of oncology practices' switching to (that is, voluntarily contracting for) the incentivized fee schedule. To minimize concerns about selection effects (nonrandom switching of practices into the new contract), our primary difference-in-differences analyses were limited to patients treated by practices that switched to the new fee schedule, comparing those treated before switching to those treated after switching.[20] This approach exploited the staggered nature of the program's rollout across markets. We assumed that a practice's timing of switching was determined by contracting work flows rather than practice preferences or treatment patterns and was therefore plausibly random across providers. We conducted analyses to confirm the lack of differential trends in outcomes before switching to support the assumption that switch timing was uncorrelated with providers' prescription preferences.

Our specifications controlled for time-invariant observed and unobserved practice characteristics, using fixed effects for each practice. Only practices with at least five attributed patients were included in regression analyses. Additionally, attributed patients had to have been treated within three years of the practice's date of switching to the incentivized fee schedule. Patient covariates included age, sex, comorbidities, and cancer type. We included year fixed effects to control for secular trends in treatment patterns. We used logistic regression to assess the receipt of at least one incentivized drug. Linear probability models supplemented these analyses by providing more interpretable estimates of the main effect. Generalized linear models with gamma family and log link function were used to analyze overall spending. Standard errors were adjusted by clustering at the level of the Taxpayer Identification Number.

Our primary model assessed the average effect of switching to the incentivized fee schedule. Within this model, we obtained two different estimates. First, we recovered a single estimate for the effect of exposure to the incentivized fee schedule—an "exposed" indicator was used to denote all patients who received care after

their oncology practice had switched. In the second approach, we used event study methods. We estimated separate effects for patients based on when they received their index drug relative to the practice's date of switching to the incentivized fee schedule. Patients were assigned to six-month bins relative to the switching date. This approach allowed us to create a series of estimates that modeled the likelihood of a patient's receiving an incentivized drug (or having higher or lower spending), relative to patients treated immediately before the provider switched. We were therefore able to evaluate changes in care over time[21] and assess any differential trends in outcomes before "treatment"—that is, a practice's switch to the incentivized fee schedule.

We estimated two secondary models to assess heterogeneity in response to the program. First, we evaluated the possibility that practices with the lowest baseline prescription rates of incentivized drugs would show greater response to the incentive since they had greater room for improvement (having a preprogram rate of 75 percent versus a rate of 98 percent for the remaining practices). To implement this model, we obtained an additional estimate for exposed patients whose providers were in the bottom quartile of baseline prescription rates before their practice switched. Second, we evaluated the possibility that the incentivized fee schedule would have more prominent effects in regions where UnitedHealthcare had a higher market share. To implement these models, we obtained an additional estimate for exposed patients whose providers were located in states where UnitedHealthcare's market share was greater than 15 percent.

SENSITIVITY ANALYSES Our main sensitivity analysis consisted of a traditional difference-in-differences approach that included all practices with at least five patients, whether or not they switched to the incentivized fee schedule. Comparisons of effect estimates from these difference-in-differences models to the estimates from our primary model may offer insights into the direction and potential magnitude of selection bias. In particular, if nonswitching practices were less likely to prescribe incentivized regimens before the launch of the program, we would anticipate that this approach would estimate a greater positive effect of the incentive than our primary specification did. Finally, we created an alternative outcome variable that reflected the proportion of the drugs in each patient's regimen that were incentivized, as a potential measure of variation in the mix of drugs used for each patient.

All analyses were conducted using Stata, version 11.0. We used Bonferroni adjustment ($\alpha = 0.05/5 = 0.01$ for five different analytic approaches) to determine significance ($p < 0.01$).

LIMITATIONS This study had several limitations. First, as a nonrandomized study, it could not make causal inferences. However, we employed a quasi-experimental design and conducted multiple sensitivity analyses.

Second, commercial claims data sets lack detailed clinical data, though we used validated algorithms to both identify the cohorts and treatments and develop case-mix adjustment.

Third, the data set we used did not permit analyses of precise financial margins and their effects on substitution of anticancer drugs at the patient-drug level.

Fourth, the data set we used also restricted our ability to characterize practices with further detail (for example, we lacked variables for academic or cancer center affiliation). However, our regression analyses included fixed effects for each practice, accounting for characteristics that did not change over time.

Fifth, over the study period, several new targeted anticancer drugs became available. For some patients with specific mutations, evidence-based care could have mandated starting first-line therapy with one of these brand-name drugs.

Lastly, patients' preferences regarding toxicity and out-of-pocket spending were not accounted for in our analytic models.

Study Results

ONCOLOGY PRACTICES THAT SWITCHED TO THE INCENTIVIZED FEE SCHEDULE Over the study period, 695 of 1,905 (36 percent) oncology practices switched to the incentivized fee schedule (online appendix exhibit 1).[22]

OVERALL PATIENT CHARACTERISTICS AND SPENDING Among all of the oncology practices, 12,689 patients received an index anticancer drug regimen. Of these, 6,632 (52 percent) had breast cancer, 3,208 (25 percent) had lung cancer, and 2,885 (23 percent) had colorectal cancer[23] (appendix exhibit 2).[22] Overall, 188 unique anticancer drug regimens were prescribed during the study period, and 11,424 of the 12,689 (90 percent) patients received at least one incentivized anticancer drug in their index anticancer drug regimen. In the first thirty days, mean total spending was $20,624, while mean anticancer drug spending was $10,033 (49 percent). Mean total out-of-pocket spending was $677.

PRACTICES THAT SWITCHED VERSUS THOSE THAT DID NOT Practices that switched to the incentivized fee schedule differed from those that did not on three key observable dimensions. First, compared to practices that did not switch,

switchers were more likely to be physician office–based (instead of hospital outpatient–based) practices (76.7 percent versus 68.7 percent) (exhibit 1). Second, on average, switchers had more than twice the number of attributed patients (10.3 versus 4.6). Third, switchers were more likely to prescribe at least one of the incentivized drugs before switching (92.2 percent versus 87.6 percent)—a difference in prescription patterns that persisted after switching as well. Among the approximately two-thirds of the practices that were geocoded by location, switching practices were marginally more likely to be urban, but the difference was not significant (26.7 percent versus 23.4 percent; $p = 0.18$) (data not shown).

PRIMARY ANALYSES OF EFFECTS OF INCENTIVIZED FEE SCHEDULE Our primary models evaluated patients treated by those practices that switched to the incentivized fee schedule during the study period and that had at least five attributed patients (3,928 patients treated by 272 practices). In our event study analyses, the likelihood of receiving an incentivized drug (or of having higher or lower spending) for patients treated in any six-month period was compared to the likelihood for patients treated during the six months immediately before a practice switched to the incentivized fee schedule. This analysis did not demonstrate any meaningful or consistent trends in the use of incentivized anticancer drugs or in spending before a practice's switch (appendix exhibit 3).[22] This provides reassuring evidence to support our identifying assumptions.

Our primary difference-in-differences models, which included only patients treated by oncology practices that switched to the incentivized fee schedule at some point in the study period, revealed an insignificant reduction in the use of incentivized drugs after switching (–3.4 percentage points) and no significant effects in any spending categories (exhibit 2).

SECONDARY AND SENSITIVITY ANALYSES Models that evaluated differential response by practices in the bottom quartile of baseline prescription rates of incentivized drugs showed a small and insignificant response to the incentivized fee schedule, relative to practices with high baseline prescription rates (appendix exhibit 4).[22] Models that evaluated differences in treatment effects among providers located in states where UnitedHealthcare's market share was greater than 15 percent also revealed no significant effects (appendix exhibit 5).[22]

The main sensitivity analyses, which consisted of a traditional difference-in-differences approach that included both switching and nonswitching oncology practices, also revealed no significant effects on the use of incentivized drugs or on any spending categories (appendix exhibit 6).[22] Sensitivity analyses that evaluated the proportion of a patient's anticancer drugs that were incentivized as the outcome showed that the proportion of incentivized drugs was insignificantly lower among exposed patients

EXHIBIT 1

Characteristics of practices and patients, by whether or not the practice was ever reimbursed under the incentivized regimen for any patient ("switched") during the study period

		Ever switched		
	Never switched	Overall	Before switching	After switching
PRACTICE				
All	1,210	695	—[a]	—[a]
Designated as physician offices	831 (68.7%)	533 (76.7%)****	—[a]	—[a]
Designated as hospital outpatient facilities	379 (31.3%)	162 (23.3%)	—[a]	—[a]
PATIENT				
Attributed patients	5,558	7,131	3,016	4,115
Patients per practice (average)	4.6	10.3****	6.1	8.1
Male attributed patients	1,619 (29.1%)	1,946 (27.3%)**	846 (28.1%)	1,100 (26.7%)
Age of attributed patients (mean years)	54.9	54.8	54.6	54.9
Attributed patients who received an incentivized drug	4,870 (87.6%)	6,554 (91.9%)****	2,782 (92.2%)	3,772 (91.7%)
30-day episode spending after index drug claim (2016 $)				
Anticancer drug spending	10,191	11,069****	10,874	11,212
Total spending	22,499	21,418***	19,958	22,489****

SOURCE Authors' analysis of UnitedHealthcare claims data for 2007–16. **NOTES** The designations of practices as physician offices or hospital outpatient facilities are based on the source of the chemotherapy claims of the majority of its attributed patients. Significance in the "Ever switched: overall" column refers to differences between "Ever switched" and "Never switched." Significance in the "Ever switched: after switching" column refers to differences between "Before switching" and "After switching." [a]Not applicable. **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

EXHIBIT 2

Effect of switching to the voluntary incentivized fee schedule on receipt of an incentivized drug, anticancer drug spending, and total spending

				Outcome	
	Observations	Point estimate	99% CI	Mean	SD
RECEIPT OF INCENTIVIZED DRUG					
Linear probability model	3,928	–3.4[a]	–7.2, 0.4	93.1%	25.4%
Logistic model	2,796	–0.6	–1.4, 0.2	90.5%	29.4%
EPISODE SPENDING					
Anticancer drug spending	3,925	–2.3%	–14.8, 10.2	$11,470	$9,626
Total spending	3,928	–6.5%	–21.2, 8.1	$20,902	$18,429

SOURCE Authors' analysis of UnitedHealthcare claims data for 2007–16. **NOTES** This table presents the main regression results of the study. The linear probability model directly estimates the percentage-point differences in the probability of receiving at least one incentivized drug between exposed patients (those treated by a practice after it had switched to the incentivized fee schedule) and unexposed patients, while the point estimates for the logistic model represent log odds that an exposed patient would receive at least one incentivized drug (compared to an unexposed patient). Estimates from spending models represent the percentage differences in spending expected between exposed and unexposed patients. We report 99% confidence intervals (CIs) to account for multiple comparisons simultaneously. Spending amounts are in 2016 dollars. SD is standard deviation. [a]Percentage points.

(those who received care after their oncology practice had switched) (appendix exhibit 7).[22]

Discussion

We evaluated how a commercial insurer's voluntary incentivized fee schedule, designed to encourage oncologists' use of generic anticancer drugs through higher financial margins, affected treatment patterns and health care spending among patients with breast, lung, or colorectal cancer. We found that the incentivized fee schedule had no significant or meaningful effect on physicians' use of incentivized anticancer drugs or spending on health care services. We also found that physician practices that switched to the incentivized fee schedule had higher rates of generic anticancer drug use before switching, compared to nonswitchers—which demonstrates the presence of selection bias in the take-up of the new fee schedule. Next, we highlight three key implications of our findings.

First, our findings complement prior research highlighting the prominent role that spending on anticancer drugs plays in overall spending for cancer care.[2] During the first thirty days of treatment, spending on anticancer drugs accounted for about half of all health care spending for privately insured patients with cancer. Additionally, out-of-pocket spending was high: Even with full private insurance, UnitedHealthcare enrollees were responsible for almost $700, on average, in out-of-pocket spending during the first month after initiating anticancer drug treatment.

Second, our results are consistent with and extend the growing literature underscoring the selection effects that surface when health insurers implement voluntary opt-in interventions aimed at changing physicians' behavior.[24–26] The practices that volunteered to switch to the incentivized fee schedule demonstrated significantly higher use of generic anticancer drugs both before and after switching.

Third, we found no meaningful differential effects for patients treated by practices in the bottom quartile of baseline prescription rates of incentivized drugs, relative to those treated by practices with high baseline rates. This finding implies that high rates of incentivized drug use before the program did not explain the absence of response to the program.

Taken together, our results suggest two potential reasons why this intervention failed to have a significant effect on providers' behavior. First, the additional financial margin applied to generic anticancer drugs was likely not sufficient to promote substitution by physicians of lower-cost generic drugs for high-cost brand-name drugs. The financial incentives produced margins that were similar to those for brand-name drugs in some cases but fell short in others. Thus, some substitutions of generic for brand-name drugs were rendered financially neutral under the new fee schedule, while other substitutions were simply less unattractive.

Second, a unilateral intervention by a single commercial payer to alter anticancer drug prescribing patterns may have been overwhelmed by the multipayer environment in which most physicians practice medicine. In most states, market share among commercial payers is fragmented, and a substantial proportion of patients with cancer are covered by Medicare.

These findings may help inform future interventions: Mandatory participation, larger incentives, or cooperation among multiple payers may be required to have a measurable impact on physicians' prescribing behavior involving expensive anticancer drugs. However, while it would be convenient to predict that larger incentives may have had more impact, the pay-for-performance literature does not necessarily support such an assumption and cautions policy makers about the possibility of unintended consequences.[27]

Conclusion

We examined the effects on the use of generic anticancer drugs and on spending of a voluntary new fee schedule implemented by a large commercial payer that financially incentivized such drugs. While we found strong evidence of selection effects—practices that prescribed generic anticancer drugs more often before switching were also more likely to contract for the new fee schedule—we found no significant or meaningful effect of the new fee schedule on practice patterns or spending. Our study provides cautionary evidence of the limitations of voluntary payment reform initiatives in meaningfully affecting health care practice and spending. ■

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