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Mayo Clinic Employees Responded To New Requirements For Cost Sharing By Reducing Possibly Unneeded Health Services Use

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ABSTRACT Some health plans have experimented with increasing consumer cost sharing, on the theory that consumers will use less unnecessary health care if they are expected to bear some of the financial responsibility for it. However, it is unclear whether the resulting decrease in use is sustained beyond one or two years. In 2004 Mayo Clinic's self-funded health plan increased cost sharing for its employees and their dependents for specialty care visits (adding a \$25 copayment to the high-premium option) and other services such as imaging, testing, and outpatient procedures (adding 10 or 20 percent coinsurance, depending on the option). The plan also removed all cost sharing for visits to primary care providers and for preventive services such as colorectal screening and mammography. The result was large decreases in the use of diagnostic testing and outpatient procedures that were sustained for four years, and an immediate decrease in the use of imaging that later rebounded (possibly to levels below the expected trend). Beneficiaries decreased visits to specialists but did not make greater use of primary care services. These results suggest that implementing relatively low levels of cost sharing can lead to a long-term decrease in utilization.

Managing health care costs has been a focus for employers, payers, providers, and policy makers during the past several decades. Many potential ways to manage health care costs have been tested during this period. Most of the efforts in the 1980s and 1990s focused on the ability of managed care organizations to keep costs down through various methods, such as using “gatekeepers” to reduce patients’ use of services or putting providers at financial risk for excess use of services. Although these approaches had modest effects, they were ineffective in controlling the growth of health care costs in the long run, and beneficiaries were resisting these techniques by the late 1990s.

During the years since, the focus has turned to managing costs through increased cost sharing for consumers.¹ The underlying theory is that increasing patients’ contributions to health care costs will make those using health care resources more sensitive to the costs of care, thereby reducing both use and overall spending.

A large number of published studies address the effects of changes in cost sharing on total costs, pharmaceutical use, and number of outpatient office visits.^{2–4} Most of this literature evaluated these effects over just two years—a relatively short time frame—and generally found increased cost sharing to be effective in managing costs. However, it was not clear whether this effect could be sustained over a longer period of time.

The RAND Health Insurance Experiment in the 1980s demonstrated varying effects of cost sharing on health care use.⁵ The impact of recent technological advances in medicine also casts doubt on what effect changes in copayments and coinsurance may have in areas of medicine such as imaging and diagnostic testing, which have been the fastest-growing physician-ordered services for Medicare beneficiaries.⁶ Many payers now require prior authorization—the patient must get approval from the payer in advance, or it will not guarantee coverage for the procedure—for these services, which has reduced utilization and costs. But the effects of increased cost sharing on the use of these services is unknown.

In 2004 Mayo Clinic introduced increased cost sharing for employees and their dependents for certain services such as imaging, laboratory testing, outpatient procedures, and specialty care visits, while removing all cost sharing for primary care and preventive service use. The goal of this benefit change was to encourage beneficiaries to obtain care through primary care providers and to simultaneously reduce inappropriate use of other services, such as specialty care and imaging.

This change also provides a delivery system-based example of value-based insurance design, which attempts to produce high-quality health care with minimal waste, partly by reducing high-cost care that is of limited or no benefit. Much of the literature on value-based insurance design has focused on cost sharing for prescription drugs; there are few data from a delivery system perspective.

This article evaluates the long-term effects of

Mayo Clinic's benefit change on the use of physician and ancillary services, including imaging and testing. This evaluation included employees and dependents who were continuously enrolled from 2002 to 2007.

Mayo Clinic's Benefit Changes

Using a self-funded health plan, Mayo Clinic implemented benefit changes in 2004 to increase the use of primary care services and decrease the use of potentially inappropriate services. Three plan options had been available to employees, one with a high premium and two with low premiums. Because fewer than 1 percent of the population had participated in the basic plan, the one with the lowest premium, we focused on those enrolled in the other two options. The high-premium option provided coverage from the first dollar and did not require any beneficiary cost sharing for office visits, diagnostic testing, imaging, procedures, or hospitalizations. The low-premium option required various copayments for different services (Exhibit 1).

In 2004 Mayo offered two options, both of which included cost sharing for most services except primary care visits and preventive services (Exhibit 1). The high-premium option included 10 percent coinsurance and the low-premium option, 20 percent coinsurance, for all other services, including diagnostic testing, imaging, therapeutic procedures, and hospitalizations. A full description of the benefit change is available elsewhere.⁷

A decision tool was provided to employees to help them determine which plan best matched their health care needs. The tool allowed employ-

EXHIBIT 1

Comparison Of Mayo Clinic's Medical Plans

Charge	Plans before 2004			Plans in 2004 and after	
	High-premium	Low-premium	Basic	High-premium	Low-premium
Premium (per month)	\$58 (S), \$115 (F1D), \$172 (F2D)	\$20 (S), \$40 (F1D), \$60 (F2D)	\$10 (S), \$20 (F1D), \$30 (F2D)	\$63 (S), \$189 (F)	\$25 (S), \$75 (F)
Coinsurance	0%	0%	20%	10%	20%
DEDUCTIBLE					
Per person	\$0	\$0	\$200	\$0	\$250
Per family	0	0	400	0	500
COPAYMENTS					
Primary care	0	10	0	0	0
Specialty care	0	25	0	25 ^a	25 ^a
Emergency department	0	100	0	45 ^a	45 ^a
Inpatient hospitalization	0	300	0	0	0

SOURCE Authors' analysis. **NOTES** Less than 1 percent of the population was enrolled in the basic plan, which is not considered in any of the evaluations. S is single coverage. F is family coverage with any number of dependents. F1D is family coverage with one dependent. F2D is family coverage with two or more dependents. ^aCopayment remains in effect after out-of-pocket maximum is reached.

ees to calculate expected total out-of-pocket costs (including premiums) based on expected levels and types of care. The Mayo Clinic primary care practice was also redesigned to better support the anticipated increase in primary care use. Specifically, new clinics were opened, and additional staff members were hired.

Study Data And Methods

DATA SOURCES AND STUDY SAMPLE We used health benefit enrollment information, claims data, and management data from the Mayo Clinic primary care practice to evaluate the effects of the benefit change on resource use. The study included three groups of employees and dependents: those who moved from the previous high-premium plan to the new high-premium plan (which we called the high-high group); those who moved from the previous low-premium plan to the new low-premium plan (the low-low group); and those who moved from the previous high-premium plan to the new low-premium plan (the high-low group). Because fewer than 250 beneficiaries moved from the previous low-premium plan to the new high-premium plan, we excluded that group from our analyses.

So that we could evaluate the long-term effects of the change in benefits, we limited the sample to enrollees who were continuously enrolled in Mayo's self-funded health plan from 2002 to 2007. Doing so also eliminated introducing bias as a result of the changing population over time—for example, if sicker or healthier individuals left the plan. And it removed beneficiaries who would not have experienced the benefit change because they entered the plan after January 2004.

We restricted our study sample to beneficiaries who were older than eighteen at the beginning of the study and removed all beneficiaries who retired during the study period. We removed the retiree group because we did not want the transition to Medicare, which happened for more than 90 percent of the retirees, to affect the utilization rates. We used age at the beginning of the study, sex, and comorbidities (measured using the Charlson method)⁸ to compare the population enrolled in each of the groups.⁹

CALCULATING UTILIZATION RATES Our outcome measures included use of both resources and preventive care. Specifically, we were interested in the effect of the introduction of copayments on the number of primary and specialty care visits and the effect of coinsurance on the use of diagnostic testing, imaging, and outpatient procedures. We calculated the use of these services as per member per month rates

for each of the three groups described above.

STATISTICAL ANALYSIS We used an interrupted time series approach, with segmented linear regression models, to estimate changes in trends of monthly utilization rates (per member per month primary care and specialty care visits, diagnostic tests, imaging, and outpatient procedures).¹⁰ We defined two time segments: a baseline period of utilization (January 2002–September 2003) and a postbenefit change period (April 2004–December 2007).

We estimated changes attributable to the introduction of cost sharing as changes in the levels and slopes of the regression coefficients. Our models included a constant term to estimate utilization at baseline, a linear baseline time trend, an indicator for benefit change (yes or no), and a linear time trend for the postbenefit change period. The full model specification and additional assumptions and adjustments are provided in the online Appendix.¹¹

Although the benefit change occurred in January 2004, we did not include the period from October 2003 to March 2004 in our study, to account for the “anticipatory effect.” We observed higher utilization rates after the change was announced in October 2003, probably because beneficiaries who needed services that would cost more under the new plans rushed to obtain them before the change took effect. Thus, we determined that removing this period would allow us to better estimate the impact of the benefit change.

We calculated the baseline utilization rate (a constant term), the time trend in per member per year utilization before the benefit change, the one-time effect of the change on the per member per month utilization, and the time trend in per member per year utilization after the change. To calculate the relative effect of the implementation of cost sharing, we compared the differences between the observed utilization one year after the benefit change to the predicted utilization by extrapolating the 2002–04 baseline trend to the same time point for each of the groups.

STRENGTHS Our study has several strengths. First, for a period of six years, we were able to observe a stable cohort that underwent a benefit change. Second, we report on the impact of cost sharing on the use of services such as diagnostic testing and imaging, which has not been previously reported in the literature. And third, we used interrupted time series analysis, a strong, quasi-experimental study design.

LIMITATIONS It is important to note some of the key limitations of this study. The main drawback was the absence of a control group to more completely account for any underlying trends in uti-

lization. However, we were able to identify three groups that underwent different levels of cost sharing simultaneously, which in effect gave us some pseudocontrol groups. For example, the low-low group already had a copayment in place for office visits, while the other two groups had the copayment introduced as a change.

We did not capture preventive service use completely because we looked only at use within a single-provider system, and it is possible that enrollees sought some preventive services outside the system. Although this probably led to some underreporting of use, the relatively complete benefit coverage offered within the system—a multispecialty group practice—probably means that we captured the large majority of preventive service use.

Study Results

CHARACTERISTICS OF THE COHORTS There were differences in the age and comorbidities for each of the groups (Exhibit 2). As expected, the enrollees in the high-high group tended to be older and had more comorbidities. However, the percentages of female beneficiaries were similar across the three groups. Although the differences are important, the focus of our evaluation was to determine the relative changes in the utilization rates after cost sharing began.

EFFECTS ON OFFICE VISITS We found that the introduction of modest cost sharing (\$25) for specialty care office visits coupled with increased access to primary care providers significantly reduced the annual number of specialty care visits. The number of these visits during the first year after the benefit change decreased by 0.7 visit per person for the high-high and high-low groups and 0.2 visit for the low-low group. Four years after the benefit change, specialty care office visits were significantly lower than predicted based on the baseline trend (Exhibit 3).

The effect of the copayment was greater for the two groups—the high-high and high-low groups—that had not had cost sharing before the benefit change. There was a much smaller effect on specialty care visits in the low-low group, which had no change in copayments. The effect of implementing the copayment was sustained for specialty care use four years after the benefit change for each of the three groups (Exhibit 3). Exhibit 4 presents the change during the four-year period for the high-high group; similar presentations for the other two groups are in the Appendix.¹¹

One of the reasons for introducing the specialty care copayment was the hypothesis that there would be a substitution effect: Beneficiaries would increase their use of less-expensive

primary care to make up for their decreased use of more-expensive specialty care. However, we did not observe this effect in any of the groups. There were no changes in the number of primary care office visits during the study period, even for those beneficiaries who saw a decrease in cost sharing for this service (the low-low group).

EFFECTS ON UTILIZATION We found that introducing cost sharing through the use of coinsurance for diagnostic testing, imaging, and outpatient procedures resulted in large decreases in the use of these services. For diagnostic testing, we observed a large drop in use in the first year after the benefit change. Four years after the change, there were decreases in use compared to predicted use based on the baseline trend (Exhibit 3).

We also observed an immediate decrease in the use of imaging, but between 2004 and 2007 utilization rates increased (results presented in the Appendix).¹¹ It is possible that the rate of growth for imaging after the benefit change was lower than would have occurred without the change. Rebecca Smith-Bindman and colleagues have shown that the annual rate of growth in the use of imaging in an integrated health system between 1997 and 2006 was more than 9 percent.¹² Our analysis showed that the observed imaging use rates were lower than expected for two of the three groups one year after the benefit change.

The use of outpatient procedures decreased after the introduction of coinsurance. This decrease was sustained at four years (Exhibit 3). Exhibit 5 shows the change over the four-year period for the high-high group; the Appendix¹¹ gives similar information for the other groups.

Discussion

The goal of Mayo Clinic's benefit change was to decrease the use of potentially inappropriate

EXHIBIT 2

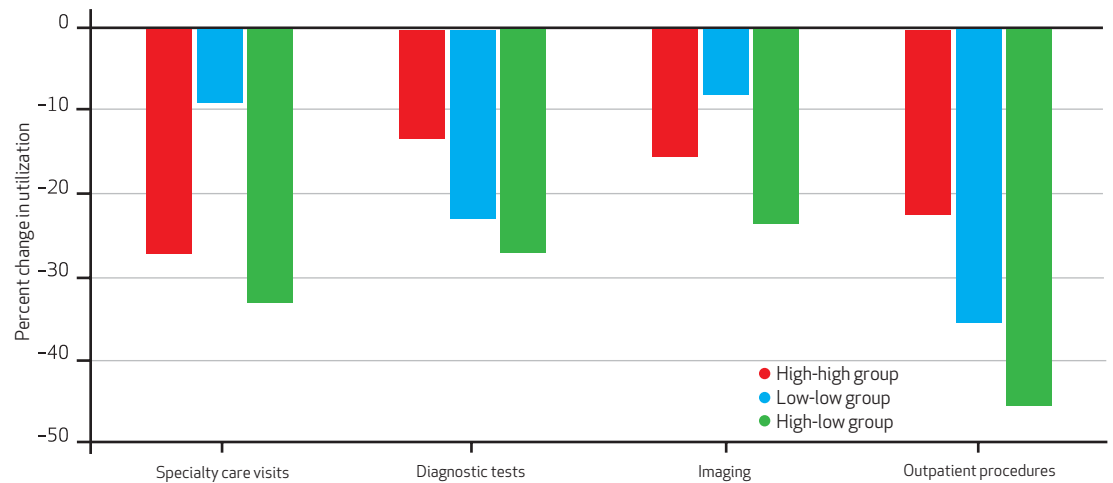
Characteristics Of Mayo Clinic Medical Plan Beneficiaries, By Plan Options Before And After Benefit Change

Characteristic	Group		
	High-high (n = 15,812)	Low-low (n = 2,615)	High-low (n = 3,305)
Age, mean years, 2002	41.1 (9.70)	37.8 (8.34)	39.3 (9.34)
Percent female	56.4	54.4	55.4
Comorbidities, mean number, 2002	0.58 (0.95)	0.25 (0.56)	0.35 (0.67)

SOURCE Authors' analysis. **NOTES** The groups are explained in the text. Standard deviations are in parentheses. Comorbidities are Charlson comorbidities (see Notes 8 and 9 in text).

EXHIBIT 3

Change In Observed Utilization Compared To Expected Utilization, Four Years After Benefit Change, Mayo Clinic Medical Plan



SOURCE Authors' analysis. **NOTES** The groups are explained in the text. Expected utilization was based on the baseline trend, as explained in the text. All items except specialty care visits, low-low group, were statistically significant ($p < 0.05$).

health care services and foster a deliver system centered on primary care. We found that the introduction of cost sharing greatly decreased the use of all targeted services. More important, this decrease was sustained for most services during the four years after the benefit change.

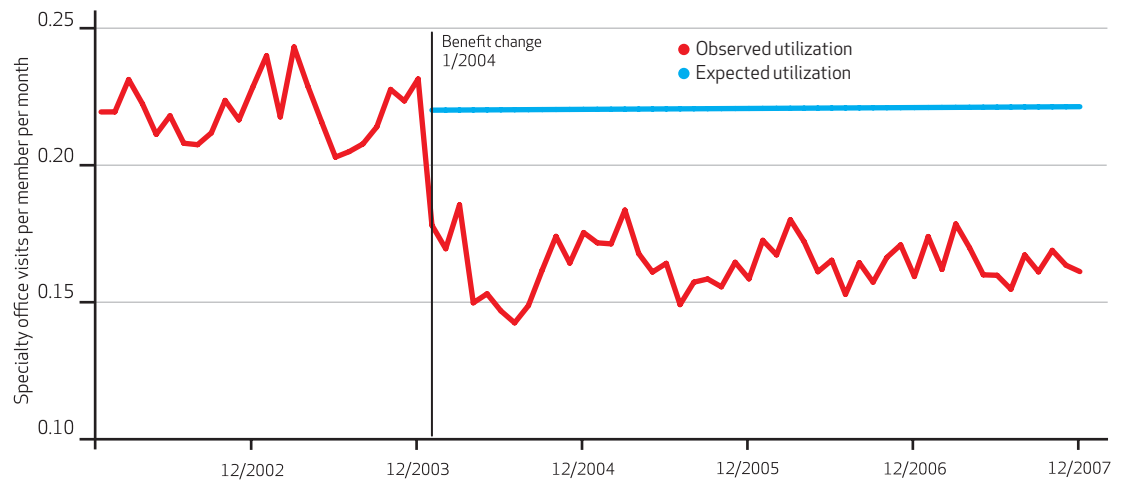
The results of this study have three main implications. First, a modest amount of cost sharing had an important and sustained effect on

health care use. Second, we did not observe any effect of the benefit change on primary care use, even though the change made all primary care visits free to beneficiaries.

Third, the benefit change did not adversely affect the use of preventive care services (results presented in the Appendix).¹¹ The change eliminated cost sharing for preventive services such as colorectal screening and mammography.

EXHIBIT 4

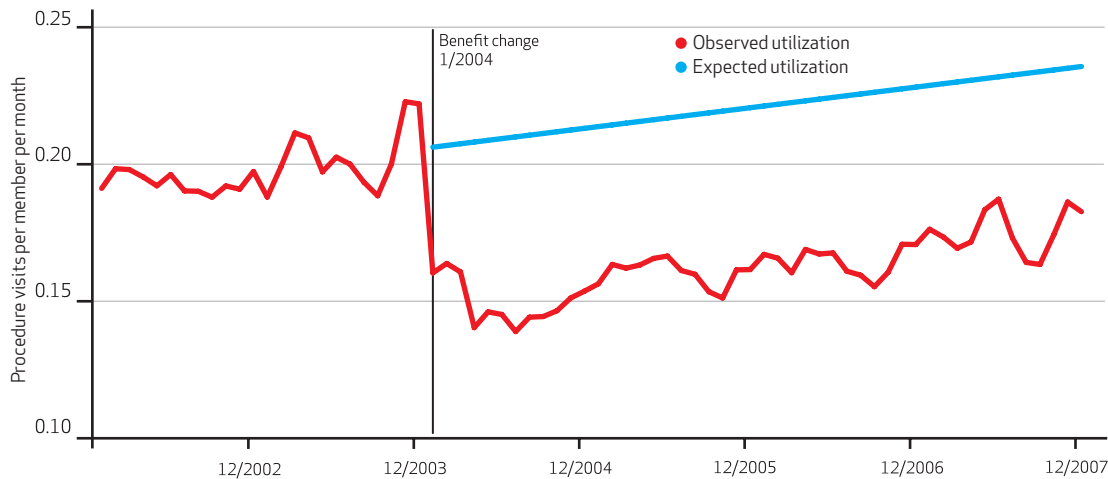
Observed And Expected Specialty Care Utilization, High-High Group Of Beneficiaries, Mayo Clinic Medical Plan, January 2002-December 2007



SOURCE Authors' analysis. **NOTES** "High-high group" is beneficiaries who moved from the previous high-premium plan to the new high-premium plan. Observed utilization is the fitted time series regression line to the observed data. Expected utilization is assuming no benefit change.

EXHIBIT 5

Observed And Expected Outpatient Procedure Utilization, High-High Group Of Beneficiaries, Mayo Clinic Medical Plan, January 2002–December 2007



SOURCE Authors' analysis. **NOTES** "High-high group" is beneficiaries who moved from the previous high-premium plan to the new high-premium plan. Observed utilization is the fitted time series regression line to the observed data. Expected utilization is assuming no benefit change.

However, there was concern that some beneficiaries might assume that these services had the same amount of cost sharing as other procedures and tests and thus decide to forgo them. The concern proved to be unwarranted.

It is also important to note that this benefit change suggests another way to manage costs in an accountable care organization. Our system functions much the same way as an accountable care organization does, according to the definition advanced by Robert Berenson and Kelly Devers. They write that an accountable care organization is "a local entity and a related set of providers, including at least primary care physicians, specialists, and hospitals, that can be held accountable for the cost and quality of care delivered to a defined subset of traditional Medicare program beneficiaries or other defined populations, such as commercial health plan subscribers."¹³

Much of the literature on accountable care organizations has focused on incentivizing providers. In our system providers receive salaries, so we chose instead a mechanism to change beneficiaries' use of health care. That may be an efficient and sustainable mechanism for reducing costs in accountable care organizations as well.

We believe that part of Mayo Clinic's success in managing utilization has been the communication of benefit changes to providers working in an integrated, multispecialty group practice. This knowledge may have affected both patients' and providers' decisions, related to ordering of

services. With a majority of their patients affected by increased coinsurance, some primary care providers preferred watchful waiting to ordering further testing.

We observed a large decrease in diagnostic testing. However, our evaluation of the diabetic population (results not presented) showed that the change did not affect the completion rates of evidence-based testing for hemoglobin A1c and lipids, which are important indicators of how well diabetes is being controlled.

Our finding that the implementation of copayments decreased the use of specialty care services differed from the results observed in the German health care system.¹⁴ This difference may be attributable to many factors. However, one major factor is probably that the Mayo Clinic benefit change was implemented in a multispecialty group practice where primary care providers have ready access to specialists and can receive consultations outside the formal referral process. Our results on the absence of changes in preventive service completion after the benefit change were similar to those published by Susan Busch and colleagues.¹⁵

In this article we present evidence of the long-term effects of a benefit change. However, we do not know whether the long-term impact is attributable to continued effects of cost sharing or to permanent changes in individual behavior that might remain even if the financial incentive to reduce demand for certain kinds of medical care were removed. The continued lower utilization rates are especially interesting because this is a

cohort study, and the entire study population has aged. Increased utilization would be anticipated in an aging population.

This study has provided evidence of a sustained impact of benefit changes without adversely affecting needed services. Additionally, we believe that the continued reduction in uti-

lization was encouraged by the coordinated care delivery provided in Mayo Clinic's multispecialty group practice. But future work is needed to better evaluate the effects of such benefit changes on vulnerable subgroups such as the chronically ill, as well as on larger and more general population samples. ■

The authors thank Pascal Briot and Tom Belnap for providing comments on an earlier version of this article.

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In this month's *Health Affairs*, Nilay Shah and colleagues at Mayo

Clinic report on the results of cost-sharing modifications in Mayo's self-funded health plan. Starting in 2004, employees and dependents were charged a \$25 copay for specialty visits and for other services such as imaging, testing, and outpatient procedures. The result was large decreases in visits to specialists and in the use of diagnostic testing and outpatient procedures that were sustained for

four years.

More surprising was the fact that there was no corresponding increase in the use of primary care services. "The hypothesis was that by adding cost sharing, we were going to get more people in primary care," says Shah, an assistant professor of health services research in the Division of Health Care Policy and Research at Mayo Clinic. "We actually hired

more primary care doctors, assuming demand would go up. That did not occur.”

In addition to his position in policy and research at Mayo, Shah is also the codirector of the Translating Comparative Effectiveness Research core of the Mayo Center for Translational Science Activities. He received his master’s degree in pharmacy and his doctorate in population health sciences from the University of Wisconsin.



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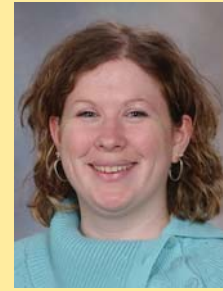
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