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Maryland's Experiment With Capitated Payments For Rural Hospitals: Large Reductions In Hospital-Based Care

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ABSTRACT **In 2010 Maryland replaced fee-for-service payment for some rural hospitals with "global budgets" for hospital-provided services called Total Patient Revenue (TPR). A principal goal was to incentivize hospitals to manage resources efficiently. Using a difference-in-differences design, we compared eight TPR hospitals to seven similar non-TPR Maryland hospitals to estimate how TPR affected hospital-provided services. We also compared health care use by "treated" patients in TPR counties to that of patients in counties containing control hospitals. Inpatient admissions and outpatient services fell sharply at TPR hospitals, increasingly so over the period that TPR was in effect. Emergency department (ED) admission rates declined 12 percent, direct (non-ED) admissions fell 23 percent, ambulatory surgery center visits fell 45 percent, and outpatient clinic visits and services fell 40 percent. However, for residents of TPR counties, visits to all Maryland hospitals fell by lesser amounts and Medicare spending increased, which suggests that some care moved outside of the global budget. Nonetheless, we could not assess the efficiency of these shifts with our data, and some care could have moved to more efficient locations. Our evidence suggests that capitation models require strong oversight to ensure that hospitals do not respond by shifting costs to other providers.**

In the past several years there has been a major push to transform the traditional fee-for-service (FFS) model into Alternative Payment Models for health care providers.[1,2] Many of the models move toward capitated payment, where providers are paid for serving a defined population instead of being paid more for doing more. Understanding how the alternative models affect care delivery is vital to the ongoing debate on health care cost, quality, and access. We studied an important early model: a voluntary global payment pilot in Maryland called Total Patient Revenue (TPR) that was implemented in 2010 by Maryland's Health Services Cost Review Commission in eight rural hospitals.[3,4]

In 2014 the commission replaced TPR with an expanded statewide program called Global Budget Revenue (GBR), which covers all Maryland hospitals and remains in place today.[5] While TPR and GBR have some important differences, both programs replace traditional fee-for-service with "global budgets" for participating hospitals. Under both programs, each hospital receives a fixed budget for caring for the local population. The budget covers all hospital-based services, whether inpatient; in the emergency department (ED); or in hospital-affiliated outpatient facilities, including ambulatory surgery centers and clinics.[6] However, physician fees—including fees for in-hospital care—are not subject to the commission's oversight and continue to be paid under

fee-for-service.

TPR's goals included constraining spending growth, promoting efficient resource use, encouraging hospitals to engage in community prevention efforts to reduce ED visits, and providing stable revenue streams for rural hospitals.[7–9] TPR was an outgrowth of Maryland's history of payment innovation—including its all-payer rate-setting system that has been in place since the 1970s, under which payments are similar across types of insurance.[5,10,11]

In TPR and GBR, the Health Services Cost Review Commission lets hospitals charge patients FFS rates. Under TPR, if a hospital's charges exceeded its global budget in year 1, it was paid less in year 2 to offset excess year 1 payments. Conversely, if a hospital treated fewer patients or performed fewer services in year 1 and fell below budgeted revenue, it could raise prices in year 2 to recover the prior year's revenue shortfall. Hospitals that fell below the revenue target were permitted to raise rates automatically to keep revenues on budget, up to 5 percent per year; they could raise rates up to 10 percent subject to the commission's review. These increases were across the board, instead of being targeted to specific areas where volumes decreased. The commission retained discretion to adjust hospital budgets based on prior years' experience, and it reduced budgets of six of the eight TPR hospitals in response to outpatient service declines.[7] The GBR program allows more frequent changes to budgets and prices, and it shifts some revenue from hospitals that lose patients to others that gain patients.[12]

The TPR model created a strong incentive for hospitals to stay within budget. Hospitals earned no additional revenue by admitting more patients or providing additional services. TPR hospitals could improve margins by operating more efficiently and reducing costs.[13] However, hospitals could also reduce costs by cutting inpatient or outpatient services, thus treating fewer patients. Providing fewer services would reduce year 1 revenue, but the hospital would be allowed to charge higher prices in year 2. If the hospital provided still fewer services in year 2, it could raise prices again in year 3. However, these services would likely be performed by other providers. The hospital's costs would fall, but overall health care system costs might not.

Some shifts could be efficient. Examples include shifts from hospital- to office-based care and shifts from complex care performed at smaller, rural hospitals to such care provided at larger, tertiary hospitals. However, there was no assurance of efficiency gains in these shifts. A hospital's incentive to provide less care was offset by the risk that the hospital could face future budget cuts imposed by the Health Services Cost Review Commission, a process that could not recur indefinitely if the hospital were to remain viable. In practice, as noted above, the commission implemented some targeted cuts in response to drops in outpatient services, but it otherwise granted annual rate increases up to 5 percent automatically, and potentially up to 10 percent, "so long as [the commission's staff] is satisfied with the [hospital's] explanation of the volume reduction."[10]

We provide evidence below that is consistent with both the incentive to provide care more efficiently and the incentive to provide less care. ED admissions declined in TPR hospitals, consistent with efficiency incentives. But TPR hospitals also provided fewer nonemergency services, consistent with incentives to provide fewer services. Our data did not let us assess how often this care moved to more efficient locations.

There have been two prior studies of TPR. Eric Roberts and coauthors found no significant changes in hospital use or price-standardized hospital spending by FFS Medicare beneficiaries in areas served by TPR hospitals, relative to other rural Maryland residents.[14] Karoline Mortensen and coauthors found no relative change in readmission rates in the first eighteen months of TPR.[4] To our knowledge, there has been no direct examination of how hospitals responded to TPR in both inpatient and outpatient settings using an all-payer data set.

In this study we used a difference-in-differences design to assess how TPR affected ED, inpatient, and outpatient care delivered at TPR hospitals, compared to a control group of similar rural Maryland hospitals that did not participate in TPR. We also assessed whether health care use changed for residents of TPR counties, relative to residents of counties with control hospitals.

Study Data And Methods

STUDY POPULATION AND DATA SOURCES Our principal data source consisted of visit-level inpatient, ED, and outpatient data sets for Maryland for the period 2007–13, obtained from the Healthcare Cost and Utilization Project.[15] For most analyses we aggregated data to the hospital–calendar quarter level. We obtained county characteristics from the Area Health Resources Files and county-level Medicare spending per beneficiary from reports from the Centers for Medicare and Medicaid Services.[16] We compared eight rural Maryland hospitals that transitioned to TPR in July 2010 ("treated" hospitals) and seven non-TPR rural hospitals ("control" hospitals). We excluded two hospitals that began the

TPR program before July 2010. (See the online appendix for sample and data source details.)[17]

OUTCOME MEASURES

▶ **CARE PROVIDED BY TOTAL PATIENT REVENUE HOSPITALS:** We studied several outcomes potentially affected by shifts to global budgets. For EDs, we studied visits per 100 county residents and ED admission rates (denominator: total ED visits), which included admissions to observation units. For inpatients, we studied direct (non-ED) admissions per 100 county residents, total admissions (direct plus ED) per 100 county residents, inpatients transferred to other hospitals (denominator: total inpatients), and length-of-stay. For outpatients, we studied ambulatory surgery center visits and outpatient clinic visits and services (for example, laboratory and radiology) per 100 county residents. We also assessed changes to case-mix and procedures using the Healthcare Cost and Utilization Project's Clinical Classifications Software.[18]

▶ **HEALTH CARE SERVICES RECEIVED BY COUNTY RESIDENTS:** We assessed if changes in health care delivered to residents of TPR counties mirrored changes in care delivered by TPR hospitals. We used the same Healthcare Cost and Utilization Project data sets and outcome measures as above (other than length-of-stay and transfers of inpatients to other hospitals). We also studied aggregate county-level FFS Medicare Part A, Part B, and total (Parts A and B) spending per beneficiary.

STATISTICAL ANALYSES We used a difference-in-differences approach to compare TPR hospitals and control hospitals, and residents of TPR counties to residents of control counties (that is, counties containing control hospitals). We used January 1, 2007–June 30, 2010, as the pretreatment period and July 1, 2010–December 31, 2013, as the treatment period. We used three models: a "simple" difference-in-differences model, which assumed a one-time change in the behavior of treated hospitals at the time of TPR adoption and measured the average treated-minus-control difference in the treatment period, relative to the average treated-minus-control in the pretreatment period; a "distributed lag" model, which allowed the outcome (the treated-minus-control difference in the treatment period) to evolve during the treatment period and measured the average treatment effect during the last TPR year, relative to the treated-minus-control average for the pretreatment period; and a "leads-and-lags" model, in which we let the treatment effect vary in both the treatment period (similar to the distributed-lag model) and the pretreatment period and plotted the estimated treatment effects over time in leads-and-lags graphs. The leads-and-lags model required a "baseline" period, so we set the treated-minus-control difference to zero in the fourth quarter of 2009 (three quarters before the first TPR quarter). The cumulative estimated effects in 2013 from the distributed-lag model were very close to both the estimates for 2013 from the leads-and-lags model and the estimate from the simple difference-in-differences model, where we dropped a "transition period" from the third quarter of 2010 through the end of 2012 and kept only the last treatment year of 2013.

A core difference-in-differences assumption is that the treated and control outcomes would have evolved in parallel, in the absence of the treatment. This is not directly testable, but we assessed whether pretreatment trends were parallel and graphed hospitals' responses to the TPR model over time using the leads-and-lags graphs. We also assessed pretreatment "covariate balance" on county characteristics and outcomes between treated and control groups. We controlled for general time effects and for unobserved, time-invariant hospital-level factors using calendar-quarter dummy variables and either hospital fixed effects (to study hospitals) or county fixed effects (to study overall health care use). Standard errors were clustered on the hospital (or county). We chose not to control for time-varying hospital or patient characteristics, because these could be affected by TPR. (See the appendix for methods details.)[17]

We relied primarily on the leads-and-lags graphs and the distributed-lag regressions because we expected a gradual as opposed to an immediate response to TPR adoption (as did TPR's architects).[9] The leads-and-lags graphs confirmed that the response emerged over the treatment period.

LIMITATIONS Our findings had several limitations. First, TPR was a voluntary program, and there may have been differences between the response of TPR hospitals and how eligible hospitals that chose not to participate might have responded.

Second, hospital catchment areas do not perfectly match county boundaries, so we likely misestimated the population that each hospital serves. However, both because we used a difference-in-differences design and because TPR hospitals are rural hospitals located at some distance from other hospitals, we do not believe that any mismeasurement of the catchment area should have induced significant bias.

Third, our difference-in-differences models assumed that treated and control hospitals would have followed parallel trends, in the absence of the treatment. The leads-and-lags graphs provided evidence supporting parallel pretreatment

trends for most of the outcomes we studied. Ambulatory surgery center visits were an exception. They showed a rising pretreatment trend, which implies that our estimated 45 percent drop in these surgeries could be conservative.

Fourth, our sample of treated and control hospitals (or counties) was small. We confirmed in "leave-one-out" robustness checks that no single hospital (county) drove our results (see the appendix).[17]

Fifth, we relied on administrative (claims) data, lacked access to full health records, and did not track the same patients over time. Sixth, our primary analysis observed only hospital-based care within Maryland and could not assess how TPR affected outpatient care in settings not affiliated with a hospital, or how much care moved from Maryland to neighboring states. Finally, we did not observe health outcomes.

Study Results

SAMPLE The sample included 5.0 million ED visits; 1.3 million hospital admissions (0.9 million ED and 0.4 million direct), 0.6 million outpatient surgery visits, and 3.5 million outpatient clinic visits and services. In the twelve months before Maryland's Total Patient Revenue program began, TPR hospitals generally delivered more services per population than control hospitals did. Some differences likely reflect county demographic characteristics. The TPR hospitals were located in counties with lower incomes, older adults, and fewer black residents (exhibit 1). Some of these characteristics may be predictive of higher hospital use.

CHANGES IN HOSPITAL AND OUTPATIENT SERVICES PROVIDED We examined the effect of TPR on hospital-based ED, inpatient, and outpatient services. We present both "simple" and distributed-lag difference-in-differences results in exhibit 2, but we relied primarily on the distributed-lag results, which allowed the treatment effect to appear over time. Progressive declines in services are visually apparent in the leads-and-lags graphs (exhibits 3–5; see the appendix for additional graphs).[17]

We found evidence that TPR affected a number of outcomes, all in the direction of TPR hospitals' providing fewer services relative to control hospitals (exhibit 2). By 2013 TPR hospitals were admitting 23 percent fewer patients directly, 12 percent fewer from the ED, and 15 percent fewer overall, relative to controls. We also found that transfers of inpatients to other hospitals increased by 38 percent, relative to control hospitals. However, this relative change came entirely from declines in transfers from control hospitals during the TPR period, rather than increased transfers from TPR hospitals.

ED visit volumes per 100 county residents at TPR hospitals declined but not significantly relative to controls (−3 percent). Hospital length-of-stay also did not change significantly (−2 percent).

In exhibit 5 we examine the impact of TPR on ambulatory surgery center visits and outpatient visits and services per 100 county residents. We observed a progressive decline, beginning in the second TPR year. Overall, ambulatory surgery center visit rates fell 45 percent, and outpatient visits and services rates fell by 40 percent (exhibit 2).

For outpatient visits and services, there was variation in outcomes based on the nature of the services provided. We found large declines in some radiology services, with mammography falling by 70 percent and echocardiograms and electrographic cardiac monitoring falling by 51 percent and 61 percent, respectively. (See the appendix for TPR's effect on procedures for outpatient services.)[17] However, we also found that some outpatient services increased. For example, cancer chemotherapy increased 176 percent, and other physical therapy and rehabilitation services increased 42 percent.

HEALTH CARE USE AND MEDICARE SPENDING We conducted two analyses to assess whether overall health care use and Medicare spending changed for residents of TPR counties, relative to residents of the counties containing the control hospitals. The first analysis used the same visit-level data as our analysis of treated versus control hospitals, but we assessed changes in health care received by all patients in treated and control counties—wherever that care was received—rather than changes in services provided by specific hospitals (exhibit 2). We found a small, nonsignificant relative increase in ED visits (3 percent) in treated counties, relative to control counties. This compares to the 3 percent decline in ED visits at TPR hospitals. Although neither change was significant by itself, taken together, they suggest that some residents of TPR counties sought ED care at other hospitals in nearby counties.

For ED admissions, we found a 13 percent drop in the share of ED visits by residents of treated counties that led to hospital admission, relative to residents of control counties. This relative drop is quite close to the 12 percent drop in ED admissions reported above for treated hospitals, relative to control hospitals. This is not surprising, given the modest shift in where residents of TPR counties obtained emergency care.

Direct inpatient admissions of residents of treated counties fell by 6 percent relative to residents of control counties; however, this was not

EXHIBIT 1

Summary statistics for outcome variables and county covariates for hospitals in the control and treated groups before implementation of the Total Patient Revenue (TPR) global budget in Maryland

	Control (mean)	Treated (mean)	Normalized difference
OUTCOME VARIABLES			
Volume (% of county population)			
ED visits	10.82	15.00	0.71**
Direct inpatient admissions	0.80	1.23	0.58**
Total inpatient admissions	2.39	3.80	0.84***
Ambulatory surgery center visits	1.12	3.29	1.37***
Outpatient clinic visits and services	11.92	16.30	0.38
Clinical management decisions			
ED admissions[a] (% of ED visits)	16.77	18.00	0.32
Inpatient transfers[b] (% of all inpatients)	3.23	3.46	0.13
Hospital length-of-stay (days)	3.51	3.60	0.20
COUNTY COVARIATES			
Log of median income	11.13	10.93	−0.80**
Population (per 100 county residents)			
Ages 65–74	7.41	8.81	0.59**
Ages 75–84	4.11	5.26	0.77**
Ages 85 and older	1.55	2.23	1.10***
Black	18.82	12.40	−0.69**
Female	51.21	50.74	−0.43
Younger than age 65 and uninsured	11.44	12.58	0.47*
Income below federal poverty level	8.46	11.23	0.74**
Ages 16 and older and unemployed	7.83	8.58	0.41
Disabled	13.85	14.00	0.05
Managed care penetration (%)	4.10	3.42	−0.30
Active nonfederal physicians (per 100 county residents)	0.16	0.19	0.51*

SOURCE Authors' analysis of hospital data for Maryland in the period 2007–13 from the Healthcare Cost and Utilization Project. **NOTES** TPR was implemented in the third quarter of 2010. The exhibit presents statistics for the year before implementation, from the third quarter of 2009 through the second quarter of 2010. The treated group consisted of the eight TPR hospitals in Maryland. The control group consisted of seven similar non-TPR Maryland hospitals. Normalized difference is the difference in means relative to the standard deviation (the appendix contains definitions; see note 17 in text). Outcome variables were measured quarterly. We considered results with p values <0.05 to be significant. [a]Percent of emergency department (ED) visits that led to hospital admission (including observation status). [b]Percent of inpatients transferred to another acute care hospital. *$p < 0.10$ **$p < 0.05$ ***$p < 0.01$

significant. The modest 6 percent relative drop in direct admissions for residents of TPR counties, compared to the much larger 23 percent relative drop in direct admissions by TPR hospitals, suggests that some patients who lived in TPR counties sought care at other hospitals. Note that our Maryland data sets did not capture inpatient admissions that moved to neighboring states, so we could not assess whether, or to what extent, overall hospital admissions declined for residents of TPR counties.

Ambulatory surgery visits declined 23 percent, and outpatient clinic visits and services declined 22 percent. These declines, although significant, were again substantially less than the corresponding drops in services provided by TPR hospitals, which suggests that some patients sought outpatient care elsewhere—at other Maryland hospitals (captured in our data), hospitals outside Maryland (not captured in our data), or outside hospital-affiliated facilities entirely (also not captured in our data). Given the data-set limitations, we could not determine whether there was any overall change in the amount of care delivered to residents of TPR counties.

To address these limitations, we studied county-level spending on FFS Medicare beneficiaries for Medicare Part A, Part B, and total (Parts A and B). We found that per beneficiary spending increased 11 percent for Part A, 4 percent for Part B, and 8 percent overall in TPR counties (exhibit 2). Our approach differed somewhat from that of Roberts and coauthors in that we used different control areas, did not perform beneficiary-level matching, and used actual Medicare payments rather than standardized prices.[14]

Considering both analyses together and including the possibility that some patients obtained hospital services outside Maryland, it appears that residents still obtained most and perhaps all of the same nonemergency services that TPR hospitals no longer provided, but from other providers. Only the drop in ED admission rates was confirmed by the county-level analysis.

Discussion

Global budgets are one of several Alternative Payment Models that policy makers and payers are exploring to move hospitals away from fee-for-service. Maryland's Total Patient Revenue program is an early example of global budgeting for rural hospitals, which are generally the sole local providers of hospital services. In this section we discuss our TPR findings; in the following section we discuss implications for other models, including the Global Budget Revenue program, which replaced TPR in Maryland beginning in 2014. TPR created incentives for hospitals to reduce costs relative to their fixed budgets by providing less care relative to hospitals that remained in fee-for-service. It is unclear to what extent these shifts in care led to improved efficiency—either by better matching care needs with providers or by moving care to lower-cost locations. The TPR program was a blunt tool that provided incentives to hospitals to provide less care, whether or not that care moved to a more efficient location. In addition, it is possible that some shifts may have imposed travel or other inconvenience costs on patients.

We found evidence to support both the incentive to provide efficient care and the incentive to provide less care. ED admissions gradually fell, by a cumulative 12 percent. While we lacked the

EXHIBIT 2

Difference-in-differences analysis of the effect of the Maryland Total Patient Revenue (TPR) global budget on care provided by TPR hospitals and health care use by patients in TPR counties

	Pre-TPR		Simple DiD	Distributed-lag DiD	
	Mean	SD	Coefficient	Sum of coefficients	Change (%)
HOSPITAL-LEVEL ANALYSIS					
ED and outpatient care					
ED visits	15.00	(5.45)	−0.28	−0.52	−3.48
Ambulatory surgery center visits[a]	3.29	(2.11)	−0.38*	−1.49***	−44.92
Outpatient clinic visits and services[a]	16.30	(10.67)	−3.03**	−6.46***	−39.63
Hospital admissions and transfers					
Direct inpatient admissions	1.23	(0.70)	−0.17*	−0.28**	−22.85
ED admissions	18.00	(3.66)	−0.92*	−2.19**	−12.15
Total inpatient admissions[b]	3.80	(1.75)	−0.32*	−0.56**	−14.79
Inpatient transfers	3.46	(1.20)	0.57**	1.32***	38.09
Hospital length-of-stay (days)	3.60	(0.41)	−0.10	−0.07	−1.95
COUNTY-LEVEL ANALYSIS[c]					
ED and outpatient care					
ED visits	9.90	(2.27)	0.09	0.29	2.96
Ambulatory surgery center visits[a]	3.05	(1.07)	−0.31	−0.71**	−23.19
Outpatient clinic visits and services[a]	15.62	(8.24)	−2.55*	−3.49**	−22.31
Hospital admissions and transfers					
Direct inpatient admissions	1.37	(0.21)	−0.10*	−0.08	−6.14
ED admissions	23.28	(5.10)	−1.60*	−2.92**	−12.53
Total inpatient admissions[b]	3.51	(0.60)	−0.18	−0.23	−6.41
Inpatient transfers	3.21	(0.86)	0.61	0.89*	27.60
Aggregate FFS Medicare spending per beneficiary					
Part A	$5,059	(352)	$292.00*	$539.00**	10.66
Part B	4,310	(289)	102.40	170.00**	3.94
Parts A and B combined	9,369	(582)	394.50**	709.00***	7.57

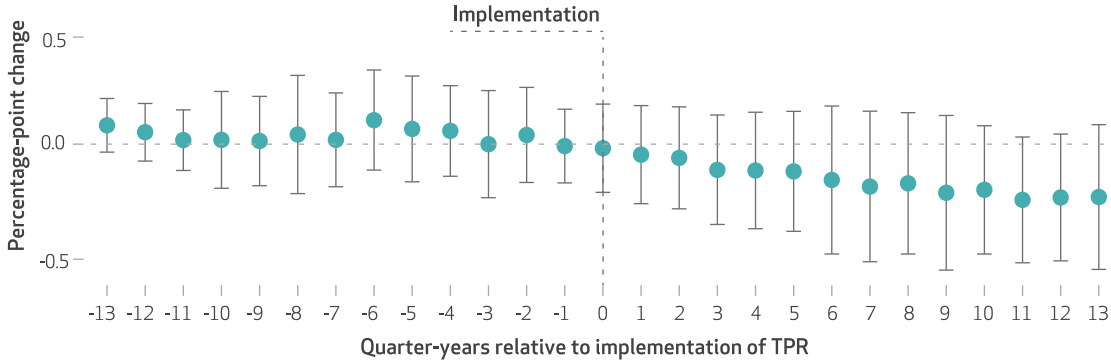
SOURCE Authors' analysis of hospital data for Maryland in the period 2007–13 from the Healthcare Cost and Utilization Project and of Medicare per capita spending data from the Centers for Medicare and Medicaid Services. **NOTES** The simple difference-in-differences (DiD) model assumed a one-time change at implementation of TPR (in the third quarter of 2010). The distributed-lag DiD model allowed the effect of TPR to appear gradually and measured the cumulative effect in the last TPR year (2013). Emergency department (ED) admissions and inpatient transfers are defined in the notes to exhibit 1. All other outcomes except hospital length-of-stay and aggregate fee-for-service (FFS) Medicare spending per beneficiary are measured per 100 county residents. Change (%) is the percent change from the pre-TPR mean to the end of 2013, as estimated from the distributed-lag model. Because of missing data for some hospitals in the early part of the TPR program, we excluded data for ambulatory surgery center visits and outpatient clinic visits and services from the first quarter of 2007 through the second quarter of 2008. All regressions include the hospital and quarter fixed effects and time-varying county-level covariates shown in exhibit 1. We considered results with p values <0.05 to be significant. SD is standard deviation. [a]Mutually exclusive categories. [b]Includes both direct inpatient admissions and ED admissions. [c]Variables are measured based on patients' county of residence, regardless of where care was received. *$p < 0.10$ **$p < 0.05$ ***$p < 0.01$

data to assess which admissions were appropriate, this reduction could be efficient and reflect TPR's reversing hospitals' prior incentives to admit marginal patients from the ED. Prior research has found large variation in ED admission rates across hospitals, which suggests that some of the admissions are discretionary.[19] We did not find a reduction in length-of-stay, perhaps because hospitals already had substantial incentives to limit it. Perhaps, too, patients who were still admitted were sicker, on average, which would offset any drops in length-of-stay for similar patients. We did not find large changes in ED visits, which are not under the hospital's direct control. In addition, prior studies have found that neither TPR nor GBR has reduced readmission rates.[3,14]

We also found large declines in nonemergency, inpatient, and outpatient care. Some declines in direct admissions could reflect greater efficiency (for example, moving some surgeries from inpatient to outpatient). But we also found evidence that most of the drop in inpatient admissions at TPR hospitals was offset by higher admissions at Maryland hospitals outside the global budget (some could also have moved to neighboring states). Similarly, some outpatient services likely moved from TPR hospitals to other hospitals, physician offices, or outpatient clinics not affiliated with the TPR hospitals. As we document in the appendix,[17] there were differential service shifts by care type, with sharp relative

EXHIBIT 3

Relative changes in rates of direct inpatient admissions to Maryland hospitals over time



SOURCE Authors' analysis of hospital data for Maryland in the period 2007–13 from the Healthcare Cost and Utilization Project. **NOTES** Direct inpatient admissions are per 100 county residents. The Total Patient Revenue (TPR) global budget was implemented in the third quarter of 2010 (quarter 0 in the exhibit). All regressions include hospital and quarter fixed effects, time-varying county characteristics, and standard errors clustered on the hospital. Point estimates are from the leads-and-lags model and are relative to quarter -3. The error bars indicate 95% confidence intervals.

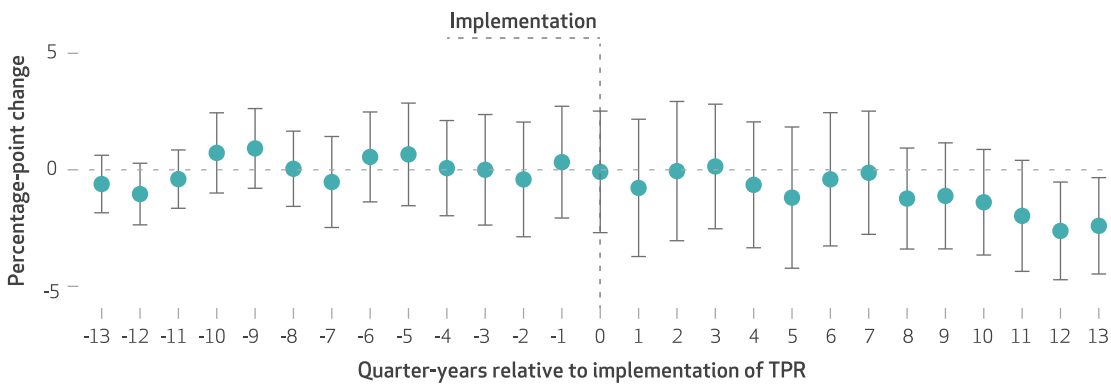
declines in mammography and a relative increase in chemotherapy. We were not able to determine why these specific services increased or declined. We could not tell from our data how often care moved to more appropriate locations (for example, specialized care moving to tertiary hospitals) or lower-cost locations (such as mammography and cardiac imaging moving to physicians' offices).

We lacked data on hospitals' margins for specific services. These could have helped explain some of the service-specific shifts we observed. We hypothesize that hospitals would have stronger incentives to reduce volume for services with lower margins (high cost relative to revenue). For ambulatory surgery centers, hospitals have substantial discretion in deciding which surgery services to offer. We found increasing declines in the volume of both inpatient and outpatient visits over time, which is consistent with hospitals' assessing—and modifying over time—what mix of services to provide under global budgets.

The Maryland Health Services Cost Review Commission responded to reduced outpatient services by reducing hospital budgets. Without these budget reductions, there might have been larger declines in outpatient services.[9] These reductions were insufficient to counteract hospitals' incentives to reduce outpatient services. However, an important question is whether

EXHIBIT 4

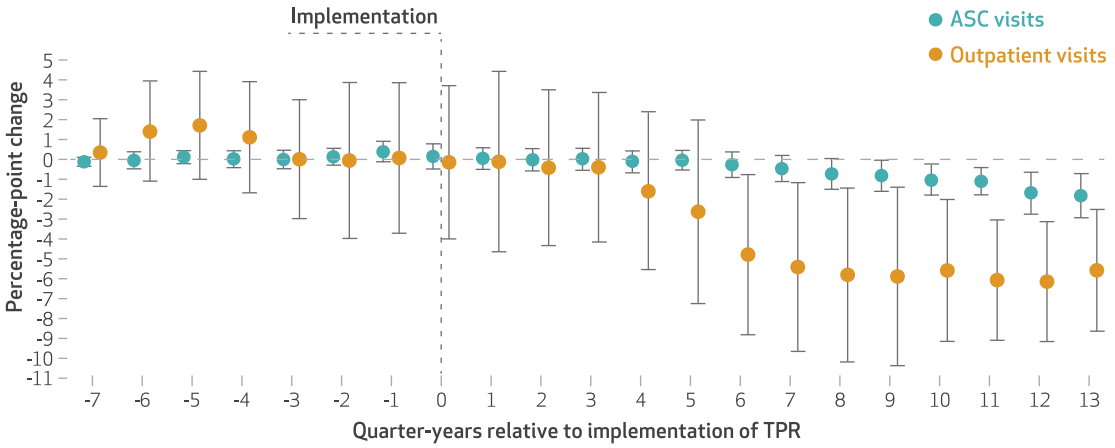
Relative changes in rates of admissions to Maryland hospitals from the emergency department over time



SOURCE Authors' analysis of hospital data for Maryland in the period 2007–13 from the Healthcare Cost and Utilization Project. **NOTES** Admissions are percentages of emergency department visits that led to hospital admissions (including observation stays). The Total Patient Revenue (TPR) global budget was implemented in the third quarter of 2010 (quarter 0 in the exhibit). Regressions and error bars are explained in the notes to exhibit 3.

EXHIBIT 5

Relative changes in ambulatory surgery center (ASC) and outpatient visits and services in Maryland over time



SOURCE Authors' analysis of hospital data for Maryland in the period 2007–13 from the Healthcare Cost and Utilization Project. **NOTES** Visits and services are per 100 county residents. The Total Patient Revenue (TPR) global budget was implemented in the third quarter of 2010 (quarter 0 in the exhibit). Regressions and error bars are explained in the notes to exhibit 3.

these location shifts improve efficiency, including the cost to residents of TPR counties of seeking care in more distant locations.

We had hypothesized that TPR hospitals would transfer more inpatients to other, more specialized hospitals. We found a relative increase, but only in the third TPR year. This relative increase was driven by lower transfer rates at control hospitals, rather than by increased rates at TPR hospitals. Thus, we found only mild evidence that TPR led to higher transfer rates, and we note that any increase in transfers might be efficient: Some services are better provided in larger, tertiary hospitals.

For FFS Medicare beneficiaries, combining Roberts and coauthors' finding of flat price-standardized spending per beneficiary in TPR service areas[14]—and hence no change in the amount of health care consumed—with our finding of higher nonstandardized Medicare spending in TPR counties suggests that the prices that Medicare paid may have increased. This could be a direct outcome of the TPR program. If services fell at TPR hospitals, the program allowed hospitals to charge more for the services they still provided.

Broader Policy Implications For Alternative Payment Models

Stepping back from the details of the Maryland experience, we provide evidence that global budgets or other hospital capitation models may create incentives both to provide services more efficiently and to reduce services, with the likely effect of moving care (and costs) to providers outside the capitation. Future research is needed to assess to what extent global hospital budgets reduce versus shift care costs to other areas of the health care system. Where health care intensity declines, research is needed to assess whether these declines reduce long-term as well as near-term health care costs. Thus far, no published studies have examined the effect of Maryland's Total Patient Revenue program on population health or on overall health care costs.[10] This study is consistent with studies of other Alternative Payment Models, most of which have shown small effects on costs. A study of the first three years of Maryland's Global Budget Revenue program (2014–16) did find fewer ED admissions, lower hospital costs, and lower total expenditures for the Medicare population, but no spending reductions for commercially insured patients.[20] However, another study of the first two years of GBR that focused on FFS Medicare beneficiaries found no evidence that GBR affected hospital use or primary care visit frequency.[21]

A further concern with the global budget model involves the cost implications of services shifting outside the budget. If within-budget care declines, within-budget prices will rise. If much of the care that is no longer provided within budget moves off budget, as our study suggests, a logical implication is that total health care costs could rise. We found evidence of higher overall health care spending for the FFS Medicare population.

The expansion of TPR to GBR in 2014 to cover all Maryland hospitals did not provide the same opportunity to move services to other in-state hospitals, since all hospitals in the state were

in GBR. However, GBR provides similar incentives for hospitals to reduce outpatient services and could induce hospitals—at least on average—to invest less in community health initiatives. Smaller hospitals will likely retain some ability to reduce direct admissions, thus pushing more patients to other hospitals, inside or outside Maryland. In the end, reducing overall health care costs is challenging. Opportunities for hospitals to gain by investing in community care for zero marginal revenue are likely limited.

For global budget initiatives and other Alternative Payment Models, close oversight using detailed data (on both claims and health outcomes) across all settings is needed to monitor shifts in care and their efficiency and health implications. The Health Services Cost Review Commission has mechanisms in place to monitor TPR and GBR and has made payment adjustments in both programs.

GBR, unlike TPR, includes a mechanism to reward Maryland's major tertiary hospitals (the University of Maryland Medical Center and Johns Hopkins Hospital) for accepting transfers without penalizing the transferring hospital and provides for budget adjustments for some volume shifts.[12] The effects of these additional regulatory measures remain to be seen. However, GBR, like TPR, provides an incentive to shift costs to nonhospital settings. Still, the incentives created by any global budget model will be problematic as applied to providers that—unlike true health maintenance organizations (HMOs)—provide only some of a patient's health care and that lack HMOs' incentives to provide services with a price-quality mix that attracts patients. When top-down regulation, however well intentioned, competes with providers' financial incentives, the incentives will often win—a problem known in the management literature as "the folly of rewarding A, while hoping for B."[22]

Our results suggest that Alternative Payment Models should be implemented cautiously, with close attention to the incentives they create, how effects can be evaluated, and recognition that the full effects are likely to appear over time. Perhaps global budget models, which fall short of full capitation, could be narrowly targeted. For example, we found that TPR reduced ED admission rates. One could imagine a capitation plan limited to ED visits and resulting admissions that succeed in reducing ED admission rates and pushing marginal ED visits to urgent care centers.

Our results suggest that Alternative Payment Models should be implemented cautiously.

Conclusion

We found evidence of large, progressive changes in care volumes delivered by hospitals in Maryland's Total Patient Revenue program, including declines in ED admissions, direct admissions, ambulatory surgeries, and outpatient visits and services. We also found evidence that—aside from a modest drop in ED admission rates—most and perhaps all of the care not provided by TPR hospitals moved to other providers, both in and possibly outside Maryland. Further study is needed to increase understanding of how care patterns and outcomes may change if hospitals move to capitated payment models, while other providers remain outside the capitation model, and the efficiency implications of those shifts. ■

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17 To access the appendix, click on the Details tab of the article online.

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