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Physician Participation in Medicare Accountable Care Organizations and Spillovers in Commercial Spending

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Abstract

Importance: The benefits of public payment policy may extend to private populations through “spillover” effects. If cost-saving efforts in Medicare also reduce costs among commercially-insured patients, Medicare payment systems could be a versatile policy tool in future reform efforts.

Objective: To determine whether physicians who participated in a Medicare Accountable Care Organization (ACO) reduced spending among their commercial patients.

Design: Retrospective, longitudinal study using Blue Cross Blue Shield of Michigan (BCBSM) claims data from 2010–2015. We compared patients seen by physicians who participated in a Medicare ACO to patients whose physicians were not part of an ACO. We used a difference-in-differences design to test whether physician participation in an ACO was associated with reduced

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spending among their commercially-insured patients. We also tested for heterogeneous effects: we assessed whether spillovers were larger among patients with clinical conditions (acute myocardial infarction, pneumonia, congestive heart failure) that have previously been targeted by Medicare payment programs.

Setting: Population-based study of commercially-insured patients in Michigan.

Participants: Patients who experienced a significant clinical episode (e.g. labor and delivery, acute myocardial infarction) between 2010–2015.

Exposure: Our patient-level exposure is treatment by a Medicare ACO-affiliated physician.

Main Outcomes and Measures: Medical spending 0–90 days and 91–365 days after a clinical episode.

Results: Patients in the exposure group (n=54,750) and in the control group (n=137,883) were similar in demographic characteristics of age, sex, and type of clinical episodes. Adjusted mean 90-day spending in the pre-exposure period was \$21,292 among the exposure group and \$21,157 among the comparison group; these means declined to \$21,250 and \$20,995 in the post-period, yielding a difference-in-differences (DID) estimate of \$119 (95% CI, –170 to 408). Adjusted means for 91–365 day spending in the pre-period were \$4,258 among the exposure group and \$4,251 among the comparison group; these means rose to \$4,338 and \$4,421 in the post-period, yielding a difference-in-differences estimate of -\$90 (95% CI, –312, 132). We also separately examined patients with conditions that have been targeted by other Medicare payment programs. Among these patients, 90-day spending did not differ between exposure and comparison groups (DID: –223, 95% CI, –2,037, 1,591), although 91–365 day spending decreased among the exposure group with marginal statistical significance (DID: -\$1,160, 95% CI, –2,459, 140).

Conclusions and Relevance: Physicians who participated in Medicare ACOs did not reduce spending among most of their commercially-insured patients. Medicare policy is unlikely to confer significant spillover benefits to the commercially-insured population.

Introduction

Over 8 million Medicare beneficiaries receive their health care from a provider participating in one of the Centers for Medicare & Medicaid Services' (CMS) Accountable Care Organization (ACO) programs¹. Providers in ACOs share in savings with CMS if they keep spending for their attributed beneficiaries below a financial benchmark. To boost shared savings bonuses, providers have aggressively pursued cost-saving interventions (e.g., the use of care coordinators, electronic health records, and medication reconciliation services). In turn, ACO providers have achieved spending reductions around inpatient care episodes². Given that many of these interventions are likely applied to all patients, not just the Medicare population, it is possible that the benefit of greater episode efficiency may “spill over” into an ACO provider’s commercial patients, as well. If so, CMS’s ACO programs would be a versatile policy tool that affects both the publicly and privately insured.

However, the question of whether CMS’s ACOs have spilled over to commercially insured patients remains unanswered. Prior research has found that Shared Savings Plan ACOs modestly reduce spending^{3,4}. In addition, research has found that cost savings do spill over

from Medicare Advantage to fee-for-service Medicare and from commercial ACOs to Medicare beneficiaries^{5,6}. These findings suggest that Medicare-to-commercial spillovers are possible. Further, spillovers may differ by medical condition. They may be larger for conditions that disproportionately affect older adults, especially if other reforms target such conditions (for example, pneumonia); or smaller for conditions that are rare among older adults (for example, pregnancy and childbirth). Alternatively, shared savings incentives for Medicare beneficiaries may be too weak to influence systemic changes in provider behavior.

To evaluate the extent of Medicare-to-commercial spillovers, we compared the pre-ACO and post-ACO medical spending of two groups: first, Blue Cross Blue Shield of Michigan (BCBSM) beneficiaries treated by a Medicare ACO provider; and second, a comparison group of BCBSM beneficiaries whose treating providers did not join a Medicare ACO. We also tested for evidence of clinical heterogeneity **by running three analyses: effects on a clinical subgroup where we expect little to no effect (“control” conditions); effects on a clinical subgroup where we expect the strongest effects (“targeted” conditions); and effects across our full sample. Michigan is an ideal state in which to evaluate spillovers, where CMS reports that 7 out of 19 ACOs operating in the state qualified for shared savings payments in 2014.** Together, these ACOs earned over \$40 million in shared savings payments⁷. This suggests the presence of a primary effect, which led us to explore whether such an effect might spill over into the commercial population.

Methods

Data sources and study population

We analyzed medical claims from the Michigan Value Collaborative, which include beneficiaries enrolled in BCBSM’s preferred provider organization (2010 to 2015). These data contain patient-level information on facility and professional services. We supplemented these data with the Shared Savings Program Provider-level Research-Identifiable File (RIF) to determine which providers participated in ACOs.

We identified the subset of beneficiaries in our data who were between the ages of 18 and 65. To be included in the Michigan Value Collaborative sample, beneficiaries must have experienced a major clinical episode – such as a cholecystectomy, acute myocardial infarction (AMI), or labor and delivery – between July 1st, 2010 and December 31st, 2014 (see eTable 1 for full list of conditions). For each beneficiary, we observed the facility and professional claims information for the 12 months prior to and after the index episode. **In the event that a beneficiary experienced multiple major clinical episodes, we only considered the first episode and excluded the others to avoid overinflating by double-counting across episodes (the excluded episodes constituted 12% of the episodes).**

Exposure

We defined our exposure of interest as treatment by an ACO provider, and we measured this for each beneficiary in our BCBSM sample. **We mirrored the MSSP’s attribution methodology, using a two-step algorithm to attribute patients to providers. Specifically, we assigned patients to a National Provider Identifier (NPI) if the NPI represented a**

primary care physician (PCP) – family practice, internal medicine, geriatric medicine, or general practice physician – who accounted for the plurality of allowed charges for primary care services in a year (166,703 patients, or 87 percent of our sample, were assigned this way). Patients who were not assigned to an NPI in the first step (because they did not receive any eligible primary care services from a PCP) were assigned to the NPI of the professional who accounted for the plurality of primary care services (as categorized by CMS, using Healthcare Common Procedure Coding System codes). The remaining 25,880 patients in our sample were assigned this way (13 percent of our sample). Results were not sensitive to whether a patient was attributed in Step 1 or Step 2. We used the Shared Savings Program Provider-level RIF to distinguish between treating providers who participated in an ACO. Our treatment group included 54,750 beneficiaries treated by 3,266 ACO providers. Our comparison group included 137,833 beneficiaries treated by 9,020 non-ACO providers.

Study Outcomes

Our study outcome was total BCBSM spending in the year after the index episode for two intervals: 90-day (i.e., admission date for the index episode to 90 days post-discharge) and 91–365 days (91 to 365 days post-discharge). We focused on these two intervals of spending because they describe utilization during distinct periods – one immediately following an acute event and the other reflecting longer-term care management. We calculated spending for these two intervals by summing all facility and professional payments. Facility payments were price-standardized by BCBSM, while professional payments were not. **Our measure of spending is derived from the payment field in the medical claims data. It is price-standardized across providers to protect confidentiality, which means that our spending variable captures differences in practice patterns and service use. To account for skewed costs, we winsorized the upper 1 percent and lower 1 percent (coded any observations above these threshold values as the threshold value).**

Study Design and Statistical Analysis

We hypothesized that a provider who participated in an ACO would change her practice style to achieve spending reductions for her Medicare beneficiaries. In turn, these changes would also affect care for commercial patients through the spillover effect. Further, we reasoned that if ACO providers developed skills in reducing Medicare spending, then the largest Medicare-to-commercial spillover effects would likely be found in conditions that were common among older adults and/or targeted under other payment reforms. Therefore, in addition to measuring spillover effects for our full sample of all conditions, we also measured spillover effects for the subsample of beneficiaries with conditions that were especially salient in the Medicare population.

We defined those conditions to be AMI, congestive heart failure (CHF), and pneumonia. Studies have found that ACO providers often begin with interventions targeting these conditions⁸. In addition, the Medicare Hospital Readmissions Reduction Program (HRRP) launched in 2012 and penalized providers for readmissions related to these three conditions. Given these circumstances, we expected to see the largest spending reductions among these conditions, to which we refer as “targeted conditions” **(though we recognize it is also**

possible that the HRRP and ACO programs could be substitutes rather than complements in achieving cost reduction). Conversely, we expected that spillovers would be less likely in conditions that are uncommon among older adults— childbirth is perhaps the most obvious example. As such, we expected to see little to no spending reductions among our “control conditions” (vaginal delivery and cesarean or C-section birth).

We applied this reasoning to conduct three differences-in-differences analyses to test for Medicare-to-commercial spillover effects on spending. Specifically, we compared spending between beneficiaries treated by ACO providers to beneficiaries treated by non-ACO providers, before and after ACO participation. We made this comparison for patients with “control conditions,” with “targeted conditions,” and for the full sample. We defined “treatment” at the provider level: a provider who joins an ACO during our study period is a “treated” provider and her patients are part of the treatment group.

ACOs in the Shared Savings Program had several start dates during our study period: January 1, 2012, April 1, 2012, June 1, 2012, January 1, 2013, and January 1, 2014. We normalized the start date to account for these varied start dates. We randomly assigned start dates to beneficiaries in the control group to align with the different ACO start dates. Our dependent variables were 90-day and 91–365 day spending. We estimated linear regression models which included variables for whether the observation was in the pre- or post-period and in the comparison or treatment group. We also included an interaction term between the post-period and treatment group variables; the coefficient on this term is the differences-in-differences (DID) estimator. Finally, we adjusted for beneficiary age, sex, clinical risk as measured by hierarchical condition categories (HCCs), clinical reason for admission into the sample, provider type (primary care, specialist, or nurse practitioner/physician assistant) and calendar year, clustering standard errors at the physician level.

We used Stata SE version 14 (Stata Corp., College Station, TX) for all statistical analyses. Tests were two-tailed, and we set the probability of Type 1 error at 0.05. This study was deemed exempt from review by the University of Michigan Institutional Research Board.

Limitations

Our study is based on medical claims data. Claims data offer excellent service-level detail of health care spending and utilization, but they paint an incomplete picture of patient health complexity and care quality, which should be a key consideration in subsequent research. **In addition, we were unable to gather information on the organizational context in which ACO innovations, tools, and processes were implemented, or whether such innovations were routinely used for both Medicare and commercial patients. In this respect, our study treated the inner workings of an ACO as a “black box.”** However, to date, CMS has not issued prescriptive guidelines for operating ACOs; rather, CMS pays based on results and leaves the innovations up to the individual provider groups. Our study took the same approach in that we evaluated the measurable results while remaining agnostic about the operational execution of the ACOs. This being said, we think that in the future, research which combines both aspects would considerably enhance the evidence base on ACO effectiveness.

Further, our analysis is limited to one state, raising the requisite cautions about extrapolating results. However, Michigan has a large population, considerable ACO participation, and a proportion of residents enrolled in Medicare (19%) that is comparable to many other states, suggesting that the results from Michigan might reasonably inform payment policies elsewhere⁹.

Lastly, by only including BCBSM beneficiaries who experienced a major clinical episode, our sample is non-random. Thus, it may not be representative of all working age adults (a sizable proportion of whom incur no health claims in a given year). **However, our sample is relatively large (n=192,583), and has the advantage of allowing us to assess whether ACO spillover effects occur among adults where there is more room to “move the needle” on health care spending.**

Results

We identified 192,583 patients who met our criteria between July 1, 2010 and December 31st, 2014. Table 1 presents the pre- and post-period characteristics of the treatment (n=54,750) and comparison (n=137,883) groups. The groups were similar with respect to patient and physician characteristics both before and after the start of the ACO program. Consistent with the working-age population, childbirth was the most common reason for entry into our sample, with a correspondingly high proportion of women (approximately 71 percent). Targeted conditions (AMI, CHF, pneumonia) comprised about seven percent of the sample for both treatment and comparison groups, while control conditions (vaginal delivery, C-section birth) comprised about a third. Across the full sample, unadjusted 90-day and 91–365 day spending averages were approximately \$21,000 and \$4,000, though there was some variation from the pre- to the post-period.

In our regression analysis, we did not detect a spillover effect for 90-day or 91–365 day spending at significance levels of $p=.05$ (Figure 1). This was true across three sets of conditions: our full sample (all conditions), our targeted conditions, and our control conditions. The direction and magnitude of these three estimates, however, varied in ways that make sense with our hypotheses.

In the full sample, from the pre-period to the post-period, 90-day spending decreased slightly among the comparison group (-\$161) and the treatment group (-\$43). Our difference-in-differences estimate was \$119 (95 percent confidence interval, -\$170 to \$408) (Table 2). Conversely, 91–365 day spending rose slightly among the comparison group (\$170) and the treatment group (\$80) for a differences-in-differences estimate of -\$90 (-\$312 to \$132). These non-significant results from our full sample suggest little evidence of an overall spillover effect (see eTable 2 and eTable 3 for full model).

Spending within the control conditions (vaginal delivery and C-section birth, n=63,823) changed little from the pre-period to the post-period for the comparison group (\$34) and the treatment group (\$106) for 90-day spending. Changes were similarly small in magnitude for 91–365 day spending (\$26 among control and \$5 among treatment). The differences-in-differences estimates for 90-day and 91–365 day spending were non-

significant at \$72 (-\$44 to \$189) and \$21 (-\$89 to \$130). These results fit with our expectation that there would be little or no spillover effect in conditions that are uncommon among older adults.

Spending within the targeted conditions (AMI, CHF, pneumonia, n=13,532) also changed little for the 90-day window: the differences-in-differences estimate (-\$223; -\$2,037 to \$1,591) was not significant. However, spending for 91–365 days decreased noticeably within the treatment group (-\$633) while it increased by a comparable magnitude within the comparison group (\$526). This DID estimate (-\$1,160; -\$2,459 to \$140) was marginally significant ($p=.08$) and is consistent with our hypothesis that spillover effects would be largest in conditions that are more common in older adults.

Sensitivity analysis did not change our conclusions. We tested models that included physician fixed effects. We also tested whether our results were sensitive to patients being attributed in Step 1 or Step 2 of the physician attribution process. We stratified our analysis by age and estimated effects over the age groups of 18 to 45 years and 46 to 65 years. We examined spillovers among the subset of physicians affiliated with Medicare ACOs that performed sufficiently well to earn a shared savings payment. None of these analyses substantially changed our results. We also tested whether the treatment and comparison groups exhibited different trends in spending during the pre-period, which would violate the parallel trends assumption of difference-in-differences analysis. We found no significant differences between the trends of the two groups.

Discussion

In this study, we asked whether providers who participated in one of CMS's ACO programs reduced 90-day or 91–365 day spending among their commercially insured adults who experienced a major clinical episode. On average, they did not. We found some suggestive heterogeneity by clinical condition: childbirth spending was essentially unchanged, but for targeted Medicare conditions (AMI, CHF, and pneumonia), 91–365 day spending fell somewhat more (-\$1,160, $p=.08$) among beneficiaries treated by ACO providers compared to those treated by non-ACO providers. **We point out that this result is only marginally statistically significant, but also note that our \$1,160 relative spending reduction in 91–365 day spending (\$633 decrease among treatment, \$527 increase among comparison) is of a similar direction and magnitude to other research on ACOs and episode-based payments.** Together, these findings imply that CMS payment policies might confer a modest benefit to commercially insured adults in later intervals of episode-based care if there are significant clinical carryovers, but that the working-age population needs its own programs to substantially reduce spending.

The Medicare Hospital Readmissions Reduction Program (HRRP) launched during the same time period as the MSSP. Because all hospitals are incentivized by this program to keep their patients from being readmitted, both ACO and non-ACO hospitals are expected to have faced similar incentives to reduce readmission-related spending for the time period immediately following discharge. Thus, the HRRP may help to explain why we did not observe a relative reduction in early episode spending among ACO providers.

Our findings generally conform to the spillover literature. Previous investigators found a modest spending reduction spillover from a commercial ACO (the Massachusetts Alternative Quality Contract) to Medicare patients⁶. **Prior work thus finds that spillovers in the commercial-to-Medicare direction exist; we do not find a similar spillover in the Medicare-to-commercial direction. We suggest that our findings inform rather than contradict prior work. The room to “move the needle” on spending varies by age. If interventions successfully reduce spending in the low-spending younger commercial ACO population, it seems reasonable that they would also be successful in an older population with higher initial health spending, hence the presence of a spillover in past work. By contrast, our analysis tests for spillovers in the opposite direction. Interventions designed for older adults will not necessarily prove as effective in a younger population, which is consistent with our results. With that said, our data do not allow us to directly observe whether providers in fact applied Medicare ACO innovations to commercial patients. It is not possible to deduce whether our null findings stemmed from ACO innovations being ineffective in this population, or rather stemmed from ACO innovations not being tried in this population.**

Our findings do, however, fit with theoretical mechanisms that explain the occurrence of health care spillovers. Providers choose treatments for patients based on representative patient types¹⁰. Spillovers are more likely if providers can easily extend general treatment practices across populations. If participants in one of CMS’s ACO programs adopt treatment interventions designed for select conditions, they may have more difficulty extrapolating the same practices to a patient population with different needs. Since we find a **(marginally significant)** larger magnitude of spending reductions among patients most similar to Medicare beneficiaries, our study adds some evidence for this hypothesis.

Designers of successful alternative payment models might start by homing in on specific conditions, especially if other programs, such as the Hospital Readmissions Reduction Program, have already targeted those conditions. **This may help providers make the business case for investing in care delivery innovations.** Policymakers might also consider the interval over which to evaluate the success of payment models: the ACO effect, or spillovers thereof, could be different shortly after an acute clinical episode (90 day spending) compared to a longer interval (91–365 days). **Finally, we could not detect a spending reduction on the average patient. This may have been because the average commercial patient did not benefit much from ACO care delivery innovations designed for older adults, or because ACO providers simply did not extend such innovations to their commercial patients. We recommend that future work evaluate the clinical profiles and ACO treatment practices that show the most potential for benefitting both elderly adults and working-age adults.**

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Points

Question:

Does participation in a Medicare Accountable Care Organization (ACO) encourage physicians to reduce spending among their commercially-insured patients?

Findings:

Using a differences-in-differences study design, we compared the spending of commercially-insured patients whose physicians participated in Accountable Care Organizations (ACOs) to patients whose physicians did not participate. The spending of patients treated by physicians in ACOs was no lower than patients with non-ACO physicians.

Meaning:

Cost-containing public payment policy is unlikely to help curb spending among privately insured populations.

Panel A: Full Sample

Panel B: Targeted Conditions

Panel C: Control Conditions

Figure 1.
Commercial Spending Levels Before and After the Implementation of Medicare Accountable Care Organizations

Table 1.

Patient and Physician Sample Characteristics

N	Pre		Post		P value
	ACO	Comparison	ACO	Comparison	
ACOs	-	-	11	-	
Physicians	2,925	7,348	2,603	7,037	
Patients	33,956	77,203	20,794	60,630	
Physicians					
Number patients (mean)	11.6	10.5	8.0	8.6	.02
Generalist (%)	74.9	75.7	75.0	75.4	.34
Practitioner (%)	0.7	1.3	0.9	1.8	<.01
Specialist (%)	24.4	23.3	24.1	22.4	<.01
Patients					
Female (%)	71.1	70.7	72.3	71.4	.02
Mean number of HCCs (SD)	0.77 (1.35)	0.75 (1.32)	0.73 (1.30)	0.73 (1.30)	.70
Mean age (SD)	44.1 (13.4)	43.9 (13.5)	43.1 (13.5)	43.2 (13.7)	.34
Mean 90-day spending (SD)	21,886 (19,413)	21,805 (19,207)	20,085 (18,554)	20,237 (20,085)	.31
Mean 91–365 day spending (SD)	4,742 (12,059)	4,592 (11,673)	3,819 (10,453)	3,822 (10,551)	.97
Most Common Reasons for Sample Entry (%)					
Vaginal Delivery	22.0	21.0	22.9	21.2	<.01
C-Section	12.0	11.7	12.0	11.4	0.02
Hysterectomy	8.9	9.1	8.8	9.3	0.01
Cholecystectomy	6.6	7.5	8.6	8.9	0.18
Knee Replacement	6.9	7.1	6.6	6.7	0.57
Targeted Conditions (%)					
AMI	7.4	7.3	6.6	6.6	0.88
CHF	3.7	3.6	3.3	3.4	0.65
	1.0	1.0	1.0	1.0	0.67

	Pre			Post		
	ACO	Comparison	P value	ACO	Comparison	P value
Pneumonia	2.7	2.7	0.75	2.3	2.2	0.56
Control Conditions (%)						
Vaginal Delivery	34.0	32.7	<.01	34.9	32.6	<.01
C-Section	22.0	21.0	<.01	22.9	21.2	<.01
	12.0	11.7	0.07	12.0	11.4	0.02

P-values are reported for the comparison with a difference of zero.

Table 2.
Association between Medicare ACO Participation and Episode Spending for Commercially Insured Patients

Adjusted means	Pre-intervention		Post-intervention		Differences-in-Differences (95% CI)
	ACO	Comparison	ACO	Comparison	
90 Day Total Spending					
Full sample (\$)	21,292	21,157	21,250	20,995	119 (-170, 408)
Targeted conditions (\$)	34,485	34,406	34,434	34,579	-223 (-2,037, 1,591)
Control conditions (\$)	11,258	11,314	11,364	11,348	72 (-44, 189)
91-365 Day Total Spending					
Full sample (\$)	4,258	4,251	4,338	4,421	-90 (-312, 132)
Targeted conditions (\$)	8,585	9,071	7,952	9,597	-1,160* (-2,459, 140)
Control conditions (\$)	1,100	1,093	1,095	1,067	21 (-89, 130)

p<0.01,

**
p<0.05,

*
p<0.1

Models were adjusted for age, sex, HCCs, clinical reason for admission into sample, provider type, and year.

Cell sizes: Full sample (n=192,583), targeted conditions (n=13,532), control conditions (n=63,823).

We tested for parallel trends in the pre-period. We found no significant differences in trends between treatment and comparison groups (p=0.42)