

# Physician Compensation Strategies and Quality of Care for Medicare Beneficiaries

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The continuing national debate over federal spending, deficits, and the debt underscores the need to find ways to address problems related to escalating costs and inadequate quality of care in the US healthcare system.<sup>1,2</sup> Changing physician practice incentives, through payment reforms such as global payments, pay-for-performance, or shared savings arrangements, is a primary focus. Ideally, a reformed payment system would promote the delivery of high-value care, meaning care that is relatively high in quality and low in cost. Some reforms, such as accountable care organizations (ACOs), explicitly set up rewards for both reducing costs and improving quality. Many are concerned, however, that efforts to reduce costs through physician payment reform will have deleterious effects on quality, either indirectly, by shifting care from higher-quality to lower-quality physicians (who happen to be less costly) or directly, by leading to the underprovision of beneficial care.

Although there is a relatively strong literature documenting how financial arrangements are structured between physician practices and health plans, much less is known about how arrangements between payers and practices are translated into specific compensation arrangements for physicians, and how these arrangements, in turn, influence the delivery of care.<sup>3-9</sup> We recently found that physician compensation arrangements are related to costs and intensity of care,<sup>10</sup> but the relationship between physician-level compensation incentives for primary care physicians (PCPs) and the quality of care they deliver has not been studied.

Physician organizations generally compensate physicians with fixed salaries or through a variety of productivity arrangements that provide incentives to see more patients or provide more intensive services. At times, these arrangements are coupled with incentives to achieve quality benchmarks, improve patient satisfaction, or hit targets on measures such as generic drug use or hospitalization rates. Such arrangements can be present in practices whether they generally receive fee-for-service payments or per patient capitated pay-

## ABSTRACT

### Objectives

To examine the relationship between the compensation strategies of primary care physicians (PCPs) and the quality and outcomes of care delivered to Medicare beneficiaries.

### Study Design

Cross-sectional analysis of physician survey data linked to Medicare claims. We used a previously constructed typology that was developed based on the survey to categorize physician compensation strategies.

### Methods

We combined data from the 2004-2005 Community Tracking Study Physician Survey on PCP compensation methods with administrative claims from the Medicare program. We analyzed the proportion of eligible beneficiaries receiving each of 7 preventive services and rates of preventable admissions for acute and chronic conditions. We measured the latter using Prevention Quality Indicators (PQIs), available from the Agency for Healthcare Research and Quality.

### Results

The 2211 PCP respondents included 937 internists and 1274 family or general physicians who were linked to more than 250,000 Medicare enrollees. Employed physicians with productivity and other incentives were more likely to deliver care of high quality when compared with salaried physicians. For instance, the odds of appropriate monitoring for diabetics ranged from 1.26 to 1.47 (all  $P < .01$ ). Physicians in highly capitated environments had similar or better quality compared with physicians in other environments across most measures. The association between compensation strategies and outcomes of care as measured by PQIs was inconsistent, although owners with no other incentives had consistent higher rates of acute and chronic PQI admission (eg, for the chronic PQI composite: odds ratio = 1.07; 95% CI, 1.02-1.12).

### Conclusions

Physician compensation strategies are associated with the quality of preventive services delivered to Medicare patients, but inconsistently associated with outcomes of care. Increasing use of global payment strategies is not likely to lead to lower quality.

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ments. Physician organizations design such compensation strategies in order to maximize their revenue in the face of the net effect of all of their payment arrangements with various health plans and programs such as Medicare and Medicaid. With the current resurgence in global and partial-capitation payment strategies, such as through bundled payments and ACOs, many are concerned that quality of care will suffer as physician organizations strive to generate profit by tightly controlling spending.

In this study, we investigate the relationship between physician compensation strategies and the quality of care delivered to Medicare beneficiaries by analyzing data from a large, nationally representative sample of physicians, the Community Tracking Study (CTS) Physician Survey, linked to claims data from Medicare.<sup>11</sup> We employ a validated typology of physician payment arrangements derived from the 2004-2005 CTS survey.<sup>10,12</sup> We focus both on process measures for routine and preventive care that Medicare beneficiaries should receive and on hospitalization for ambulatory care sensitive medical conditions that should be reduced by good quality primary care.

## METHODS

### Data on Physicians

The CTS Physician Survey, conducted periodically by the nonpartisan Center for Studying Health System Change, surveys a nationally representative sample of nonfederal physicians who have completed residency training and spend at least 20 hours per week in direct patient care. The fourth CTS survey, conducted by telephone in 2004-2005, had 6628 respondents (weighted response rate of 52%) drawn from 60 local healthcare markets that together are representative of the continental United States. Details of the survey are available at [www.hschange.org/CONTENT/888/](http://www.hschange.org/CONTENT/888/). Our study included 2211 PCPs, defined as those with a primary specialty of family practice, general practice, geriatrics, or general internal medicine.

### Data on Medicare Patients

We obtained data from the Medicare program on Medicare beneficiaries aged 65 years or more who did not have end-stage renal disease (ESRD), were enrolled in the traditional fee-for-service Medicare program, and for whom surveyed physicians submitted at least 1 claim during the 3-year period from 2004 to 2006. For each patient identified in this manner,

### Take-Away Points

Using data from the Community Tracking Study Physician Survey linked to Medicare data from 2004 to 2006, we investigated the relationship between primary care physician (PCP) compensation strategies and the quality of preventive care and outcomes of care as measured by avoidable hospital admissions. We find that:

- PCPs paid via productivity formulas delivered care of higher quality than those paid by straight salary.
- PCPs who owned their own practices generally delivered care of lower quality.
- PCPs in highly capitated environments delivered care of similar or better quality compared with physicians in other environments across most measures.

we obtained a complete history of all claims submitted by all Medicare providers for the entire time period. Since claims data are not available for patients enrolled in a Medicare Advantage health plan, patients are only included for full-year periods in which they were enrolled in traditional Medicare. CTS survey data and Medicare claims were linked by obtaining Medicare's Unique Physician Identifier Number (UPIN) from the American Medical Association for CTS respondents and matching it to the UPIN recorded on the Medicare claims. As beneficiaries were indirectly sampled through contact with a CTS physician respondent, they are not nationally representative, for 2 reasons: physicians had different likelihoods of being included in the CTS sample, and patients seeing a greater number of unique physicians had a greater likelihood of being included in the beneficiary sample. We constructed beneficiary weights that were based on the weight assigned to the physician respondent through whom they entered the beneficiary sample, divided by the number of unique physicians seen from 2004 to 2006. Weighted beneficiary characteristics closely matched those obtained from administrative data for non-ESRD patients aged 65 years or more.

### Assigning Patients to PCPs

We assigned beneficiaries to a PCP using an algorithm that matched the beneficiary to the PCP who provided the plurality of their evaluation and management visits over the entire 2004-2006 period.

### PCP Compensation Strategies

The typology of compensation strategies was developed based on the 2004-2005 CTS Physician Survey.<sup>10</sup> The survey first asked whether the physician was an owner or an employee, since owners' net incomes are based primarily on practice profits. It then asked if the physician was paid on the basis of a fixed salary or time worked (wage-based), or some form of variable compensation (such as share of practice revenues). The survey also asked whether the physician received pay in the form of a bonus,

withholding, or other performance-based incentive; and whether the amount of compensation was affected by any of the following explicit factors: individual productivity, financial performance of the practice, results of patient satisfaction surveys, measures of quality, or comparative practice profiling. The physician then indicated the importance (not very, moderately, or very) of each of these 5 factors in determining their compensation. Owners of solo practices were not asked about factors affecting their compensation, for they were assumed to be remunerated solely on the basis of productivity. Finally, to identify incentives from the external payment environment likely to influence internal compensation arrangements, the survey asked the percentage of practice revenue drawn from capitated contracts. We constructed and validated a typology of compensation strategies because of multiple combinations of highly correlated answers to these questions.<sup>12</sup>

The resulting 7-category typology of compensation strategies begins by creating separate categories of physician owners and employees.<sup>10</sup> Each of these categories is then further subdivided into those with no other explicit incentives (employees with fixed salaries, owners whose compensation comes only from practice profits), those with productivity incentives alone, and those with productivity and other incentives (eg, for quality), and based on whether the practice receives more than 35% of its revenue in the form of capitation.

### Quality Measures

**Quality of preventive services.** We investigated Medicare claims to measure beneficiaries' receipt of recommended tests for diabetes monitoring (glycated hemoglobin [A1C] monitoring, retinal eye exams, cholesterol screen, and nephropathy screen); cancer screening (mammography, colonoscopy/sigmoidoscopy); and receipt of a pneumococcal vaccination. The measures have been used in previous studies and are ascertainable by claims.<sup>13</sup> Except for pneumococcal vaccination and colon cancer screening, these services should be delivered annually. Fecal occult blood testing was excluded because it is not adequately captured in claims and because colonoscopy has become the most prevalent means for screening for colorectal cancer. Influenza vaccination was also excluded because it is often administered in settings not captured in claims. Because patients may have been eligible for these quality indicators for up to 3 years, we restricted our analyses to the most recent year of data available for each patient.

**Prevention Quality Indicators.** We also examined the full set of Prevention Quality Indicators (PQIs), which are

measures of preventable hospitalizations that were developed with the support of the Agency for Healthcare Research and Quality.<sup>1</sup> PQIs can be used to assess the quality of care for ambulatory care-sensitive conditions for which good outpatient care can potentially reduce the need for hospitalization, or for which early intervention can prevent complications or more severe disease. Because these types of admissions are relatively infrequent, we stratify PQIs into acute and chronic categories and create composite measures in both of these domains consisting of any acute or any chronic PQI and use the entire available time period for each beneficiary to identify admissions.

### Patient (and physician) Control Variables

Patient control variables were derived from the Medicare beneficiary summary file and included age, race/ethnicity (categorized as white, black, or other), sex, Hierarchical Condition Category score (to control for case mix), and Medicaid coverage (an indicator of low socioeconomic status).

Physician control variables derived from the CTS survey included primary care specialty (general internal medicine vs family or general practice), age, sex, race, years in practice (less than 5 years, 5-10 years, or more than 10 years), foreign medical graduate status, board certification, and the percentages of practice revenue from Medicare or Medicaid (categorized in terciles). We did not include practice type as a control variable, because this was used to develop our typology of incentives.

### Statistical Analysis

We first present descriptive information on the PCPs included in the study and their associated patient populations. Comparisons of this study's sample of Medicare patients with the entire Medicare population are reported elsewhere.<sup>10</sup>

We then examined the proportion of times each individual quality measure and the PQI composite were met for the subpopulation of physicians with each type of compensation strategy. To control for the effects of other factors, we next estimated a series of logistic regression models to assess the association between the compensation strategies typology and the individual preventive care quality measures and the chronic and acute PQI measures. The predictors included patient-level and physician-level control variables. Models were estimated using generalized software that used Generalized Estimating Equation methods with physician as a clustering variable to account for the clustering of the data, fixed effects for the 60 CTS sites to control for any time-invariant local market effects,

■ **Table 1.** Description of PCPs and Beneficiaries Linked to PCPs

		PCP Respondents		Beneficiaries Linked to a PCP <sup>a</sup>	
		N	Percent	N	Percent
<b>Specialty</b>	<b>General internal medicine</b>	937	42.38	123,284	48.82
	<b>Family/general practice</b>	1274	57.62	129,268	51.18
<b>Years in practice</b>	0-5	336	15.20	20,506	8.12
	6-10	497	22.48	50,922	20.16
	11+	1378	62.32	181,124	71.72
<b>Board certification</b>	Yes	1923	86.97	222,832	88.23
	No	288	13.03	29,720	11.77
<b>Location of medical school</b>	US/Canada	1685	76.21	204,577	81.00
	Elsewhere	526	23.79	47,975	19.00
<b>Practice type</b>	Solo/2-person	842	38.08	106,548	42.19
	Small group (3-10)	336	15.20	49,507	19.60
	Medium group (11-50)	176	7.96	23,094	9.14
	Large group (>50)	94	4.25	11,486	4.55
	Medical school	123	5.56	6800	2.69
	Hospital practice/ other	554	25.06	50,777	20.11
	Group/staff HMO	86	3.89	4340	1.72
<b>Practice revenue derived from Medicaid</b>	0-5	958	43.33	126,975	50.28
	6-20	803	36.32	97,238	38.50
	21+	450	20.35	28,339	11.22
<b>Practice revenue derived from Medicare</b>	0-20	662	29.94	45,736	18.11
	21-40	822	37.18	100,770	39.90
	41+	727	32.88	106,046	41.99
<b>Practice revenue derived from managed care</b>	0-25	702	31.75	87,841	34.78
	26-50	697	31.52	91,247	36.13
	51+	812	36.73	73,464	29.09
<b>Practice revenue prepaid, capitated</b>	0	959	43.37	127,820	50.61
	1-34	840	37.99	94,508	37.42
	35-100	412	18.63	30,224	11.97

HMO indicates health maintenance organization; PCP, primary care physician.

<sup>a</sup>Beneficiaries include those linked to PCPs as their usual primary care physicians.

and beneficiary sampling weights as weights to account for the nonrandom selection of patients into the sample.

Our study was approved by the CMS Privacy Board and by the Institutional Review Board at Harvard Medical School.

## RESULTS

The 2211 PCP respondents included 937 general internists linked to more than 123,000 Medicare patients whom they treated at least once between 2004 and 2006, and 1274 family or general physicians linked to over 129,000 Medicare patients (Table 1). Most physicians

(62%) had been in practice for 11 or more years and 87% were board certified. About one-third were in a solo or 2-person practice and a quarter were in hospital-based practices. Seventy percent derived at least 20% of practice revenue from Medicare. The Medicare beneficiaries linked to these physicians, for specific episodes of care (−300,000) and/or as their principal provider (−250,000), were slightly younger than the general Medicare population (45% aged 65 to 74 years vs 38%;  $P < .01$ ), but were otherwise similar, with 61% being female and 90% white (data not shown).

Table 2, reproduced from another publication, summarizes the groupings of physician payment arrangements

**Table 2.** Major Components of the Physician Compensation Typology

Typology Category	Abbreviation Used in Tables 3 and 4	N	Ownership	Productivity (vs salary pay)	Other Incentive <sup>a</sup>	High Capitation
Employed physicians paid via fixed salary	Employed	277				
Employed physicians paid based on productivity with no additional incentives	Employed productivity	58		✓		
Employed physicians in a low-capitation environment paid based on productivity with additional incentives	Employed productivity Other incentives	424	✓	✓		
Employed physicians in a high-capitation setting (>35% of revenue) paid based on productivity with additional incentives	Employed productivity Other incentives High capitation	96		✓	✓	✓
Practice owners including full owners of solo practices; these practices have no additional internal payment arrangements	Owner Productivity	672	✓	✓		
Owners (part or full) practicing in a low-capitation environment with any other combination of incentives	Owner Productivity Other incentives	582	✓	✓	✓	
Practice owners in a high-capitation setting (>35% of revenue) who also receive incentive payments	Owner Productivity Other incentives High capitation	102	✓	✓	✓	✓

<sup>a</sup>Other incentives include those for quality, use of generic medications, and patient satisfaction.

and the number of physicians in each group.<sup>10</sup> The largest group (672 physicians) consists of practice owners, primarily full owners of solo practices, who were compensated based on their personal productivity without additional internal payment arrangements, followed by physicians compensated on the basis of productivity along with additional incentives (such as those based on quality or satisfaction). Of these, 582 were owners or part owners of their practices and 424 were employees.

### Physician Compensation Strategies and Delivery of Preventive Services and Rates of PQI Admissions

The overall proportion of patients receiving the 7 preventive measures we examined ranged from an average of 6.3% for pneumococcal vaccination to 80.4% for A1C monitoring for patients with diabetes (Table 3). Annual rates of acute and chronic PQI admissions were 1.1 and 1.2 per 100 persons, respectively, and ranged from 0.7 per 100 for the acute composite for employed physicians compensated in part by productivity bonuses with incentives and high capitation, to 16 per 100 for the chronic care composite for employed physicians who receive a productivity bonus.

In adjusted comparisons (Table 4), patients cared for by employed physicians with a productivity bonus, with or without other incentives, generally had higher odds of receiving most of the preventive services. For instance, for employed physicians paid via a productivity formula with other incentives, compared with salaried physicians, the odds of adhering to a quality measure were statistically sig-

nificantly greater than 1 for 6 of the 7 measures, with the odds ratios (ORs) ranging from 1.09 to 1.47. There were similar patterns for employed physicians with productivity incentives, but only 3 of these reached statistical significance. Notably, physicians in highly capitated practices (whether employed or owners), defined as having at least 35% of practice revenue in the form of capitated payments, did not consistently deliver care of higher or lower quality, relative to their similarly paid counterparts in low-capitation practices. The relationship with preventable admissions was variable with no consistent relationship between payment arrangements and the rate of acute or chronic PQI admissions, although owners with no additional explicit incentives had higher rates of both acute and chronic PQI admissions (eg, for chronic PQIs, OR = 1.07; 95% CI, 1.02-1.12).

## DISCUSSION

The relationship between physician compensation strategies and the quality and outcomes of care has rarely been studied. Prior studies have examined health plan-level payment policies, but lacked granular data on how physicians experience these incentives. Our study has several notable findings. We found that PCP compensation strategies were only loosely associated with quality of care. Generally, employed physicians working under productivity arrangements, with or without additional incentives, delivered care of higher quality, whereas owners with no other incentives delivered care of lower quality

■ **Table 3.** Unadjusted Quality of Care Rates, by Physician Payment Arrangements, Displayed as Percent of Beneficiaries Who Received the Service (for process measures) or Rate per 100 Patients With Ambulatory-Sensitive Hospitalizations (for acute and chronic PQI composites)

	A1C Monitoring	Eye Exam for Diabetics	Cholesterol Screen for Diabetics	Nephropathy Screen for Diabetics	Colon Cancer Screening	Breast Cancer Screening	Pneumonia Vaccine	Acute PQI Composite	Chronic PQI Composite
Overall average	80.4	37.8	73.8	20.9	7.5	42.3	6.3	1.1	1.2
Employed with fixed salary (reference group)	76.9	40.6	67.2	23.1	7.1	37.6	5.1	1.3	1.3
Employed with productivity bonus	84.8 <sup>a</sup>	36.6	76.9 <sup>c</sup>	19.5	10.0 <sup>b</sup>	54.8 <sup>a</sup>	9.0 <sup>c</sup>	1.5	1.6
Employed with productivity and other incentives	83.0 <sup>c</sup>	38.2	68.3	24.6	7.9 <sup>b</sup>	46.3 <sup>*</sup>	6.8	1.0	1.0
Employed with productivity, other incentives, and high capitation	78.5	41.1	77.0 <sup>c</sup>	38.5 <sup>c</sup>	8.1	46.3 <sup>c</sup>	6.9	0.8 <sup>a</sup>	0.9
Owner with no other explicit incentives	76.1	36.8 <sup>b</sup>	75.0	16.2	6.6	35.7	5.6	1.2	1.2
Owner with productivity and other incentives	84.4 <sup>a</sup>	40.5	77.0 <sup>c</sup>	23.1	7.9	45.0 <sup>a</sup>	7.0 <sup>c</sup>	1.2	1.1
Owner with productivity, other incentives, and high capitation	85.4 <sup>b</sup>	35.3	67.4	20.1	9.9 <sup>b</sup>	53.8 <sup>a</sup>	5.9	1.1	1.3

A1C indicates glycated hemoglobin; PQI, Prevention Quality Indicator.  
<sup>a</sup>*P* < .001; <sup>b</sup>*P* < .01; <sup>c</sup>*P* < .05.

when measured by process measures. Salaried physicians were somewhere in between. Although the fee-for-service reimbursement system and associated productivity incentives are seen as root causes of the failure of the current payment system to provide efficient care of high quality, we find no evidence in this cross-sectional study of associations that quality suffers. In fact, there are indications that it may be enhanced. We cannot speak to the efficiency by which care is delivered, however.

Our findings related to physicians practicing in environments with higher rates of capitation might be relevant for policy makers, but additional data are needed to confirm these findings. A major limitation of our study is that it is cross-sectional in nature. Thus, we cannot determine if there were additional unmeasured confounders at the patient, physician, or practice level that might explain our findings. For instance, more highly capitated practices might also have more developed quality improvement and monitoring capabilities. Nonetheless, our findings show that practicing in such environments was associated with similar overall quality when compared with physicians practicing in low-capitation environments.

Under health reform, it is likely that there will be significant changes to physician payment systems. The Affordable Care Act funds the Center for Medicare & Medicaid Innovation at the level of over \$1 billion per year, and among the initial innovations to be tested are new pay-

ment models for PCPs. The recently launched Pioneer and Shared Savings ACO programs currently have over 350 participants and more are likely to join in the future. In contrast to the failed experiment with capitation in the 1990s, new efforts such as ACOs include strong incentives to deliver high-quality care, including both robust quality incentives and planned public reporting.<sup>14,15</sup>

It is also notable that employed physicians generally delivered care of higher quality. It is likely that many of these physicians work in larger physician organizations. In the time since our data were collected, there has been a dramatic trend toward employment of physicians by other, larger organizations, most notably hospitals. Unlike earlier experience in the 1990s with physician employment, physicians in practices purchased by larger organizations operate under productivity incentives. Our results suggest that these ownership and compensation trends may result in higher-quality care as indicated by our measures. Research from the National Survey of Provider Organizations shows that larger organizations generally have more developed care management practices that facilitate the delivery of higher-quality care.<sup>16</sup> It is possible that these organizational approaches to quality are important determinants of quality and may well act as a strong counterbalance to incentives to stint. Healthcare organizations can affect quality through one of several different mechanisms that influence physician behavior, and compensation

**Table 4.** Adjusted Relationship Between Quality of Care and Physician Payment Arrangements

	A1C Monitoring	Eye Exam for Diabetics	Cholesterol Screen for Diabetics	Nephropathy Screen for Diabetics	Colon Cancer Screening	Breast Cancer Screening	Pneumonia Vaccine	Acute PQI Composite	Chronic PQI Composite
Employed with fixed salary (reference group)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Employed with productivity bonus	<b>1.53</b> <b>(1.09-2.16)</b>	0.94 (0.71-1.25)	1.98 (0.84-4.68)	1.08 (0.50-2.33)	1.27 (0.96-1.68)	<b>1.89</b> <b>(1.32-2.71)</b>	<b>1.71</b> <b>(1.04-2.82)</b>	0.98 (0.91-1.07)	<b>0.91</b> <b>(0.84-0.99)</b>
Employed with productivity and other incentives	<b>1.47</b> <b>(1.43-1.52)</b>	0.93 (0.91-0.95)	<b>1.44</b> <b>(1.40-1.48)</b>	<b>1.26</b> <b>(1.23-1.30)</b>	<b>1.09</b> <b>(1.06-1.11)</b>	<b>1.11</b> <b>(1.09-1.14)</b>	<b>1.19</b> <b>(1.17-1.22)</b>	<b>0.89</b> <b>(0.85-0.93)</b>	<b>0.88</b> <b>(0.84-0.92)</b>
Employed with productivity, other incentives, and high capitation	1.38 (0.89-2.15)	1.07 (0.85-1.35)	1.19 (0.87-1.64)	<b>1.87</b> <b>(1.00-3.51)</b>	1.13 (0.87-1.48)	1.13 (0.78-1.64)	1.11 (0.81-1.51)	1.06 (0.98-1.14)	1.04 (0.96-1.12)
Owner with no other explicit incentives	1.03 (0.81-1.32)	<b>0.83</b> <b>(0.69-0.99)</b>	<b>1.51</b> <b>(1.18-1.94)</b>	0.76 (0.48-1.18)	0.95 (0.79-1.14)	0.99 (0.75-1.31)	1.12 (0.85-1.46)	<b>1.04</b> <b>(1.00-1.09)</b>	<b>1.07</b> <b>(1.02-1.12)</b>
Owner with productivity and other incentives	<b>1.39</b> <b>(1.07-1.82)</b>	1.02 (0.85-1.22)	<b>1.76</b> <b>(1.38-2.24)</b>	1.07 (0.68-1.71)	1.03 (0.86-1.24)	1.29 (0.99-1.67)	<b>1.31</b> <b>(1.02-1.69)</b>	<b>1.07</b> <b>(1.03-1.12)</b>	1.02 (0.97-1.06)
Owner with productivity, other incentives, and high capitation	<b>2.04</b> <b>(1.39-3.00)</b>	0.96 (0.76-1.22)	<b>1.32</b> <b>(1.03-1.69)</b>	1.39 (0.90-2.16)	1.09 (0.90-1.31)	1.21 (0.94-1.55)	<b>1.40</b> <b>(1.09-1.81)</b>	1.00 (0.93-1.07)	<b>0.92</b> <b>(0.85-0.98)</b>

A1C indicates glycated hemoglobin; PQI, Prevention Quality Indicator. The adjusted relationship is presented as an odds ratio with the associated 95% CI in parentheses, with employed physicians paid a fixed salary as the reference group. Numbers in boldface were significantly different at  $P < .05$  level.

strategy is but one method.<sup>17</sup> Thus, in addition to compensation strategies, the mix of other strategies employed by these organizations and the culture of the organization are likely to be important.

A limitation of this study is that we investigated only quality measures that could be defined by claims data. These process and outcome measures fail to capture the full dimensions of quality primary care. For instance, our measures include none that examine the overuse of services, such as imaging for low back pain. At the same time, measures of quality used in physician organization compensation have often been limited in their scope. Spurred by private and public efforts, there has been robust development of additional quality measures in recent years, many of which rely on abstracted data from electronic medical records. As a result, the opportunities to tie physician compensation to more meaningful measures of quality are likely to continue to increase, as seen in the Medicare ACO programs. Although we found relatively little association with other compensation incentives from our data—which asked about incentives related to quality and patient satisfaction measures—quality-based compensation schemes may become more robust in coming years.

Our results should also be considered in light of several other limitations. First, we were unable to assess screening prior to the baseline year, likely leading to underestimation of population rates for some measures. In addition, our approach is based on the assumption that a similar proportion of patients will be eligible for these measures each year. This issue is particularly relevant for colorectal cancer screening and pneumococcal vaccination, where beneficiaries may not require repeat testing for 10 years after receipt of a service.<sup>18</sup> If anything, use of these measures may bias our findings against physicians practicing in organizations with more developed quality improvement and monitoring functions, as their patients may have been more likely to have received these recommended treatments prior to the study years. Second, we studied patients enrolled in the traditional Medicare program wherein physician services are reimbursed through standard fee-for-service payments. Although theory suggests that physicians develop a uniform approach to care that maximizes their performance under a mix of payment incentives (such as capitation),<sup>19</sup> this may have dampened the association between practice-level incentives and physician practice patterns. Third, we were not able to characterize the incentive structures to the level of detail we would have liked, particularly related to the

structure of capitation payments and the practice-level incentives. Nonetheless, our results provide the most detailed description of financial arrangements from a large survey of this type. In addition, our data show a wide variety of compensation arrangements for PCPs, which likely reflects the diversity of patient types and insurance coverage seen by individual practices. Fourth, our data are from the time period of 2004 to 2006, and compensation strategies may have evolved since that time. Nonetheless, to our knowledge there were not substantial changes in physician compensation methods from 2007 to the present. Finally, as noted above, patients are not randomly assigned to practices and might choose practices that conform to their taste for medical care. Similarly, physicians might select into practices that deliver care that conforms to their preferred approach. Thus, our findings might reflect unmeasured attributes of either the patient or physician populations that are associated with practice payment arrangements, and we can only infer associations and not causal relationships.

In conclusion, in this large nationally representative study of the relationship between PCP compensation strategies and quality of care and outcomes for their Medicare patients, we find that employed physicians paid via productivity-based reward formulae generally delivered higher-quality care. Notably, those practicing in highly capitated practices delivered care of similar quality to that delivered by other physicians, suggesting that current models of capitation may contain features that mitigate incentives to stint on care. Our findings related to physician payment arrangements suggest that payment reforms being considered for the Medicare program nationally may be implemented without adversely impacting quality.

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