Title

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Journal

Health Services Research, 51(2)

ISSN

0017-9124

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Publication Date

2016-04-01

DOI

10.1111/1475-6773.12339

HSR Health Services Research

DOI: 10.1111/1475-6773.12339
RESEARCH ARTICLE

Comparing the Cost of Caring for Medicare Beneficiaries in Federally Funded Health Centers to Other Care Settings

Dana B. Mukamel, Laura M. White, Robert S. Nocon, Elbert S. Huang, Ravi Sharma, Leiyu Shi, and Quyen Ngo-Metzger

Objective. To compare total annual costs for Medicare beneficiaries receiving primary care in federally funded health centers (HCs) to Medicare beneficiaries in physician offices and outpatient clinics.

Data Sources/Study Settings. Part A and B fee-for-service Medicare claims from 14 geographically diverse states. The sample was restricted to beneficiaries residing within primary care service areas (PCSAs) with at least one HC.

Study Design. We modeled separately total annual costs, annual primary care costs, and annual nonprimary care costs as a function of patient characteristics and PCSA fixed effects.

Data Collection. Data were obtained from the Centers for Medicare & Medicaid Services.

Principal Findings. Total median annual costs (at $2,370) for HC Medicare patients were lower by 10 percent compared to patients in physician offices ($2,667) and by 30 percent compared to patients in outpatient clinics ($3,580). This was due to lower nonprimary care costs in HCs, despite higher primary care costs.

Conclusions. HCs may offer lower total cost practice style to the Centers for Medicare & Medicaid Services, which administers Medicare. Future research should examine whether these lower costs reflect better management by HC practitioners or more limited access to specialty care by HC patients.

Key Words. Federally funded health centers, costs, primary care, specialty care, Medicare

Since the 1960s, federally funded health centers (HCs), those receiving funds under Section 330 of the Public Health Service Act as Amended, have been providing primary care to low-income and medically underserved populations. The HCs program has grown rapidly since then (Shi et al. 2010).

In 2012, 1,198 HCs with over 8,900 delivery sites operated nationally and provided care to over 21.1 million people (Health Resources and Services Administration 2012b). In 2012, 40.8 percent of HCs' patients were Medicaid, 36 percent were uninsured, and 8 percent were Medicare (Health Resources and Services Administration 2012a). The HCs are often viewed as the core of the primary care safety-net providers in the United States. Their total operating revenues in 2009 were $11.5 billion, with 6 percent paid by Medicare ($674 million) (Medicare Payment Advisory Committe [MedPAC] 2011).

The role of the HCs is expected to increase significantly in the coming years. Many of the uninsured are expected to gain access to Medicaid through Medicaid expansion (Adashi, Geiger, and Fine 2010; Katz et al. 2011). Currently, 27 states and the District of Columbia have opted to implement Medicaid expansion. In addition, an estimated 30–40 million people will remain uninsured under the 2010 Affordable Care Act (Congressional Budget Office 2014). Some of these individuals, as well as those purchasing low-premium, high-deductible plans in the insurance exchanges, may end up using HCs because they will find out-of-pocket costs for using other sources of care to be prohibitive. Expecting such trends, the 2010 Affordable Care Act includes new funding for the HCs program which will enable the HCs to serve considerably more patients (Adashi, Geiger, and Fine 2010).

As HCs expand their locations and the services they offer, they are likely to reach new patients, including increasing numbers of elderly and Medicare beneficiaries (both new elderly beneficiaries and new disabled nonaged beneficiaries). Current demographic trends indicate more than a doubling of those aged 65 and over by 2050. Their numbers are expected to grow from about 40 million currently to a projected 89 million (Jacobson et al. 2011). This aging population is projected to have an increasing prevalence of chronic diseases and complex medical conditions, and hence an increased demand for medical services (Dall et al. 2013). Many of these individuals will have aged into the Medicare program from their previous coverage, including Medicaid.

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Those who have been receiving care at HCs during their adult years, prior to qualifying for Medicare, may wish to continue to seek care in the same HCs they have been accessing before. Continuity of care considerations, ability to keep their doctor, convenient geographic proximity, and the ability to access primary medical care and other services in one center all suggest that beneficiaries might choose to stay in their HC as they transition from Medicaid and other safety-net programs and become eligible for Medicare. Furthermore, as the current physician shortage is expected to continue, and possibly increase as the population ages and the effects of the Affordable Care Act on the physician labor supply sort themselves out (Association of American Medical College [AAMC] 2010), some new Medicare enrollees may find that even if they wish to move to private physician offices for their primary care, their choices may be limited. Thus, HCs may experience an increase in the number and proportion of Medicare patients they are serving.

While there have been a number of studies over the years examining the costs and utilization of HCs focusing on Medicaid patients (Starfield et al. 1994; Shi et al. 2010; Gurewich et al. 2011; Texas Association of Community Health Centers [TACHC] 2011), only two studies have examined the Medicare population. Forrest and Whelan (2000) focused only on primary care visits, presenting data for 1994. Shi et al. (2010) examined 2006 data and reported a bivariate comparison of the characteristics of those aged 65 and above receiving care in HCs and physician offices. The study we present here offers the most recently available data, for 2009, and a different perspective. We compare total annual health care costs of Medicare patients in different settings, including both primary and nonprimary care. Using 2009 Medicare claims data for 14 diverse states, this study compares the total annual costs of care (excluding long-term care and prescription drug costs) of Medicare beneficiaries whose primary care provider is an HC to the total annual costs of care of Medicare beneficiaries whose primary care provider is a physician office or an outpatient clinic.

We hypothesize that Medicare expenditures will differ across these settings because the Medicare program pays HCs differently than it pays private physicians or outpatient clinics. HC services provided to Medicare beneficiaries are paid on an all-inclusive, per-visit basis, as opposed to traditional fee-for-service payment. The per-visit payment amount does not differ by provider type, specialty, or service provided (i.e., Current Procedural Terminology [CPT] code). Medicare Part B deductibles do not apply to services provided by HCs. However, beneficiaries do face a 20 percent coinsurance payment, which is adjusted on a sliding scale based on the beneficiary's income level, up to 200 percent of

the federal poverty level (Centers for Medicare & Medicaid Services 2014). The HCs also receive grant funding from the Health Resources and Services Administration (HRSA). These funding are not specific to Medicare patients and are typically used to provide enriched services, such as transportation and interpreters, to all HCs' patients (U.S. Department of Health and Human Services and Health Resources and Services Administration 2014). These additional services, available to HC patients but not to those seeking care in other settings, may lead to both different practice styles and possibly better health outcomes. In particular, one might hypothesize that HC patients may require fewer nonprimary care services, partly due to the availability of these enriched services, if they indeed improve primary care outcomes.

We include in the comparison both primary and nonprimary care costs because from an insurer perspective, such as the Centers for Medicare and Medicaid Services (CMS), total cost is important. Furthermore, this allows us to examine possible substitution between primary and nonprimary care costs, when comparing across these settings.

METHODS

Data and Sample

This study utilized Medicare Part A and B claims obtained from CMS. These claims include hospital inpatient, physician offices, outpatient clinics, emergency departments, other ambulatory services such as laboratories and imaging, home care, and skilled nursing facilities. Data were for 2009 for all fee-for-service Medicare beneficiaries residing in specific primary care service areas (PCSAs) (Goodman et al. 2003) located within 14 selected states. Analysis was limited to 14 states due to data costs and limited project resources. PCSAs were included if they had HCs funded for primary care within their services area. We chose this design because PCSAs are geographic units created based on an analysis of Medicare claims data and reflect primary care-seeking patterns of Medicare beneficiaries. Thus, PCSAs can be viewed as primary care health care markets such that the individuals residing within them experience the same supply of primary care resources. The 14 states were chosen to represent geographic diversity, urban/rural mix, and states with a substantial HC presence. The states include Alabama (AL), California (CA), Colorado (CO), Connecticut (CT), Florida (FL), Iowa (IA), Illinois (IL), Maine (ME), Mississippi (MS), Montana (MT), North Carolina (NC), Texas (TX), Vermont (VT), and West Virginia (WV). Because some of the chosen PCSAs cross multiple

states, the analysis included a small number of beneficiaries from states other than the 14 states listed above. The initial sample included 4,414,149 beneficiaries, or about 10 percent of the national Medicare population.

Beneficiaries with end-stage renal disease (2.07 percent), those who had transplant procedures (0.03 percent), those who were served by a provider participating in a payment demonstration (0.08 percent), and those with missing data (3.25 percent) were excluded from the analysis. Beneficiaries with no health care encounters at all during the year (18.1 percent) and those who had only specialty care encounters (8.75 percent) were also excluded because our methodology for assigning patients to primary care settings requires at least one primary care encounter. Therefore, the final analytical sample included 3,161,084 beneficiaries, or 71.61 percent of the initial sample.

One of the challenges of these data was to correctly identify HCs, separately from the "look-alikes" (i.e., health centers that meet all requirements to receive a federal grant but do not receive federal funding; Health Resources and Services Administration [HRSA] 2009), tribal health centers, and other clinics that were not federally funded health centers but share the Federally Qualified Health Center designation by CMS. We identified providers as HCs based on an extensive analysis of providers' Medicare provider numbers, National Provider Identifiers (NPIs), and taxonomy codes.

Variables

Definitions of Primary Care Settings. To determine if a provider was a primary care provider, we used a modification of the Affordable Care Act and the CMS definitions of primary care practitioners and services (Department of Health and Human Services and Centers for Medicare and Medicaid Services), as follows: A provider was considered to be a primary care provider if *either* (1) for physicians, they had a specialty of 01-general practice (not included in the Affordable Care Act/CMS definition), 08-family practice, 11-internal medicine, or 38-geriatrics; *or* (2) for nonphysicians, they had a specialty designation of 50-nurse practitioner, 89-certified clinical nurse specialist, or 97-physician assistant; *and* (3) the provider had at least one claim with a CPT code for evaluation and management (E/M) in the office (99201-99215), in a nursing facility (99304-99340), or in the patient's home (99341-99350). If at least one claim for a provider met this criterion, we assumed that all claims for the provider were primary care claims.

We chose not to include in this study the case of the "specialist as primary care physician" as sometimes is the case for cancer patients or patients

with chronic diseases such as diabetes, because this is not a typical practice pattern in the HCs and would not be an appropriate comparison.

We defined four primary care settings—HCs, physician offices, outpatient clinics, and others. The Other category included "HC look-alikes," rural health clinics, and all other settings. This analysis was based only on the primary care claims (those generated by a primary care provider as defined above). A primary care encounter was determined to be provided at a given setting based on an analysis of the Carrier (Medicare Part B) Line file's Place of Service variable and CPT code variable, the Outpatient Claim File's Claim Facility Type Code variable, and the Outpatient Claim File's Organization NPI.

Assigning Medicare Beneficiaries to Care Settings. Initial analysis revealed that while the majority (80 percent) of Medicare patients sought all their primary care in one setting, there was a nonnegligible percent (20 percent) that had a mixed profile. Furthermore, the distribution of the percent of days by setting did not exhibit any natural cutoff points to suggest how one might label a patient as seeking care from one setting rather than another. Therefore, rather than arbitrarily assigning patients to settings, and to maximize the use of the information, we created for each patient four variables indicating the percent of primary care days the patient received care at each setting. For example, a patient might have had 20 percent of his or her primary care days in an HC, 50 percent in a physician office, 25 percent in an outpatient clinic, and 5 percent in other settings. Note, that by definition, the values for all these variables for the same beneficiary have to sum to 100 percent, and, therefore, only three of the four variables can be included in the estimated models. We chose the HCs as the omitted (or reference) category. This assignment of patients to care settings reflects the nature of fee-for-service coverage (rather than managed care), which allows patients to seek care wherever Medicare is accepted and to make a different choice of provider every time. For further discussion of this methodology and its advantages please, see Appendix 1.

Dependent Variables. The dependent variables were total annual costs for each beneficiary, total annual primary care costs, and total annual nonprimary care costs. The latter were defined as inpatient, emergency room, and all other non-

primary care costs, including specialists, imaging, laboratory, and therapies but excluding long-term care and drug costs. Costs included all payments by Medicare to the provider plus beneficiary out-of-pocket expenses. Costs were summed over all claims for the beneficiary for the period of time the beneficiary was enrolled, up to one full year. Costs were not annualized, but rather we controlled for enrollment period in Medicare Parts A and B as well as state buy-in on the right-hand side of the estimated models.

Independent Variables. The independent variables of interest were the variables indicating the percent of primary care encounters that the Medicare patient had in each of the three settings: physician office, outpatient clinic, and other, with the HC setting serving as the reference category, as described above.

Other variables can be viewed as proxies or controls for either the health status or health-seeking behavior of the patient. These included age, gender, race, a dichotomous variable indicating if the patient died during the year, the original reason for Medicare enrollment (disability or aged), and 70 dichotomous severity grouping variables calculated by the CMS-Hierarchical Condition Category (CMS-HCC) and used by Medicare for payment (Pope et al. 2004).

We also included three variables describing the Medicare insurance status of the beneficiary: the number of month enrolled in Part A, the number of month enrolled in Part B, and the number of months with state buy-in, during which the state contributes to the low-income beneficiary's Part A and/or B premium. These variables were needed because not all beneficiaries were observed for the full year due to either death or midyear enrollment, while costs were aggregated over services covered by only one of the programs. This approach was, therefore, more appropriate in this case than annualizing expenditures.

Analyses

We estimated three separate cost functions—one for total annual costs, one for annual primary care costs, and one for annual nonprimary care costs. Because initial analyses suggested different cost patterns for the aged (65+) and the nonaged (younger than 65) beneficiaries, all cost functions were stratified by age and estimated separately for each age group. The unit of analysis was the beneficiary. The estimated models were of the following form:

$$\log C_{i,j} = \alpha + \beta X_{i,j} + \sum_j \text{PCSA}_j + u_{ij}$$

where C is total annual costs, $\boldsymbol{X}$ is a vector of characteristics of beneficiary i residing in PCSA j as described in the variables section, PCSA is a vector of PCSA fixed effects capturing characteristics of the local health care system, and u is the error term. The dependent variable was logged because the cost data were skewed with a heavy right tail.

Inference was based on robust standard errors with clustering by PCSA to account for heteroscedasticity and residual correlation between observations in the same PCSA.

Predicted costs were calculated from the estimated models based on each beneficiary's actual values for all variables and then back transformed from the log of costs. To avoid bias due to the transformation, we applied the Baser correction, which accounts for the heteroscedasticity (Baser 2007).

We also performed several sensitivity analyses to examine the robustness of our findings to the CMS-HCCs' severity adjustment. We repeated all analyses replacing the CMS-HCCs with the overall score provided by the CMS methodology. This resulted in very similar results for all variables and an R^2 that was only 2 percentage points lower. We repeated the analysis without any adjustment for severity based on CMS-HCCs, because of concerns for endogeneity, as the CMS-HCCs were based on diagnostic data for the same year as the costs data. This also did not affect the results. Finally, we stratified the sample by the health condition severity of the beneficiaries. For this analysis, we used the overall severity score calculated using the CMS-HCCs. We repeated the analyses separately for the sample of the low-severity beneficiaries and the high-severity beneficiaries, splitting the sample at the median severity. The results for the split samples with respect to cost of care by setting were similar to those for the full sample, suggesting that patient severity does not interact with care setting and does not bias our conclusions.

To further address the concern that adjustments for severity based on observable data may not be sufficient, we also estimated models in which patient care setting choice was instrumented by the distance between patient residence and provider location. Data limitations prevented us from applying this method to the full sample, and, therefore, we offer these as sensitivity analyses in Appendix 2. We note, however, that as the other sensitivity analyses discussed above, these analyses also confirm our findings. In fact, these analyses suggest an even stronger HC effect compared with the main analysis. However, given the limitations of our data, we prefer to

err on the side of caution and report the more conservative findings in the main paper and refer the reader to Appendix 2 for the details of the instrumental variable analyses.

To demonstrate the effect of care setting on costs for the Medicare population in our sample, we simulated costs by primary care setting as follows: We first assumed that all beneficiaries in our sample received all their primary care at an HC and calculated total costs, primary care costs, and nonprimary care costs using the estimated models and the characteristics of each beneficiary in our sample. This gave us a distribution of the three cost types for the two age groups, assuming that all beneficiaries receive all their primary care at an HC. We repeated this calculation assuming that all beneficiaries received care in physician offices only, then in outpatient clinics only, and then in the "other" setting only. We present the results of these simulations for beneficiaries at the 25th, 50th, and 75th percentiles of the cost distributions.

RESULTS

Table 1 presents descriptive statistics stratified by age below and above 65, comparing beneficiaries in the analysis sample to beneficiaries excluded from the sample.

The aged (65+) analysis sample included 2.67 million beneficiaries, 39 percent of whom were male with an average age of 76. The nonaged (age <65) in the analysis sample, enrolled in Medicare due to disability, numbered close to half a million, were as likely to be male as female, and were about 25 years younger with an average age of 51.

The majority of beneficiaries received their primary care in physician offices: 79 percent of primary care days for the aged and 62 percent of primary care days for the nonaged. Among the aged, the next most frequented settings were the outpatient clinics and the other settings, at 8 percent each, and the HCs were the lowest at 4 percent. The patterns were different among the nonaged. The HCs and outpatient clinics were the second highest frequented at 14 percent each, with the least frequented being the other category at 10 percent.

The median annual cost of the aged beneficiary in our analysis sample was about $2,800, somewhat higher than the median cost for the nonaged at about $2,600. The aged beneficiaries had a somewhat lower median primary care cost but higher median nonprimary care cost compared with the nonaged. The nonaged also tended to have a much longer average period of state buy-in compared with the aged.

Table 1: Descriptive Statistics

	Aged Beneficiaries		*Nonaged Beneficiaries*	
Variable	*Analysis Sample*	*Excluded Sample*	*Analysis Sample*	*Excluded Sample*
Total beneficiaries	2,671,778	955,339	489,306	297,726
Total annual costs*	2,801.45 (20,340.71)	N/A	2,637.45 (26,703.32)	N/A
Total primary care costs*	506.22 (1,555.26)	N/A	527.34 (2,718.57)	N/A
Total nonprimary care costs*	2,043.16 (20,063.28)	N/A	1,796.31 (26,164.82)	N/A
Number of months of Part A coverage	11.41 (2.22)	10.58 (3.27)	11.57 (1.68)	10.96 (2.77)
Number of months of Part B coverage	11.6 (1.61)	7.36 (5.50)	11.48 (1.83)	7.96 (5.26)
Number of months of state buy-in coverage	2.42 (4.73)	1.12(3.37)	7.08 (5.66)	2.86 (4.89)
Age at the end of reference year	76.21 (7.87)	73.21 (9.02)	50.96 (10.07)	49.89 (10.91)
Male (yes = 1)†	0.39	0.55	0.49	0.63
Died during year (yes = 1)†	0.04	0.05	0.02	0.02
Race: white (yes = 1)†	0.79	0.73	0.64	0.63
Race: black (yes = 1)†	0.1	0.13	0.24	0.25
Race: Other (yes = 1)†	0.02	0.03	0.02	0.02

continued

Table 1: *Continued*

	Aged Beneficiaries		*Nonaged Beneficiaries*	
Variable	*Analysis Sample*	*Excluded Sample*	*Analysis Sample*	*Excluded Sample*
Race: Asian (yes = 1)†	0.04	0.04	0.02	0.02
Race: Hispanic (yes = 1)†	0.05	0.06	0.07	0.07
Race: North American native (yes = 1)†	0	0	0.01	0
Race: Unknown (yes = 1)†	0	0	0	0
Proportion of primary care days in HCs	0.04 (0.18)	N/A	0.14 (0.32)	N/A
Proportion of primary care days in outpatient clinics	0.08 (0.24)	N/A	0.14 (0.31)	N/A
Proportion of primary care days in physician offices	0.79 (.037)	N/A	0.62 (0.44)	N/A
Proportion of primary care days in other settings	0.08 (0.25)	N/A	0.10 (0.27)	N/A
Overall HCC score	1.40 (1.27)	N/A	1.34 (1.30)	N/A

Notes. The 70 HCC indicator variables are not shown. We report means and standard deviations in parenthesis. N/A—Most beneficiaries in the excluded sample have been excluded because they do not receive any care.
*For those variables that have a very skewed distribution, we report the median instead of the mean.
†Standard deviations are not shown for dichotomous variables.
HC, federally funded health center; HCC, hierarchical condition category.

The excluded sample was enrolled for a shorter time on average—half a month less in Part A and about 4 months less for Part B, and to have substantially fewer months of state by-in, especially among the nonaged. This is not surprising given our exclusion criteria—the shorter the coverage period during the year, the less likely it is that we will observe claims. Of more interest are the differences in personal characteristics. The excluded beneficiaries were much more likely to be male (39 percent vs. 55 percent for the aged and 49 percent vs. 63 percent for the nonaged beneficiaries). This again is likely tied to our exclusion criteria as men have been shown to be less likely to seek care than women (Addis and Mahalik 2003). The excluded and included samples cannot be compared on costs or care settings because the majority of exclusions were due to beneficiaries who either did not receive any care or did not receive primary care during the year.

Tables 2 and 3 present the three estimated cost functions for aged and nonaged beneficiaries, respectively. The R-squared for the total costs models were 0.49 and 0.48, respectively, indicating that the models explain almost 50 percent of the variation in expenditures. The nonprimary care costs models (which include inpatient and ER costs as well) performed similarly with R-squared values of 0.43 and 0.42. The primary care models, however, were less predictive, with R-squared values of 0.22 and 0.24.

The coefficient patterns for the two age groups across all three models were similar. For all models, costs increased with duration of insurance (except for state buy-in for aged nonprimary and total costs), female gender, age, and being disabled (in the aged model). Death during the year increased both nonprimary care costs and total costs but lowered primary care costs.

Costs were significantly different at the 0.001 level between all care settings and the reference category—HCs, with one exception, the other setting category was not significantly different in the primary care costs models. Outpatient clinics had higher costs (positive coefficients) relative to HCs for all three cost types, and for both the aged and the nonaged. Physician offices had higher total costs and higher nonprimary costs but lower primary costs, also for both age groups. The other category had similar (qualitative) results to the physician office category, with the exception that for the nonaged, the nonprimary care finding was not statistically significant.

Table 4 presents simulated annual costs for an aged and a nonaged Medicare beneficiary (total costs, primary care costs, and nonprimary care costs) conditional on where they receive their primary care. We present costs for beneficiaries at the median and quartiles of the cost distributions. We discuss the cost patterns for the median beneficiaries but the patterns are the same

Table 2: Estimated Cost Functions—Aged Beneficiaries

Independent Variables	*Total Costs Model Coefficient Estimates*	*Primary Care Costs Model Coefficient Estimates*	*Nonprimary Care Costs Model Coefficient Estimates*
Number of months of Part A coverage	0.025****	†	0.036****
Number of months of Part B coverage	0.084****	0.091****	0.054****
Number of months of state buy-in coverage	−0.001*	0.012****	−0.006****
Age at the end of reference year	0.108****	0.045****	0.120****
(Age at the end of reference year)^2	−0.001****	0.000****	−0.001****
Male (yes = 1)	−0.135****	−0.119****	−0.125****
Originally disabled (yes = 1)	0.025****	0.031****	0.030****
Died during year (yes = 1)	0.263****	−0.183****	0.246****
Race: black (yes = 1)	−0.151****	−0.017	−0.167****
Race: Other (yes = 1)	−0.171****	0.019	−0.237****
Race: Asian (yes = 1)	−0.147****	0.146****	−0.276****
Race: Hispanic (yes = 1)	−0.051**	0.039**	−0.065***
Race: North American Native (yes = 1)	−0.011	0.139****	−0.097**
Race: Unknown (yes = 1)	−0.115****	0.021	−0.145****
Proportion of primary care days in outpatient clinics	0.396****	0.378****	0.392****
Proportion of primary care days in physician offices	0.111****	−0.182****	0.237****
Proportion of primary care days in other settings	0.125****	−0.024	0.193****
Constant	1.648****	3.084****	0.997****
N	2,671,778	2,671,778	2,557,450
R^2: within PCSAs	0.48	0.2	0.43
R^2: between PCSAs	0.57	0.49	0.51
R^2: overall	0.49	0.22	0.43

Notes. The 70 HCC indicator variables and the Primary Care Service Area fixed effects are not shown.

†The variable number of months Part A coverage was not included in the Primary Care Costs Model.

****$p < .001$; ***$.001 \le p < .01$; **$.01 \le p < .05$; *$.05 \le p < 0.1$.

HCC, hierarchical condition category.

for those at the 25th and the 75th percentile. Furthermore, we found that the general patterns are the same for the aged and the nonaged.

Beneficiaries with the lowest total annual costs received primary care in HCs, with a total median annual cost of $2,370 for the aged patient, which is lower by 11 percent compared with aged beneficiaries receiving primary care

Table 3: Estimated Cost Functions—Nonaged Beneficiaries

Independent Variables	*Total Costs Model Coefficient Estimates*	*Primary Care Costs Model Coefficient Estimates*	*Nonprimary Care Costs Model Coefficient Estimates*
Number of months of Part A coverage	0.014****	†	0.030****
Number of months of Part B coverage	0.078****	0.078****	0.042****
Number of months of state buy-in coverage	0.006****	0.012****	0.001
Age at the end of reference year	0.013****	0.026****	0.002
(Age at the end of reference year)^2	0.000****	0.000****	0
Male (yes = 1)	−0.314****	−0.185****	−0.322****
Died during year (yes = 1)	0.226****	−0.225****	0.197****
Race: black (yes = 1)	−0.040****	−0.023**	−0.032***
Race: Other (yes = 1)	−0.063****	0.002	−0.101****
Race: Asian (yes = 1)	−0.170****	0.020*	−0.279****
Race: Hispanic (yes = 1)	−0.003	0.034***	−0.027
Race: North American Native (yes = 1)	0.057*	0.128****	0.013
Race: Unknown (yes = 1)	−0.141***	−0.076***	−0.158***
Proportion of primary care days in outpatient clinics	0.305****	0.222****	0.318****
Proportion of primary care days in physician offices	0.068****	−0.201****	0.181****
Proportion of primary care days in other settings	0.148****	−0.044	0.215****
Constant	5.550****	4.257****	5.755****
N	489,306	489,306	453,700
R^2: within PCSAs	0.48	0.23	0.41
R^2: between PCSAs	0.75	0.39	0.65
R^2: overall	0.48	0.24	0.42

Notes. The 70 HCC indicator variables and the Primary Care Service Area fixed effects are not shown.

†The variable number of months Part A coverage was not included in the Primary Care Costs Model.

****$p < .001$; ***$.001 \le p < .01$; **$.01 \le p < .05$; *$.05 \le p < .1$.

HCC, hierarchical condition category.

in physician offices (at a median cost of $2,667 for the aged patient) and by 34 percent compared with those receiving primary care in outpatient clinics (at a median cost of $3,580). These differentials were due to lower nonprimary care costs. Compared with those receiving primary care in physician offices whose nonprimary median costs were $2,123, the HC aged beneficiaries had

Table 4: Predicted Simulated Annual Costs Conditional on Primary Care Setting

N			*25th Percentile*	*Median*	*75th percentile*
Aged beneficiaries (≥65 years)					
2,671,778	Total costs	Average care setting**	$1,789.42	$2,729.40	$5,498.90
		HC*	$1,561.61	$2,370.08	$4,753.07
		Outpatient clinic*	$2,361.19	$3,579.66	$7,173.02
		Physician office*	$1,758.53	$2,667.47	$5,347.20
		Other*	$1,805.21	$2,736.19	$5,482.46
2,671,778	Primary care costs	Average care setting**	$386.19	$504.61	$713.57
		HC*	$442.16	$559.73	$761.11
		Outpatient clinic*	$681.91	$861.40	$1,172.17
		Physician office*	$373.19	$472.21	$642.11
		Other*	$445.29	$563.04	$765.77
2,557,450	Nonprimary care costs	Average care setting**	$1,364.86	$2,144.11	$4,565.92
		HC*	$1,123.88	$1,752.94	$3,710.35
		Outpatient clinic*	$1,644.25	$2,566.92	$5,438.43
		Physician office*	$1,354.48	$2,122.91	$4,511.24
		Other*	$1,348.33	$2,104.95	$4,459.67
Nonaged beneficiaries (<65 years)					
489,306	Total costs	Average care setting**	$1,647.78	$2,714.87	$5,527.39
		HC*	$1,461.53	$2,395.51	$4,845.58
		Outpatient clinic*	$2,062.31	$3,380.34	$6,820.73
		Physician office*	$1,609.58	$2,638.10	$5,326.03
		Other*	$1,719.88	$2,819.17	$5,696.71
489,306	Primary care costs	Average care setting**	$392.14	$531.51	$768.99
		HC*	$434.55	$572.82	$806.91
		Outpatient clinic*	$566.16	$744.61	$1,047.71
		Physician office*	$363.23	$478.31	$673.36
		Other*	$428.89	$564.50	$794.44
453,700	Nonprimary care costs	Average care setting**	$1,363.57	$2,252.42	$4,727.74
		HC*	$1,143.27	$1,878.92	$3,919.77
		Outpatient clinic*	$1,620.32	$2,661.10	$5,538.45
		Physician office*	$1,362.90	$2,240.00	$4,675.28
		Other*	$1,404.82	$2,309.23	$4,821.37

*The costs presented are based on the estimated regression models with the values for the independent variables set to equal the values for the actual sample of beneficiaries, except for the care setting variable. The value for this variable is set to 1 for the shown setting and 0 for all others.
**Based on observed care settings in our sample.

nonprimary median care costs at $1,753, lower by about 17 percent. These costs were also lower compared to the outpatient clinic aged patient with median costs at $2,567 by 32 percent. Interestingly, primary care costs were higher among aged beneficiaries receiving care in the HCs by 16 percent (at $560) compared with those seen in physician offices (at $472), although they were

still below those seen in outpatient clinics by 35 percent (at $861) for aged beneficiaries. Findings for the nonaged were very similar in most cases.

DISCUSSION

HCs are expected to play an expanding role in providing primary care to the underserved population as implementation of provisions of the Affordable Care Act progress. While they currently serve mostly Medicaid beneficiaries and the uninsured, as these patients age into Medicare, or file for disability as a nonaged beneficiary, many of them may continue to seek their care in their HCs. Continuation of relationships with their primary care team as well as ease of access to clinics within geographic proximity to their residence are likely to be strong incentives to remain a HC patient. Furthermore, the shortage of primary care physicians, which is expected to continue, and which will likely result in many community primary care physicians declining to accept new Medicare patients, may actually increase use of HCs. It is, therefore, plausible to expect that the number of Medicare beneficiaries in HCs will increase.

The analyses we present suggest that at least from a *total* cost perspective, this will be a beneficial trend for Medicare, as HCs appear to offer a less costly practice pattern compared with the care offered in fee-for-service physician office practices and the outpatient clinics. The more beneficiaries seek care in HCs, the more Medicare would be saving: about 10 percent on costs per beneficiary compared with physician office practices and about 30 percent compared with outpatient clinic practices.

It is interesting to note that the cost savings seem to result not from the primary care provided in the HCs themselves, which is more expensive compared with physician offices, but rather from the nonprimary care that the HCs' Medicare beneficiaries receive. This raises the question whether the HCs can claim the credit for the less costly use of nonprimary care services of their patients. Is this a reflection of the practice style of the primary care physicians at the HCs? A practice style that substitutes primary care for nonprimary care? Minimizes referrals to specialists, diagnostic tests, and other nonprimary care services? Or is it a reflection of the limited clinical network that HCs have for specialty care? HCs are located in Medically Underserved Areas that historically have been known to have difficulty findings specialists for their patients. Or are there other possible explanations for our findings? One possibility is that quality of primary and preventive care provided by the HCs is better, especially when it comes to control of chronic diseases or

conditions, thus obviating the need for acute care, care which is often nonprimary, such as in emergency departments or avoidable hospitalizations. Another possibility is that the HCs provide some specialty services in the centers and that these services are included in the per diem payment received by the HCs (e.g., substance abuse and mental health). If such services are obtained separately as nonprimary care services by beneficiaries seen in physician offices, they would have added to the nonprimary care cost of this group of beneficiaries and would explain our finding. Finally, this might also be explained by our inability to account for individual socio-economic characteristics in the analysis. While we controlled for PCSA fixed effects, some PCSAs are rather large and might be heterogeneous when it comes to Medicare beneficiaries' socio-economic characteristics. Low income in particular may influence care-seeking patterns. Medicare patients who are not eligible for the Medicaid program as well (i.e., the nondually eligible) are responsible for all copayments and deductibles. These might deter them from seeking care at the margin. This might be more of a concern for Medicare beneficiaries seeking care in HCs than in other settings. Disentangling these various possibilities is outside the scope of this study.

Several limitations should be noted. Our analyses relied on risk adjustment provided by the CMS-HCCs, as well as several other variables such as age, gender, death, and reason for enrollment. While the models we estimated explain a large percent of the variation in costs, we acknowledge the limitation of these methods in controlling for patient heterogeneity across settings. We note, however, that our sensitivity analysis, and in particular the analysis based on instrumental variables presented in the Appendix, confirmed the findings of the main analyses, suggesting that the conclusions might be robust to this limitation. It is also unclear how generalizable our findings are. While our study covered 14 states, practice styles in other parts of the country might be different, and hence our results may not generalize to them.

Despite these caveats, our analysis applies to a large number of states and several million fee-for-service Medicare beneficiaries. It suggests that CMS might consider developing polices to encourage beneficiaries to seek care in HCs for greater cost efficiency. This may, however, be premature. In this study, we only offer one side of the picture. We have not assessed the quality of care beneficiaries receive at the HCs. While prior studies have found that HCs generally provide high-quality care (Falik et al. 2001, 2006; Hicks et al. 2006; Goldman et al. 2012) and perform better on many quality measures, future studies should link cost and quality in the same analysis, for the same population, to make a stronger case for the cost effectiveness of the care

offered by the HCs, thus justifying policies encouraging beneficiaries to use these settings.

ACKNOWLEDGMENTS

Joint Acknowledgment/Disclosure Statement: Funding for this project was sponsored by the Health Resources and Services Administration's Bureau of Primary Health Care. The sponsor (BPHC) was involved in the design and conduct of the study, analysis and interpretation of the data, and review and approval of the manuscript. The sponsor was not involved in the collection or management of data.

Disclosures: None.

Disclaimer: The views expressed in this publication are solely the opinions of the authors and do not necessarily reflect the official policies of the U.S. Department of Health and Human Services, the Health Resources and Services Administration, or the Agency for Healthcare Research and Quality; nor does mention of the department or agency names imply endorsement by the U.S. Government.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Discussion of Specification of Variables Measuring Care Setting.

Appendix SA3: Sensitivity Analyses: Comparison of Analyses Presented in the Paper to Analyses Based on Instrumental Variables.