Variation in Physician Spending and Association With Patient Outcomes

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IMPORTANCE While the substantial variation in health care spending across regions and hospitals is well known, key clinical decisions are ultimately made by physicians. However, the degree to which spending varies across physicians and the clinical consequences of that variation are unknown.

OBJECTIVE To investigate variation in spending across physicians and its association with patient outcomes.

DESIGN, SETTING, AND PARTICIPANTS For this retrospective data analysis, we analyzed a 20% random sample of Medicare fee-for-service beneficiaries 65 years and older who were hospitalized with a nonelective medical condition and treated by a general internist between January 1, 2011, and December 31, 2014. We first quantified the proportion of variation in Medicare Part B spending attributable to hospitals, physicians, and patients. We then examined the association between physician spending and patient outcomes, adjusted for patient and physician characteristics and hospital fixed effects (effectively comparing physicians within the same hospital). Our primary analysis focused on hospitalist physicians, whose patients are plausibly quasirandomized within a hospital based on physician work schedule. A secondary analysis focused on general internists overall. To ensure that patient illness severity did not directly affect physician spending estimates, we calculated physicians’ spending levels in 2011 through 2012 and examined outcomes of their patients in 2013 and 2014.


MAIN OUTCOMES AND MEASURES Patients’ 30-day mortality and readmission rates in 2013 and 2014.

RESULTS To determine the amount of variation across physicians we included 485,016 hospitalizations treated by 21,963 physicians at 2,837 acute care hospitals for the analysis of hospitalists and 839,512 hospitalizations treated by 50,079 physicians at 3,195 acute care hospitals for the analysis of general internists. Variation in spending across physicians within hospital was larger than variation across hospitals (for hospitalists, 8.4% across physicians vs 7.0% across hospitals; for general internists, 10.5% across physicians vs 6.2% across hospitals). Higher physician spending was not associated with lower 30-day mortality (adjusted odds ratio [aOR] for additional $100 in physician spending, 1.00; 95% CI, 0.98-1.01; P = .47) or readmissions (aOR, 1.00; 95% CI, 0.99-1.01; P = .54) for hospitalists within the same hospital. We observed similar patterns among general internists.

CONCLUSIONS AND RELEVANCE Health care spending varies more across individual physicians than across hospitals. However, higher physician spending is not associated with better outcomes of hospitalized patients. Our findings suggest policies targeting both physicians and hospitals may be more effective in reducing wasteful spending than policies focusing solely on hospitals.

Published online March 13, 2017.
The substantial variation in spending and quantity of health care services across US regions, as well as among hospitals within the same community, are well known.\(^1\)\(^-\)\(^8\) Findings on the clinical implications of this variation are mixed, but most suggest that greater health care spending does not reliably translate into better patient outcomes.\(^9\)\(^-\)\(^17\) Decisions on utilization of health care services, are ultimately made by frontline clinicians and not by regions or hospitals.\(^6\)\(^-\)\(^8\) However, the degree to which utilization decisions by individual physicians vary within regions and hospitals, and the clinical implications of that variation, are unknown.

While regional culture and hospital capabilities surely influence patient treatment, individual physicians are increasingly recognized as critical contributors to the observed variation in health care services.\(^6\)\(^-\)\(^8\) Physicians make key decisions about admitting and discharging patients, ordering imaging and diagnostic tests, engaging consultants, and referring for procedures. Despite the central importance of physicians in determining medical spending, we know surprisingly little about how much their utilization behavior varies within the same hospital. Even more importantly, we have almost no data on whether higher-spending physicians within the same hospital have meaningfully better patient outcomes. While some studies have profiled physician spending for specific conditions, they have not examined associations with patient outcomes or analyzed nationally representative data.\(^18\)\(^-\)\(^21\)

We used a national sample of Medicare beneficiaries hospitalized with a medical condition from January 1, 2011, to December 31, 2014, and treated by a hospitalist or general internist to answer 3 questions. First, how much variation in spending exists across individual physicians within the same hospital compared to variation in spending across hospitals? Second, what characteristics of physicians are associated with higher spending? Third, what is the relationship between physician-level spending and 30-day patient mortality and readmissions?

**Methods**

This study was approved by the Harvard Medical School institutional review board, and patient consent was not required.

**Data Source and Study Sample**

We linked 4 data sources: the 100% Medicare Inpatient Files (2011-2014), 20% Medicare Carrier Files (2011-2014), American Hospital Association (AHA) annual survey on hospital characteristics, and a comprehensive physician database assembled by Doximity, which is an online professional network for physicians whose data have been used in previous studies (additional details about the database, including its validation,\(^22\)\(^-\)\(^24\) are provided in the Supplement).

We identified Medicare fee-for-service beneficiaries 65 years and older who were hospitalized with a medical condition between January 1, 2011, and December 31, 2014, as defined by the presence of a medical diagnosis related group (MS-DRG) on hospital admission. We restricted our sample to patients treated in acute care hospitals and excluded elective hospitalizations and hospitalizations in which a patient left against medical advice. To allow sufficient follow-up, we excluded patients admitted in December 2014 for 30-day mortality analyses and patients discharged in December 2014 for readmission analyses.

We assigned a physician to each hospitalization based on the physician's National Provider Identifier in the Carrier file that accounted for the most Part B spending (visits, tests, procedures) during that hospitalization.\(^25\)\(^,\)\(^26\) On average, 51.1%, 22.0%, and 11.1% of total Part B spending was accounted for by the first, second, and third highest-spending physicians, respectively. We restricted our analysis to hospitalizations in which the assigned physician was a hospitalist or general internist to avoid comparing behavior of physicians in different specialties.

**Physician Spending**

We measured physician-level spending as follows. First, we regressed standardized Part B physician spending per hospitalization (using methods established by the Center for Medicare & Medicaid Services\(^27\)) on patient characteristics and hospital fixed effects (ie, hospital-specific indicator variables included as covariates) using ordinary least squares models, and calculated expected spending for each hospitalization. To address outliers, we excluded hospitalizations in the top and bottom 5 percent of residuals and then refit the regression model on the remaining data. Diagnostics confirmed that the statistical model fit the data well with respect to linearity, homoscedasticity, and normality. Next, we aggregated expected and observed spending over all hospitalizations for a given physician and calculated an observed-to-expected ratio for each physician. Finally, we multiplied these ratios by the grand mean of spending per hospitalization to yield a standardized spending level for each physician. Given that we included hospital fixed effects in our model to predict physician spending, we effectively compared physicians’ spending levels within the same hospital.\(^28\)\(^-\)\(^30\)

We focused on Part B spending because (1) it encompasses services at the discretion of physicians; (2) conditional on admission, Part A spending is largely invariant to physician decisions on their patients’ treatment because payment for a given MS-DRG is approximately constant within hospital (only 1.0% of hospitalizations received an additional outlier payment); and (3) Part B spending is a proxy for the intensity of resource use of physicians. For example, variation in Part B spending from radiologists’ professional fees for interpretation of imaging studies may reflect variation in the technical...
component of imaging incorporated in the Part A payment. In other words, some variation in spending that is attributable to physician decisions that we do not measure because it is incorporated in Part A spending, such as inpatient imaging and laboratory tests, is likely to be correlated with variation in Part B spending.

To avoid unstable estimates of physician spending, we restricted our sample to physicians with at least 10 observed hospitalizations in 2011 and 2012. Because we used a 20% sample of Medicare fee-for-service beneficiaries and because Medicare fee-for-service beneficiaries account for 27% of all hospitalizations (including non-Medicare) in the United States, the requirement of at least 10 hospitalizations to be included is equivalent to an annual threshold of 90 hospitalizations. Extrapolating from the average number of Medicare fee-for-service patients that physicians in our sample treated, the average number of total patients that physicians in our analyses treated annually is approximately 250. We restricted our sample to hospitalizations with both admission and discharge dates in 2011 and 2012, to ensure that we observed all spending for a given hospitalization. Additional details are provided in the Supplement.

Adjustment Variables
Patient characteristics, which served as covariates in both our model to estimate physician-level spending and our model to estimate patient outcomes as a function of physician-level spending, included: age in 5-year increments, sex, race/ethnic group (non-Hispanic white, non-Hispanic black, Hispanic, and other), MS-DRG, 27 coexisting comorbidity conditions (determined using the Elixhauser comorbidity index), median household income estimated from residential zip codes (in deciles), indicators for Medicaid coverage, and an indicator for year. Physician characteristics, which served as covariates in our model to estimate patient outcomes as a function of physician-level spending, included: age in 5-year increments, sex, medical school graduated from (medical school-specific indicator variables), and type of medical training (allopathic vs osteopathic).

Statistical Analysis
First, using data on hospitalizations in 2011 and 2012 treated by hospitalists and also by general internists (including both hospitalists and nonhospitalist internists), we analyzed how the variation in spending across individual physicians within hospital compared with variation across hospitals. We fit a cross-classified multilevel model and partitioned total variance in spending into 3 levels: hospital-, physician-, and hospitalization-level variation. A cross-classified multilevel model allows us to partition total variation into different levels, even when physicians (lower-level units) are not nested within hospitals (higher-level units) (ie, physicians may practice in multiple hospitals). We report variance partition coefficients and intraclass reliability (IUR). The variance partition coefficients describe the proportion of total variance explained by each level of the model hierarchy. For example, a variance partition coefficient of 10% for physicians indicates that 10% of total variation in spending can be explained by differences in practice patterns between physicians, after accounting for variation at the hospital level. The IUR, which takes a value between 0 and 1, assesses the degree to which the observed variation among physicians is due to true differences in physician practice patterns rather than random noise. An IUR close to 1 suggests that a physician who is classified as high-spending in one year is likely to be classified as high-spending in subsequent years, whereas an IUR close to 0 indicates that a physician categorized as high-spending in one year is likely attributable to random variation in patient mix.

Second, we investigated physician characteristics associated with higher physician spending.

Last, we examined the association between average physician spending and 30-day mortality and readmissions, using 2 multivariable logistic regression models. Model 1 adjusted for patient characteristics and hospital fixed effects, effectively evaluating the relationship between physician spending and patient outcomes within the same hospital and holding observed severity of illness of patients constant. Model 2 adjusted for all variables in model 1 plus physician characteristics, assessing whether the observed relationship was confounded by physician characteristics that correlate with physician spending. To overcome failure of the likelihood maximization algorithm to converge for logistic regression models, we combined MS-DRG codes that had no death or readmission into clinically similar categories. Standard errors were clustered at the physician level.

Given that unobservable patient characteristics that influence outcomes may vary systematically across physicians with different spending levels even within the same hospital, we focused our primary analysis on hospitalist physicians and a sensitivity analysis among general internists (including hospitalist and nonhospitalist internists). Hospitalists typically work in scheduled blocks, and therefore, within the same hospital, patients treated by hospitalists may plausibly be quasirandomized to a given physician based on that physician’s work schedule. We assessed the validity of our quasirandomization assumption by testing the balance of patient characteristics across quartiles of hospitalist physician spending (details about identification of hospitalists are provided in the Supplement). Furthermore, to prevent severity of illness of patients from directly affecting a physician’s spending level, we profiled a physician’s spending pattern using 2011 and 2012 data, and then examined the association between that categorization of physician spending and patient outcomes using 2013 and 2014 data. Using this approach, patients from different years were used to measure physicians’ spending level and patient outcomes, and assuming severity fluctuations for a physician are independent across different years, there are no correlated effects to introduce confounding.

Sensitivity Analyses
We conducted several sensitivity analyses. First, we repeated analyses using total spending (sum of Part A and B spending) instead of Part B spending, to test whether our findings were sensitive to how we defined physician spending. Second, to evaluate whether our findings were sensitive to how we attributed patients to physicians, we tested 2 alternative attribution methods: (1) attributing patients to physicians who had the largest number of evaluation and management claims and (2) attributing patients to physicians who billed the first evaluation and
management claim for a given hospitalization (“admitting physicians”). Third, we addressed potential outlier cases in 2 ways: (1) trimming the top and bottom 3 percent of residuals, and (2) trimming the top and bottom 7 percent of residuals. Fourth, to assess whether our findings were sensitive to the threshold of 10 hospitalizations per physician for inclusion in our sample, we used a threshold of 30. Fifth, to address the possibility that physicians who consistently transfer their sickest patients may be misclassified as low-spending physicians, we identified all patients who were transferred to other acute care hospitals and allocated subsequent hospital spending to the initial hospitalization. Sixth, because the association between physician spending and mortality could be confounded by unobserved care preferences of patients, such as do-not-resuscitate (DNR) directives, we excluded patients with cancer and those discharged to hospice as they are strong predictors of DNR directives. Seventh, we additionally adjusted for length of stay (LOS) (as a continuous variable with quadratic and cubic terms to allow for nonlinearity) because LOS may capture residual confounding. Eighth, to assess the generalizability of our findings, we analyzed general internists overall rather than hospitalists alone. Last, to assess whether the relationship between physician spending and patient outcomes differed by admission diagnosis, we evaluated 5 major conditions selected according to frequency: sepsis, pneumonia, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and urinary tract infection (UTI) (diagnosis codes available in eTable 1 in the Supplement).

Analyses were performed using SAS, version 9.4 (SAS Institute) and Stata, version 14 (StataCorp).

Results

Variation in Spending Across Physicians
To determine the amount of variation across physicians, we examined 485,016 hospitalizations treated by 21,963 physicians at 2837 acute care hospitals for the analysis of hospitalists and 839,512 hospitalizations treated by 50,079 physicians at 3195 acute care hospitals for the analysis of general internists. We observed a wide variation in adjusted average Part B spending per hospitalization across physicians (Figures 1 and 2). This variation in spending across physicians within hospital was larger in magnitude than variation across hospitals (for hospitalists, 8.4% across physicians vs 7.0% across hospitals; for general internists, 10.5% across physicians vs 6.2% across hospitals) (Table 1) (eTable 2 in the Supplement). Using the average number of hospitalizations per hospitalist of 27.4, the IUR was 0.73 for hospitalists, indicating that the measured variation between physicians was mostly due to true differences between physicians rather than random noise.

Physician Characteristics Related to Higher Spending
Among hospitalists, total adjusted Part B spending was more than 40% higher among physicians in the highest spending
quartile compared with the lowest ($1055 vs $743 per hospitalization) (Table 2). We found that higher-spending physicians were slightly older and more likely to be female than lower-spending physicians.

Physician Spending and Patient Mortality
To examine the association between physician spending and patient outcomes, our primary analysis included 346,613 hospitalizations treated by 13,833 hospitalists (after restricting the sample to physicians treating 10 or more hospitalizations in 2011-2012 and excluding observations with missing covariate data). Among hospitalists, patient characteristics, including demographics, comorbid conditions, and primary diagnosis, were largely similar across adjusted physician-level spending quartiles (Table 2).

The overall 30-day mortality rate was 11.0%. We observed no association between physician spending and mortality (Figure 2). An additional $100 in physician spending was associated with an adjusted odds ratio (aOR) of mortality of 0.99 (95% CI, 0.981-1.00; P = .99) (Table 3). This relationship remained qualitatively unchanged after additional adjustment for physician characteristics (aOR, 1.00; 95% CI, 0.981-1.01, P = .47).

Physician Spending and Patient Readmissions
Among 342,037 hospitalizations treated by 13,870 hospitalists, the overall 30-day readmission rate was 14.5%. We observed no systematic association between physician-level spending and readmission rates of patients after adjustment for patient characteristics and hospital fixed effects (aOR, 1.00; 95% CI, 0.991-1.01, P = .93) or additional adjustment for physician characteristics (aOR, 1.00; 95% CI, 0.991-1.01, P = .54) (Figure 2) (Table 3).

Sensitivity Analyses
Our findings were robust to sensitivity analyses: using total spending instead of Part B spending for calculating physician-level spending; alternative methods for attributing patients to physicians; using different methods for treating outlier cases; restricting analysis to physicians treating 30 or more hospitalizations; incorporating spending on patients who were transferred to other acute care hospitals; excluding patients with cancer or discharged to hospice; additional adjustment for LOS; repeating analyses among general internists overall; and stratified analysis by primary diagnosis (eTables 3-11 in the Supplement).

Discussion
Using national data on hospitalized Medicare beneficiaries, we found a wide variation in risk-adjusted, standardized spending across individual physicians practicing within the same hospital. In fact, between-physician variation in spending within hospital was larger, if not larger, than between-hospital variation. However, we observed no association between a physician's spending level and patient outcomes (30-day mortality and readmissions) within the same hospital. Taken together, these findings suggest that not only does physician spending vary substantially even within the same hospital, but also that higher-spending physicians do not reliably achieve better patient outcomes.

Policy efforts to improve the efficiency of health care should focus on units of observation where key decisions are made, ie, physicians and hospitals.5-8 While both physicians and hospitals are important in determining efficiency of health care, federal efforts to improve the quality and value of inpatient care to date, such as hospital value-based purchasing and penalties for 30-day readmissions, have focused on hospitals, implicitly assuming that hospitals can shape individual physician behavior.43 However much this is true, given that our findings demonstrate a large variation in spending across physicians practicing in the same hospital, policy interventions may be made more effective by not only targeting hospitals but by narrowing the focus to practice patterns of individual physicians.

To this point, under the Medicare Access and Children's Health Insurance Program (CHIP) Reauthorization Act (MACRA),44 most physicians will be measured and compensated on the basis of performance, 2 domains of which will be cost and quality of care. While evidence is limited as to how variation in physician spending relates to quality of care or patient outcomes, we found that for 30-day mortality and readmissions, physician-level spending is unrelated to patient outcomes. Our findings suggest that higher-spending physicians may be able to reduce resource use without compromising patient outcomes. Policy interventions that target physicians within hospitals (eg, physician-level pay-for-performance programs and reporting of how resource use of each physician compares with other physicians within the same hospital) should be developed and evaluated.

Limitations
Our study has limitations. First, we calculated physician-level estimates of Part B spending based on a limited number of hospitalizations per physician. Although we demonstrated the robustness of our findings to a larger threshold number of cases and also showed that the bulk of the variation we observed was true as opposed to random noise, estimates developed from a larger set of patients seen by each physician could differ. Second, Medicare claims data do not permit measurement of inpatient medications, laboratory tests, and imaging, because they are included in the fixed Part A payment. This precluded us from measuring how use of these resources varies across physicians. However,

Table 1. Proportion of Variation in Standardized Part B Spending Explained by Hospitals, Physicians, and Patients a

<table>
<thead>
<tr>
<th>Variation</th>
<th>General Internists b</th>
<th>Hospitalist Physicians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variance partition coefficients, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between hospitals</td>
<td>6.2</td>
<td>7.0</td>
</tr>
<tr>
<td>Between physicians</td>
<td>10.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Between patients</td>
<td>83.3</td>
<td>84.5</td>
</tr>
<tr>
<td>Interunit reliability</td>
<td>0.77</td>
<td>0.73</td>
</tr>
</tbody>
</table>

a See the Methods and eAppendix in the Supplement for details on standardization and adjustment.
b General internists include both hospitalist and nonhospitalist internists.

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we observed large relative differences in Part B spending between physicians within the same hospital, which is likely to translate into resource use encapsulated in the Part A payment. Third, although 30-day mortality and readmission rates are widely accepted standard measures of quality for hospital care, we did not measure other aspects of quality such as patient experience. Last, our analysis was restricted to the hospitalized Medicare population with medical conditions, and therefore, may not be

Table 2. Physician and Patient Characteristics Across Quartiles of Physician Spending, Among Hospitalists

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Quartile of Physician Spending, Adjusted</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1 (Lowest)</td>
<td>Q2</td>
</tr>
<tr>
<td><strong>Physician characteristics</strong>a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted Part B spending, $</td>
<td>743</td>
<td>865</td>
</tr>
<tr>
<td>No. of physicians</td>
<td>3259</td>
<td>3313</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>42.7 (8.2)</td>
<td>42.7 (7.9)</td>
</tr>
<tr>
<td>Female, %</td>
<td>32.8</td>
<td>32.6</td>
</tr>
<tr>
<td>Credentials, MD, allopathic, %</td>
<td>92.1</td>
<td>91.5</td>
</tr>
<tr>
<td><strong>Patient characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>68 619</td>
<td>90 771</td>
</tr>
<tr>
<td>Age, y</td>
<td>80</td>
<td>80.1</td>
</tr>
<tr>
<td>Female, %</td>
<td>60.5</td>
<td>60.3</td>
</tr>
<tr>
<td>Race, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>83.3</td>
<td>83.6</td>
</tr>
<tr>
<td>Black</td>
<td>9.3</td>
<td>8.9</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Other races</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Median household income, $</td>
<td>57 750</td>
<td>57 730</td>
</tr>
<tr>
<td>Medicaid status, %</td>
<td>22.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Primary diagnosis, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory system</td>
<td>20.8</td>
<td>21.1</td>
</tr>
<tr>
<td>Circulatory system</td>
<td>17.5</td>
<td>17.7</td>
</tr>
<tr>
<td>Kidney and urinary tract</td>
<td>12.1</td>
<td>11.8</td>
</tr>
<tr>
<td>Infectious and parasitic disease</td>
<td>11.4</td>
<td>11.4</td>
</tr>
<tr>
<td>Digestive system</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>Nervous system</td>
<td>8.8</td>
<td>9.0</td>
</tr>
<tr>
<td>Coexisting condition, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>19.3</td>
<td>19.6</td>
</tr>
<tr>
<td>Chronic pulmonary disease</td>
<td>24.8</td>
<td>25.1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>31.3</td>
<td>31.7</td>
</tr>
<tr>
<td>Renal failure</td>
<td>22.0</td>
<td>22.2</td>
</tr>
<tr>
<td>Neurological disorders</td>
<td>15.0</td>
<td>15.4</td>
</tr>
<tr>
<td>Cancer</td>
<td>7.1</td>
<td>6.9</td>
</tr>
<tr>
<td>Mental illness</td>
<td>14.8</td>
<td>14.4</td>
</tr>
</tbody>
</table>

a Patient characteristics were adjusted using hospital fixed effects to allow for within-hospital comparison.

Table 3. Association Between Adjusted Physician-Level Spending and Patient Outcomes, Among Hospitalist Physicians

<table>
<thead>
<tr>
<th>Rate</th>
<th>Hospitalizations, No. (Physicians, No.)</th>
<th>Adjusted Odds Ratio* (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-Day mortality rate</td>
<td>Model 1a: Adjusted for patient characteristics and hospital fixed effects</td>
<td>346 613 (13 833)</td>
<td>0.99 (0.98-1.002)</td>
</tr>
<tr>
<td></td>
<td>Model 2a: Model 1 + physician characteristics</td>
<td>277 748 (11 112)</td>
<td>1.00 (0.98-1.01)</td>
</tr>
<tr>
<td>30-Day readmission rate</td>
<td>Model 1b: Adjusted for patient characteristics and hospital fixed effects</td>
<td>342 037 (1870)</td>
<td>1.00 (0.99-1.01)</td>
</tr>
<tr>
<td></td>
<td>Model 2b: Model 1 + physician characteristics</td>
<td>274 392 (11 158)</td>
<td>1.00 (0.99-1.01)</td>
</tr>
</tbody>
</table>

a For every $100 increase in physician spending.
b Model 1 adjusted for patient characteristics and hospital fixed effects, effectively evaluating the relationship between physician spending and patient outcomes within the same hospital, and holding observed severity of illness of patients constant.

c Model 2 adjusted for all variables in model 1 plus physician characteristics, assessing whether the observed relationship was confounded by physician characteristics that correlate with physician spending.

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Conclusions

We found substantial variation in spending across physicians practicing within the same hospital that exceeded variation in spending across hospitals. Among both hospitalists and general internists, physicians with higher spending per hospitalization had no detectable differences in 30-day mortality or readmissions compared with lower-spending physicians within the same hospital. Given larger variation in spending across physicians than across hospitals, policies that target physicians within hospitals may be more effective in reducing wasteful spending than policies focusing solely on hospitals.

REFERENCES


**HEALTH CARE POLICY AND LAW**

**Physician Spending and Patient Outcomes**

Gregory Curfman, MD

Across the nation, spending on health care varies widely by geographic location. Differences in health care expenditures have been carefully documented over the past 2 decades in the Dartmouth Atlas of Health Care, a treasure trove of data on variations in Medicare spending and the implications for US health policy.

In 2009, per capita health care spending among the states varied from $5524 in Texas to $9278 in Massachusetts, and the percentage of gross state product allocated to health care varied from 13% in Texas to 22.4% in Maine. Spending also varied according to hospital referral region. For example, in Boston, Massachusetts, average Medicare reimbursement per enrollee in 2009 was $11,263, while just over 100 miles away in Lebanon, New Hampshire, average reimbursement was 27% lower at $8270.

Because prices for medical services are set by Medicare, variations in spending generally reflect differences in utilization of medical services, not differences in prices. Furthermore, the wide variations in spending are not reflected in meaningful differences in health outcomes. New research has shown that per capita spending on health care varies as much within private health insurance as it does within Medicare, but in contrast to Medicare, variation in the level of spending in private insurance is due largely to differences in prices.2

In this issue, Tsugawa et al analyze spending by individual physicians in relation to patient outcomes. The research team compared Medicare Part B spending per hospitalization by hospitalists practicing within the same hospital. To profile each physician’s level of spending, average Part B spending per hospitalization for 2011 and 2012 was used, then applied to clinical outcomes (30-day readmission and 30-day mortality rates) for 2013 and 2014. The split-sample approach mitigates bias if a physician treats a complex set of patients in one year and therefore has higher spending and worse outcomes. Despite a 40% difference in average spending propensity per hospitalization between the highest ($1055) and lowest ($743) quartiles of physicians, there were no differences in either clinical outcome.

The new data on physician spending in Medicare align with previous data on geographic variation in spending. Higher spending (reflecting greater utilization of health care services) did not translate into better health outcomes. From this study, we can conclude that differences in the utilization of health care services among hospitalists are not associated with differences in clinical outcomes, adding to the growing body of fascinating research on the complex relationship between spending and health.