Variation in the Tendency of Primary Care Physicians to Intervene

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Background: Research has documented dramatic variation in health care spending across the United States that has little relationship to health outcomes. Although high-spending areas have more physicians per capita, it is not known whether this disparity fully explains the differences in spending or whether individual physicians in high-spending regions have a greater tendency to intervene for their patients. We sought to measure the tendency of primary care physicians to intervene across regions that differ in their levels of local health care spending.

Methods: We used data from the Community Tracking Study Physician Survey, a telephone survey of a nationally representative sample of 5490 primary care physicians who provided care to adults in 1998-1999 (response rate 59%). Local health care spending in physicians’ communities was determined by assigning each participating physician to 1 of 306 US hospital referral regions. The tendency of physicians to intervene was measured by evaluating their responses to 6 clinical vignettes in which they were asked how often they would order a test, referral, or treatment for the patient described.

Results: In 5 of the 6 vignettes, physicians in high-spending regions were more likely to recommend interventions than those practicing in low-spending regions. For example, for a 35-year-old man with back pain and foot drop, physicians in high-spending regions would recommend magnetic resonance imaging 82% of the time, compared with 69% for physicians in low-spending regions (P < .001). For a 60-year-old man somewhat bothered by symptoms of benign prostatic hypertrophy, physicians in high-spending regions would make a urology referral 32% of the time, while those in low-spending regions would do so only 23% of the time (P < .001). Our findings that physicians in high-spending regions have a greater tendency to intervene persisted in analyses stratified by physician specialty (family/general practice vs internal medicine).

Conclusion: Varying rates of health care spending across the United States reflect the underlying tendency of local physicians to recommend interventions for their patients.

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Other Recognition: There is widespread recognition that health care spending varies widely across the United States. Per capita Medicare expenditure in the areas of highest spending is double that in the lowest-spending areas, even though in some cases these represent neighboring areas. Because higher spending does not appear to result in better outcomes or quality of care, there is intense interest in understanding the reasons for the wide variation in utilization of services. Average illness severity varies little across regions; therefore, attention has focused increasingly on the role of physicians who, through their actions and recommendations, control most health care resources and thereby direct most health care spending.

There are, however, competing explanations of how physicians might contribute to higher health care spending. On one hand, high-spending areas have more physicians per capita, and on average, patients in these areas each see a greater number of physicians. Even if each physician’s shared ordering pattern is identical to those in lower-spending areas, utilization (and spending) per capita would be higher in areas with a greater number of physicians. On the other hand, physicians in high- and low-spending regions may have entirely different ordering patterns. Specifically, physicians in high-spending areas may be more prone to intervene—to order tests, referrals, and treatments—for individual patients.

We sought to determine whether physician behavior is at least in part responsible for widely varying spending and utilization patterns across the United States—that is, to what extent individual physicians in high-spending regions have a greater tendency to intervene for individual patients.
METHODS

OVERVIEW

We used Medicare data to categorize regions of the United States according to health care spending within the region. We then used data from a national physician survey to examine the tendency of physicians practicing in regions with different spending levels to intervene (to order tests, referrals, or treatment) in specific clinical situations.

STUDY POPULATION

We analyzed data from the second round of the Community Tracking Study (CTS) Physician Survey, 1998-1999.4 a telephone survey of a nationally representative sample of physicians conducted for the Center for Studying Health System Change. The survey uses a complex design that includes 60 community sites and a small, independently drawn national sample.5 Using the master files of the American Medical Association and the American Osteopathic Association, the CTS sampled active nonfederal physicians (n=12,280) in a variety of clinical specialties who spent at least 20 hours per week in direct patient care. Physicians in training were excluded.

Because the present study focuses on clinical decisions encountered in adult primary care, we included only primary care physicians (identified by the CTS specialty designations family/general practice and internal medicine) who care for adult patients (n=5,940). All physicians were surveyed by telephone between August 1998 and November 1999 in interviews that averaged 21 minutes. The overall response rate was 61%; the response rate among all primary care physicians was 59%. Additional information on the CTS Physician Survey can be found elsewhere.6,7

MEASURES

Exposure: Local Spending

We used as our measure of local spending the End-of-Life Expenditure Index (EOL-EI),1,2 a previously derived measure based on health care expenditures in the last 6 months of life. The EOL-EI is calculated as age-, sex-, and race-adjusted spending (measured with standardized national prices) on hospital and physician services provided to Medicare enrollees in their last 6 months of life. We elected to use EOL-EI to compare spending across different regions of the United States because it is very closely related to overall spending2 but unrelated to illness (every patient included in the measure had the same life expectancy of exactly 6 months). In previous work, members of our research team have shown that the greater the 2-fold differences that exist across US regions in the intensity of care at the end of life are highly predictive of differences in overall spending but unrelated to differences in patient preferences at the end of life or illness level.1,9

We calculated the mean EOL-EI for each of 306 US hospital referral regions (HRRs) from mid-1994 to 1997; HRRs were then sorted in order of increasing EOL-EI and divided into quintiles of approximately equal population size based on the entire Medicare population aged 65 or older. Mean EOL-EI (calculated for each quintile by weighting each HRR according to its Medicare population) ranged from $9074 in the lowest quintile to $14,644 in the highest quintile. Based on the county of his or her primary practice location, each physician was assigned to an HRR and in turn to a quintile of health care spending. Results are displayed using 3 categories for the exposure variable: low spending (the lowest quintile of EOL-EI), moderate spending (the middle 3 quintiles combined), and high spending (the highest quintile of EOL-EI).

Outcomes: Physician Practice Intensity

Our analyses were based on responses to 6 clinical vignettes from the CTS Physician Survey. Vignettes were developed to present discretionary decisions commonly encountered in outpatient practice—decisions that do not have a clear “correct” response.10,11 In each question, physicians were presented with a vignette and a proposed intervention (a treatment, referral, or diagnostic evaluation) and were asked, “For what percentage of such patients would you recommend [an intervention]?” Consider all your patients with similar clinical descriptions.” Physicians could respond with any numerical percentage between 0% and 100%. Summary measures included in Figure 1 and Figure 2 represent the mean percentage of patients for whom physicians in a given spending quintile would recommend an intervention.

STATISTICAL ANALYSIS

All reported tests for trend were based on linear regression in which the individual physician’s response was the dependent variable and the independent variable was spending in the physician’s region, expressed as a continuous variable. All analyses used the appropriate weights and clustering information provided by the CTS to account for sampling probability and nonresponse, such that the results presented here are representative of the population of nonfederal physicians providing direct patient care to adults within the continental United States. All analyses were carried out using SUDAAN statistical software, version 9.0 (Research Triangle Institute, Research Triangle Park, NC).

The sample of primary care physicians consisted of both family/general practitioners (57%) and general internists (43%). Most were male (76%), middle-aged (mean age, 47 years), and board certified in their specialty (80%). The most common practice setting was a solo or 2-person practice (37%).

Regions in the quintile of highest spending averaged $8325 per capita in annual Medicare spending and 242 physicians per 100,000 persons compared with $6087 per capita and 193 physicians per 100,000 in moderate-spending regions and $4911 per capita and 185 physicians per 100,000 in regions of low spending (Table). The supply of hospital beds and physicians of all specialties was more abundant in regions of higher spending, with the exception of family practitioners, whose numbers declined as local spending increased.

Physicians’ clinical practice intensity varied according to local health care spending. In 5 of 6 vignettes, primary care physicians in high-spending regions were more likely to recommend interventions than those practicing in low-spending regions (Figure 1). The sole exception was a vignette in which physicians across all spending levels were equally likely to order a cardiology consultation for a 50-year-old man with new-onset exertional chest pain and positive results on an exercise tolerance test. For each of the other 5 vignettes, the aver-
Consider a 50-year-old man with a history of exertional chest pain. Taking no medications, after 6 minutes of exercise, he developed 2 mm of ST depression in leads II, III, and F. For what percentage of your patients would you recommend cardiology referral at this point?

Consider a 50-year-old man who has no other cardiac risk factors except elevated cholesterol level. After 6 months of a low-cholesterol diet, his total cholesterol is 240 mg/dL and his LDL-C level is 150 mg/dL. His HDL-C is 50 mg/dL, giving a ratio of total cholesterol to HDL-C of 4.8. For what percentage of such patients would you recommend oral agents at this point?

Consider a 60-year-old man with symptoms of benign prostatic hyper trophy. He is moderately symptomatic, has no evidence of renal compromise or cancer. The patient is somewhat bothered by these symptoms. For what percentage of such patients would you recommend a urology referral?

Consider a 35-year-old man who developed low back pain after shoveling snow 3 weeks ago. He presents to the office for an evaluation. On examination there is a new left foot drop. For what percentage of such patients would you recommend an MRI?

Consider an asymptomatic 60-year-old white man who has no history of prostate cancer and a normal digital rectal examination. For what percentage of such patients would you recommend a PSA (prostate-specific antigen) test?

Consider a 40-year-old, monogamous, married woman who calls to report a 2-day history of vaginal itching and thick white discharge. She has no abdominal pain or fever. For what percentage of such patients would you recommend an office visit to evaluate the vaginal discharge?

**Figure 1.** Tendency to intervene among physicians in regions of low, moderate, and high Medicare spending in response to 6 clinical vignettes. High spending includes the quintile of highest per capita spending (based on the End-of-Life Expenditure Index); moderate spending includes the 3 intermediate quintiles; and low spending includes the quintile of lowest spending. Abbreviations: HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; MRI, magnetic resonance imaging. For cholesterol measurements, to convert milligrams per deciliter to millimoles per liter, multiply by 0.0259.

This study shows that widely differing levels of health care spending across the United States reflect the tendency of local physicians to recommend interventions for patients. In high-spending areas, physicians would order further evaluation or treatment for approximately 10 additional patients per 100 seen than would a physician in a low-spending region. For example, the average physician in a high-spending region would recommend cholesterol-lowering therapy for 53% of men whose only cardiac risk factor was a low-density lipoprotein cholesterol level of 150 mg/dL (3.89 mmol/L), compared with 44% for physicians in low-spending regions. As shown in Figure 2, the association between area-level spending and physician practice intensity was observed for both family/general practitioners and general internists.

**COMMENT**

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Several concerns may be raised about the present study. First, because the measure of our exposure—local spending—was based on utilization of Medicare services, it might not accurately reflect spending for the remainder of the population (ie, persons younger than 65 years). However, prior studies have shown strong correlations at the area level between practice patterns for the populations younger and older than 65 years and at the state level between Medicare spending and total per capita health care spending.

Second, our findings could be influenced by survey nonresponse. However, the response rate of 59% compares favorably with rates from other national telephone surveys of physicians, which generally range from 48% to 65%.

Furthermore, for nonrespondents to account for the association between local spending and physicians’ tendency to intervene, their number and character would have to vary systematically with local spending.

Finally, some may be concerned with the use of clinical vignette responses to measure physicians’ tendency to intervene for patients. Ideally, practice intensity would be determined by ascertaining physicians’ ordering and prescribing habits for actual (identical) patients. However, because individual patients and panels of patients differ from provider to provider, a comparison of practice intensity based on actual practice is not feasible. Clinical vignettes provide a measure of actual clinical practice that is inherently case-mix adjusted: every provider is “seeing” the same patient, portrayed in each vignette by an adequately rich patient description. Similar methods of presenting hypothetical patient scenarios form the basis of other important provider comparisons, notably medical board-certifying examinations. Moreover, the validity of using clinical vignettes as a method of assess-
edly across regions. Nevertheless, although it has long been estimated that physicians’ decisions govern the way that 90% of each health care dollar is used, uncertainty has remained about whether differences in health care spending across regions reflect differences in physician behavior. Our findings demonstrate that they do.

While we have shown that physicians who practice in areas of higher local health care spending are more prone to intervene, we are unable to distinguish among 3 potential explanations: (1) more aggressive physicians may be attracted to certain areas; (2) physicians may adopt the practice style (or standard of practice) of the community where they locate; or (3) characteristics of the market itself, such as greater difficulty maintaining target incomes in a more competitive marketplace, could lead to a lower threshold for referral and test ordering. Determining which of these factors is primarily responsible should be the subject for further investigation.

It is unlikely that physician behavior is the sole explanation for higher levels of spending in some areas. Having more specialists or more hospital beds in an area, for example, likely plays a role in higher levels of local spending. It is also possible that— notwithstanding similar end-of-life preferences— differences in patient expectations and demands across different regions impact the level of local health care spending via direct influence on physician decision making. However, in the present study we have been able to show that, when faced with the same patients, physicians in higher-spending areas are more likely to intervene, and this undoubtedly accounts for some portion of the higher spending seen in some US regions.

Table. Characteristics of Areas With Different Levels of Local Health Care Spending

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>EOL-EI*</td>
<td>9074</td>
<td>11 590</td>
<td>14 644</td>
</tr>
<tr>
<td>Medicare per capita spending†</td>
<td>4911</td>
<td>6087</td>
<td>8325</td>
</tr>
<tr>
<td>Predicted 1-y mortality rate‡</td>
<td>24.81</td>
<td>24.76</td>
<td>24.80</td>
</tr>
<tr>
<td>Hospital beds,§ No. per 1000 population</td>
<td>2.5</td>
<td>2.9</td>
<td>3.2</td>
</tr>
<tr>
<td>Physicians,§ No. per 100 000 population</td>
<td>184.8</td>
<td>193.0</td>
<td>242.4</td>
</tr>
<tr>
<td>Family practice/general practice</td>
<td>35.9</td>
<td>28.9</td>
<td>26.5</td>
</tr>
<tr>
<td>General internists</td>
<td>21.3</td>
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</tr>
<tr>
<td>Medical subspecialists</td>
<td>26.9</td>
<td>30.8</td>
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</tr>
<tr>
<td>Surgeons</td>
<td>43.8</td>
<td>47.3</td>
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<tr>
<td>All other specialties</td>
<td>56.8</td>
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Abbreviation: EOL-EI, End-of-Life Expenditure Index.1,2
*Mean age-, sex-, and race-adjusted per capita fee-for-service spending in US dollars for hospital and physician services in the hospital referral regions (HRRs) within each spending level for enrollees in their last 6 months of life, for all Medicare services in 2000 (excluding health maintenance organization enrollees).
†Mean age-, sex-, and race-adjusted per capita fee-for-service spending in US dollars in the HRRs within each spending level.
‡Illness index was measured as the average predicted risk of death (using logistic regression) within 1 year of an index hospitalization for 3 respective cohorts with acute myocardial infarction, hip fracture, and colorectal cancer in 1994-1995.3
§Average supply of the specified medical resource in the HRRs within that spending level.
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Additional Information: Mr Gottlieb had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

REFERENCES