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Association of Hospitalist Care With Medical Utilization After Discharge: Evidence of Cost Shift From a Cohort Study

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Abstract

Background—Hospitalist care has grown rapidly, in part because it is associated with decreased length of stay and hospital costs. No national studies examining the effect of hospitalist care on hospital costs or on medical utilization and costs after discharge have been done.

Objective—To assess the relationship of hospitalist care with hospital length of stay, hospital charges, and medical utilization and Medicare costs after discharge.

Design—Population-based national cohort study.

Setting—Hospital care of Medicare patients.

Patients—A 5% national sample of enrollees in Medicare parts A and B with a primary care physician who were cared for by their primary care physician or a hospitalist during medical hospitalizations from 2001 to 2006.

Measurements—Length of stay, hospital charges, discharge location and physician visits, emergency department visits, rehospitalization, and Medicare spending within 30 days after discharge.

Results—In propensity score analysis, hospital length of stay was 0.64 day less among patients receiving hospitalist care. Hospital charges were \$282 lower, whereas Medicare costs in the 30 days after discharge were \$332 higher ($P < 0.001$ for both). Patients cared for by hospitalists were less likely to be discharged to home (odds ratio, 0.82 [95% CI, 0.78 to 0.86]) and were more likely to have emergency department visits (odds ratio, 1.18 [CI, 1.12 to 1.24]) and readmissions (odds

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ratio, 1.08 [CI, 1.02 to 1.14]) after discharge. They also had fewer visits with their primary care physician and more nursing facility visits after discharge.

Limitation—Observational studies are subject to selection bias.

Conclusion—Decreased length of stay and hospital costs associated with hospitalist care are offset by higher medical utilization and costs after discharge.

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Care of hospitalized patients by full-time, hospital-based physicians— called *hospitalists*— has grown rapidly over the past decade (1, 2). This growth was fueled in part by an increasing emphasis on efficiency, coupled with evidence from prospective trials that hospitalist care reduced average length of hospital stay (3–6). Major concerns about hospitalists relate to threats to continuity of care (7, 8). Discontinuity across the transition from outpatient to inpatient settings and back again might result in poor communication of important information (7, 9–12). Miscommunication at the time of hospital discharge can result in serious medication errors, which may in turn precipitate an emergency department visit (13–15). In addition, a hospitalist's lack of familiarity with the patient's preferences and values might lead to less-optimal treatment choices (16, 17). Pressure to reduce length of stay may promote early discharge to other health care facilities rather than discharge to home.

We used a 5% national sample of Medicare patients to examine the growth of hospitalist care over time (1, 18) and then used data from this sample to estimate hospital and Medicare costs in the 30 days after discharge that were associated with hospitalist care for all medical conditions. Our underlying hypothesis was that hospitalist care would be associated with cost shifting from the hospital setting to the posthospital setting—specifically, that hospitalist care would be associated with decreased discharges to home, and that discontinuity of care associated with hospitalist care would lead to more visits to the emergency department and readmissions to the hospital, resulting in increased Medicare costs.

Methods

Study Sample

We selected hospital admissions with a medical diagnosis-related group (DRG) from January 2001 to November 2006 in a 5% representative national sample of Medicare beneficiaries. We then constructed data files to include beneficiaries' demographic and enrollment information (denominator file) and claims for hospital stays (Medicare Provider Analysis and Review [MEDPAR] files), claims from outpatient facility files (outpatient statistical analysis files [OUTSAF]), and claims from physician services (carrier files).

To make patients cared for by hospitalists and those cared for by their primary care physicians (PCPs) more comparable, we included only admissions for patients with an identified PCP before admission (8). We defined patients as having a PCP if they had 2 or more visits to the same generalist physician (general internist, family physician, general practitioner, or geriatrician) in the year before hospitalization (19). We identified the treating physicians for each hospitalization by linking inpatient evaluation and management (E&M) codes in the carrier files to the admission record in the MEDPAR files. We excluded admissions if neither the patient's PCP nor a hospitalist provided care or if patients were cared for by both their PCP and a hospitalist. For patients with more than 1 admission in a given year, we randomly selected 1 admission per patient per year. We excluded admissions with intensive care unit services or inpatient deaths and those outside the 50 states, resulting

in 205 190 admissions at 4657 hospitals in the entire study cohort. For our main analysis, we selected only hospitals with at least 20 admissions cared for by hospitalists and at least 20 admissions cared for by PCPs during the study period. This final study cohort included 58 125 admissions at 454 hospitals.

Measurements

Medicare enrollment files provided data on patient age, sex, and race. We used Medicaid eligibility in the enrollment file as a proxy for low income. We obtained rates of weekend versus weekday admissions and DRGs (categorized as neurology, pulmonary, cardiac, gastrointestinal, and other) from the MEDPAR files. We determined residence in a nursing facility before admission from the MEDPAR files and by searching for any E&M codes associated with nursing facilities in the 3 months before admission (20). We generated Elixhauser comorbidity measures (21), total hospitalizations, and outpatient visits by using both inpatient and physician claims from MEDPAR, OUTSAF, and carrier files in the year before admission.

The provider-of-service file provided information on the hospitals, including census region, size (<200, 200 to 349, 350 to 499, or ≥ 500 beds), medical school affiliation (major, minor, or nonteaching), and type of hospital (public, for-profit, or nonprofit). Hospitals with a major medical school affiliation host clinical clerkship programs, whereas those with a minor affiliation have only residency programs or occasional student rotations (22). We generated metropolitan size from 2000 U.S. Census data. We defined “hospitalists” as generalist physicians who had at least 5 Medicare E&M claims and generated 90% or more of these claims from care provided to hospitalized patients at each year in the study period. When validated at 7 hospitals (1), this definition had a sensitivity of 84.2% and specificity of 96.5%. A further validation, which used generalists ($n = 8928$) with 90% or more E&M claims from hospitalized patients in the 100% Medicare data from Texas in 2006 as the gold standard, found a sensitivity of 84.7%, specificity of 98.7%, and positive predictive value of 90.9% for the algorithm with the 5% Medicare sample. We used *The Dartmouth Atlas of Health Care* definition of hospital referral regions as naturally occurring tertiary care markets within which Medicare beneficiaries receive inpatient services (23).

Context

Most studies of hospitalist care have been limited to inpatient stay.

Contribution

This study compared the patients of primary care physicians with those of hospitalists and found that hospitalist patients had shorter and less expensive admissions. After discharge, however, they had more visits to the emergency department, more readmissions to the hospital, and higher total expenses.

Caution

Observational studies (such as this one) may be biased in ways that are difficult to detect.

Implication

The decreased inpatient expenses associated with hospitalist care are offset by higher expenses after discharge.

—*The Editors*

Study Outcomes

Data on hospital length of stay were from the MEDPAR files. We estimated the cost of hospitalization by the amount of total charges in the MEDPAR files. We estimated Medicare costs in the 30 days after discharge by the Medicare paid amounts in the MEDPAR, OUTSAF, and carrier files, following the payment-calculation worksheets provided by the Research Data Assistance Center (24, 25). On the basis of E&M codes in the carrier files, we classified provider visits as outpatient, emergency department, or nursing facility services. We also calculated total Medicare spending in the period from 12 months to 1 month before admission for each admission and adjusted for that in the cost-estimation model. We presented the adjusted cost differences in 2006 U.S. dollars by using the gross domestic product deflator.

For the analysis of 30-day rehospitalization and emergency department visits, we excluded admissions with transfers to other acute care hospitals and deaths without an event (rehospitalization or emergency department visit) occurring within 30 days after discharge. In the analysis of discharge location, we excluded admissions with transfers to other acute care hospitals and those in which the patients had resided in a nursing facility any time in the 3 months before admission.

Statistical Analysis

To assess differences between patients cared for by hospitalists and those cared for by their PCP within a hospital, we used a nonpooling approach of propensity analysis (26, 27) and treated hospital as a covariate. We generated the propensity that an admission would be cared for by a hospitalist from a logistic regression model that incorporated the patient characteristics listed in Table 1 for each hospital. This approach implicitly balances hospital-level characteristics that affect choice of hospitalist care. We examined the assumptions for use of propensity score analysis, including overlap, balance, and ability to pull across deciles (Appendix 1, Appendix Figure, and Appendix Table 1, available at www.annals.org). We excluded patients with propensity scores in the nonoverlap regions within each hospital (27).

We used conditional logistic regression models to avoid inconsistent estimates of the within-hospital effect for the binary outcomes. For nonbinary outcomes, we used generalized linear models with log-link, normal distribution for length of stay; Poisson regression for number of provider visits after discharge; and log-gamma models for hospital costs (28). Some admissions had no Medicare spending in the 30 days after discharge. Therefore, in estimating differences in postdischarge Medicare costs, we used a 2-part model: a logit model that estimated the percentage of patients with any Medicare costs and a log-gamma model that estimated the average costs in patients with any costs (29, 30). We computed the 95% CIs of the cost differences from the 2-part model by using the cluster bootstrap method with 1000 bootstrap samples of the hospitals. All of these models included the hospital as a covariate and controlled for the propensity score decile within hospitals. To allow for nonlinear relationships, we included the propensity score decile as a categorical covariate in the analysis. For the cost models, we also adjusted for Medicare spending in the year before admission.

We also conducted a sensitivity analysis for our final study cohort (31). We postulated prevalence differences and effect sizes for an unmeasured confounder on the basis of our findings with the known confounders (Appendix 2, available at www.annals.org). To determine whether the effect of hospitalist care varied by hospital or patient characteristics, we tested interactions between hospitalist care and these characteristics in multivariate conditional logistic regression models for the final study cohort (Appendix 2).

Only 28.3% of admissions and 9.7% of hospitals in our entire study cohort met the criteria for the main analysis. We also analyzed the entire study cohort (205 190 admissions at 4657 hospitals) by using marginal models to study the average differences between patients cared for by hospitalists and those cared for by their PCPs. Appendix 2 details the methods used. We performed all analyses by using SAS, version 9.1 (SAS Institute, Cary, North Carolina), and STATA, version 9.2 (StataCorp, College Station, Texas).

Role of the Funding Source

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Results

Table 2 shows the characteristics of the 454 hospitals included in the final study cohort. Compared with the 4657 hospitals in the entire study cohort (Appendix Table 2, available at www.annals.org), the 454 hospitals were larger, were more likely to be teaching and nonprofit hospitals, and were located in larger metropolitan areas. Table 1 presents the characteristics of the final cohort of hospitalized patients, stratified by whether their in-hospital care was provided by their PCP or a hospitalist. Because of the large sample size, even small differences will be statistically significant. The patients cared for by hospitalists were slightly younger, were more likely to be white, had slightly more comorbid conditions, and were more likely to be admitted on the weekends and from nursing homes. Geographic region, hospital size, and hospital type also differed between the 2 groups. All differences except race were removed after we controlled for the propensity score decile.

Table 3 compares hospitalized patients cared for by hospitalists with those cared for by their PCPs on medical utilization and costs during and after hospitalization. We estimated length of stay, overall hospital costs, and Medicare spending in the 30 days after discharge. We also stratified the postdischarge spending by type of service (such as professional service or rehospitalization), controlling for the propensity of receiving hospitalist care within each hospital. The adjusted length of stay was 0.64 day shorter and the hospital charges were \$282 lower for patients cared for by hospitalists, whereas total Medicare spending in the 30 days after discharge was \$332 higher ($P < 0.001$ for all). When the postdischarge costs were stratified by type of service, 59% was from rehospitalization, 19% from skilled-nursing facilities, and 22% from professional and other services.

We also examined the number of provider visits in the 30 days after discharge categorized by type of provider (Table 4). Patients cared for by their PCPs had more visits to their PCP and fewer visits to other outpatient providers. Patients cared for by their PCPs also had fewer provider visits in emergency departments and nursing facilities ($P < 0.001$ for all comparisons). The results were similar in the unadjusted and the propensity score-adjusted analyses (Table 4).

Table 5 shows the association of hospitalist care with the proportion of patients discharged to home, readmissions, and emergency department visits within 30 days of discharge. The unadjusted rates and propensity score-adjusted odds ratios are presented for each measure. Patients cared for by hospitalists were less likely to be discharged directly to home (odds ratio, 0.82 [95% CI, 0.78 to 0.86]) and were more likely to have emergency department visits (odds ratio, 1.18 [CI, 1.12 to 1.24]) and readmissions (odds ratio, 1.08 [CI, 1.02 to 1.14]) in the 30 days after discharge.

The decreased odds of discharge to home and increased odds of emergency department visits associated with hospitalist care (Table 5) were robust in the sensitivity analysis, postulating an unmeasured confounder with a range of prevalence differences and effect sizes. However, the higher 30-day readmission rate associated with hospitalist care became insignificant with relatively small postulated differences in prevalence and magnitude of effect size (Appendix Table 3, available at www.annals.org).

Interactions between hospitalist care and other covariates were tested in multivariate conditional logistic regression models (Appendix Table 4, available at www.annals.org). We found no statistically significant interactions between hospitalist care and any hospital characteristic on odds of discharge to home, readmission, and emergency department visits and no interactions with patient age, DRG group, comorbid condition, or year of hospitalization. A subgroup analysis removing patients with a nursing home stay before hospitalization produced similar results.

Finally, we conducted confirmatory analyses by using the entire study cohort (205 190 admissions at 4657 hospitals) (Appendix Tables 2 and 5, available at www.annals.org), similar to those presented in Tables 3 and 5. The results, presented in Appendix Tables 6 and 7 (available at www.annals.org), are similar to those found with the smaller cohort.

Discussion

The reduction in hospital charges associated with hospitalist care in this national study of Medicare patients is smaller than the cost savings reported in the prospective trials (3, 6) but is similar to that in an observational study of hospitalist care in 45 hospitals (32). It could be argued that the randomized trials, unblinded by necessity, were conducted by early adopters of the hospitalist model, and their results might not translate nationally. Our finding of \$332 more Medicare spending associated with hospitalist care in the 30 days after discharge means that all of the reduction in hospital costs shifted to costs after discharge. The cost shift might be considered modest. However, if applied to the approximate 25% of Medicare admissions cared for by hospitalists (1, 2), this represents more than \$1.1 billion in additional Medicare costs annually (33).

The prospective trials and several observational studies found no significant increase in postdischarge visits to emergency departments or readmissions associated with hospitalist care (3–6, 32). Most prior studies were from single institutions and lacked the statistical power to detect the differences we found. As the hospitalist model has rapidly disseminated nationally, the outcomes may also have changed. A recent prospective analysis of hospitalist care for patients with upper gastrointestinal hemorrhage at 6 academic hospitals also found higher readmission rates in the patients assigned to hospitalists (34). We also found a higher rate of readmissions after hospitalist care in patients with stroke (35).

In the unadjusted analysis, 5.5% more patients who were cared for by their PCPs were discharged to home compared with patients cared for by hospitalists. The differences remained significant in multivariate, propensity, and sensitivity analyses. The adjusted difference translates to a reduction of 120 000 patients discharged to home per year, suggesting that the decrease in length of stay by hospitalists may be obtained at a cost of increased discharges to other health care facilities, such as skilled-nursing facilities.

Our study has limitations. We limited the patient cohort to those who had an identified PCP, and we compared patients cared for by their PCP in the hospital with those cared for by hospitalists. Thus, our results may not be applicable to patients without an identified PCP. In addition, the study included only patients admitted with medical diagnoses. Hospitalists

have a smaller effect on length of stay with surgical patients (18), so the results may differ. Also, we did not include patients cared for by medical subspecialists who were hospitalists.

Another limitation is that we studied patients with fee-for-service Medicare coverage. The results may not be applicable to younger patients and patients in HMOs. Our study period is 2001 to 2006; results might differ in later years. However, within our study period, we did not find a significant interaction between hospitalist care and year of hospitalization. We did not directly assess costs of hospitalization or costs after discharge. We used total charges as an indicator of hospital costs during hospitalization and calculated total Medicare spending in the 30 days after discharge. Charges reflect price setting rather than resource consumption and, as a result, overestimate costs. Medicare reimbursement does not include other payers' payments, out-of-pocket expenses, and copayments; therefore, it underestimates costs. Thus, the estimated cost shift in our study is conservative.

The hospitals in the study cohort were limited to those with at least 20 patients in each group (hospitalist and PCP) to allow for propensity adjustment at the hospital level. However, analyses without propensity adjustment for the entire cohort produced similar results (Appendix Tables 6 and 7).

The estimates from the unadjusted, multivariate-adjusted, and propensity score-adjusted analyses were remarkably similar, which reflects the fact that the patients cared for by hospitalists versus those cared for by their PCPs differed only slightly in key characteristics (Table 1). In observational trials, it is always possible that an unmeasured confounder is responsible for the results. The fact that the measured potential confounders differed very little in prevalence even before statistical adjustment allays that concern somewhat.

In conclusion, in this national study, patients cared for by hospitalists versus their PCPs had a shorter length of stay but were less likely to be discharged to home; were less likely to see their PCP after discharge; and had more readmissions, emergency department visits, and nursing home visits after discharge. Hospital cost savings associated with hospitalists were offset by increased medical utilization and costs after discharge. Many incentives and opportunities for cost shifting are in the present Medicare system (36, 37). In the current example, the cost shift is from a fixed prospective payment (DRG) to post-discharge services in a fee-for-service system, thus lowering hospital costs while increasing overall Medicare cost. Hospitalists, who typically are employed or subsidized by hospitals (2), may be more susceptible to behaviors that promote cost shifting. Current efforts to increase bundling of payments based on episodes of care should reduce these incentives and clarify the effect of different models of hospital care on overall medical costs.

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Appendix 1: Propensity Score Analysis

We restricted the analysis to the 454 hospitals with at least 20 admissions in each category: PCPs and hospitalists. We estimated the propensity score by using a separate logistic regression model for each hospital. In each model, the dependent variable was 1 for hospitalized patients cared for by a hospitalist and 0 for hospitalized patients cared for by

their PCP. We included the patient characteristics listed in Table 1: age, sex, race, low income, weekend admission, admission from nursing facilities, DRG weight, DRG group, number of comorbid conditions, number of hospitalizations, and number of outpatient physician visits in the prior year. We examined the assumptions of the propensity score model within hospitals and overall. The 16.8% of admissions in the nonoverlapping regions within a hospital were excluded (27). The Appendix Figure shows the distribution of propensity scores and decile markers for the admissions in the overlapping regions across the 454 hospitals. For hospitalized patients cared for by hospitalists and their PCPs, the ranges of the propensity scores were 0.003 to 0.981 and 0.003 to 0.982, respectively.

All patient characteristics except for race were balanced between the 2 groups in the overall study cohort. Within each hospital, patient characteristics were balanced, except for race and low income for 5 hospitals (1.1% of studied hospitals).

Appendix Table 1 shows the association between hospitalist care and the odds of readmission, emergency department visits, and discharge to home, stratified by decile of propensity score. We found little evidence of an interaction of hospitalist care and propensity score decile on odds of readmission ($P = 0.766$), emergency department visits ($P = 0.748$), and discharge to home ($P = 0.555$).

Appendix 2: Confirmatory Analyses

We conducted 3 sets of confirmatory analyses to examine the robustness of study results: sensitivity analysis, multivariate analysis for the final study cohort ($n = 58\,125$), and population average models for the entire study cohort ($n = 205\,190$).

Sensitivity Analysis

We performed a sensitivity analysis to estimate the potential effect of an unmeasured confounder or confounders on the odds of readmission, emergency department visits, and discharge to home. Appendix Table 3 shows the results of controlling for a postulated unmeasured confounder with different prevalences and odds ratios for the unknown factor. On the basis of our known confounding variables listed in Table 1, the largest difference in prevalence of confounders between the hospitalist and PCP groups was 4.6%. Therefore, we chose a 5- and 10- percentage point difference in prevalence for the 2 groups, with a prevalence level of 5% or 20% in the PCP group. We chose low prevalence levels for the postulated unknown confounder in the PCP group because such situations produce the largest effect in estimating the association between hospitalist care and outcomes.

We used a similar approach to construct possible effect sizes for the postulated unknown confounder. Except for the effect of DRG group on discharge to home, the known confounding variables had effect sizes (odds ratios) below 1.5 (Appendix Table 4). Therefore, we chose effect sizes for the unmeasured confounders with odds ratios of 1.5, 2.5, and 3.5.

Appendix Table 3 shows the prevalence of the postulated confounder for each group (hospitalist and PCP) and the postulated effect size (odds ratio). We then applied this unmeasured confounder to the propensity analysis, calculating the association between hospitalist care and outcomes. For example, if the difference in prevalence of an unmeasured confounder between hospitalized patients cared for by hospitalists and those cared for by their PCPs is 5 percentage points (25% vs. 20% in the 2 groups) and the association of the confounding variable with readmission is 1.5, then the odds of readmission associated with hospitalist care becomes 1.06 (CI, 1.00 to 1.11). The association of hospitalist care with increased odds of readmission became insignificant, with relatively small postulated effect

sizes and small differences in prevalence for an unknown confounder. However, the association of hospitalist care with odds of emergency department visits and discharge to home was very robust.

Multivariate Analysis

We examined the association between hospitalist care and costs in the 30 days after discharge for the final study cohort by using a multivariate 2-part model. We also assessed the associations of hospitalist care and readmission, emergency department visits, and discharge to home for the final study cohort by using conditional logistic regression models. This allowed us to show the magnitude of the associations of the covariates with the outcomes and also allowed for testing of interactions. Appendix Tables 4 and 8 show the complete models, including covariates.

Analysis Involving the Entire Cohort

In Appendix Tables 2, 5, 6, and 7, we present analyses with the entire cohort of 205 190 admissions at 4657 hospitals. Appendix Table 2 presents the characteristics of the 4657 hospitals. Appendix Table 5 presents patient characteristics stratified by whether the patients received hospitalist or PCP care. Appendix Table 6 presents the results of the analysis of length of stay, hospital charges, and Medicare costs in the 30 days after discharge for patients cared for by hospitalists or their PCPs. This analysis is similar to that presented in Table 3. Appendix Table 7 presents the results of analysis of readmission, emergency department visits, and discharge to home within 30 days after discharge for patients who received care from hospitalists or their PCPs. This analysis is similar to that presented in Table 5.

We analyzed the average differences between patients cared for by hospitalists and PCPs by using marginal models—generalized estimating equations with an exchangeable working correlation matrix (28). We reported the differences for each outcome associated with hospitalist care with their 95% CIs on the basis of a modified sandwich estimate of variance. In the cost-estimation models, we also adjusted the geographic adjustment factor available from the Centers for Medicare & Medicaid Services Web site (38). To further adjust for clustering within hospital referral regions, we treated hospital referral region as a covariate in the generalized estimating equation analysis. We also conducted a propensity score analysis by using a complete pooling approach.

Comparing results shown in Appendix Tables 2 and 5 with those in Tables 1 and 2, the differences in characteristics of hospitalized patients cared for by hospitalists versus their PCPs were larger in the entire cohort than in the final cohort, especially for hospital characteristics. The differences in average hospital length of stay, average hospital costs, and average costs in the 30 days after discharge between hospitalized patients cared for by hospitalists and those cared for by their PCPs estimated from the marginal model with the entire cohort were similar to those with the final cohort (Appendix Table 6 vs. Table 3). Average adjusted length of stay was 0.63 day shorter and average adjusted hospital charges were \$296 lower for hospitalized patients cared for by hospitalists. Average adjusted total Medicare spending in the 30 days after discharge was \$228 higher for admissions cared for by hospitalists (Appendix Table 6). The estimates of the association between hospitalist care and odds of readmission, emergency department visits, and discharge to home from the marginal models in the entire cohort were also close to those from the conditional logistic regression models used in the final cohort (Appendix Table 7 vs. Table 5). Results of the propensity analysis were similar to those of multivariate analysis. Further adjustments for

clustering of hospitals within hospital referral regions were almost identical to results without adjustments.

Appendix Figure.

Distribution of propensity scores for admissions cared for by hospitalists and primary care physicians.

Table 1

Characteristics of Hospitalized Patients Cared for by Hospitalists or Their PCPs

Characteristic	PCP Cohort*	Hospitalist Cohort*
Patients, <i>n</i>	36 871	21 254
Age, <i>y</i>		
Mean (SD)	78.0 (10.7)	77.3 (11.6)
Median (25th, 75th percentiles)	79 (72, 85)	79 (71, 85)
Sex, %		
Male	36.3	36.6
Female	63.7	63.4
Race, %		
White	85.9	86.3
Black	11.2	10.3
Other	2.9	3.4
Low income, %	18.0	21.2
Weekend admission, %	24.6	29.2
Diagnosis, %		
Medical, neurology	9.0	9.5
Medical, pulmonary	22.7	21.7
Medical, cardiology	18.7	16.2
Medical, gastroenterology	15.1	14.1
Medical, other	34.5	38.5
DRG weight		
Mean (SD)	1.0 (0.4)	1.0 (0.4)
Median (25th, 75th percentiles)	0.9 (0.8, 1.1)	1.0 (0.8, 1.1)
Comorbid conditions, <i>n</i>		
Mean (SD)	3.1 (2.3)	3.3 (2.4)
Median (25th, 75th percentiles)	3 (1, 4)	3 (1, 5)
Hospitalizations in prior year, <i>n</i>		
Mean (SD)	1.0 (1.4)	1.0 (1.5)
Median (25th, 75th percentiles)	0 (0, 1)	0 (0, 1)

Characteristic	PCP Cohort*	Hospitalist Cohort*
Outpatient physician visits in prior year, <i>n</i>		
Mean (SD)	11.4 (8.6)	11.7 (8.5)
Median (25th, 75th percentiles)	9 (5, 15)	10 (6, 15)
Admitted from nursing facility, %		
	4.9	8.5
Region, %		
Mid-Atlantic	11.7	8.4
New England	6.8	8.7
East North Central	17.3	14.6
West North Central	8.2	6.5
South Atlantic	28.1	31.7
East South Central	11.3	8.8
West South Central	9.0	10.4
Mountain	3.7	5.9
Pacific	4.0	5.1
Metropolitan size, %		
<100 000 persons	9.6	8.4
100 000–249 999 persons	10.7	10.4
250 000–999 999 persons	29.3	26.8
≥1 000 000 persons	50.4	54.4
Teaching hospital, %		
Nonteaching	48.5	47.7
Minor teaching	26.9	26.2
Major teaching	24.6	26.1
Hospital size, %		
<200 beds	9.7	10.0
200–349 beds	25.6	25.6
350–499 beds	27.8	26.1
≥500 beds	36.9	38.3
Type of hospital, %		
Nonprofit	84.6	81.1

Characteristic	PCP Cohort [*]	Hospitalist Cohort [*]
For-profit	7.4	10.6
Public	8.0	8.3

DRG = diagnosis-related group; PCP = primary care physician.

^{*} After adjustment for decile of propensity score in conditional logistic regression models, all patient characteristics were balanced except for race ($P = 0.029$). All other P values were > 0.20 .

Table 2

Characteristics of the 454 Hospitals*

Characteristic	Hospitals, %
Region	
Mid-Atlantic	10.4
New England	8.8
East North Central	15.4
West North Central	7.9
South Atlantic	26.9
East South Central	8.8
West South Central	9.5
Mountain	6.0
Pacific	6.4
Metropolitan size	
<100 000 persons	10.4
100 000–249 999 persons	9.9
250 000–999 999 persons	26.8
≥1 000 000 persons	52.9
Teaching hospital	
Nonteaching	52.0
Minor teaching	26.2
Major teaching	21.8
Hospital size	
<200 beds	15.0
200–349 beds	28.6
350–499 beds	26.9
≥500 beds	29.5
Type of hospital	
Nonprofit	80.9
For-profit	11.2
Public	7.9

* The final cohort included hospitals with ≥ 20 admissions cared for by hospitalists and ≥ 20 admissions cared for by their primary care physicians. This cohort allowed us to generate propensity scores for each hospital.

Table 3

Propensity Analyses Estimating Mean Length of Stay, Mean Hospital Charges, and Medicare Costs in the 30 Days After Discharge for Hospitalized Patients Cared for by Hospitalists or Their PCPs*

Variable	PCP Cohort	Hospitalist Cohort	Difference
Mean length of stay (95% CI), <i>d</i>	5.82 (5.76 to 5.87)	5.17 (5.11 to 5.23)	−0.64 (−0.56 to −0.72) [†]
Mean hospital charges (95% CI), \$[‡]	15 301 (15 188 to 15 416)	15 019 (14 884 to 15 155)	−282 (−115 to −451) [†]
Medicare costs in the 30 d after discharge^{‡,§}			
Professional services			
Patients with charges, %	93.0	91.8	–
Average cost, \$	643	690	–
Combined model (95% CI), \$	598 (579 to 616)	633 (606 to 662)	35 (12 to 59) [†]
Outpatient facilities			
Patients with charges, %	37.3	41.0	–
Average cost, \$	446	435	–
Combined model (95% CI), \$	166 (160 to 173)	178 (170 to 187)	12 (3 to 21) [†]
Hospitalization			
Patients with charges, %	17.2	18.0	–
Average cost, \$	9008	9412	–
Combined model (95% CI), \$	1548 (1498 to 1601)	1694 (1623 to 1769)	146 (71 to 218) [†]
Skilled-nursing facility			
Patients with charges, %	6.3	6.6	–
Average cost, \$	7755	8147	–
Combined model (95% CI), \$	487 (458 to 518)	535 (494 to 579)	48 (9 to 85)
Other facilities			
Patients with charges, %	1.0	1.2	–
Average cost, \$	12 643	11 687	–
Combined model (95% CI), \$	132 (117 to 154)	140 (112 to 161)	8 (−11 to 25)
Total costs			
Patients with charges, %	93.6	93.0	–
Average cost, \$	3149	3523	–
Combined model (95% CI), \$	2947 (2834 to 3063)	3279 (3106 to 3459)	332 (160 to 486) [†]

PCP = primary care physician.

* We generated propensity scores by using the nonpooling approach and adjusted for decile of propensity in the analyses.

[†] $P < 0.001$.

[‡] Adjusted for total Medicare costs in the 12 mo to 1 mo before the index admission in the propensity analyses of costs.

[§] Medicare spending was estimated in a 2-part model. The first part estimated the differences in the proportion of patients with any postdischarge spending in that category, and the second part estimated the difference in spending in patients with any Medicare spending in that category. We computed the 95% CI of cost difference by using the cluster bootstrap method with 1000 bootstrap samples of the hospitals.

^{||} The estimated difference in Medicare costs for the overall model differs from the sum of the differences in costs from the 5 individual models.

Table 4

Provider Visits in the 30 Days After Hospitalization for Patients Cared for by Hospitalists or Their PCPs, by Type of Provider Visit

Variable	PCP Cohort	Hospitalist Cohort	Difference *
Unadjusted mean (95% CI)			
Outpatient visits, $n^{\dagger}$			
With PCP	0.82 (0.81 to 0.83)	0.64 (0.63 to 0.65)	-0.18 (-0.17 to -0.20)
With other providers	0.60 (0.58 to 0.61)	0.75 (0.73 to 0.76)	0.15 (0.13 to 0.17)
ED visits, n	0.21 (0.21 to 0.22)	0.26 (0.26 to 0.27)	0.05 (0.04 to 0.06)
Nursing facility visits, n	0.62 (0.60 to 0.63)	0.79 (0.76 to 0.81)	0.17 (0.14 to 0.21)
Propensity-adjusted mean (95% CI)[‡]			
Outpatient visits, $n^{\dagger}$			
With PCP	0.79 (0.78 to 0.81)	0.62 (0.61 to 0.64)	-0.17 (-0.16 to -0.19)
With other providers	0.56 (0.55 to 0.57)	0.71 (0.69 to 0.72)	0.14 (0.13 to 0.16)
ED visits, n	0.21 (0.20 to 0.21)	0.25 (0.24 to 0.26)	0.04 (0.03 to 0.05)
Nursing facility visits, n	0.52 (0.51 to 0.53)	0.58 (0.56 to 0.59)	0.06 (0.04 to 0.07)

ED = emergency department; PCP = primary care physician.

* All differences between the hospitalist and PCP cohorts were significant ($P < 0.001$).

[†] Include visits to any provider in an outpatient setting but do not include emergency department visits or nursing home care.

[‡] We generated propensity scores by using the nonpooling approach, categorized the propensity score in deciles, and adjusted for decile of propensity in the analyses.

Table 5

Rate of Readmission, ED Visits, and Discharge to Home in the 30 Days After Discharge for Patients Cared for by Hospitalists or Their PCPs

Variable	Readmission Rate	ED Visit Rate	Discharge Home Rate
Sample size, <i>n</i> *	53 356	53 184	52 233
Unadjusted rates ($\pm$ SE), %			
PCP cohort	17.4 $\pm$ 0.2	17.8 $\pm$ 0.2	76.0 $\pm$ 0.2
Hospitalist cohort	19.0 $\pm$ 0.3	20.7 $\pm$ 0.3	70.6 $\pm$ 0.3
Difference	1.6 $\pm$ 0.3	2.9 $\pm$ 0.3	−5.5 $\pm$ 0.4
Propensity score–adjusted OR (95% CI): hospitalist vs. PCP	1.08 (1.02–1.14)	1.18 (1.12–1.24)	0.82 (0.78–0.86)

ED = emergency department; OR = odds ratio; PCP = primary care physician.

* Sample size varies by the outcome assessed. For example, for analyses of the percentage of patients discharged to home, we removed patients who had resided in a nursing home any time in the 3 mo before admission (see Methods section for details).

Appendix Table 1

Association Between Hospitalist Care and Rates of Readmission, ED Visits, and Discharge to Home, by Decile of Propensity Score

Propensity Score Decile	Odds Ratio (95% CI)		
	Readmission	ED Visit	Discharge Home
1	1.03 (0.76–1.41)	1.15 (0.86–1.55)	0.96 (0.72–1.27)
2	1.01 (0.81–1.27)	1.17 (0.94–1.45)	0.83 (0.68–1.00)
3	1.10 (0.90–1.34)	1.15 (0.94–1.40)	0.77 (0.65–0.92)
4	1.03 (0.86–1.24)	1.23 (1.03–1.47)	0.92 (0.78–1.08)
5	1.22 (1.02–1.45)	1.34 (1.13–1.59)	0.89 (0.76–1.04)
6	0.99 (0.84–1.18)	1.08 (0.92–1.27)	0.74 (0.64–0.86)
7	0.93 (0.79–1.10)	1.08 (0.91–1.27)	0.71 (0.61–0.81)
8	1.09 (0.93–1.28)	1.21 (1.03–1.41)	0.89 (0.77–1.03)
9	1.08 (0.92–1.27)	1.22 (1.04–1.43)	0.96 (0.83–1.11)
10	1.03 (0.85–1.25)	1.05 (0.87–1.27)	0.79 (0.65–0.95)

ED = emergency department.

Appendix Table 2

Characteristics of the 4657 Hospitals in the Entire Cohort*

Characteristic	Hospitals, %
Region	
Mid-Atlantic	9.9
New England	4.0
East North Central	16.5
West North Central	12.9
South Atlantic	15.1
East South Central	9.2
West South Central	14.3
Mountain	7.2
Pacific	10.8
Metropolitan size	
<100 000 persons	47.5
100 000–249 999 persons	7.1
250 000–999 999 persons	12.5
≥1 000 000 persons	32.9
Teaching hospital	
Nonteaching	76.5
Minor teaching	14.3
Major teaching	9.2
Hospital size	
<200 beds	67.0
200–349 beds	16.6
350–499 beds	8.7
≥500 beds	7.7
Type of hospital	
Nonprofit	61.2
For-profit	13.6
Public	25.2

* The entire cohort includes all hospitals with ≥ 1 admission fitting the study selection criteria: 205 290 admissions and 4657 hospitals.

Sensitivity Analyses of the Association Between Hospitalist Care and Rates of Readmission, ED Visits, and Discharge to Home, Controlling for an Unmeasured Binary Confounder

Appendix Table 3

Prevalence of Confounder, %		Effect Size		Odds Ratio (95% CI)		
Hospitalist	PCP			Readmission	ED Visit	Discharge Home
25	20	1.5		1.06 (1.00–1.11)	1.15 (1.10–1.21)	0.84 (0.80–0.88)
10	5	1.5		1.05 (1.00–1.10)	1.15 (1.09–1.21)	0.84 (0.80–0.88)
30	20	1.5		1.03 (0.98–1.09)	1.13 (1.07–1.19)	0.86 (0.82–0.90)
15	5	1.5		1.03 (0.97–1.09)	1.13 (1.07–1.18)	0.86 (0.82–0.90)
25	20	2.5		1.02 (0.96–1.08)	1.12 (1.06–1.17)	0.87 (0.83–0.91)
10	5	2.5		1.01 (0.95–1.07)	1.10 (1.05–1.16)	0.88 (0.83–0.92)
30	20	2.5		0.97 (0.91–1.02)	1.06 (1.00–1.11)	0.91 (0.87–0.96)
15	5	2.5		0.95 (0.90–1.00)	1.04 (0.98–1.09)	0.93 (0.89–0.98)
25	20	3.5		1.00 (0.94–1.05)	1.09 (1.03–1.14)	0.89 (0.85–0.93)
10	5	3.5		0.97 (0.92–1.03)	1.06 (1.01–1.12)	0.91 (0.87–0.96)
30	20	3.5		0.93 (0.87–0.98)	1.01 (0.96–1.06)	0.96 (0.91–1.00)
15	5	3.5		0.88 (0.83–0.93)	0.97 (0.92–1.01)	1.00 (0.95–1.05)

ED = emergency department; PCP = primary care physician.

Appendix Table 4

Multivariate Analyses of Odds of Readmission, ED Visit, and Discharge to Home

Variable	Odds Ratio (95% CI)		
	Readmission	ED Visit	Discharge Home
Hospitalist (vs. PCP)	1.07 (1.02–1.13)	1.17 (1.11–1.24)	0.84 (0.80–0.88)
Age (continuous)*	1.00 (1.00–1.01)	1.00 (0.99–1.00)	0.95 (0.95–0.95)
Sex (male vs. female)	1.09 (1.04–1.14)	1.02 (0.97–1.07)	1.14 (1.09–1.20)
Race			
White	1.00 (reference)	1.00 (reference)	1.00 (reference)
Black	1.01 (0.93–1.09)	1.10 (1.02–1.19)	1.12 (1.03–1.22)
Other	1.00 (0.87–1.15)	0.96 (0.84–1.10)	1.32 (1.14–1.52)
Low income	1.04 (0.98–1.11)	1.31 (1.23–1.39)	0.83 (0.78–0.89)
Weekend admission	0.99 (0.94–1.05)	1.02 (0.97–1.07)	1.02 (0.97–1.07)
Admitted from nursing home	1.14 (1.04–1.25)	1.15 (1.05–1.26)	—†
Diagnosis			
Medical, neurology	1.00 (reference)	1.00 (reference)	1.00 (reference)
Medical, pulmonary	1.08 (0.99–1.19)	1.00 (0.92–1.10)	4.58 (4.22–4.97)
Medical, cardiology	1.13 (1.03–1.25)	1.02 (0.93–1.12)	5.21 (4.77–5.68)
Medical, gastroenterology	1.20 (1.09–1.33)	1.08 (0.98–1.19)	5.96 (5.43–6.54)
Medical, other	1.14 (1.05–1.25)	1.05 (0.96–1.15)	2.34 (2.18–2.52)
Comorbid conditions (continuous)*	1.13 (1.12–1.24)	1.09 (1.08–1.11)	0.93 (0.92–0.94)
DRG weight (continuous)*	1.26 (1.20–1.34)	1.14 (1.07–1.20)	0.76 (0.72–0.80)
Hospitalizations in 1 y before studied admission (continuous)*	1.09 (1.07–1.11)	1.12 (1.10–1.14)	1.02 (0.99–1.04)
Physician visits in 1 y before studied admission (continuous)*	1.01 (1.00–1.01)	1.01 (1.01–1.01)	1.02 (1.01–1.02)

DRG = diagnosis-related group; ED = emergency department; PCP = primary care physician.

* We repeated the analyses after grouping the continuous variables into quartiles. There was almost no change in the odds of the outcomes associated with hospitalist care: odds ratio for readmission, 1.07 (95% CI, 1.01–1.12); for ED visits, 1.17 (CI, 1.12–1.23); and for discharge to home, 0.83 (CI, 0.79–0.87).

† Patients admitted from nursing homes and patients with evidence of a nursing home stay in the 3 mo before admission were removed from the analyses of rate of discharge to home.

Appendix Table 5

Characteristics of Hospitalized Patients Cared for by Hospitalists or Their PCPs in the Entire Cohort*

Characteristic	PCP [†]	Hospitalist [†]
Total, <i>n</i>	169 298	35 892
Age, <i>y</i>		
Mean (SD)	77.6 (11.0)	76.7 (12.2)
Median (25th, 75th percentiles)	79 (72, 85)	79 (71, 85)
Sex, %		
Male	36.0	37.1
Female	64.0	62.9
Race, %		
White	86.8	84.6
Black	9.5	10.9
Other	3.7	4.5
Low income, %	22.7	24.4
Weekend admission, %	24.4	28.6
Diagnosis, %		
Medical, neurology	7.9	8.9
Medical, pulmonary	24.7	22.0
Medical, cardiology	17.7	15.5
Medical, gastroenterology	15.0	14.2
Medical, other	34.7	39.4
DRG weight		
Mean (SD)	1.0 (0.4)	1.0 (0.4)
Median (25th, 75th percentiles)	0.9 (0.8, 1.0)	1.0 (0.8, 1.1)
Comorbid conditions, <i>n</i>		
Mean (SD)	3.1 (2.2)	3.3 (2.4)
Median (25th, 75th percentiles)	3 (1, 4)	3 (2, 5)
Hospitalizations in prior year, <i>n</i>		
Mean (SD)	1.0 (1.5)	1.0 (1.6)
Median (25th, 75th percentiles)	0 (0, 1)	1 (0, 1)
Outpatient physician visits in prior year, <i>n</i>		

Characteristic	PCP [†]	Hospitalist [†]
Mean (SD)	11.1 (8.6)	11.6 (8.6)
Median (25th, 75th percentiles)	9 (5, 15)	10 (6, 15)
Admitted from nursing facility, %	4.6	8.6
Region		
Mid-Atlantic	14.6	10.3
New England	4.1	7.2
East North Central	18.1	14.8
West North Central	8.4	5.9
South Atlantic	19.9	27.0
East South Central	11.7	8.1
West South Central	13.1	10.5
Mountain	3.5	7.4
Pacific	6.6	8.7
Metropolitan size		
<100 000 persons	33.7	14.1
100 000–249 999 persons	11.0	9.0
250 000–999 999 persons	17.8	23.0
≥1 000 000 persons	37.5	53.9
Teaching hospital		
Nonteaching	66.8	52.9
Minor teaching	20.6	23.4
Major teaching	12.6	23.7
Hospital size		
<200 beds	42.1	22.1
200–349 beds	27.1	26.4
350–499 beds	16.2	21.5
≥500 beds	14.6	30.0
Type of hospital		
Nonprofit	72.1	77.1
For-profit	11.6	11.8

Characteristic	PCP [†]	Hospitalist [†]
Public	16.3	11.1

DRG =diagnosis-related group; PCP =primary care physician.

* The entire cohort included 205 290 admissions and 4657 hospitals.

[†] All differences in characteristics between patients cared for by hospitalists vs. their PCPs were significant ($P < 0.001$), by chi-square test for categorical variables and t test for continuous variables.

Appendix Table 6

Mean Length of Stay, Mean Hospital Charges, and Medicare Costs in the 30 Days After Discharge for Hospitalized Patients Cared for by Hospitalists or Their PCPs for the Entire Cohort*

Variable	PCP Cohort	Hospitalist Cohort	Difference
Mean length of stay (95% CI), <i>d</i>	5.61 (5.58–5.64)	4.98 (4.93–5.02)	–0.63
Mean hospital charges (95% CI), \$	14 105 (13 918–14 294)	13 809 (13 597–14 024)	–296 [†]
Medicare costs in the 30 d after discharge[‡]			
Professional services			
Patients with charges	92.0	92.6	–
Average cost	625	669	–
Combined model (95% CI), \$	582 (575–589)	619 (605–634)	37 [†]
Outpatient facilities			
Patients with charges, %	41.2	46.5	–
Average cost, \$	401	397	–
Combined model (95% CI), \$	166 (161–170)	185 (176–194)	19 [†]
Hospitalization			
Patients with charges, %	17.2	18.2	–
Average cost, \$	9133	9331	–
Combined model (95% CI), \$	1572 (1532–1612)	1697 (1612–1786)	125 [†]
Skilled-nursing facility			
Patients with charges, %	5.7	6.2	–
Average cost, \$	7608	7713	–
Combined model (95% CI), \$	433 (409–458)	479 (444–516)	46 [†]
Other facilities			
Patients with charges, %	0.9	1.1	–
Average cost, \$	15 793	14 361	–
Combined model (95% CI), \$	139 (126–152)	154 (131–181)	15 [†]
Total[§]			
Patients with charges, %	94.1	94.1	–
Average cost, \$	3202	3443	–
Combined model (95% CI), \$	3012 (2968–3058)	3240 (3146–3337)	228 [†]

PCP = primary care physician.

* The entire cohort included 205 290 admissions and 4657 hospitals.

[†] $P < 0.001$.

[‡] Medicare spending was estimated in a 2-part model. The first part estimated the differences in the proportion of patients with any postdischarge spending in that category, and the second part estimated the difference in spending in patients with any Medicare spending in that category.

[§] The estimated difference in Medicare costs for the overall model differs from the sum of the differences in costs from the 5 individual models.

Appendix Table 7

Association of Hospitalist Care With Rates of Readmission, ED Visit, and Discharge to Home for the Entire Cohort*

Variable	Readmission	ED Visit	Discharge Home
Sample size, $n^{\dagger}$	184 278	183 606	181 610
Unadjusted rate ($\pm$ SE), %			
PCP cohort	17.9 $\pm$ 0.1	17.6 $\pm$ 0.1	77.5 $\pm$ 0.1
Hospitalist cohort	19.1 $\pm$ 0.2	21.4 $\pm$ 0.2	71.3 $\pm$ 0.3
Difference	1.2 $\pm$ 0.2	3.8 $\pm$ 0.2	-6.2 $\pm$ 0.3
Multivariate-adjusted OR (95% CI)	1.07 (1.04–1.11)	1.24 (1.20–1.28)	0.83 (0.80–0.86)
Propensity score-adjusted OR (95% CI)	1.06 (1.03–1.10)	1.22 (1.18–1.26)	0.80 (0.78–0.83)
Adjusted for hospital referral region OR (95% CI)	1.07 (1.04–1.11)	1.22 (1.18–1.26)	0.83 (0.80–0.86)

ED = emergency department; OR = odds ratio; PCP = primary care physician.

* The entire cohort included 205 290 admissions and 4657 hospitals.

[†] Sample size varies by the outcome assessed. For example, for analyses of the percentage of patients discharged to home, we removed patients who had resided in a nursing home any time in the 3 mo before admission (see Methods section for details).

Appendix Table 8

Multivariate Analyses of 30-Day Postdischarge Costs*

Variable	Logit [†]		Gamma [‡]	
	Parameter (±SE)	P Value	Parameter (±SE)	P Value
Hospitalist (vs. PCP)	−0.0076 ± 0.0193	0.6939	0.0946 ± 0.0161	<0.001
Age (continuous)	−0.0126 ± 0.0017	<0.001	0.0016 ± 0.0007	0.0233
Sex (male vs. female)	−0.1343 ± 0.0356	0.0002	0.1431 ± 0.0150	<0.001
Race				
White	1.0000		1.0000	
Black	−0.3107 ± 0.0561	<0.001	−0.0107 ± 0.0261	0.6814
Other	−0.2606 ± 0.0971	0.0073	−0.0069 ± 0.0445	0.8768
Low income	−0.1815 ± 0.0461	<0.001	0.0040 ± 0.0203	0.8431
Weekend admission	0.0420 ± 0.0387	0.2783	0.0061 ± 0.0161	0.7065
Admitted from nursing home	0.1197 ± 0.0776	0.1231	0.0950 ± 0.0307	0.0020
Diagnosis				
Medical, neurology	1.0000		1.0000	
Medical, pulmonary	0.0257 ± 0.0627	0.6819	−0.3724 ± 0.0280	<0.001
Medical, cardiology	0.2507 ± 0.0680	0.0002	−0.1756 ± 0.0291	<0.001
Medical, gastroenterology	−0.0873 ± 0.0667	0.1904	−0.2030 ± 0.0301	<0.001
Medical, other	0.1778 ± 0.0598	0.0030	−0.1194 ± 0.0265	<0.001
Comorbid conditions (continuous)	0.0522 ± 0.0109	<0.001	0.1048 ± 0.0043	<0.001
DRG weight	−0.1475 ± 0.0426	0.0005	0.3075 ± 0.0214	<0.001
Hospitalizations in 1 y before admission	−0.0826 ± 0.0184	<0.001	−0.0055 ± 0.0074	0.4511
Physician visits in 1 y before admission	0.0529 ± 0.0030	<0.001	0.0030 ± 0.0009	0.0008
Medicare spending from 12 mo to 1 mo before admission (per \$100)	0.0137 ± 0.1364	0.9199	0.0002 ± 0.0001	<0.001

DRG = diagnosis-related group; PCP = primary care physician.

* The estimated difference in 30-day postdischarge costs between hospitalists and PCPs from multivariate analyses was \$263.

[†]The logit part of model estimated the differences in the proportion of patients with 30-day postdischarge spending.[‡]The gamma part of model estimated the differences in 30-day postdischarge spending in patients with any spending.