Hospitalist Vs. Non-Hospitalist Care Outcomes and Costs for Medicare Beneficiaries Discharged to Skilled Nursing Facilities in 2012–2014

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BACKGROUND: Hospitals are increasingly at risk for post-acute care outcomes and spending, such as those in skilled nursing facilities (SNFs). While hospitalists are thought to improve patient outcomes of acute care, whether these effects extend to the post-acute setting in SNFs is unknown.

OBJECTIVE: To compare longer term outcomes of patients discharged to SNFs who were treated by hospitalists vs. non-hospitalists during their hospitalization.

DESIGN: This was a retrospective cohort study.

PARTICIPANTS: Participants are Medicare fee-for-service beneficiaries over 66 years of age who were hospitalized and discharged to a SNF in 2012–2014 ($N = 2,839,779$).

MAIN MEASURES: We estimated the effect of being treated by a hospitalist on 30-day rehospitalization and mortality, 60-day episode Medicare payments (Parts A and B), and successful discharge to community. Patients discharged to the community within 100 days of SNF admission who remained alive and not readmitted to a hospital or SNF for at least 30 days were considered successfully discharged. All outcomes were adjusted for demographics and clinical characteristics. To account for heterogeneity across facilities, we included hospital fixed effects.

KEY RESULTS: The 30-day rehospitalization rate was 17.59% for hospitalists' vs. 17.31% for non-hospitalists' patients (adjusted difference, 0.28%; 95% CI, 0.13 to 0.44). Sixty-day payments were \$26,301 for hospitalists' vs. \$25,996 for non-hospitalists' patients (adjusted difference, \$305; 95% CI, \$243 to \$367). There was a non-significant trend toward lower successful discharge to the community rate (adjusted difference, -0.26% ; 95% CI, -0.48 to -0.04) and lower mortality for patients of hospitalists (adjusted difference, -0.12% ; 95% CI, -0.22 to -0.02).

CONCLUSIONS: Among hospitalized Medicare beneficiaries who were discharged to SNFs, readmissions and Medicare costs were slightly higher for stays under the care of hospitalists compared with those of non-

hospitalist generalist physicians, but there was a non-significant trend toward lower mortality.

KEY WORDS: nursing home; care quality; hospitalist; post-acute care; readmissions.

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INTRODUCTION

As hospitals transition to value-based payment, they become increasingly invested in improving not only inpatient but also post-acute care delivery to control longer term costs and optimize patient outcomes. Hospitals working to improve the value of acute and post-acute care may consider concentrating care among physicians who focus practice on acute hospital care (i.e., hospitalists) to reduce utilization and improve patient outcomes. However, the role of the hospitalist physicians in the outcomes and spending on post-acute care is not well understood.

Patients in post-acute care are particularly vulnerable to poor outcomes, and thus, hospitalist care of patients who are most likely to require facility-based care after discharge may be able to improve outcomes for this group. Skilled nursing facility (SNF) stays make up nearly half (47%) of all post-acute care episodes.¹ In addition to physical and occupational therapy that may be required to safely transition patients back home, SNFs can provide short-term skilled nursing care for patients too sick to return home. Patient outcomes of post-acute care in SNFs are poor and variable across facilities. Although the goal of a short-term SNF stay is return to the community (e.g., home or assisted living facility), nearly a quarter (23%) of the 1.5 million patients discharged annually to post-acute care in SNFs are rehospitalized or die within 30 days.² Rates of successful discharge to the community after a short-term SNF stay range from 29 to 47% between facilities in the top and bottom quartiles of performance.³

Hospital attending physicians control key aspects of discharge planning and play an important role in preventing readmissions.^{4, 5} For example, premature discharge and

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inadequate post-discharge planning—both under the influence of hospital attending physician—were identified as common predictors of preventable readmissions in a large cohort of general medicine patients.⁶ Hospitals are increasingly concentrating care among hospitalists.⁷ However, evidence that hospitalists affect the outcomes of patients who transition from hospital to post-acute care in SNFs is limited. On the one hand, hospitalists may be well-positioned to improve outcomes through better hospital discharge process and on-site availability in the hospital to optimize patients prior to discharge. On the other hand, generalist physicians who split their time between inpatient and outpatient practices may be able to follow patients across settings, have better working relationships with post-acute care facilities, and may be insulated from hospital pressures to reduce length of stay.

While some prior studies found no differences in readmission rates between hospitalists and non-hospitalists,^{8, 9} those studies did not focus on patients requiring post-acute care in SNFs, a high-risk population that may be more sensitive to specialized acute hospital care. One prior study examined outcomes of patients discharged to SNFs,¹⁰ but did not account for heterogeneity across hospitals in the use of hospitalists and SNFs. For example, if hospitalist care is concentrated within better quality hospitals, the association between hospitalists and post-acute outcomes may be driven by hospital quality rather than the type of inpatient attending. Furthermore, only 14% of hospitalized patients saw their primary care provider during the hospitalization,¹⁰ suggesting that most patients do not have access to their primary care physician in the hospital.

Our objective was to evaluate the role of the hospitalist physicians in outcomes (readmissions, discharge to community, and mortality) and Medicare spending for patients receiving post-acute care in SNFs. Empirically, we used hospital fixed effects to estimate the difference in outcomes between patients under the care of hospitalists vs. non-hospitalists within each hospital to account for heterogeneity across hospitals in the use of hospitalists and SNFs.

METHODS

Data Sources and Study Sample

We used Medicare claims data from January 2011 to December 2014. The 100% Medicare Provider Analysis and Review (MedPAR) data was used to identify all acute care hospital stays and SNF stays during the study period, and measure rehospitalizations and some of the risk-adjustment variables. The Medicare Beneficiary Summary file was used to determine beneficiary Medicare enrollment and mortality. The 100% Medicare Carrier File (i.e., Part B claim file) for patients in the cohort was used to determine attending physician during the hospitalization. These data were supplemented with the Minimum Data Set (MDS), containing detailed clinical assessments on all SNF patients, which was used to measure

successful discharge to community and for risk-adjustment. The MD-PPAS dataset was used to identify hospitalist physicians, which are defined by CMS as physicians in generalist specialties with at least 90% of claims for inpatient hospital care.¹¹

We used these data to create a cohort of Medicare fee-for-service beneficiaries admitted to a SNF within 3 days of hospital discharge. Beneficiaries under 66 years of age, admitted to a hospital that did not use either hospitalist or non-hospitalist physicians, and not enrolled in Medicare Parts A and B for the duration of the study were excluded. To calculate risk-adjustment variables, individuals without continuous enrollment in Medicare Part A for 1 year prior to the hospitalization were excluded. Our main analyses excluded surgical stays (medical vs. surgical stays were identified based on the primary diagnosis-related group (DRG) for the hospitalization).¹²

Attending Clinician Attribution

For each beneficiary in the cohort, we identified physician claims with service codes for acute hospital care (Online Appendix Table 1) that occurred between the admission and discharge dates. Hospital stays that included transfers between hospitals (0.4%) were excluded because we were unable to definitively link physicians to the hospital where care took place.

To classify patients as being under the care of an attending physician who is a hospitalist vs. non-hospitalist, we first counted the number of hospitalization days with any visits billed by each physician specialty. The specialty with the plurality of hospital days was considered the attending specialty for that stay. The stay was considered a hospitalist stay if hospitalist physicians submitted the plurality of claims in the attending specialty for that stay. If the plurality of claims submitted by physicians in the attending specialty for that stay was submitted by non-hospitalists, then the stay was a non-hospitalist stay. This approach was designed to allow for cross-coverage between different physicians during a patient's hospital stay. We also used a second approach that assigned patients to a specific physician rather than a specialty. This approach identified the physician who submitted claims for the plurality of hospital days during the stay as the attending physician. The stay was considered a hospitalist stay if the attending physician was a hospitalist, and non-hospitalist if the attending physician was a non-hospitalist. In both approaches, stays where the plurality of the stay was under subspecialty care (e.g., prolonged intensive care unit stay) were excluded (19.3%) because hospitalist designation in the MD-PPAS dataset was limited to physicians in generalist specialties only.¹¹

Study Outcomes and Other Variables

Our primary outcome was a 30-day rehospitalization, defined as any unplanned readmission to an acute care hospital within

30 days of SNF admission (or readmission).¹³ We included three secondary outcomes. Thirty-day mortality was measured if the death date occurred within 30 days after hospital discharge. Successful discharge to community was defined as a discharge within 100 days of SNF admission where the discharge destination was “community” (e.g., private home or assisted living facility) and the patient remained alive and not readmitted to a hospital or SNF for at least 30 days.¹³ Medicare payments were measured as the sum of all facility and professional payments by Medicare Parts A and B (including hospital, SNF, and physician payments) during the 60 days from hospital admission. Payments for stays that extended beyond the 60-day episode were prorated by the fraction of length of stay that occurred during the 60-day episode.

All outcomes were adjusted for demographics (age, sex, and race), Elixhauser comorbidities,¹⁴ and two sets of clinical variables used by CMS for the Nursing Home Compare clinical measure risk-adjustment (Online Appendix Table 2).¹³ These included two sets of MDS-derived variables (from the earliest assessment completed up to 14 days after admission): 55 variables for the 30-day rehospitalization, mortality, and payment measures (e.g., clinical conditions, treatments, and diagnoses) and 84 variables for the successful discharge to community measure (e.g., functional status,¹⁵ cognitive function,¹⁶ and social factors such as marital status).^{13, 17} Following the CMS methodology for the successful discharge to community measure, we included the 66 Resource Utilization Groups (RUG IV) used by CMS to determine care needs and prospective payment rates to SNFs.^{13, 18, 19} These variables were supplemented with variables from MedPAR claims (e.g., principal diagnosis group).¹³

Statistical Analysis

Analyses were conducted at the hospital-stay level. Using linear probability models, outcomes were modeled as a function of whether the attending physician(s) was a hospitalist or not, patient covariates, year, and hospital fixed effects. By including hospital fixed effects, we estimated the average difference in outcomes between patients under the care of hospitalists vs. non-hospitalists *within each hospital*, using each hospital as a control for itself. It also adjusts for time-invariant heterogeneity across hospitals. Adjusted patient outcomes for hospitalists and non-hospitalists were estimated using the average adjusted predictions (margins command in Stata).²⁰ The Huber White sandwich estimator was used in all regressions to account for clustering of observations within hospitals.²¹

Additional Analyses

We conducted a number of additional analyses. First, we repeated the analyses using hospital-SNF pair fixed effects as SNF choice may not be under the control of hospitalists, but is determined by the hospital discharge management staff at the time of discharge. By including hospital-SNF pair fixed effects, we measured the average effect of hospitalist vs. non-

hospitalist attending(s) for patients admitted to the same hospital and discharged to the same SNF. Thus, if SNF selection were driving our findings, then we would expect the association between hospitalists and our outcomes to be attenuated with hospital-SNF pair fixed effects. Second, we recalculated the estimates using all hospital stays (for both medical and surgical conditions). Third, we recalculated 60-day payments for the acute and post-acute care components separately. Fourth, we performed sensitivity analyses using the Charlson Comorbidity Index variables¹³ instead of Elixhauser.

To account for multiple comparisons, we considered *p* value of less than 0.01 to be statistically significant. Statistical analyses were performed using Stata, version 14.1. The study was approved by the University of Pennsylvania Institutional Review Board and the CMS privacy board.

RESULTS

Our study included 2,839,779 hospital stays from 4664 hospitals: 72.0% were medical and 28.0% surgical. Sixty-six percent of the patients were female, 88.1% white, and 20.9% were dually eligible for Medicare and Medicaid (Table 1). Characteristics of hospitalists' (*n* = 1,033,860) and non-hospitalists' (*n* = 1,805,919) stays were similar (Table 2). Considering all physician visits during a hospital stay, 27.5% had a mix of hospitalist and non-hospitalist, 19.0% had only hospitalist, and 53.6% had only non-hospitalist visits.

Patient Outcomes

Patients under the care of hospitalists during the hospital stay were slightly more likely to be rehospitalized during 30 days after SNF admission (Table 3). The differences in 30-day mortality and successful discharge to the community were not statistically significant. The differences in outcomes were small and were not sensitive to the alternative classifications of hospitalist stays.

Using the approach that allowed for cross-coverage between different physicians within the same specialty during a hospital stay, hospitalists' patients were slightly more likely to be rehospitalized (17.59% vs. 17.31%; adjusted difference, 0.28%; 95% CI, 0.13 to 0.44). When hospitalist stays were defined based on a single attending physician, the 30-day rehospitalization rate was 0.23% higher (95% CI, 0.08 to 0.38) (Table 3). There was a trend toward lower mortality in the hospitalist group which was not statistically significant using the approach that allowed for cross-coverage (8.08% for hospitalists' vs. 8.20% for non-hospitalists' stays; adjusted difference, -0.12; 95% CI, -0.22 to -0.02). For single attending physician approach, 30-day mortality was lower for hospitalists' stays (7.95% vs. 8.12% for non-hospitalists'; adjusted difference, -0.17%; 95% CI, -0.28 to -0.07) (Table 3.) Successful discharge to community was not statistically significantly different for the two groups (allowing for cross-coverage: 49.53% for hospitalists' vs. 49.79% for non-

Table 1 Hospital Stay Characteristics

	All stays (<i>n</i> = 2,839,779)		Medical stays (<i>n</i> = 2,044,355)		Non-medical stays (<i>n</i> = 795,424)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Patient age categories, years						
66–70	260,962	9.19	160,310	7.84	100,652	12.65
71–75	352,886	12.43	226,824	11.10	126,062	15.85
76–80	481,910	16.97	327,226	16.01	154,684	19.45
81–85	640,176	22.54	463,648	22.68	176,528	22.19
86–90	644,626	22.70	496,612	24.29	148,014	18.61
Greater than 90	459,219	16.17	369,735	18.09	89,484	11.25
Gender						
Male	963,403	33.93	713,365	34.89	250,038	31.43
Female	1,876,376	66.07	1,330,990	65.11	545,386	68.57
Race						
White	2,500,617	88.06	1,785,125	87.32	715,492	89.95
Black	233,722	8.23	182,618	8.93	51,104	6.42
Other	105,440	3.71	76,612	3.75	28,828	3.62
Dual eligibility for Medicare and Medicaid*	593,445	20.90	480,816	23.52	112,629	14.16

*At hospital discharge

hospitalists' stays; adjusted difference, -0.26 ; 95% CI, -0.48 to -0.04 ; for single attending physician approach: 49.76% for hospitalists' vs. 49.94% for non-hospitalists' stays; adjusted difference, -0.18% ; 95% CI, -0.41 to 0.04) (Table 3). Patients under the care of hospitalists had slightly higher total 60-day Medicare payments (\$305 higher for hospitalist stays (95% CI, \$243 to \$367) allowing for cross-coverage; and \$252 higher (95% CI, \$193 to \$311), using a single attending physician to categorize the stays) (Table 3).

Sensitivity Analyses

Additional analyses among patients treated within the same hospital-SNF pairs also found similar small differences between hospitalists' vs. non-hospitalists' stays (Online Appendix Table 3). Allowing for cross-coverage between different physicians within a specialty, hospitalists' patients were more likely to be rehospitalized (adjusted difference, 0.30%; 95% CI, 0.15 to 0.44) and had higher 60-day Medicare payments (adjusted difference, \$291; 95% CI, \$242 to \$341).

When hospitalist stays were defined based on a single attending physician, the differences were similar (for readmissions, 0.25%; 95% CI, 0.10 to 0.40; and for 60-day payments, \$227; 95% CI, \$178 to \$277). Sensitivity analyses that included all stays were generally consistent with the main results, albeit the differences between hospitalist and non-hospitalist stays were smaller (Online Appendix Table 4). The initial acute hospital stay accounted for about a third of the difference in payments between 60-day episodes of care following hospitalists' and non-hospitalists' stays (Online Appendix Table 5). Sensitivity analyses using the Charlson Comorbidity Index instead of Elixhauser Comorbidity Index variables were generally consistent with the main results (Online Appendix Table 6).

DISCUSSION

Among Medicare fee-for-service beneficiaries discharged to a SNF, those under the care of hospitalists during their hospital stays had slightly higher readmissions and Medicare costs

Table 2 Characteristics of Hospital Stays under the Care of Hospitalists vs. Non-Hospitalists

Patient characteristics	Stays under the care of hospitalists (<i>n</i> = 1,033,860)			Stays under the care of non-hospitalists (<i>n</i> = 1,805,919)		
	All stays	Medical	Non-medical	All stays	Medical	Non-medical
Age, mean (SD)	82.12 (7.95)	82.97 (7.83)	80.68 (7.90)	82.05 (7.96)	83.21 (7.84)	80.67 (7.90)
Race, %						
White	88.09	87.33	89.98	87.50	87.31	89.93
Black	8.23	8.97	6.39	8.63	8.91	6.45
Other	3.68	3.70	3.63	3.87	3.77	3.62
Female, %	64.64	65.58	68.24	65.94	65.40	68.76
Elixhauser Index, mean (SD)	9.90 (10.27)	10.66 (10.64)	8.06 (10.30)	9.12 (10.21)	9.84 (9.98)	6.97 (10.05)
Charlson Comorbidity Index, mean (SD)	3.05 (2.55)	3.20 (2.49)	2.44 (2.46)	2.98 (2.51)	3.18 (2.48)	2.37 (2.44)
Hospital LOS, mean (SD)	7.46 (5.14)	7.16 (4.54)	8.17 (6.32)	7.78 (5.62)	6.94 (4.20)	8.01 (6.31)
Late loss ADLs*, mean (SD)	8.45 (4.04)	8.39 (4.06)	8.61 (4.01)	8.37 (4.11)	8.47 (4.12)	8.49 (4.07)
Cognitive Function, %						
Cognitively intact	50.58	46.13	61.53	51.25	44.26	62.43
Mildly impaired	25.17	26.73	21.37	24.68	26.54	20.56
Moderately impaired	19.67	21.88	14.23	19.29	23.27	14.03
Severely impaired	4.58	5.26	2.88	4.78	5.93	2.98

*Late loss ADLs refer to dependence in bed mobility, transfer, eating, and toileting

Table 3 Main Models: Comparison of Outcomes of Hospital Stays for Hospitalists vs. Non-Hospitalist Physicians for Medical Stays

	Stays under the care of hospitalists (95% CI)	Stays under the care of non-hospitalists (95% CI)	Difference (95% CI)	p value
Cross-coverage approach: allowing for switches between different physicians within the same specialty over the course of hospital stay				
30-day readmissions, %	17.59 (17.50–17.68)	17.31 (17.25–17.37)	0.28 (0.13–0.44)	< 0.001
30-day mortality, %	8.08 (8.02–8.14)	8.20 (8.16–8.24)	–0.12 (–0.22 to –0.02)	0.02
Discharge to community, %	49.53 (49.39–49.66)	49.79 (49.70–49.87)	–0.26 (–0.48 to –0.04)	0.02
60-day Medicare payments, \$	26,301 (26262–26,340)	25,996 (25973–26,019)	305 (243–367)	< 0.001
Attending physician approach: assigning a single attending physician based on plurality of claims				
30-day readmissions, %	17.32 (17.23–17.41)	17.09 (17.03–17.15)	0.23 (0.08–0.38)	0.003
30-day mortality, %	7.95 (7.88–8.01)	8.12 (8.08–8.16)	–0.17 (–0.28 to –0.07)	0.001
Discharge to community, %	49.76 (49.62–49.90)	49.94 (49.85–50.03)	–0.18 (–0.41 to 0.04)	0.11
60-day Medicare payments, \$	26,054 (26017–26,091)	25,802 (25780–25,824)	252 (193–311)	< 0.001

compared with patients of non-hospitalists. The differences were small and may be driven by unobserved imbalance in patient case mix (e.g., hospitalists treating higher risk patients). However, 30-day mortality rates were slightly lower in the hospitalist group. These findings suggest caution regarding strategies that aim to reduce utilization or spending on post-acute care by concentrating the care of hospitalized patients under hospitalists.

These findings contrast some prior studies²² that did not account for heterogeneity between facilities. For instance, if hospitals with a greater proportion of patients under the care of hospitalists also discharge patients to higher (or lower) quality SNFs, the association between hospitalists and post-acute outcomes would be confounded by the hospitals' use of higher (or lower) quality SNFs. Including hospital fixed effects allowed us to compare outcomes for patients under the care of hospitalists vs. non-hospitalists within the same hospital. Although this approach effectively excludes hospitals that use only one type of physician, over three-quarters of U.S. hospitals have hospitalist programs.²³

Value-based payment reforms, such as bundled payments and accountable care organizations, rely on the notion that coordination during care transitions improves patient outcomes and reduces spending.^{24–26} Physician specialization in setting-based care (e.g., acute hospital, nursing home) could improve outcomes by matching expert physicians to patients whose conditions are typically treated in these facilities. However, it is unclear whether the observed growth in hospital medicine^{23, 27} is the result of such matching or the consequence of other forces that may lead to increased fragmentation of care delivery and worse outcomes. In fact, a 2013 study found that hospitalists had higher 7- and 30-day readmission rates compared with primary care physicians.¹⁰ We did not specifically compare the outcomes of hospitalists' patients with those of primary care physicians' patients discharged to SNFs. We reasoned that the use of primary care physicians with prior knowledge of the patient as the hospital attending is not a viable staffing strategy for most hospitals.

Although prior research found that physician demographics such as age and gender can affect patient outcomes,^{28, 29} we did not isolate the effect of those characteristics from other aspects of an attending physician. For instance, since hospital medicine is a relatively young specialty, and hospitalists are

more likely to be younger compared with non-hospitalists, the differences in age may explain the findings. However, from the perspective of policy or practice re-design, physician demographics are an intrinsic trait hard to separate from other characteristics that make hospitalists who they are.

Hospitals and health systems transitioning to value-based payment are increasingly at risk for long-term patient outcomes and spending. Our findings are consistent with studies that found higher utilization and costs for hospitalists' patients in the 30 days after discharge.³⁰ However, we also observed a trend toward lower mortality in the hospitalist group, suggesting that there might be a trade off between utilization and short-term survival. Nevertheless, the differences were small and may have been due to different coding practices or patient preferences. Future research should evaluate the role of advance care planning by hospitalists and non-hospitalists in utilization and patient outcomes after discharge.

Limitations

This study has limitations. First, observational retrospective design limits inferences regarding causality. Despite risk-adjustment for many observed differences, there might be patient selection between hospitalists and non-hospitalists that is difficult to mitigate retrospectively. In fact, a 2013 study found that non-hospitalists were more likely to discharge patients home (vs. SNF).¹⁰ The decision regarding discharge destination involves consideration of numerous factors which are not readily available in secondary data. Future prospective studies to understand the role of discharge planning in post-acute care outcomes are needed. Second, we used data through 2014 which may not reflect current care practices of a relatively young specialty. Third, because we used the earliest SNF assessment completed up to 14 days after admission, there may be some temporal confounding. However, 98% of the assessments used in our study were completed within 7 days of admission. Fourth, we did not evaluate post-acute care outside of SNFs (e.g., inpatient rehabilitation facilities). While SNFs represent the most commonly used facility type, future studies should evaluate outcomes across all settings. Lastly, a considerable proportion of patients was treated by a mix of hospitalists and non-hospitalists, which may have diluted the differences.

CONCLUSIONS

After accounting for patient case mix and heterogeneity across hospitals, readmissions and spending for patients discharged to SNFs were slightly higher for hospitalists' compared with those for non-hospitalists' patients. There was a non-significant trend toward lower short-term mortality for hospitalists' patients. The findings suggest caution regarding expanding hospitalist services as a strategy to improve post-acute care outcomes while controlling utilization and spending.

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Compliance with Ethical Standards:

The study was approved by the University of Pennsylvania Institutional Review Board and the CMS privacy board.

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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