Comparing Hospitalist-Resident to Hospitalist-Midlevel Practitioner Team Performance on Length of Stay and Direct Patient Care Cost

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Abstract

Background A perception exists that residents are more costly than midlevel providers (MLPs). Since graduate medical education (GME) funding is a key issue for teaching programs, hospitals should conduct cost-benefit analyses when considering staffing models.

Objective Our aim was to compare direct patient care costs and length of stay (LOS) between resident and MLP inpatient teams.

Methods We queried the University HealthSystems Consortium clinical database (UHC CDB) for 13 553 "inpatient" discharges at our institution from July 2010 to June 2013. Patient assignment was based on bed availability rather than "educational value." Using the UHC CDB data, discharges for resident and MLP inpatient teams were compared for observed and expected LOS, direct cost derived from hospital charges, relative expected mortality (REM), and readmissions. We also

compared patient satisfaction for physician domain questions using Press Ganey data. Bivariate analysis was performed for factors associated with differences between the 2 services using χ^2 analysis and Student t test for categorical and continuous variables, respectively.

Results During the 3-year period, while REM was higher on the hospitalist-resident services ($P < .001$), LOS was shorter by 1.26 days, and per-patient direct costs derived from hospital charges were lower by $617. Patient satisfaction scores for the physician-selected questions were higher for resident teams. There were no differences in patient demographics, daily discharge rates, readmissions, or deaths.

Conclusions Resident teams are economically more efficient than MLP teams and have higher patient satisfaction. The findings offer guidance when considering GME costs and inpatient staffing models.

Introduction

Federal and state governments, through Medicare and Medicaid, provide nearly $20 billion annually to support graduate medical education (GME).[1] The need for this funding is being debated, as some question the need to subsidize resident education while others argue support is needed.[2,3] The Institute of Medicine has recommended

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changes over the next decade that align GME funding with outcomes and performance.[4] A perception also exists that, despite receiving lower compensation than alternatives, such as attendings or midlevel practitioners (MLPs), residents are a financial burden to hospitals through inefficiency, increased use of ancillary services, and greater use of drugs and medical supplies.[5] Because efficient patient care teams are paramount to hospital finances, we compared hospitalist-resident and hospitalist-MLP inpatient teams on direct patient care costs and length of stay (LOS) using the University HealthSystems Consortium clinical database (UHC CDB). The UHC CDB data are derived from an alliance of 120 academic medical centers and 299 affiliate hospitals, and facilitate comparisons. We also assessed patient satisfaction for both types of teams.

Methods

We abstracted Upstate Medical University Department of Medicine's administrative discharge data during the 3-year period from July 2010 to June 2013 from the UHC CDB. Because UHC does not apply risk modeling for patients

admitted under "observation" status, only "inpatient" discharges were included in the analysis.

We evaluated 13 650 "inpatient" discharges. Of these, 107 were excluded because of incomplete financial data, resulting in a final sample size of 13 553. Discharges were classified as covered (hospitalist with residents) or uncovered (hospitalist with MLPs). The primary determinant of team assignment was bed availability to promote team geography, rather than patients' "educational value." Hospitalist-resident teams were composed of 1 hospitalist, 1 senior resident, 2 interns, and students (1 to 2 clerkship students and, at times, a medical student acting intern). Teams had a "hard" patient cap of 20. Overnight coverage was provided by a core group of nocturnal residents (2 seniors, 2 interns), with supervision via an in-house nocturnal hospitalist. Hospitalist-MLP teams were made up of 1 hospitalist, 1 MLP, and, at times, a medical student acting as the intern. These teams had a "soft" cap of 16 (which could be exceeded if required by the hospital census). Overnight coverage for all uncovered teams was provided by the same nocturnal hospitalist. The MLP worked an average of 50 hours weekly with weekends off. Hospitalists rotated on both service types and had no other clinical responsibilities while on service. During the study period, we operated 5 covered services and 3 uncovered services.

Data were analyzed for direct patient care costs and LOS on patients discharged from the medicine services. The observed direct cost for each discharge was obtained from the UHC CDB, which was derived from hospital charges. For each hospital-reported line item charge, the unadjusted direct cost was determined using ratios of cost to charge according to revenue code assigned to that item. The observed direct cost was derived by adjusting for wage index applied to the labor portion of the cost. Observed direct patient care costs and observed LOS were compared with expected patient care costs and expected LOS, as determined by UHC risk adjustment models.[6] UHC does not perform the same analysis for indirect or total costs, so we limited our analysis to direct costs. Differences (O − E) and ratios (O / E) between observed and expected values were calculated for each end point. We obtained relative expected mortality (REM) from the UHC CDB, which provides a qualitative description of the patient's percentage expected mortality, in comparison with other patients in the same base Medicare severity-diagnosis related group or model group.

We also evaluated the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) and the Press Ganey physician performance survey domains for covered and uncovered patients. HCAHPS scores were evaluated based on Centers for Medicare & Medicaid Services (CMS) funding requirements of "top box" scores, with only "always" responses receiving credit. Press Ganey

What was known and gap

There is limited knowledge about the impact of residents on hospitalist teams on the cost of care, and hospitals lack data to select among alternative staffing models.

What is new

Length of stay was shorter, and per-patient direct costs from hospital charges were lower on the hospitalist-resident teams compared to hospitalist–midlevel practitioner (MLP) teams.

Limitations

Single institution, single specialty study limits generalizability.

Bottom line

Hospitalist-resident teams are more economically efficient and have higher patient satisfaction than hospitalist-MLP teams.

scores were on a Likert scale and were converted into normalized values (−1 for unfavorable responses, 0 for neutral, and 1 for positive responses).

The study was declared exempt by our Institutional Review Board.

Bivariate analysis was performed for factors associated with differences between the 2 service types using χ^2 analysis and Student t test for categorical and continuous variables, respectively. Differences between services in O − E and O / E for direct patient care costs and LOS were assessed using Student t test. Factors with 2-tailed P value < .05 were considered statistically significant. All analyses were performed using SPSS version 20.0 (IBM Corp).

Results

T A B L E 1 provides data on demographics, discharge type, REM, in-hospital deaths, and 30-day readmissions. There was no significant difference in age, sex, or self-identified race between covered and uncovered discharges. Covered discharges included a greater proportion of home discharges, despite caring for patients with higher REM and longer critical care requirements. There was no difference in the average number of discharges per day, per service type (covered 1.53 versus uncovered 1.57). In-hospital deaths and 30-day readmission rates were similar between the 2 service types.

Although observed direct costs per hospital discharge for both service types were greater than anticipated, the expected direct costs per hospital discharge were significantly higher for covered compared to uncovered services (T A B L E 2). The observed minus expected direct costs averaged $617 less for a covered discharge than for an uncovered discharge (P = .02).

Observed LOS was greater than expected for covered and uncovered discharges, and expected LOS

TABLE 1	COMPARISON OF DEMOGRAPHICS, DISCHARGE TYPE, RELATIVE EXPECTED MORTALITY (REM), IN-HOSPITAL DEATHS, AND 30-DAY READMISSIONS BETWEEN COVERED AND UNCOVERED SERVICES			
	Total	**Covered**	**Uncovered**	**P Value**
N	13 553	8392	5161	
Age, y (mean ± SD)	59.3 (19.2)	59.2 (18.9)	59.5 (19.7)	.89
Race, No. (%)				.21
White	10 098 (74.5)	6221 (74.1)	3877 (75.1)	
Black	2488 (18.4)	1548 (18.4)	940 (18.2)	
Other	967 (7.1)	623 (7.4)	344 (6.7)	
Sex, No. (%)				.92
Male	6539 (48.2)	4046 (48.2)	2493 (48.3)	
Female	7014 (51.8)	4346 (51.8)	2668 (51.7)	
Payer, No. (%)				.29
Private	2034 (15.0)	1276 (15.2)	758 (14.7)	
Medicaid	3615 (26.7)	2194 (26.1)	1421 (27.5)	
Medicare	7441 (54.9)	4627 (55.1)	2814 (54.5)	
Other	463 (3.4)	295 (3.5)	168 (3.2)	
Discharge type, No. (%)				< .001
Home	6924 (51.1)	4454 (53.1)	2470 (47.9)	
Home health care	2668 (19.7)	1704 (20.3)	964 (18.9)	
Facility	2946 (21.7)	1675 (20.0)	1271 (24.6)	
Other	714 (5.3)	378 (4.5)	337 (6.5)	
Expired	300 (2.2)	181 (2.2)	119 (2.3)	
REM, No. (%)				< .001
Extreme	1414 (10.4)	1024 (12.2)	390 (7.6)	
Major	5966 (44.0)	3787 (45.1)	2179 (42.2)	
Moderate	4739 (35.0)	2779 (33.1)	1960 (38.0)	
Minor	1434 (10.6)	802 (9.6)	632 (12.2)	
In-Hospital Deaths, No. (%)	300 (2.2)	181 (2.2)	119 (2.3)	.60
Readmissions, No. (%)	1142 (8.4)	737 (8.8)	405 (7.8)	.07

was significantly higher for covered discharges, resulting in a smaller difference and decreased ratio between observed and expected LOS for covered discharges compared to discharges by hospitalist-MLP teams (TABLE 3). Hospitalist-resident teams saved 1.26 days per patient.

Compensation (salaries and benefits) for the 3-year study period for MLPs resulted in a cost of $195 per discharge; resident stipends and benefits resulted in a $173 cost per discharge. Additional resident noncompensation expenses (including funding for the program director, associate program directors, and support staff; resident

recruitment expenses; and educational costs, such as simulation training, in-service examinations, scientific meetings, and social events) during the same time period were $140,040 for the 15 residents ($9,336 per resident), or $16.57 per case. The $9,336 per resident is within the range reported by Kelly et al,[7] in which noncompensation costs, termed ''hidden costs,'' for a 2006 sample of 8 core Accreditation Council for Graduate Medical Education residency programs comprising 461 trainees at 1 academic medical center, were estimated to be $1,500 to $9,417, with an average of $4,439 per resident. The combined stipend

TABLE 2	COMPARISON OF DIRECT COSTS BETWEEN COVERED AND UNCOVERED SERVICES		
	Covered (n = 8392)	Uncovered (n = 5161)	P Value
Direct cost observed[a]	$9,839 (±$16,126)	$9,667 (±$18,877)	.57
Direct cost expected[b]	$8,392	$7,603	< .001
Observed − expected	$1,447 (±$13,302)	$2,064 (±$15,882)	.02
Observed / expected	1.15 (±1.23)	1.20 (±1.49)	.03

[a] Observed: Upstate Medical University.
[b] Expected: University HealthSystems Consortium clinical database.

and noncompensation costs for residents were $189.57 ($173 + $16.57) per discharge, less than the $195 for the hospitalist-MLP team.

We compared patient satisfaction scores for covered and uncovered discharges using HCAHPS and the Press Ganey physician-related questions (TABLES 4 and 5). Percentage survey response was statistically higher for patients discharged by hospitalist-resident teams (6.7% versus 5.6%). The covered team had statistically higher scores on physician-related HCAHPS questions, and a Press Ganey question regarding physician time spent with patient.

Discussion

Using the UHC CDB and risk models, we found that hospitalist-resident teams had lower patient care costs and LOS than hospitalist-MLP teams, with no difference in mortality and readmission rates. For the 8392 covered discharges during the study period, the lower cost of $617 per discharge would result in a savings of nearly $5.2 million. Even after adjusting for additional resident noncompensation costs, the savings would remain substantial. We estimated that reducing LOS by 1 day per patient reduced cost by approximately $1,050 per patient; and the 1.26 LOS reduction found in our study represents an estimated decrease in costs of $1,323 per discharge, or

approximately $11 million in savings during the study period. Our analysis suggests an annual savings of more than $5 million could be achieved at our institution by replacing our MLP teams with resident teams.

We also found that resident teams had a higher patient satisfaction score for the physician-related questions. Since the CMS began withholding payments to hospitals in October 2012, resident-associated higher patient satisfaction could have resulted in greater savings.

Few studies have discussed the cost of replacing residents with MLPs. A time and motion study of internal medicine residents found that only about half of the work performed by residents could be replaced by MLPs.[8] Previous reports that have compared outcomes between residents and MLPs found no differences in mortality, adverse events, readmissions, and patient satisfaction between MLP-associated (specifically, physician assistant) and resident-associated hospitalist services.[9,10]

We also found statistically higher physician-related HCAHPS scores and "physician time with patient" Press Ganey scores for patients on covered services. Neither survey, however, is specific to provider type, with HCAHPS referring to "the doctors" (which could be one or a combination of attending, resident, MLP, or student) and Press Ganey using "the physician" (again, open to interpretation). Resident involvement in care may have an

TABLE 3	COMPARISON OF LENGTH OF STAY (LOS) BETWEEN COVERED AND UNCOVERED SERVICES		
	Covered (n = 8392)	Uncovered (n = 5161)	P Value
LOS observed[a]	6.88 (±9.37)	7.84 (±14.49)	< .001
LOS expected[b]	5.58 (±3.85)	5.28 (±3.76)	< .001
Observed − expected	1.30 (±8.16)	2.56 (±13.4)	< .001
Observed / expected	1.23 (±1.32)	1.43 (±2.06)	< .001

[a] Observed: Upstate Medical University.
[b] Expected: University HealthSystems Consortium Clinical Database.

| T A B L E 4 | ODDS RATIOS BETWEEN HOSPITAL CONSUMER ASSESSMENT OF HEALTHCARE PROVIDERS AND SYSTEMS (HCAHPS) COVERED AND UNCOVERED SATISFACTION SCORES |

HCAHPS Survey	OR (95% CI)	P Value
CMS 6 (n = 603)[a]	1.61 (1.13–2.30)	.008
CMS 7 (n = 605)[b]	1.72 (1.23–2.42)	.002
CMS 8 (n = 606)[c]	1.60 (1.14–2.25)	.006

[a] CMS 6: During this hospital stay, how often did doctors treat you with courtesy and respect?
[b] CMS 7: During this hospital stay, how often did doctors listen carefully to you?
[c] CMS 8: During this hospital stay, how often did doctors explain things in a way you could understand?

| T A B L E 5 | COMPARISON OF COVERED AND UNCOVERED PRESS GANEY SATISFACTION SCORES |

Press Ganey Survey	Mean Likert Score: Covered (SD)	Mean Likert Score: Uncovered (SD)	P Value
P 1 (n = 823)[a]	0.72 (0.59)	0.61 (0.64)	.02
P 2 (n = 814)[b]	0.77 (0.55)	0.70 (0.60)	.12
P 3 (n = 815)[c]	0.69 (0.62)	0.66 (0.63)	.44
P 4 (n = 822)[d]	0.84 (0.46)	0.80 (0.50)	.30
P 5 (n = 800)[e]	0.84 (0.46)	0.83 (0.47)	.73

[a] P 1: Time physician spent with you.
[b] P 2: Physician's concern for your questions and worries.
[c] P 3: How well physician kept you informed.
[d] P 4: Friendliness/courtesy of physician.
[e] P 5: Skill of physician.

impact on the perception of or actual time spent with each patient, hence why that single domain remained statistically significant in the Press Ganey survey.

Our study has several limitations. We focused only on internal medicine services, examined costs for residents on the inpatient service, and did not look at costs associated with other rotations. UHC CDB does not provide expected values for indirect or total costs, allowing us to examine only direct patient care costs. We also did not control for potential differences in medical record documentation. Documentation issues also could have accounted for our findings that observed LOS was higher than expected LOS for both types of teams. The low patient satisfaction survey response rate may limit generalizability.

Of note, we calculated the financial benefit of hospitalist-resident teams without accounting for federal support of residency education. Taking funding into account would further support the financial advantage of employing residents. When taking into account CMS-supported postgraduate positions, the cost savings of hospitalist-resident teams becomes more significant.

Conclusion

We compared direct patient care costs and LOS, finding that hospitalist-resident teams were economically more efficient than hospitalist-MLP teams. Our analysis suggested that more than $5 million in annual savings could have been achieved at our institution if the latter were replaced with the former. Our approach is worthy of consideration at other institutions, particularly as the future of GME funding is under consideration.

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