

## Inpatient Care in a Community Hospital: Comparing Length of Stay and Costs Among Teaching, Hospitalist, and Community Services

Peter J. Carek, MD, MS; Holly Boggan, MHA; Arch G. Mainous III, PhD;  
Mark E. Geesey, MS; Lori Dickerson, PharmD; Scott Laird, MHA

**Introduction:** *Specific patient care measures and cost of hospitalization are being studied as health care providers and payers are seeking methods to improve the hospital care of patients. This study's purpose was to examine the length of stay and cost of inpatient care by a family medicine teaching service in comparison with the hospitalists' and community physicians' services in the same community hospital. **Methods:** We analyzed inpatient admissions to either a family medicine teaching service (FMTS), hospitalist physician group, or the patient's own primary care community physician in a 290-bed, for-profit, community hospital over a 12-month period. Outcome variables investigated included length of stay, fixed costs, variable costs, and readmission rate. **Results:** A total of 5,453 hospital admissions were analyzed. Patients admitted to the FMTS experienced a significantly shorter length of stay and had significantly lower fixed, variable, and total costs per admission. No significant differences in readmission rates were noted. **Conclusions:** The care provided by a teaching service as indicated by length of stay, costs, and readmission rates compared favorably with the care provided by other physicians.*

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The care of patients hospitalized in acute care hospitals has been extensively reviewed as a result of mounting economic pressures, increasing problems with patient flow in hospitals, increasing focus on patient safety, implementing quality improvement initiatives, and implementing of government interventions. Specific quality of care indicators, such as length of stay and readmission rates as well as overall cost of hospitalization, have also been studied as health care providers and payers seek policies to improve these measures of quality while controlling the cost of care.

The practice arrangement of physicians caring for hospitalized patients may influence the care provided. Several studies have examined the outcomes of hospitalized patients cared for by family physicians or internists and found no significant differences between the two specialties.<sup>1-3</sup> Other studies have supported the

findings that hospitalists have shorter lengths of stays and lower costs per patient compared to inpatient teaching services and community physicians.<sup>5-11</sup>

In general, however, studies reviewing length of stay and costs by physician specialty or service have provided inconsistent results. On the one hand, some studies have found that the implementation of hospitalist programs are associated with significant reductions in hospital costs (average decrease, 13.4%) and average length of stay (average decrease, 16.6%).<sup>12</sup> In such studies, patients managed by hospitalists had shorter lengths of stay and lower costs overall but had higher costs per day than patients managed by non-hospitalists in a study of a general medicine service at an academic teaching hospital.<sup>13</sup> Similarly, a voluntary hospitalist service at a community-based teaching hospital produced significant reductions in length of stay and hospital costs.<sup>14</sup> Patients cared for by an academic hospitalists' service that included actively participating medical residents had lower lengths of stay, total costs, and consultation rates than patients receiving routine private care.<sup>15</sup> Patients admitted to academic hospital-

ists had a shorter length of stay compared with private hospitalists, while having similar variable costs per admission and no significant differences in mortality and readmission rates.<sup>16</sup>

In contrast, Smith<sup>17</sup> noted that adult patients admitted for pneumonia to the care of family medicine primary care physicians had lower mean charges and shorter lengths of stay than similar patients admitted to critical care hospitalists and rotating residency faculty family physician hospitalists. No significant differences in primary or secondary outcomes were found. In another study, no statistically significant differences in total charges, including laboratory and radiology, direct costs, length of stay, or mortality rates between a family practice residency teaching service and a hospitalist team were noted.<sup>18</sup>

This study's purpose was to further examine the length of stay, readmission rates, and costs of inpatient care provided by a family medicine teaching service in comparison with the hospitalists and community physicians in the same community hospital.

## Methods

### Setting

The inpatient admissions to a 290-bed, for-profit, community hospital located in a moderate-sized Southeastern city were used for analysis. This hospital served as the sponsoring institution for an accredited family medicine residency program and had an open intensive care unit during the study period. This study was approved as exempt research by the Institutional Review Board at the Medical University of South Carolina and the Trident Medical Center.

### Subjects

A retrospective cohort study was conducted and examined non-pregnant patients ages 18 years or older admitted to one of three inpatient services (described below) during a 12-month period. To eliminate the effects of unusual outliers (patients with long hospital stays or with frequent hospitalizations), all admissions with a length of stay of 60 days or more were eliminated from the analyses, and only new admissions for each patient were included. Readmissions for any reason within 30 days of a discharge were used to calculate readmission rates but were excluded from other analyses. Readmissions more than 30 days after the previous discharge were considered as a new admission and were included in analyses.

### Hospital Core Groups

Patients were admitted to one of three types of inpatient care service: the family medicine teaching service (FMTS), the community hospitalist physician group (CHPG), or the service of their primary care community physician (PCCP).

The FMTS consisted of a family medicine faculty physician, a third-year family medicine resident, and three first-year family medicine residents. The faculty physicians (n=13) provided attending supervision for 1 to 2 weeks on a rotating basis. The residents were assigned to the inpatient service for a 1-month rotation. This inpatient service admitted patients from their continuity practice as well as patients requiring hospitalization from several local family medicine practices. On a predetermined rotating basis with the CHPG, the FMTS also admitted patients designated as unassigned, indicating that they did not have or identify a primary care physician of record. These patients were initially evaluated in the emergency room and determined to require hospitalization by the attending emergency room physician.

The CHPG consisted of 12 board-certified internal medicine and two family physicians. These physicians were recruited and hired to provide inpatient care only. The CHPG admitted patients from the practice group as well as from other local primary care physicians and unassigned patients as previously described.

The 52-person PCCP admitted their own patients and those of partners in their practice. They did not admit unassigned patients. This group of physicians self-identified themselves as either family physicians or internal medicine physicians.

Each service, regardless of physician specialty, admitted patients to the same hospital floors and used the same nursing staff and other hospital personnel as each of the other services. The teams provided care in the following settings: intensive care unit, close observation unit, and general adult floor. The admitting attending physician determined the level of care and setting for each individual patient.

### Variables

Outcome variables investigated for this study included length of stay, fixed costs, variable costs, and whether a readmission occurred within 30 days of discharge. All costs were defined as fixed or variable. Fixed costs included capital, some employee salaries including office and administrative staff salaries, benefits, building maintenance, and utilities. Variable costs included health care worker salaries, employee supplies, patient care supplies, paper, food, radiographic film, laboratory reagents, and medications with their delivery system. The classification and allocation of costs by hospital accounting followed predetermined definitions and formula.

Control variables included patient age, gender, race (white, black, other), and severity of illness (none/minor, moderate, or major/catastrophic). Severity of illness was determined with a version of the all patient refined-diagnosis related group (APR-DRG) severity scale used by the sponsoring hospital system. This soft-

were formulated patient severity scores using principal diagnosis, comorbidities, age, and procedures. For each of the three inpatient services, the 10 most common DRGs were identified.

#### Data Analysis

Descriptive statistics were used to characterize and summarize the patient data obtained based on the service to which they were admitted: FMTS, PCCP, or CHPG. The initial descriptive statistics were investigated using analysis of variance (ANOVA) and chi-square distributions. Descriptive statistics were then calculated for the subpopulation of patients with any of the most common DRGs and again for the further subpopulation of financially susceptible patients with any of these most common DRGs. Linear regression analyses of these subpopulations were performed to predict the relative impact of inpatient care service on each of the outcome variables of length of stay, fixed costs, and variable costs. Logistic regression analyses were performed to predict the relative likelihood of patient readmission based on inpatient care service. All regressions included controls for DRG and the patient characteristics of age, gender, race, and severity of

illness. Statistical significance was defined as  $P < .01$  level of confidence.

#### Results

A total of 6,416 hospital admissions were reviewed. After eliminating patients under the age of 18 (340), those with a length of stay of 60 days or more (17) and readmissions as previously described (604), the final number of records analyzed was 5,453.

The characteristics of the patients differed based upon admitting service (Table 1). Patients under the care of the PCCP were significantly older and more likely to be female and white than patients under the care of the other two groups. The FMTS cared for significantly more black patients. No significant difference in the distribution of illness severity among the three patient care services was noted.

Patients admitted to the FMTS experienced a significantly shorter length of stay and had significantly lower fixed, variable, and total costs per admission (Table 1). No difference in the readmission rate was noted between the specific services studied.

A total of 14 DRGs were identified that were common to all three services. For the regression analyses,

Table 1

Patient Demographic Data As Well As Illness Severity, Length of Stay, Cost, and Readmission Rate by Inpatient Service

	<i>Family Medicine Teaching Service</i>	<i>Hospitalists Physician Group</i>	<i>Primary Care Community Physicians</i>	<i>P Value</i>
Admissions	832	1,648	2,973	
Age: mean ( $\pm$ SD)	58.0 ( $\pm$ 18.7)	58.9 ( $\pm$ 18.7)	66.0 ( $\pm$ 16.9)	<.001*
Gender				<.001**
Male: # (%)	377 (45.3)	713 (43.3)	1,061 (35.7)	
Female: # (%)	455 (54.7)	935 (56.7)	1,912 (64.3)	
Race				<.001**
White: # (%)	520 (62.5)	1,093 (66.3)	2,216 (74.5)	
Black: # (%)	290 (34.9)	513 (31.1)	698 (23.5)	
Other: # (%)	22 (2.6)	42 (2.6)	59 (2.0)	
Illness severity:				.276**
None/minor: # (%)	234 (28.1)	448 (27.2)	859 (28.9)	
Moderate: # (%)	477 (57.3)	980 (59.5)	1,755 (59.0)	
Major/catastrophic: # (%)	121 (14.5)	220 (13.4)	359 (12.1)	
Length of stay: mean days ( $\pm$ SD)	4.6 ( $\pm$ 5.5)	5.4 ( $\pm$ 5.8)	5.7 ( $\pm$ 5.4)	<.001*
Fixed costs mean ( $\pm$ SD)	\$2,055 ( $\pm$ 2,723)	\$2,638 ( $\pm$ 3,519)	\$2,382 ( $\pm$ 2,843)	<.001*
Variable costs mean ( $\pm$ SD)	\$2,787 ( $\pm$ 4,123)	\$3,543 ( $\pm$ 5,873)	\$3,233 ( $\pm$ 4,242)	<.001*
Readmissions: # (%)	83 (10.0)	112 (6.8)	246 (8.3)	.020**

\* ANOVA

\*\* Chi square analysis

only patients with these 14 DRGs were examined and included as a control variable. The 14 most common DRGs were as follows (in order of DRG designation): intra-cranial hemorrhage or cerebral infarction (DRG 14), chronic obstructive pulmonary disease (88), simple pneumonia/pleurisy (89), heart failure and shock (127), chest pain (143), gastrointestinal hemorrhage (174), esophageal/gastrointestinal/miscellaneous (182), pancreas disorder excluding malignancy (204), nutrition and miscellaneous metabolic disorders (296), renal failure (316), kidney/urinary tract infection (320), red blood cell disorder (395), septicemia (416), and poison or toxic effects of drugs (449).

These 14 DRGs represented a total of 2,494 patients. As with the entire patient population, the patients cared for by the PCCP were significantly older and more likely to be female or white (Table 2). The FMTS patients had the lowest length of stay, fixed costs, and variable costs of the three services. The patients cared for by the FMTS were significantly less likely to have moderate illness severity. No significant difference in 30-day readmission rates for patients with these specific DRGs was noted between the service groups.

After controlling for patient age, gender, race, severity of illness, and DRG, patients admitted to the HPG or the PCCP had significantly longer length of stay, fixed costs, and variable costs than patients admitted to the FMTS ( $\beta$  coefficients  $>0$ ,  $P < .01$ ) (Table 3). The average costs (fixed and variable) per patient day were lowest in the PCCP group. There was no significant difference in the likelihood of being readmitted between FMTS and either CHPG or PCCP patients.

### Discussion

Based on the results of this study, the care provided by an FMTS as indicated by length of stay, costs, and readmission rates compared favorably with the care provided by either CHPG or PCCP. In general, patients admitted to the FMTS were noted to have significantly lower lengths of stay and costs (fixed and variable) compared to patients admitted by the PCCP and the CHPG. While the readmission rate for CHPG patients was lower than for FMTS patients, the difference was not statistically significant.

The length of stay for patients varied depending upon the physician group. The length of stay was found to be

Table 2

Patient Demographic Data As Well As Illness Severity, Length of Stay, Cost, and Readmission Rate by Inpatient Service for Patients With Any of the Most Common DRGs

	<i>Family Medicine Teaching Service</i>	<i>Hospitalists Physician Group</i>	<i>Primary Care Community Physicians</i>	<i>P Value</i>
Admissions	392	793	1309	
Age: mean ( $\pm$ SD)	61.2 ( $\pm$ 19.1)	60.9 ( $\pm$ 18.3)	67.8 ( $\pm$ 16.6)	<.001*
Gender				<.001**
Male: # (%)	178 (45.4)	331 (41.7)	463 (35.4)	
Female: # (%)	214 (45.6)	462 (58.3)	846 (64.6)	
Race				<.001**
White: # (%)	239 (61.0)	510 (64.3)	960 (73.3)	
Black: # (%)	141 (36.0)	261 (32.9)	332 (25.4)	
Other: # (%)	12 (3.1)	22 (2.8)	17 (1.3)	
Illness severity:				.222**
None/minor: # (%)	68 (17.4)	130 (16.4)	222 (17.0)	
Moderate: # (%)	280 (71.4)	589 (74.3)	987 (75.4)	
Major/catastrophic: # (%)	44 (11.2)	74 (9.3)	100 (7.6)	
Length of stay: days ( $\pm$ SD)	4.0 (3.7)	4.7 (4.2)	5.4 (4.6)	<.001*
Fixed costs mean ( $\pm$ SD)	\$1,719 ( $\pm$ 1,744)	\$2,072 ( $\pm$ 1,858)	\$2,036 ( $\pm$ 1,897)	.005*
Variable costs mean ( $\pm$ SD)	\$2,318 ( $\pm$ 2,670)	\$2,689 ( $\pm$ 2,619)	\$2,656 ( $\pm$ 2,535)	.046*
Readmissions: # (%)	39 (10.0)	55 (6.9)	114 (8.7)	.165**

DRG—diagnosis-related group

\* ANOVA

\*\* Chi-square analysis

Table 3

Regression Analyses Comparing Outcomes From HPG and PCCP  
With FMTS Among Patients With Any of the Most Common DRGs\*

	HPG		PCCP	
	$\beta$ Coefficient	P Value $\beta=0$	$\beta$ Coefficient	P Value $\beta=0$
Length of stay**	0.76	<.001	1.48	<.001
Fixed costs**	392.1	<.001	415.6	<.001
Variable costs**	417.9	.002	479.9	<.001
Readmission***	-0.38	.093	-0.17	.409

HPG—hospitalists physician group  
PCCP—primary care community physicians  
FMTS—family medicine teaching service  
DRG—diagnosis-related group

\* while controlling for patient age, race, gender, illness severity, and DRG (a positive  $\beta$  coefficient means that the outcome for the care service is greater than for FMTS).

\*\* Linear regression analysis

\*\*\* Logistic regression analysis

lowest for patients of a teaching service and greatest for patients of primary care community physicians. Characteristics unique to individual services may explain these differences but not severity of illness, which was the same in all groups. The individual factors affecting the variable length of stay noted require further study.

The costs of care (fixed and variable) were noted to be lower for FMTS patients than for either HPG or PCCP patients. No significant differences in cost between HPG and PCCP service groups were found. While the lower length of stay may partially explain the differences in cost, other factors such as practice patterns and use of ancillary services were probably present.

While the length of stay and fixed and variable costs of the FMTS compares favorably with the same measures of both the HPG and PCCP, the readmission rate tended to be lowest for the CHPG patients. Overall, no significant difference was found among the readmission rates of the three study groups. In general, the readmission rate for each service reported in this study is similar to readmission rates previously reported.<sup>8,10,11,19</sup> The differences in diagnoses admitted to individual services and the socioeconomic differences of patients may have accounted for this finding.

#### Limitations

This study has several limitations. First, the study included patient care data obtained retrospectively from a medium-sized, community hospital located in a Southeastern US city. Therefore, the results and conclusions may not be applicable to other hospitals of varying size or locations. Second, the specific training

and credentialing of the physicians who participated in hospitalist services at the hospital in this study may differ from hospitalist physicians in other hospitals. Third, while the analyses controlled for DRG and the severity of illness, other methods to incorporate these variable into analyses of length of stay, costs, and readmission rates are available and could have been used, and those different methods may have influenced the results obtained. Further, the DRG identification and the severity of illness determination may be influenced by differing documentation in the medical record as well as local variables. Finally, the data used in this study were obtained from the hospital's administrative informational system, and a mechanism to confirm accuracy was not available.

#### Conclusions

Improvements in efficiency, quality of care, and inpatient continuity of care have been noted as potential advantages of the hospitalist model. This study, on the other hand, found that patients admitted to a family medicine inpatient teaching service experienced favorable length of stay and costs compared to patients admitted to the inpatient service of either a hospitalist group or the service of individual community-based primary care physicians.<sup>20</sup>

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*Corresponding Author:* Address correspondence to Dr Carek, Medical University of South Carolina, Department of Family Medicine, 9298 Medical Plaza Drive, Charleston, SC 29406. 843-876-7080. Fax: 843-876-7111. carek@muscc.edu.

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