ORIGINAL RESEARCH

Effect of a Hospitalist–Care Coordinator Team on a Nonteaching Hospitalist Service

Kevin J. O'Leary, MD[1]
Lee A. Lindquist, MD[2]
Marcia A. Colone, PhD[3]
Corinne Haviley, RN, MS[3]
Jason A. Thompson, BA[1]
David W. Baker, MD, MPH[1]

[1] Division of General Internal Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois

[2] Division of Geriatric Medicine, Northwestern University Feinberg School of Medicine, Chicago, Illinois

[3] Northwestern Memorial Hospital, Chicago, Illinois

BACKGROUND: Although many hospitalists work with clinical coordinators, few studies have evaluated their impact.

OBJECTIVE: The purpose of the study was to evaluate the impact of a hospitalist–care coordinator team on hospitalist work experience, patient satisfaction, and hospital efficiency.

DESIGN AND PARTICIPANTS: During each of 12 weeks, hospitalists on a nonteaching hospitalist service were randomly assigned to work with a hospitalist care coordinator (HCC) or to work independently.

MEASUREMENTS: Each week hospitalists completed a survey to assess their satisfaction and perceived work efficiency. Patient satisfaction with hospital discharge was assessed by telephone interviews. Hospital efficiency was analyzed with multivariate linear regression using log-transformed length of stay (LOS) and cost as dependent variables.

RESULTS: The 356 patients cared for by hospitalist–HCC teams were similar to 337 patients cared for by control hospitalists. Twenty-eight of 31 hospitalists (90%) who worked with an HCC responded that the HCC improved their efficiency and job satisfaction. Seventy-one of 196 eligible patients (36%) completed the postdischarge interview. The mean ratings of overall satisfaction with hospital discharge on a scale of 10 were similarly high in both groups (8.57 vs. 8.37; $P = .94$). In multivariate regression analyses, LOS was 0.28 days shorter and cost was $585.62 lower for patients cared for by hospitalist–HCC teams; however, these results were not statistically significant ($P = .17$ and .15, respectively).

CONCLUSIONS: Hospitalists working in a team approach with an HCC reported improved efficiency and job satisfaction compared with hospitalists working independently. These findings are important in light of growing concerns about hospitalist workload and job satisfaction. ***Journal of Hospital Medicine* 2008;3: 103–109.** © *2008 Society of Hospital Medicine.*

KEYWORDS: hospital medicine, randomized clinical trial, case management.

Many hospitalists work with clinical coordinators and case managers.[1–3] The descriptions of these roles often overlap[4] and commonly include activities such as obtaining medical records, expediting tests and procedures, coordinating the plan of care with other health care providers, assessing postdischarge needs, completing discharge paperwork, and arranging follow-up visits.[2,5,6] Despite the potential to improve patient care and hospital efficiency, few studies have formally evaluated the impact of these roles. Moher et al. found that adding a clinical coordinator to a general medical team decreased length of stay (LOS) and improved patient satisfaction.[5] However, this study was conducted at a time when the LOS was routinely longer than it is today. Forster et al. found that adding a clinical coordinator to a

DOI 10.1002/jhm.280
Published online in Wiley InterScience (www.interscience.wiley.com).

TABLE 1
Comparison of Activities Performed by Unit-Based Care Coordinators (UCCs) with Those Performed by Hospitalist Care Coordinators (HCCs)

Activity type	Activities performed by both UCCs and HCCs	Additional activities performed by HCCs only
Care coordination	• Document the interdisciplinary plan of care	• Ensure collaboration in formulating the plan of care • Obtain outside medical records • Inform staff nurse of stat orders during rounds • Obtain certain test results (eg, preliminary echo reports)
Patient and family needs	• Address patient and family concerns • Schedule family meetings	• Proactively identify and address patient and family concerns
Efficiency of care delivery	• Remediate barriers that impede plan of care and/or discharge • Identify and document avoidable days	• Identify barriers that impede plan of care • Ensure tests are scheduled
Discharge process	• Coordinate discharge plans with social work and discharge planner	• Schedule and confirm follow-up appointments • Initiate discharge instructions • Write discharge prescriptions—verified and signed by physician • Review discharge instructions with patient and/or family

general medical team resulted in improved patient satisfaction but did not reduce length of stay or risk of adverse events occurring following hospital discharge.[6] Both these studies evaluated the impact of adding a clinical coordinator to resident-covered medical teams. Yet many hospitalists deliver care without residents, limiting the generalizability of the findings from these studies.

To date, no studies have evaluated the impact of clinical coordinators, case managers, or other nonphysician providers on the hospitalist work experience. This is surprising, as hospital medicine group leaders list daily workload and work hours among their top concerns.[7] Clinical coordinators have the potential to improve patient care and hospital efficiency while simultaneously improving the experience of the hospitalists with whom they work. We conducted this study to evaluate the impact of a hospitalist–care coordinator team on hospitalist work experience, patient satisfaction, and hospital efficiency.

METHODS

Setting

The study was conducted on the hospitalist service at Northwestern Memorial Hospital (NMH), a 753-bed hospital in Chicago, Illinois. The hospitalist service is staffed by 5 hospitalists on duty at a time. Hospitalists work without residents and are on service for 7 consecutive days, usually followed by 7 consecutive days off. Daytime admissions are distributed among all hospitalists on duty in a consecutive fashion. A night float hospitalist performs admissions and all cross-cover activities from 7:00 PM until 7:00 AM. Nighttime admissions are distributed to day hospitalists based on each hospitalist's daily census.

Study Design

Funding was provided by the hospital for a 12-week study, and hospital administrative leaders collaborated as part of the research team. During each of the 12 weeks from September 2006 through November 2006, half the hospitalists on duty each week were randomly assigned to work with a hospitalist care coordinator (HCC) in a team approach. Hospitalists not assigned to work with a hospitalist care coordinator continued to work in their usual fashion, which included working with unit-based care coordinators (UCCs). UCCs follow all patients on a 30-bed medicine unit but generally do not round with physicians. HCCs performed all the activities that UCCs perform but also performed additional key activities (see Table 1) and worked in a team approach with their hospitalist. Unit-based social workers and discharge planners were available for all hospitalists during the study. During each day patients were admitted consecutively to one of the hospitalists on service, regardless of their assignment to work with or without an HCC. Similarly, night admissions were distributed to hospitalists without regard to their assignment to work with or without an HCC.

Hospitalist–Care Coordinator Team

Four HCCs were used in this study. All 4 were registered nurses with specialized training in case management. Prior to the start of the study, the investigators held meetings with hospitalists and the HCCs to describe this new role, the work flow

for the hospitalist–care coordinator team, and work activities appropriate for the HCC. Activities related to the discharge process were emphasized as a key feature of the HCC role. Hospitalists and HCCs were instructed to round together as a team each morning. They were advised to collaborate on the daily plan of care and assign specific activities for each to accomplish. During the study weekly meetings were held with the HCCs, the hospitalists with whom they were finishing the week, and the hospitalists with whom they were scheduled to work during the upcoming week. The purpose of these meetings was to ensure that the work flow and work activities were optimal.

Outcome Measures

At the completion of each week, all hospitalists on service were given an anonymous Web-based survey designed to assess their satisfaction and perceived work efficiency. Hospitalists were asked to rate the efficiency of various work activities during the preceding week on a 5 point Likert scale (1 = very inefficient, 2 = somewhat inefficient, 3 = neutral, 4 = somewhat efficient, 5 = very efficient). Hospitalists who had worked with an HCC were also asked whether they thought working with an HCC improved their efficiency and increased their job satisfaction. We postulated that patient satisfaction with the discharge process might improve with use of the hospitalist–HCC team. Therefore, patient satisfaction was assessed by telephone interviews conducted 7-14 days after discharge. Because of resource limitations, we were only able to interview patient during the second half of the study. Patients were asked to rate their satisfaction with the clarity of verbal and written discharge instructions as well as their overall satisfaction with hospital discharge using a 10-point Likert scale (from 1 = least satisfied to 10 = most satisfied). Hospital databases provided information on patient demographics, LOS, and cost.

Data Analysis

All analyses were conducted using Stata version 9.0 (StataCorp LP, College Station, TX). Patient characteristics were compared using chi-square and *t* tests. Responses to the hospitalist survey for the weeks when they worked independently and the weeks when they worked as a hospitalist–HCC team were compared using the Wilcoxon rank sum test. To adjust for the clustering of responses by physicians (ie, individual physicians completed more than 1 survey), we used linear regression and the cluster option. The results were very similar, and only the *P* values from the Wilcoxon rank sum test are presented. Unadjusted LOS and cost were compared using the Wilcoxon rank sum test. We also conducted multivariate linear regressions using log-transformed LOS and log-transformed cost as dependent variables. The independent variable was the team type (whether patients were cared for by a hospitalist–HCC team or a hospitalist working independently); age, sex, ethnicity, payer type, and diagnosis-related group (DRG) weight were included as covariates, and *P* values were adjusted for physician clustering. We hypothesized a priori that the HCC would have no effect on the LOS of or cost for patients whose hospitalizations were very short. We therefore conducted secondary analyses in which we eliminated patients with an LOS of 1 day or less.

RESULTS

There were 356 patients cared for by hospitalist–HCC teams and 337 patients cared for by control hospitalists. Of the 60 weeks of hospitalist service of the study, hospitalist–HCC teams accounted for 31 weeks (52%) and control hospitalists for 29 weeks (48%). Patients cared for by the hospitalist–HCC teams were similar in age, sex, ethnicity, payer type, and DRG weight to those cared for by control hospitalists (see Table 2).

Sixty surveys were completed by hospitalists at the end of their week on service (response rate 100%). Of the 31 responses from hospitalists completing a hospitalist–HCC team week, 28 (90%) reported that working with an HCC improved their efficiency and 28 (90%) that working with an HCC improved their job satisfaction. The hospitalists indicated that working with an HCC significantly improved the efficiency of most of their activities (see Table 3). Specifically, activities related to communication with nurses and patients and activities involving discharge planning and execution were improved with the use of an HCC. As would be expected, certain other activities did not improve. For example, there were no differences between the groups in the perceived efficiency of performing histories and physicals or placing admission orders. For activities that were significantly different, the Wilcoxon rank sum test and linear regression analysis adjusting for physician clustering showed identical results.

Seventy-one of 196 eligible patients (36%) completed the discharge satisfaction interview. Of the 71

TABLE 2
Characteristics of Patients Cared for by Hospitalist–Hospitalist Care Coordinator (HCC) Teams Compared with Those of Control Hospitalists

	Hospitalist–HCC team	Control	
	n (%) or mean ± SD		*P* value
Patients, n (%)	356 (51.4%)	337 (48.6%)	
Age (years)	59.3 ± 18.6	59.0 ± 20.1	.86
Women (%)	190 (53.4%)	192 (57.0%)	.34
Ethnicity			.74
White	182 (51.1%)	174 (51.6%)	
Black	111 (31.2%)	114 (33.8%)	
Hispanic	23 (6.5%)	21 (6.2%)	
Asian	5 (1.4%)	4 (1.2%)	
Other	35 (9.8%)	24 (7.1%)	
Payer			.47
Medicare	177 (49.7%)	168 (49.9%)	
Private	76 (21.4%)	69 (20.5%)	
Medicaid	43 (12.1%)	44 (13.1%)	
Capitated	43 (12.1%)	31 (9.2%)	
Other	17 (4.8%)	25 (7.4%)	
Diagnosis-related group weight	1.1 ± 0.8	1.2 ± 0.8	.31

TABLE 3
Differences in Efficiency of Key Work Activities Between Hospitalists with Hospitalist Care Coordinators (HCC) and Control Hospitalists

	Hospitalist–HCC Team	Control	
	Mean score ± SD*		*P* value†
Performing histories and physicals	3.94 ± 0.77	3.93 ± 0.84	.98
Performing medication reconciliation	3.35 ± 1.08	2.03 ± 1.18	< .001
Placing admission orders	3.94 ± 0.73	4.00 ± 0.87	.57
Communicating with nurses	4.45 ± 0.68	3.14 ± 1.09	< .001
Communicating with consultants	3.65 ± 0.75	3.34 ± 1.04	.25
Communicating with patients	4.42 ± 0.62	3.62 ± 1.01	< .001
Communicating with families	4.32 ± 0.70	2.89 ± 1.14	< .001
Coordinating discharge plans	4.74 ± 0.51	2.76 ± 1.18	< .001
Making/updating sign-out	3.55 ± 0.72	3.49 ± 0.83	.55
Making discharge instructions	4.29 ± 0.74	3.10 ± 1.01	< .001
Going over discharge instructions	4.48 ± 0.57	2.76 ± 1.15	< .001
Writing discharge prescriptions	3.87 ± 0.67	2.52 ± 1.21	< .001
Arranging follow-up appointments	4.19 ± 0.75	2.03 ± 1.09	< .001

*Hospitalists responded using a 5-point scale (1 = very inefficient, 2 = somewhat inefficient, 3 = neutral, 4 = somewhat efficient, 5 = very efficient).
†P values for Wilcoxon rank sum tests.

patients interviewed, 44 (62%) were cared for by hospitalist–HCC teams and 27 (38%) were cared for by control hospitalists. Patient satisfaction with the clarity of the verbal and written discharge instructions and overall satisfaction with hospital discharge was similar between the 2 groups (see Table 4).

The unadjusted mean LOS for patients cared for by hospitalist–HCC teams was 4.70 ± 4.15 days compared with 5.07 ± 3.99 days for patients cared for by control hospitalists ($P = .005$; see Table 5). The unadjusted mean cost for patients cared for by hospitalist–HCC teams was \$10,052.96 ± \$11,708.73 compared with \$11,703.19 ± \$20,455.78 for patients cared for by control hospitalists ($P = .008$). In multivariate analysis using age, sex, ethnicity, payer type, and DRG weight as independent variables and adjusting for physician clustering, LOS remained lower for patients cared for by hospitalist–HCC teams; however, this result was not statistically significant (−0.28 days, $P = .17$). Similar multivariate regression analysis showed a trend toward lower cost for patients cared for by the hospitalist–HCC teams (−585.62, $P = .15$).

TABLE 4
Satisfaction with Hospital Discharge of Patients Cared for by Hospitalist–Hospitalist Care Coordinator (HCC) Teams Compared with That of Patients Cared for by Control Hospitalists

	Hospitalist–HCC Team (n = 44)	Control (n = 27)	
	Mean score (SD)*		*P* value
Clarity of verbal discharge instructions	8.86 (± 2.31)	8.44 (± 2.63)	0.52
Clarity of written discharge instructions	8.95 (± 2.30)	8.93 (± 2.54)	0.78
Overall satisfaction with hospital discharge	8.57 (± 2.42)	8.37 (± 2.90)	0.94

*Patients rated items using a 10-point scale (from 1 = least satisfied to 10 = most satisfied).

TABLE 5
Differences in Length of Stay and Cost between Patients Cared for by Hospitalist–Hospitalist Care Coordinator (HCC) Teams and Patients Cared for by Control Hospitalists

	Unadjusted mean (SD)	*P* value for unadjusted difference*	Adjusted difference with hospitalist–HCC team	*P* value for adjusted difference†
Length of stay				
Hospitalist–HCC teams	4.70 (4.15)	.005	− 0.28	.17
Control hospitalists	5.07 (3.99)			
Cost				
Hospitalist–HCC teams	10,052.96 (11,708.73)	.008	−585.62	.15
Control hospitalists	11,703.19 (20,455.78)			

**P* values for Wilcoxon rank sum tests.

‡*P* values for multivariate analyses with adjustment for age, sex, ethnicity, payer type, diagnosis-related group (DRG) weight, and physician clustering.

DISCUSSION

Our study found that hospitalists working in a team approach with an HCC rated the efficiency of their daily work and their job satisfaction significantly higher than did control hospitalists. Specific areas of improved efficiency included communication activities and activities related to hospital discharge. A prior study conducted by our group found that hospitalists spend a lot of time on indirect patient care activities such as communication and activities related to the discharge process, while spending relatively little time on direct patient care.[8] Improving the efficiency of indirect patient care activities of hospitalists is likely to improve their job satisfaction. The importance of improving hospitalist workload and job satisfaction is underscored by the relatively high number of hospitalists at risk for burnout[9] and the growing concern about daily workload among hospital medicine group leaders.[7]

Patient satisfaction was not significantly affected by the use of the hospitalist–HCC team in our study. A priori, we postulated that patient satisfaction with the discharge process might improve with the use of the hospitalist–HCC team. We therefore limited survey questions to assessing only satisfaction with hospital discharge rather than other aspects of patient hospital care. A recent study reported that patients rated the quality of discharge instructions significantly lower than they rated the overall quality of their hospital stay.[10] However, the patients in our study gave high ratings to both discharge instructions and overall satisfaction with hospital discharge. This may explain why we were unable to detect a difference. Our study was limited by the relatively small number of patients we were able to contact to assess satisfaction. Previous studies evaluating the impact of care coordinators either did not assess patient satisfaction with discharge[5] or found no difference in satisfaction with hospital discharge.[6]

Although our study did not find a difference in patient satisfaction with the discharge process, we believe the hospitalist–HCC model has the potential to complement efforts to reduce the risk of adverse events as patients transition out of the hospital. It has been reported that 12% of patients have a preventable or ameliorable adverse event in the period immediately following hospital dis-

charge.[11,12] Although Forster et al. did not find a reduction in the risk of adverse events with the addition of a clinical coordinator to a general medical team, they noted incongruence between the coordinator's role and the outcomes measured.[6] Similarly, we would need to modify the role of the HCC from a position designed mainly to improve efficiency to one that complements efforts to improve the quality of the discharge process. Possible ways to enhance the HCC role in this regard include increasing the emphasis on and training in patient education skills. Several recently published articles have emphasized the need to redesign the discharge process in an effort to reduce the risk of adverse events following hospital discharge.[13–15] A modified HCC role might be an essential feature of a redesigned multidisciplinary discharge process.

We were unable to demonstrate improved efficiency for the hospital. Although LOS and cost were lower for patients cared for by the hospitalist–HCC teams, the difference was not statistically significant. One possible explanation for why we did not observe a larger reduction in LOS is that our hospitalist service had a lower-than-average patient volume during the study period. The lower volume mirrored an unanticipated dip in hospital volume during the same period. Specifically, our service normally discharges an average of 338 patients per month, but during the study period we discharged an average of 235 patients per month. A potential LOS and cost benefit may have been attenuated by the relatively low volume, as hospitalists had ample time to dedicate to communication and coordination of discharge plans.

Our study had several limitations. It was conducted on a nonteaching hospitalist service at a single site. Hospitalist practices vary widely in their staffing and scheduling models. As previously mentioned, we were only able to perform patient satisfaction surveys during the second half of the study period. In addition, hospitalist–HCC team patients made up a larger percentage of the patient survey responses (62%) than did control hospitalist patients (38%). This may have affected our ability to detect differences in satisfaction with the hospital discharge process. As also previously noted, our patient volume was lower than normal during the study period. We believe that a higher volume would have magnified differences in hospitalists' perceived efficiency and perhaps resulted in significant improvements in LOS and cost. Finally, the hospital provided funding for only a 12-week study. This limited our sample size and the power of the study to detect important differences. It is possible that a larger sample size and/or longer study period may have been able to demonstrate a statistically significant improvement in LOS and cost.

Our findings are of particular importance in light of the persistent concerns about hospitalist workload and job satisfaction. Although many hospitalists work with clinical coordinators and case managers, we believe that having the formal structure of a hospitalist–care coordinator *team* was the key element to improving hospitalist efficiency and satisfaction. We hope that our study is a precursor to research evaluating models of delivering hospital care and their impact on hospitalist work experience, hospital efficiency, and patient outcomes.

Address for correspondence and reprint requests: Kevin J. O'Leary, MD, Associate Division Chief for Hospital Medicine, Division of General Internal Medicine, 675 North St. Clair, Suite 18-200, Chicago, IL 60611; Fax: (312) 695-2857; E-mail: koleary@nmff.org

Received 1 June 2007; revision received 13 July 2007; accepted 12 August 2007.

REFERENCES

1. Nyberg D. Innovations in the management of hospitalized patients. *Nurse Pract.* 2006;Suppl:2-3.
2. McHale-Ramsey M, Daniels S. Hospitalists and case managers: the perfect partnership. *Lippincotts Case Manag.* 2004;9:280-286.
3. Amin AN, Owen MM. Productive interdisciplinary team relationships: the hospitalist and the case manager. *Lippincotts Case Manag.* 2006;11:160-164.
4. Bayard JM, Calianno C, Mee CL. Care coordinator—blending roles to improve patient outcomes. *J Nurs Manage.* 1997; 28:49-52.
5. Moher D, Weinberg A, Hanlon R, Runnals K. Effects of a medical team coordinator on length of hospital stay. *Can Med Assoc J.* 1992;146:511-515.
6. Forster AJ, Clark HD, Menard A, et al. Effect of a nurse team coordinator on outcomes for hospitalized medicine patients. Am *J Med.* 2005;118:1148-1153.
7. Society of Hospital Medicine. Available at: http://www.hospitalmedicine.org/Content/NavigationMenu/ResourceCenter/Surveys/Surveys1.htm. Accessed April 2, 2007.
8. O'Leary KJ, Liebovitz DM, Baker DW. How hospitalists spend their time: insights on efficiency and safety. *J Hosp Med.* 2006;1:88-93.
9. Hoff TH, Whitcomb WF, Williams K, Nelson JR, Cheesman RA. Characteristics and work experiences of hospitalists in the United States. *Arch Intern Med.* 2001;161:851-858.
10. Clark PA, Drain M, Gesell SB, Mylod DM, Kaldenberg DO, Hamilton J. Patient perception of quality in discharge instruction. *Patient Educ Couns.* 2005;59:56-68.

11. Forster AJ, Clark HD, Menard A, et al. Adverse events among medical patient after hospital discharge. *Can Med Assoc J.* 2004;170:345-349.
12. Forster AJ, Harvey JF, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Ann Intern Med.* 2003;138:161-167.
13. Coleman EA, Berenson RA. Lost in transition: challenges and opportunities for improving the quality of transitional care. *Ann Intern Med.* 2004;141:533-536.
14. Halasyamani L, Kriplani S, Coleman E, et al. Transition of care for hospitalized elderly patients—development of a discharge checklist for hospitalists. *J Hosp Med.* 2006;1:354-360.
15. Anthony D, Chetty VK, Kartha A, et al. Re-engineering the hospital discharge—an example of a multifaceted process evaluation. *Advances in Patient Safety: From Research to Implementation.* Vol. 2, Concepts and Methodology. AHRQ publication 05-0021-2. Rockville, MD: AHRQ; 2005. p 379-394.