Cost Savings Vary by Length of Stay for Inpatients Receiving Palliative Care Consultation Services

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Abstract

Background: Cost savings associated with palliative care (PC) consultation have been demonstrated for total hospital costs and daily costs after PC involvement. This analysis adds another approach by examining costs stratified by hospital length of stay (LOS).

Objective: To examine cost savings for patients who receive PC consultations during short, medium, and long hospitalizations.

Methods: Data were analyzed for 1815 PC patients and 1790 comparison patients from two academic medical centers between 2005 and 2008, matched on discharge disposition, LOS category, and propensity for a PC consultation. We used generalized linear models and regression analysis to compare cost differences for LOS of 1 to 7 days (38% of consults), 8 to 30 days (48%), and >30 days (14%). Comparisons were done for all patients in both hospitals ($n=3605$) and by discharge disposition: survivors ($n=2226$) and decedents ($n=1379$); analyses were repeated for each hospital.

Results: Significant savings per admission were associated with shorter LOS: For stays of 1 to 7 days, costs were lower for all PC patients by 13% (\$2141), and for survivors by 19.1% (\$2946). For stays of 8 to 30 days, costs were lower for all PC patients by 4.9% (\$2870), and for survivors by 6% (\$2487). Extrapolating the per admission cost across the PC patient groups with lower costs, these programs saved about \$1.46 million for LOS under a week and about \$2.5 million for LOS of 8 to 30 days. Patients with stays >30 days showed no differences in costs, perhaps due to preferences for more aggressive care for those who stay in the hospital more than a month.

Conclusion: Cost savings due to PC are realized for short and medium LOS but not stays >30 days. These findings suggest savings can be achieved by earlier involvement of palliative care, and support screening efforts to identify patients who can benefit from PC services early in an admission.

Introduction

OVER THE LAST DECADE, the field of palliative care (PC) has grown and matured. Similarly, so have studies evaluating the cost outcomes associated with different delivery models of hospital-based PC, including special inpatient units and interdisciplinary consultation teams that either assume primary responsibility for the care of PC patients or work in collaboration with the patients' care teams. The evidence from observational studies examining PC-related cost savings is also increasing, and continues to support the argument that PC not only contributes to increased quality of care, but does so at lower costs than usual care.¹⁻⁹

There are many different ways of studying hospital costs including examining total costs per admission, costs by service unit (e.g., room, nursing, pharmacy, lab, etc.), and daily costs before and after PC is introduced.^{2,5,10,11} Our analysis adds another approach by examining costs by length of stay (LOS), which as Smith and Cassel note,⁵ has been used as both a predictor (or trigger) for PC consultation as well as an outcome. Because of this dual role in care, LOS may be a significant confounder in determining cost savings for PC programs. We were interested in exploring this potential confounding and examining costs by LOS for several reasons. In monitoring our inpatient PC programs as they matured over a 4-year period, we observed a trend toward earlier

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referrals as hospital clinicians gained exposure to the services and benefits of involving PC in managing complex and seriously ill patients. About one-third of the consultations occurred during hospital stays of 1 to 7 days (Fig. 1). In addition, we also observed that 14% of the consultations occurred during admissions lasting over a month. Both of these time periods were described as outliers in the cost analyses done by Morrison and colleagues,⁴ in part because of a paucity of cases with LOS of longer or shorter duration than the targeted 8 to 30 days in that study's hospitals (personal communication, R. S. Morrison, October 2011). In our hospitals, only about half of the consultations occurred during the 8- to 30-day period used in the Morrison et al. study. Therefore, we were interested in determining whether cost savings associated with PC consultations also occurred when consults happened during short (within one week) and long (over a month) stays in the hospital.

Methods

Setting and study population

Using a payer perspective and a retrospective, observational study design, we examined cost differences between patients who received at least one PC consultation and a matched usual care group in two academic medical centers for hospitalizations occurring between 2005 and 2008. Both hospitals serve a five-state region, providing tertiary and specialty care. Hospital 1 is a quaternary care institution that includes a cancer center that performs solid organ and bone marrow transplants. The PC service began operating in 2005 providing consultations 20 hours/week, Monday through Friday, with phone coverage only nights and weekends. The service was staffed with 0.5 full-time equivalent (FTE) divided across four physicians and a 0.8 FTE (donated) chaplain resident. The service added a 1.00 FTE nurse practitioner in 2008. Consultants usually met patients and families with the pri-

mary attending team and made recommendations that were implemented by the team. Consultants followed patients to discharge or death, or until it was deemed by all parties (primary team, patient and family, PC consultants) that they were no longer needed.

Hospital 2 is a county-owned safety net hospital and level I trauma and burn center. The consultation service started in 2003 with a 1.0 FTE nurse practitioner (who directed the service) and 0.25 FTE of physician time; by 2008 the FTE for physicians had grown to 2.0. Consults were available 24 hours per day, 7 days per week. Consultants made recommendations to primary attending teams and also assumed a primary attending role for terminally ill patients who did not have a community primary care provider. This enabled the PC team to follow patients into the community (including long-term care facilities) and serve as the provider of record for hospice referrals.

For PC patients who received consultations on multiple hospitalizations, we used the data only from the initial consultation and hospitalization to assess the impact of consultation services on PC-naïve patients. The sample included 1815 unique PC patients and a comparison sample of 1790 unique patients matched on (1) discharge disposition (survival to discharge or died in hospital); (2) LOS, matched on the exact number of days for all but 61 cases, which were matched on average within 1.7 days (range 1–6); and (3) propensity scores for referral to PC. Propensity scores are a method frequently used in observational studies to control for selection bias and confounding, and to improve estimates of the effect of a treatment or intervention (in this case, PC consultations) on outcomes (cost).¹² We chose these three domains for matching based on evidence of confounding in the literature. We matched first on discharge disposition because of demonstrated differences in costs and patterns of care for survivors and those who die in the hospital,¹³ second on LOS to control for the effects of PC on LOS,^{13,14} and third on

FIG. 1. Palliative care consultations by length of stay and discharge disposition.

propensity scores to assure similar distributions of the measured predictors of referral for PC consultation.

Propensity scores

In this study, propensity scores represent the probability that a patient could be referred to PC for a consultation. Our estimates were computed using a two-part model that included physician and patient factors. First, we estimated the physician factors that we hypothesized would be associated with making a referral to PC based on physician demographics, training, and practice. Attending physicians play a gatekeeper role in the referral process, as their approval is a requirement for initiating a consultation. We wanted to capture their contribution as well as patient factors in computing the propensity score. Physician variables were obtained from secure medical personnel files and included the age, gender, years of employment, and primary affiliation (hospital department). We stratified these scores into terciles (representing low, medium, and high propensity to refer). The propensity score for the attending physician of record for the patient's hospitalization was assigned to each patient's data. The overall propensity score model included this variable along with the following patient characteristics predictive of PC referral: age, gender, race, number of comorbidities (computed using the Healthcare Cost and Utilization Project's [HCUP] comorbidity software, version 3.2¹⁵), number of prior hospitalizations, an injury severity score (computed using the *International Classification of Diseases*, 9th Revision [ICD-9]-CM-Trauma program in Stata/MP version 10.1 to account for the patient population at the trauma and burn hospital), diagnosis-related group (DRG), and diagnosis of any of the following (computed from ICD-9 codes as part of the HCUP comorbidity software): cancer or metastatic cancer, acute myocardial infarction, chronic obstructive pulmonary disease, cerebral vascular disease, or renal disease.

We computed propensity scores for all patients in both hospitals ($n=128,952$ hospitalizations). We identified the 1815 unique patients who received a PC consultation during the 4-year study period (2005–2008) and performed one-to-one nearest neighbor matching to identify unique comparison patients who had propensity scores within 0.1 of PC patients.¹⁶ We were able to identify 1790 matches for comparison. The 25 cases without matches were from Hospital 1 and are included in the analysis.

Statistical analyses

Cost, provider, and patient data were obtained from the administrative databases at each hospital. These hospitals use the same cost-accounting system that assigns actual costs to services and standardizes costs across units within the hospital and across the two hospitals. We used total costs for each hospitalization that included indirect costs and direct costs for room and board, radiology and laboratory tests, pharmacy, and nursing care. We compared groups using adjusted models to estimate the cost differences attributable to PC. We used multivariable regression and generalized linear models (GLM) with gamma distributions and log link functions to estimate average dollar and percentile cost differences by LOS category: 1 to 7 days (38% of consultations), 8 to 30 days (48% of consultations), and >30 days (14% of consultations). Comparisons were done for all patients ($n=3605$) and sepa-

ately for survivors ($n=2226$) and decedents ($n=1379$). Both models were adjusted for age, gender, race, number of comorbidities, number of prior hospitalizations, diagnosis of any cancer, acute myocardial infarction, or cerebral vascular disease, injury severity score, DRG, and number of intensive care unit (ICU) days. We ran all models for the two hospitals combined (controlling for site), and separately for each hospital. All analyses were conducted using Stata/MP version 10.1 (StataCorp., College Station, TX).

The study protocol and access to hospital administrative datasets was reviewed and approved by the University of Washington's Institutional Review Board.

Results

Characteristics of the PC ($n=1815$) and matched usual care ($n=1790$) patients are described in Table 1 by hospital. The two groups have similar distributions of propensity scores (Table 1, line 1) meaning that overall, the physician and patient characteristics predicting a referral to PC were evenly distributed between the two groups. However, despite propensity score matching, there remained some significant differences between the groups and between the hospitals: In both hospitals, PC patients had higher rates of metastatic cancer, additional prior hospitalizations, and different discharge locations for survivors, with more PC patients discharged to hospice (either at home or in a facility) and skilled nursing facilities and fewer to self care at home. In Hospital 1, PC patients were about 2 years younger and had lower rates of cancer and acute myocardial infarction. In Hospital 2, PC patients had higher rates of cancer, lower rates of cerebrovascular disease, and lower injury severity scores. We also examined the number of days spent in the ICU and found slightly longer ICU LOS for Hospital 1 and no difference for Hospital 2.

Figure 1 shows the distribution of consultations for decedents and survivors by hospital and LOS category. Table 2 reports the average LOS and number of days between admission and when the PC consultation was initiated for each hospital by LOS category. For all three LOS categories, initial consultations were made about half-way through the hospitalization.

The cost results are reported for both hospitals combined and separately, as well as for all patients, and by survivors and decedents. Table 3 reports the average adjusted savings per admission in dollars and Table 4 reports the same data in terms of percent savings. These analyses used different methods (regression and GLM, respectively), which computed different significance values for some of the comparisons (e.g., comparisons of all patients and survivors with LOS of 8 to 30 days is significant in Table 3 but not in Table 4).

Results from both hospitals combined show cost savings for all patients and for survivors with LOS of 1 to 7 days and 8 to 30 days. There were no cost savings for decedents, regardless of LOS, or for any patients with LOS >30 days. For LOS of 1 to 7 days, costs were lower for all PC patients by 13% (\$2141) and for survivors by 19.1% (\$2946). For stays of 8 to 30 days, costs were lower for all PC patients by 4.9% (\$2870) and for survivors by 6% (\$2487). We extrapolated the average savings per hospitalization across the patients who received consultations ($n=1815$) and estimated total cost savings of \$3,984,304 over the 4 years, with \$2,522,415 in

TABLE 1. PATIENT CHARACTERISTICS

Variable	Hospital 1 usual care (n = 731)	Hospital 1 PC patients (n = 756)	P value	Hospital 2 usual care (n = 1059)	Hospital 2 PC patients (n = 1059)	P value
Propensity score, mean (SD)	0.094 (0.092)	0.101 (0.099)	0.127	0.078 (0.073)	0.082 (0.077)	0.217
Age, mean (SD)	60.8 (16.8)	58.8 (16.4)	0.022	63.0 (18.4)	64.5 (18.1)	0.062
Male, %	56.2	54.8	0.571	62.2	60.0	0.285
Race, %						
White	68.8	65.2	0.140	69.0	66.8	0.264
Black	5.6	5.8	0.861	13.6	14.2	0.706
Asian	5.9	8.3	0.066	10.0	10.8	0.569
Native American	0.6	0.8	0.561	1.7	1.7	1.000
Hispanic	1.9	1.9	0.928	4.3	4.8	0.603
Unknown	17.2	18.0	0.703	1.3	1.8	0.380
Diagnoses, %						
Cancer	32.3	25.7	0.005	7.2	10.8	0.004
Metastatic cancer	28.2	33.9	0.018	7.7	11.7	0.002
Chronic obstructive pulmonary disease	10.7	10.7	0.978	16.8	19.0	0.192
Cerebrovascular disease	8.2	6.8	0.284	29.3	22.4	<0.001
Congestive heart failure	16.3	15.2	0.572	16.0	14.9	0.508
Renal disease	11.6	10.2	0.372	8.0	9.4	0.280
Acute myocardial infarction	5.8	3.6	0.046	8.1	7.3	0.463
AIDS	1.4	1.7	0.583	4.9	3.8	0.201
Injury severity score, mean (SD)	0.12 (0.92)	0.14 (1.32)	0.703	6.7 (18.2)	4.4 (11.2)	<0.001
Comorbidities, mean (SD)	3.5 (2.5)	3.7 (2.5)	0.166	2.3 (2.3)	2.5 (2.4)	0.039
Prior hospitalizations, mean (SD)	1.2 (2.6)	1.6 (2.8)	0.006	0.6 (1.8)	0.9 (2.3)	<0.001
Discharge status, %						
Home	34.6	13.4	<0.001	26.4	15.3	<0.001
Skilled nursing facility	10.4	15.3	0.004	19.7	33.0	<0.001
Hospice	2.2	22.1	<0.001	1.2	3.3	0.001
Died	35.7	37.3	0.523	39.5	39.5	1.000
Length of stay (LOS), days, mean (SD)	18.6 (20.9)	20.4 (25.0)	0.142	14.1 (15.6)	14.1 (15.6)	0.986
ICU days, mean (SD)	5.3 (12.0)	6.9 (16.0)	0.024	4.9 (8.4)	5.2 (9.5)	0.499

AIDS, acquired immune deficiency syndrome; ICU, intensive care unit; SD, standard deviation.

savings for survivors. About one-third of the savings occurred for PC patients with LOS of 1 to 7 days (\$1,464,444) and the remaining \$2,519,860 in savings was for LOS of 8 to 30 days.

The analysis by hospital shows very different savings patterns. Most of the savings were realized by Hospital 1 (the

cancer and transplant center) and happened for all patients with LOS up to 30 days. Hospital 2 (the trauma and burn center) only realized savings for patients who survived with LOS of 1 to 7 days; costs were significantly higher for patients who received PC and died during an admission lasting more than 30 days.

TABLE 2. AVERAGE LOS AND NUMBER OF DAYS TO FIRST PALLIATIVE CARE CONSULTATION BY LOS CATEGORY^a

	Hospital 1			Hospital 2		
	N (%)	Days	(SD)	N (%)	Days	(SD)
1–7 days	230 (30%)			454 (41%)		
Mean (SD) LOS		4.5	(1.8)		4.0	(1.9)
Mean (SD) days to first consultation		2.4	(1.7)		2.1	(1.7)
8–30 days	385 (51%)			493 (46%)		
Mean (SD) LOS		15.2	(6.1)		15.2	(6.2)
Mean (SD) days to first consultation		9.5	(5.9)		8.3	(5.9)
>30 days	141 (19%)			112 (11%)		
Mean (SD) LOS		60.3	(34.1)		49.8	(20.5)
Mean (SD) days to first consultation		39.1	(31.2)		21.4	(16.9)
Total LOS	756 (100%)			1059 (100%)		
Mean (SD) LOS		20.4	(25.0)		14.1	(15.6)
Mean (SD) days to first consultation		12.8	(19.1)		7.0	(9.0)

^aPalliative care patients only.

LOS, length of stay; SD, standard deviation.

TABLE 3. ADJUSTED^a SAVINGS BY HOSPITAL DISCHARGE DISPOSITION AND LOS

	1–7 days			8–30 days			> 30 days			Total LOS		
	N	Savings (\$)	P value	N	Savings (\$)	P value	N	Savings (\$)	P value	N	Savings (\$)	P value
Both hospitals												
All patients	1367	2141	0.001	1750	2870	0.012	488	–2913	0.707	3605	2004	0.177
Survivors	772	2946	<0.001	1111	2487	0.047	343	–867	0.914	2226	2814	0.132
Decedents	595	1679	0.115	639	4182	0.059	145	–6471	0.723	1379	–172	0.945
Hospital 1												
All patients	459	4131	0.003	764	7481	<0.001	264	–2882	0.825	1487	4313	0.150
Survivors	320	4028	0.035	469	4836	0.010	155	–3425	0.815	944	4504	0.179
Decedents	139	4875	0.029	295	12309	<0.001	109	–3536	0.890	543	3912	0.499
Hospital 2												
All patients	908	1307	0.084	986	–1571	0.300	224	–4062	0.590	2118	–375	0.793
Survivors	452	2588	0.001	642	–131	0.941	188	–3681	0.683	1282	995	0.632
Decedents	456	721	0.562	344	–2790	0.346	36	–20044	0.207	836	–4155	0.025

^aModels adjusted for age, race, gender, number of comorbid conditions, number of prior hospitalizations, diagnosis of any cancer or metastatic cancer, acute myocardial infarction, cerebral vascular disease, injury severity score, DRG, number of ICU days, and hospital. Negative numbers indicate palliative care costs were higher than the usual care group.

DRG, diagnosis-related group; ICU, intensive care unit; LOS, length of stay.

Discussion

This study examined cost savings by short, medium, and long lengths of stay to further understand patterns of savings associated with inpatient PC consultation. As PC programs grow, patterns are shifting toward earlier referrals. Our findings extend the range of cost analyses by including results for LOS of 1 to 7 days and greater than 30 days, and suggest that for these two hospitals, the PC programs saved about \$1.46 million for LOS under a week and about \$2.5 million for LOS of 8 to 30 days. Patients with stays over a month showed no differences in costs, perhaps because of differences in patient preferences, with those who stay in the hospital for more than a month preferring more aggressive care.

This analysis was motivated by the fact that 30% to 43% of referrals in these two hospitals occurred during hospitalizations of 7 days or less and provides data regarding cost savings for these admissions. The trend in these hospitals is

toward earlier referrals, a trend that could be expected in other hospitals with consultation services, especially as they gain more experience and familiarity within their institutions. We describe methods that other hospitals may use to analyze costs based on their own distribution of referrals. We organized the analysis around LOS because it is related to both predictors of referrals to PC programs,¹³ as well as being an outcome (reduced LOS) of PC involvement. Because we controlled for the effect of LOS on costs through matching, our estimates of savings are likely to be conservative. Previous studies have attributed savings to shifts in care based on alignment of therapies to palliative goals. For example, studies of PC consultation in ICUs found no change in mortality but shorter LOS for patients who died.^{14,17}

Although all observational studies are limited by selection biases, our analysis is strengthened by the use of propensity scores to select matches for comparison, which helps to reduce error due to confounding but can only do so with the variables

TABLE 4. ADJUSTED^a PERCENT SAVINGS BY HOSPITAL, DISCHARGE DISPOSITION, AND LOS

	1–7 days			8–30 days			> 30 days			Total LOS		
	N	Savings (%)	P value	N	Savings (%)	P value	N	Savings (%)	P value	N	Savings (%)	P value
Both hospitals												
All patients	1367	13.0	0.001	1750	4.9	0.068	488	–3.9	0.373	3605	3.3	0.300
Survivors	772	19.1	<0.001	1111	6.0	0.060	343	–2.8	0.611	2226	4.6	0.269
Decedents	595	10.0	0.096	639	5.1	0.232	145	–4.2	0.600	1379	1.8	0.717
Hospital 1												
All patients	459	23.1	<0.001	764	14.0	<0.001	264	–4.9	0.458	1487	8.3	0.100
Survivors	320	23.7	<0.001	469	12.2	0.009	155	–4.8	0.585	944	10.2	0.142
Decedents	139	20.5	0.071	295	17.9	0.002	109	–4.8	0.645	543	8.5	0.276
Hospital 2												
All patients	908	7.7	0.115	986	–4.5	0.220	224	–2.7	0.617	2118	–1.5	0.691
Survivors	452	16.0	0.001	642	–1.5	0.716	188	–3.1	0.623	1282	–1.0	0.887
Decedents	456	5.5	0.440	344	–7.6	0.187	36	–11.0	0.275	836	–8.9	0.128

^aModels adjusted for age, race, gender, number of comorbid conditions, number of prior hospitalizations, diagnosis of any cancer or metastatic cancer, acute myocardial infarction, cerebral vascular disease, injury severity score, DRG, number of ICU days, and hospital. Negative numbers indicate palliative care costs were higher than the usual care group.

DRG, diagnosis-related group; ICU, intensive care unit; LOS, length of stay.

available for inclusion in analysis.¹² The differences between the patient characteristics for those in the palliative and usual care groups suggests there are other unmeasured variables that contribute to the propensity to get a PC referral. However, where there were group differences in patient characteristics, the PC patients were the ones with more comorbidities and prior hospitalizations, and higher rates of serious illness, factors that are more likely to be associated with higher rather than lower costs.

We ran several models with different variables to improve the fit for both hospitals, for example, adding injury severity scores to account for the trauma and burn population of Hospital 2. Other hospitals can apply these methods to tailor analyses to the specific characteristics of their own patient and provider populations. The different pattern of savings for the two hospitals may be explained by the differences in patient populations or patient preferences and the opportunities for savings to occur. For example, there may be more ways to tailor therapy for cancer and transplant patients than there are for trauma patients.

Conclusion

These findings suggest that savings can be achieved by earlier involvement of PC and support screening efforts at or near admission to identify patients who can benefit from PC services early in an admission.

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Author Disclosure Statement

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