

Impact of Inpatient Palliative Care on Treatment Intensity for Patients with Serious Illness

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Abstract

Background: Palliative care is associated with decreased treatment intensity and improved quality for individual patients at the end of life, but little is known about how hospital-wide outcomes are affected by the diffusion of palliative care principles.

Objective: We examined the relationship between presence of palliative care programs and hospitals' average treatment intensity, as indicated by mean intensive care unit (ICU) length of stay (LOS) and days under Medicare hospice coverage, in the last six months of life among Medicare beneficiaries aged 67 and over with serious chronic illness.

Methods: We linked hospital-level data from the American Hospital Association Annual Survey, National Palliative Care Registry, and Dartmouth Atlas of Health Care to examine hospital-level treatment intensity for chronically ill Medicare beneficiaries who died in 2010. We used propensity score-adjusted linear regression to estimate the relationship between palliative care programs and hospitals' mean ICU LOS and hospice length of enrollment.

Results: Among 974 hospitals meeting inclusion criteria, we compared 295 hospitals with palliative care programs to 679 hospitals without. Hospitals with palliative care programs were higher volume, more likely to be teaching hospitals, and have oncology services and less likely to be located in rural areas. In propensity score weighted analyses, the mean ICU LOS in hospitals with palliative care was shorter by 0.23 days (standard error [SE]=0.26), but this was not statistically significant ($p=0.76$). In addition, the mean length of hospice enrollment among beneficiaries served by hospitals with palliative care was longer by 0.22 days (SE=0.61), but also was not statistically significant ($p=0.76$).

Conclusions: Hospital-based palliative care programs alone may not be sufficient to impact ICU LOS or hospice length of enrollment for all chronically ill older adults admitted to hospitals. Future work should measure hospital-wide palliative care outcomes and effects of core palliative knowledge and skills provided by nonpalliative care specialists.

Introduction

THERE IS A LARGE AND EXPANDING POPULATION of older adults with serious chronic illnesses. By 2020, 20% of the U.S. population will be over the age of 65 with approximately one-half experiencing three or more chronic conditions.¹ This population of seriously ill older adults receives treatment at the end of life that is often of high intensity,²⁻⁴ but has not been clearly linked to higher quality.³⁻⁸ Studies have shown that palliative care is associated with increased

quality and decreased treatment intensity at the end of life,⁹⁻¹¹ specifically demonstrating reduced intensive care unit (ICU) utilization¹²⁻¹⁷ and increased hospice utilization.¹⁸⁻²⁰

Most hospitals with more than 50 beds have a palliative care program, yet much variation by state and hospital type remains.²¹⁻²³ While studies have investigated the relationship between palliative care and treatment intensity at the individual patient level,^{9-11,24,25} palliative care programs may also influence local practice patterns and thereby reduce treatment intensity for a hospital's entire population of

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seriously ill patients. This hospital-level effect would be especially important because the shortage of palliative care clinicians precludes specialist care for all who might benefit.^{26,27}

Therefore, we aimed to evaluate the relationship between hospital palliative care programs and treatment intensity among older patients as evidenced by hospitals' average ICU and hospice use in the last six months of life using propensity score-adjusted analyses of a national sample of hospitals.

Methods

Data sources

This study used data from three sources linked at the hospital level: the Dartmouth Atlas of Health Care, the National Palliative Care Registry, and the American Hospital Association (AHA) Annual Survey of Hospitals. First, the Dartmouth Atlas uses Medicare claims to provide hospital-level rates of health-care utilization.²⁸ The Atlas links chronically ill patients, who died in 2010, to the hospital where they were admitted most often during the last two years of life (excluding surgical admissions). The Atlas includes all U.S. hospitals with 80 or more Medicare decedents aged 67–99 years at the time of death, who were hospitalized at least once during the last two years of life and had one or more of nine chronic illnesses with high risk of mortality.^{29,30} The illnesses included cancer, congestive heart failure, chronic lung disease, dementia, diabetes, peripheral vascular disease, renal failure, chronic liver disease, and coronary artery disease.^{29,30}

Next, the National Palliative Care Registry is a repository created by the Center to Advance Palliative Care and the National Palliative Care Research Center for self-reported operational information about palliative care programs.³¹ Finally, the AHA Annual Survey of Hospitals from 2006 to 2007 collects data on hospital characteristics, including size, governance, personnel, and the presence of facilities and services (including palliative care).³²

We merged data from these three sources to create a composite dataset, including hospital characteristics (palliative care program, hospital control/ownership, sole community provider, region, community size, oncology services, Accreditation Council of Graduate Medical Education (ACGME), Catholic affiliation, Joint Commission accreditation, hospice ownership, ICU bed count, and number of Medicare discharges), palliative care program characteristics (consult service, palliative care unit (PCU), age of program, number of clinicians employed, and percent of hospital discharges who were treated by palliative care), and ICU length of stay (LOS) and hospice length of enrollment.

Sample selection

We included hospitals from the 2010 Dartmouth Atlas in the treatment group (palliative care) if they reported a palliative care program operating before 2006 in the National Palliative Care Registry.^{31,32} This insured that treatment group hospitals had a palliative care program for a minimum of five years. For inclusion in the control group, we required negative responses to all questions in both the 2006 and 2007 AHA Annual Surveys regarding the presence of palliative care programs. Hospitals with conflicting data, for example, those reporting a palliative care program in the AHA Survey,

but not in the National Palliative Care Registry, were excluded from the study sample, as were those that reported the initiation or cessation of palliative care services during the study period.

Measures

We selected two proxy measures of treatment intensity. First, the hospital's mean ICU LOS among chronically ill older adults in the last six months of life was chosen because it is a frequently reported objective indicator of end-of-life treatment intensity.^{12–17} Next, we examined mean days under Medicare hospice coverage in the last six months of life because enrollment in hospice before death has been shown to be associated with decreased treatment intensity at the end of life.^{33–36} Outcome measures were drawn from the 2010 Dartmouth Atlas and reflect the average ICU LOS and hospice length of enrollment during the last six months of life among chronically ill Medicare beneficiaries at each hospital.

The Dartmouth Atlas adjusts outcomes for differences in age, sex, race, primary chronic condition, and the presence of more than one chronic condition.³⁰ ICU LOS was calculated as the adjusted mean number of days that each hospital's cohort of beneficiaries spent in any ICU during the last six months of life. Hospice length of enrollment was calculated as the adjusted mean number of days that each hospital's cohort of beneficiaries spent under the hospice benefit during the last six months of life.

Covariates included hospital characteristics shown to be associated with treatment intensity or the presence of palliative care.^{21,22,37,38} These included hospital control/ownership, sole community provider, region, community size, oncology services, ACGME, Catholic affiliation, Joint Commission accreditation, hospice ownership, ICU bed count, and number of Medicare discharges. Because ICU bed count and number of Medicare discharge distributions were substantially skewed, they were log-transformed to improve normality.

Analyses

Data regarding the characteristics of hospitals with and without palliative care were explored with descriptive statistics and compared using *t*-tests or chi-square tests, as appropriate. Statistical significance was considered an alpha level of <0.05. The ideal strategy for controlling for potentially confounding differences between treatment groups is randomization. Because randomization of palliative care programs is very difficult, propensity score methods have become increasingly common in palliative care research.^{39,40} We used propensity score weighting to control for selection bias when examining programs' relationships with treatment intensity outcomes. Specifically, this approach allowed us to control for observed factors associated with the outcomes and the presence of palliative care programs.^{41,42}

We estimated the propensity scores using the covariate balancing propensity score method, which simultaneously estimates propensity scores and optimizes the balance of included covariates.⁴³ If standardized differences are <10% after weighting, covariates are considered well balanced between treatment and control groups, indicating that confounding due to these observed covariates has been effectively controlled.^{41,44} Using an approximate doubly robust approach,⁴⁵ we conducted ordinary least-squares regression,

with propensity score weighting (i.e., inverse probability of treatment weighting) and adjusted for all previously described covariates to estimate the relationship between having a palliative care program and mean ICU LOS or hospice length of enrollment.

Multiple comparisons in the multivariate model were corrected for using the Holm method to reduce the likelihood that testing for more than one outcome increases the probability of false positives.^{46,47} All analyses were conducted using Stata/IC 13.1 and R 3.0.1 software. This study was deemed exempt from the Institutional Review Board at the Icahn School of Medicine at Mount Sinai and the NYU Committee on Activities Involving Human Subjects.

Results

Of the 2554 U.S. hospitals in the 2010 Dartmouth Atlas, 295 met study criteria for inclusion in the palliative care group and 679 were included in the control group. The remaining 1580 hospitals were excluded due to absence of data on palliative care services or because services were started or stopped during the study period. A comparison of the hospital characteristics is provided in Table 1. Overall, hospitals with palliative care, compared to those without, were higher volume (mean = 8737 Medicare discharges vs. 3479 Medicare discharges), more likely to be ACGME members (51% vs.

10%), not for profit (88% vs. 57%), and have oncology services (77% vs. 31%), whereas they were less likely to be in Southern states (33% vs. 53%), rural areas (1% vs. 11%), or to be sole community providers (5% vs. 16%), all *p*-values <0.001.

In unweighted analyses, the mean ICU LOS for hospitals with palliative care (M=4.37 days, standard deviation [SD]=2.3) was not significantly different than that in hospitals without palliative care (M=4.16 days, SD=2.5), *p*=0.11. The mean Medicare hospice enrollment for hospitals with palliative care (M=18.3 days, SD=5.9) was not significantly different than that in hospitals without palliative care (M=18.8 days, SD=7.9), *p*=0.85 (Table 1).

We provide a description of palliative care program characteristics in Table 2. Greater than 90% of programs provided consultative services (71.9% consult services only and 21.4% both consult and PCU). On average, programs employed 1.2 full-time equivalent (FTE) physicians, 1.1 advanced practice nurses, and 1.6 registered nurses. Palliative care had been provided for a mean of 7.8 years and treated 3.4% of hospital discharges.

Following propensity score weighting, 18 out of 19 covariates met the balance parameters. For the remaining covariate, Medicare discharges, balance was substantially improved (standardized difference = 10.2%), but did not meet our balance parameter of standardized difference <10%.

TABLE 1. HOSPITAL CHARACTERISTICS

Characteristic	Hospitals with palliative care (n=295)	Controls (no palliative care) (n=679)	P
Hospital control/Ownership, n (%)			
Nongovernment, not-for-profit	259 (87.8)	386 (56.9)	<0.001
Government, nonfederal	35 (11.9)	131 (19.3)	
Investor owned, for profit	1 (0.34)	162 (23.9)	
Sole community provider, n (%)	15 (5.0)	106 (15.6)	<0.001
Region, n (%)			
Midwest	88 (29.8)	128 (18.9)	<0.001
Northeast	68 (23.1)	95 (14.0)	
South	96 (32.5)	361 (53.1)	
West	43 (14.6)	95 (14.0)	
Community size, n (%)			
Rural ^a	2 (0.7)	73 (10.8)	<0.001
Micropolitan ^b	18 (6.1)	221 (32.6)	
Metropolitan ^c	206 (69.8)	294 (43.3)	
Metropolitan division ^d	69 (23.4)	91 (13.4)	
Oncology services, n (%)	228 (77.3)	213 (31.4)	<0.001
ACGME, n (%)	150 (50.9)	66 (9.7)	<0.001
Catholic, n (%)	83 (28.1)	48 (7.1)	<0.001
Joint Commission accreditation, n (%)	298 (97.3)	601 (88.5)	<0.001
Hospice ownership, n (%)	232 (78.6)	345 (50.8)	<0.001
ICU beds, mean (SD)	44.3 (33.5)	16.3 (16.9)	<0.001
Medicare discharges/year, mean (SD)	8736.5 (5116.4)	3479.2 (2369.3)	<0.001
Outcomes measure			
Mean ICU LOS in days	4.37 (2.3)	4.16 (2.5)	0.11
in last six months of life (SD)			
Mean days of Medicare hospice enrollment in last six months of life (SD)	18.3 (5.9)	18.8 (7.9)	0.85

^aPopulation <10,000.

^bPopulation 10,000–49,999.

^cPopulation 50,000–2,499,999.

^dPopulation ≥2,500,000.

ACGME, Accreditation Council of Graduate Medical Education; ICU, intensive care unit; LOS, length of stay; SD, standard deviation.

TABLE 2. PALLIATIVE CARE PROGRAM CHARACTERISTICS

Type of palliative care service (<i>n</i> = 295)	
Consult service only, <i>n</i> (%)	212 (71.9)
PCU only, <i>n</i> (%)	20 (6.8)
Both consult and PCU, <i>n</i> (%)	63 (21.4)
Mean age of program (<i>n</i> = 295) (SD)	7.8 years (3.9)
Mean clinician full-time equivalents (<i>n</i> = 196) (SD)	
Total	3.9 (4.8)
Physician	1.2 (1.7)
Advanced practice nurse	1.1 (1.2)
Registered nurse	1.6 (3.7)
Penetration ^a (<i>n</i> = 165) (SD)	3.4 (2)

^aPercent of hospital discharges treated by palliative care in 2010. PCU, palliative care unit.

Table 3 presents the results of the weighted and fully adjusted analysis. Palliative care was not significantly associated with hospital-wide ICU LOS (*p* = 0.76). Likewise, palliative care was not significantly associated with hospital-wide days of Medicare hospice enrollment (*p* = 0.76).

Discussion

This study of hospital-level outcomes did not demonstrate differences in ICU LOS or days of Medicare hospice enrollment between hospitals with and without palliative care programs. Previous studies examining these outcomes among individual patients who received palliative care ranged from single-institution studies to one 8-hospital multisite study and found increased hospice utilization and either decreased or no difference in ICU LOS.^{13-17,20} To our knowledge, our study is the first to examine the association between palliative care and end-of-life outcomes for seriously ill older adults at the hospital level. Furthermore, our study used a national sample of hospitals and statistical methods that attempt to more fully adjust for relevant covariates.

Despite finding no difference in outcomes, this study confirmed previous work identifying characteristics associated with the presence of palliative care services.^{21,22,37, 38,48-50} Compared to other hospitals, those with palliative care were higher volume, more likely to be academic or sole community providers, have a cancer program, and have Catholic or non-profit ownership. In addition, this investigation included descriptive information about the scope of palliative care services in the hospitals. Most programs provided consultative services alone or in combination with a PCU, while a minority had a PCU alone.

Because inclusion was limited to hospitals with palliative care for five or more years, this sample includes rather mature

programs in operation for greater than seven years on average. Despite this relative maturity, programs were somewhat small, with each team averaging approximately four FTEs of physicians and nurses (including all registered nurses) combined.

Furthermore, as an estimate of how well programs are reaching patients who might benefit from palliative care, the hospitals in our sample provided palliative care services to 3.4% of annual hospital discharges in 2010. This rate is similar to the 3% mean penetration found in a report from the same year utilizing a larger sample of hospitals⁵¹ and strengthens our conclusion that our sample is representative in this regard. In addition, palliative care has been associated with significant cost reduction in hospital populations approaching a 4% penetration rate.⁵² Although the ideal penetration for palliative care is unknown, one estimate states that programs should aim to reach ~6% of hospital discharges.²⁷ Further research is needed to determine if greater penetration of palliative care services is associated with improved outcomes.

This study has several additional limitations. The outcomes are from the Dartmouth Atlas, which uses Medicare data for fee-for-service beneficiaries only. Because these data exclude Medicare Advantage enrollees and those under age 65, our results may not be generalizable to all seriously ill patients, although studies suggest that Medicare Advantage enrollees are typically healthier than patients enrolled in traditional Medicare.⁵³ Patients admitted with primary surgical diagnoses were not included and so were patients with serious medical illnesses who survived the observational period. This enhanced the homogeneity of the sample, but may have excluded the contributions that palliative care makes for surgical patients and those with complex medical problems who survive.⁵²

Despite these limitations, the Dartmouth Atlas has collected information on the relationships between resources, utilization, and outcomes for over 20 years and for end-of-life care for more than a decade and remains a key source of data on end-of-life care.^{4,28,30} The National Palliative Care Registry and the AHA Annual Survey rely on institutional self-report and therefore may be subject to error or reporting bias. However, they are unique and important sources of information about palliative care and hospitals that cannot currently be found elsewhere for such a large number of institutions.

Using a conservative approach for identifying hospitals with palliative care, we used strict criteria based on data in the National Palliative Care Registry. While the AHA Annual Survey requires answers to only several yes/no questions about the availability of palliative care, the National Palliative Care

TABLE 3. ADJUSTED ASSOCIATIONS OF PALLIATIVE CARE WITH INTENSIVE CARE UNIT LENGTH OF STAY AND HOSPICE LENGTH OF ENROLLMENT IN THE LAST SIX MONTHS OF LIFE

Outcomes	Coefficient	SE	Adjusted p-value ^a	Corrected p-value ^b
ICU LOS, days	-0.23	0.26	0.38	0.76
Medicare hospice enrollment, days	0.22	0.61	0.72	0.76

^aAdjusted for age, sex, race, primary chronic condition (cancer, congestive heart failure, chronic lung disease, dementia, diabetes, peripheral vascular disease, renal failure, chronic liver disease, and coronary artery disease), the presence of more than one chronic condition, and propensity score.

^bCorrected for multiple comparisons using the Holm method. SE, standard error.

Registry requires the entry of extensive administrative and programmatic data. Because we used these answers to establish the presence of palliative care, we believe the likelihood of erroneously assigning a hospital without palliative care to the treatment group is quite low. In addition, this likely undercounts the presence of palliative care programs by excluding those not voluntarily participating in the Registry and may bias our results toward finding no effect.

Because we used an observational design, this analysis cannot account for differences as well as a randomized controlled trial. Propensity score analyses cannot account for unobserved or unobservable factors (such as differences in institutional culture), and these may contribute to bias due to confounding. However, propensity score analyses are commonly used in palliative care research, and random assignment of palliative care programs to hospitals on this scale would be very difficult.^{39,40} Propensity score-based weighting is designed to adjust for differences in observed covariates.

In this study, we demonstrated excellent balance between the treatment and control groups and thus conclude that confounding due to these covariates is well controlled. For one covariate (number of Medicare discharges), the adjusted standardized difference remained slightly above the cutoff (10.2%). We believe it is justified to keep Medicare discharges in the model for two reasons. First, although we chose a conservative cutoff of 10%, some proponents of balance statistics advocate for a cutoff as high as 25%.⁴¹ Second, some imbalance in covariates is found even in many randomized controlled trials.⁵⁴

Finally, we aimed to measure hospital-wide outcomes and, therefore, cannot draw conclusions about palliative care services provided to the subset of individuals who actually received them. This study hypothesized that the outcomes would be significantly different due to the combined effect on individual patients receiving palliative care and the diffusion of palliative care principles and practices throughout the hospitals with palliative care. Given the fact that other studies have demonstrated decreased treatment intensity and improved quality for individuals receiving palliative care,^{13–17,20} it is possible that our inability to detect significant differences at the hospital level is due to low penetration of services and lack of substantial diffusion of palliative care principles and practices throughout the hospitals.

As there are not enough palliative care specialists to care for all patients with palliative care needs,^{26,27} it is important to know if palliative care interventions are capable of extending benefits beyond the direct recipients of specialist care. Our findings suggest that hospital-based palliative care programs alone, at current levels of penetration, may be unable to broadly influence the larger population of patients with serious chronic illness. This, coupled with the current workforce shortage, provides evidence to support an approach that some have referred to as primary palliative care as an important complement to specialty-level palliative care.^{55,56} Primary palliative care is the integration of palliative care principles and basic skills into general clinical practice by all providers.^{55,56} This would require a substantial investment in education and training for clinicians at the undergraduate, graduate, and postgraduate levels.

In this analysis of hospital-level outcomes, we examined two indicators of intensity at the end of life. Many other studies of interventions at the individual patient level have

demonstrated benefits of palliative care using a broad range of intensity and quality outcomes.^{13–17,20,24,25} Future studies of hospital-level outcomes should include indicators such as cost and 30-day readmission.

Further research evaluating hospital-level outcomes is increasingly important, particularly as hospitals shift to risk sharing reimbursement models⁵⁷ and must make choices among competing options for resource-intensive programs. Specifically, future work evaluating palliative care should sample a broader range of hospitals, including smaller hospitals that are underrepresented in the National Palliative Care Registry, as well as investigating whether there are different effects in specific types of institutions, such as academic medical centers or cancer hospitals. In addition, it will be critical to assess the impact of hospice and palliative care services in other settings, such as the outpatient clinic, home, and nursing home.

Healthcare for older adults with serious chronic illness is too often of poor quality and high intensity.^{6–8} Although palliative care may help to mitigate these problems for individual patients, this study suggests that palliative care programs alone may not be sufficient to influence the care of all chronically ill older adults admitted to hospitals with such programs.

Given the evidence from this study and others demonstrating wide variation in the availability of hospital-based palliative care services, it is particularly important to create and test innovative approaches to improving access to palliative care. This should include efforts to enhance both access to specialty-level palliative care and the ability of all clinicians, hospitals, and health systems to incorporate core palliative care knowledge and skills (e.g., pain and symptom management, communication skills, and care coordination for the seriously ill) into routine health care.

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Author Disclosure Statement

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