Palliative Care Consults in Nursing Homes and Reductions in Acute Care Use and Potentially Burdensome End-of-Life Transitions

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Abstract

BACKGROUND/OBJECTIVES—To evaluate how receipt and timing of nursing home (NH) palliative care consults (primarily by nurse practitioners with palliative care expertise) is associated with end-of-life care transitions and acute care use

DESIGN—A propensity-score (pscore) matched retrospective cohort study

SETTING—Forty-six NHs in two states

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PARTICIPANTS—NH residents who died in 2006–2010 stratified by days between initial consult and death: 7, 8–30, 31–60 or 61–180. By strata, pscore matching identified three controls (n=1,174) for each consult recipient (n=477).

MEASUREMENTS—Outcomes were hospitalizations in the last 7, 30 and 60 days of life, emergency room visits in the last 30 and 60 days, and any potentially burdensome care transition defined as hospitalization or hospice admission within three days of death or two or more hospitalizations or emergency room visits within 30. Weighted multivariate logistic regression analyses evaluated outcomes.

RESULTS—Residents with consults (compared to controls) had lower rates of hospitalization, with rates lowest when initial consults were furthest from death. For instance, among residents with initial consults 8–30 days before death the adjusted hospitalization rate in the last seven days of life was 11.1% (95% CI, 9.79 to 12.43) compared to 22.0% (95% CI, 20.62 to 23.41) among controls; however, among those with initial consults 61–180 days before death, rates were 6.9% (95% CI, 5.47 to 8.37) compared to 22.9% (95% CI, 20.48 to 25.42). Potentially burdensome transition rates were lower when consults were 61–180 days before death (16.2% (95% CI, 13.74 to 18.57) compared to 28.2% (95% CI, 25.82 to 30.59)) for controls.

CONCLUSION—Findings suggest palliative care consults improve end-of-life NH care by reducing acute care use and potentially burdensome care transitions.

INTRODUCTION

Palliative care (PC) optimizes quality of life for persons with serious illness by anticipating, preventing, and alleviating suffering across the care continuum.[1] The Institute of Medicine recommends persons with advanced serious illness should have access to specialty palliative care across care settings.[2] Still, for the half million older adults dying in United States (US) nursing homes (NH) each year, as well as those living in NHs with advanced illness, access to palliative care is often lacking.[3–6] Hospice is a major source of palliative care in NHs but half of NH hospice patients have enrollments of 22 days or less and long hospice stays for this population are costly and trigger regulatory scrutiny.[7–9] An alternative model is needed to expand the availability of palliative care expertise in NHs beyond that currently available through Medicare hospice.[3,5,6,10] To expand access, some NHs now offer palliative care consults by external providers with palliative care expertise (i.e., specialty palliative care consults) to residents; however, empirical evidence of the value of this approach is absent.

Palliative care consults differ from Medicare hospice in that they do not require active choice by residents/families or forfeiture of Medicare Part-A benefits (i.e., hospital and skilled nursing facility care). Also, a physician-certified terminal prognosis of six months or less is not required. Similar to NH hospice, palliative care consults are often initiated at the request of NH staff or family members[3,11] and must be ordered by attending physicians. Staff and family requests often result from a recognized need such as symptom management or assistance with difficult treatment decisions. They also arise when hospice is not feasible

due to receipt of Medicare skilled nursing facility (SNF) care or a life expectancy greater than six months. Unlike hospice, there is no designated Medicare payment stream for palliative care consults; they are billed as NH visits under Medicare Part B.

In hospitals, palliative care consults are consistently associated with lower intensity of treatments and costs, and in outpatient settings, with improved quality of life and reductions in aggressive care.[12–16] Additionally, earlier (compared to later) hospice or palliative care enrollment is associated with greater reductions in acute care use and improvements in quality.[13,15,17–19]

No study has examined how specialty palliative consults affect health care utilization for residents in NHs and whether earlier receipt may be more effective. Therefore, in this study, we examined how consults in NHs are associated with the use of acute care service and burdensome transitions[14] near the end-of-life. Also, although not a main outcome, we examined Medicare expenditures near the end-of-life to understand how observed benefits are associated with Medicare costs.

METHODS

Study Data and Population

Given there was no Medicare Part B payment code(s) to validly identify palliative care consults in the time period studied, we collaborated with two palliative care provider organizations to identify NH consult recipients. Both are long-standing providers of NH consults and are subsidiaries of hospices located in hospice certificate-of-need states (North Carolina and Rhode Island); during study years, they were the exclusive providers of palliative care consults in the two counties in North Carolina and the six in Rhode Island where study NHs were located. After obtaining a data use agreement (DUA) from the Centers for Medicare and Medicaid Services (CMS) and Health Insurance Portability and Accountability Act (HIPAA) waiver approvals, the two organizations shared NH consult data for years 2005–2010. Data shared included a consult recipient's date of birth, Medicare (or insurance) identification (ID) number, gender, dates of initial palliative consults and NH identifying information. This study was approved by Brown University's Institutional Review Board.

Provider data were linked to Medicare enrollment and Part A claims data, and NH resident assessment Minimum Data Set (MDS) data. The MDS is mandated for all Medicare or Medicaid certified NHs and includes comprehensive demographic and clinical data. The enrollment file contains data on Medicare eligibility, Medicare Advantage enrollment and date of death. Part A claims data provide information on hospital, skilled nursing facility (SNF), emergency room (ER), home health care and hospice use. Data from the Online Survey, Certification, and Reporting (OSCAR) database provided information on NH characteristics.

We identified NH decedents in 2006–10 with initial palliative care consults within 180 days of death, who were Medicare-eligible and not enrolled in Medicare Advantage in the last year of life (given claims data are not available for Medicare Advantage enrollees; n=653).

For each resident, we identified a baseline MDS dated prior to the initial palliative care consult, but by no more than 180 days. We removed two residents with a hospice discharge on the date of first consult, ten with consults on the date of death and 133 with no MDS data in the required time window. Ninety percent of the 145 residents removed versus 45% of those remaining had short NH stays (i.e., <90 days). The resulting palliative care consult sample consisted of 508 residents (77.8%) from 46 of the 53 NHs (86.8%). Although examination of consult after 2010 would have been desirable, the MDS changed in October of 2010. The newer MDS is not comparable to the earlier version and is missing key information, in particular, variables indicating preference (i.e., the presence of do not resuscitate (DNR) and do not hospitalize (DNH) orders).

To control for potential differences and preferences of NH residents with and without palliative care consults, we chose propensity-score (pscore) matched controls. Decedents eligible to serve as controls came from the same NHs and time frames, and were also Medicare-eligible with no Medicare Advantage in the last year of life. They also had to have MDS assessments in time periods comparable to consult decedents' baseline assessments. To enable examination of the timing of palliative care, and congruent with previous similar research[13,15,16,18,19], we first stratified the treatment sample into four treatment groups by days between the initial consult and death: 7, 8–30, 31–60 and 61–180. Variables for pscore model inclusion were identified through previous related research.[7,18,20–23] Using pscore matching with replacement, we identified three matched controls for 477 of the 508 consult decedents (93.9%) for a total of 1,174 propensity-matched controls. (See also On-line Supplemental Material for additional information on pscore matching.)

Variables of Interest

Independent Variable – Palliative care consult and its timing—The treatment of interest was initial exposure to any specialty palliative care consult in the last six months of life, and to examine timing (as discussed above), treatment groups were created using the days between the initial consult and death: 7, 8–30, 31–60 and 61–180. At both study sites, a palliative care consult visit primarily consists of care by nurse practitioners, under the supervision of certified palliative care physicians. These nurse practitioners specialize in palliative care (do not provide primary care) and have extensive palliative care training. At initial visits and at both sites, nurse practitioners typically review diagnoses and prognoses and address symptom control needs. To ensure treatment consistent with preferences, they also review advance directives, if available, and discuss goals of care. Family meetings are a key component of many consults. While interdisciplinary palliative care team members may visit residents when needs exist, such visits are not routine or integral to the care model. Similar to other studies,[12, 15–17, 24, 25] we considered hospice enrollment (after initial consult) to be within the treatment pathway.

Study Outcomes—Using Medicare claims, we identified hospitalizations in the last 7, 30 or 60 days of life, and ER visits (without subsequent hospitalizations) in the last 30 or 60 days of life. We also identified the occurrence of any potentially burdensome end-of-life care transition since higher rates of such transitions have been shown to be associated with markers of poor quality NH care.[14] A potentially burdensome care transition was defined as

hospitalizations or hospice admissions within three days of death or two *or* more hospitalizations or ER visits (without subsequent hospitalizations) in the last 30 days of life.

Although not a main outcome, we examined total Medicare Part A expenditures in post-consult time periods: the last 7, 30 and 60 days of life. Expenditures were standardized to 2007 dollars.

Covariates for Propensity-score Matching and Multivariate Models—Resident-level sociodemographic variables included age, gender, marital status (married vs. other), and race (non-white vs. white). Per baseline MDS, preference variables included the presence or absence of DNR and DNH orders. Other baseline variables were diagnoses of cancer, dementia, both or neither, functional and cognitive impairment and whether a NH stay was short or long (90 days). Functional impairment was represented by the activities of daily living (ADL) scale, ranging from 0 to 28 (higher values indicating greater impairment). The Cognitive Performance Scale (CPS) reflected cognitive impairment, with scores ranging from 0 to 6 categorized as intact to mild impairment (0–2), moderate to moderate severe (3–4), and severe to very severe (5–6). In addition, an MDS variable denoting unstable, deteriorating, or declining cognitive or functional status was included as were variables to reflect the days between the baseline MDS and death (categorized). Finally, we controlled for previous acute care use, whether a resident had 1 or 2 hospitalizations 90 days prior to the baseline MDS.

Using aggregated MDS data, we created continuous variables reflecting a NH's percentage of non-white residents and its casemix severity, based on Medicare's Resource Utilization Groups (RUGS). NH-level variables from the OSCAR database included chain affiliation, for-profit status, and NH employment of any nurse practitioner/physician assistant (all yes/no), as well as the proportion of residents with Medicaid or Medicare as primary payer. A continuous variable represented the distance between NHs and their nearest hospitals. Lastly, we included indicator variables for state and for year of resident's death.

Analyses—For each treatment group and its potential controls, we estimated a logistic multivariate regression model of the likelihood of a decedent having a palliative care consult. We then used *k*-nearest neighbor with caliper pscore matching with replacement to choose the three closest controls whose logit pscore fell within one-fifth of the standard deviation of the mean logit pscore for each consult recipient. This resulted in 477 consult decedents and 1,174 controls. There were 101 consult decedents and 263 controls in the 7 days group; 162 and 410 in the 8–30 days group; 84 and 212 in the 31–60 days group and 130 and 289 in the 61–180 days group. Covariate balance was achieved by examining standardized differences (see Online Supplemental Material (and Tables S2–S5) for a full description of the pscore matching and model statistics).[26, 27]

To evaluate our outcomes, we controlled for any remaining confounding[28] by using weighted multivariate logistic regressions with the same variables used for matching. The weights were normalized weights generated by the pscore matching process, and the Wald X^2 test was used to assess fit of the weighted models. To evaluate Medicare expenditures

given the skewed nature of such data, we used generalized linear modeling with gamma distribution and a log link function in Stata.

RESULTS

Within the 46 study NHs, 10% of the 6,458 residents who died between 2006 and 2010 had initial palliative care consults in the last 180 days of life. Decedents who had consults were very different from unmatched decedents without consults (see Tables 1 and 2). However, after pscore matching no statistically significant differences remained and mean standardized differences between residents with and without consults post matching ranged from 3.4 to 5.6, compared to 16.9 to 24.7 prior to matching (see On-Line Supplemental Material, Tables S2–S5).

Overall, 39% of the (weighted) study population was male and 5% were non-white. At baseline, 14% had severe cognitive impairment and the average ADL score was 19 (with 28 representing total impairment). Also at baseline, 69% of the study population had DNR and 8% had DNH orders. Last, 55% were in NHs in North Carolina and 46% in RI NHs (data not shown).

As shown in Table 3, across all treatment groups and for all outcomes, residents with consults compared to matched controls had markedly lower adjusted rates of end-of-life hospitalizations. Furthermore, earlier admission to consult programs was associated with lower hospitalization rates (Table 3). Residents with the earliest consult exposure (61–180 days) had adjusted hospitalization rates in the last 7 and 30 days of life of 6.9% (95% CI, 5.47 to 8.37) and 15.4% (95% CI, 12.58 to 18.19), respectively; this compares to adjusted rates in the last 7 and 30 days of life of 13.1% (95% CI, 10.45 to 15.74) and 22.6% (95% CI, 18.61 to 26.63), respectively for decedents with consults 31–60 days before death (Table 3).

The likelihood of having an ER visit in the last 30 and 60 days of life was lower for residents with palliative care consults in both the 31–60 and 61–180 day consult groups. However, the difference was only statistically significant for NH residents in the 31–60 day consult group (Table 3). Residents with initial consults 61–180 days before death had almost half the adjusted rate of potentially burdensome transitions as did matched controls and this difference was statistically significant (Table 3).

The adjusted mean total Medicare expenditures after palliative care consult start dates were similar for those with versus without palliative care consults (Table 4). However, compared to controls, expenditures in the last 7 days of life were significantly lower for residents with initial consults in the last 30 and 61–180 days of life. Of interest and for residents with consults and their matched controls, Medicare hospice expenditures in the last 7 and 30 days of life increased as initial consults were further from death (see On-Line Supplemental Material, Table S6).

DISCUSSION

This study provides the first empirical evidence of the value of palliative care consults provided in NHs. It shows a robust association between NH residents' receipt of consults

and lower rates of end-of-life acute care use and potentially burdensome care transitions. Also, rates were generally lower with earlier consults and lowest when initial consults were 61–180 days before death. Residents' with consults had adjusted end-of-life hospitalization rates 4 to 16 absolute percentage points lower than matched controls; and, when initial consults began 61–180 days before death the rate of potentially burdensome transitions was 12 absolute percentage points lower for residents with consults compared to controls. Additionally, evaluation of Medicare expenditures showed no additional cost appeared to be associated with NH palliative care consults. Thus, this research suggests specialty palliative care consults add value to NH care for residents with advanced illness.

Study findings are in agreement with previous studies of palliative care consults in other settings,[12,15,24] and with studies showing earlier timing of hospice or palliative care has greater effects on end-of-life outcomes.[13,15,16,18,19] They are also in agreement with a study from a single NH in which receipt of palliative care consults was associated with lower ER use.[29]

Specialty palliative care consults are likely to facilitate reductions in acute care use and potentially burdensome care transitions through two primary mechanisms. First, they likely provide (earlier) palliative care exposure and symptom management for those who either do not desire or do not qualify for Medicare hospice, such as residents receiving Medicare Part A SNF care. Second, they facilitate and begin (earlier) conversations about prognoses and person-centered care preferences.[24] Such conversations often do not occur in NHs.[30] Alternatively, consult referral could be a signal of a desire to change goals of care to focus on quality of life or reflect recognition by clinicians that current care is non-beneficial.

It is well known is that NH residents with hospice, compared to those without, have lower end-of-life acute care use;[18,20] nonetheless, they incur greater Medicare expenditures in their last year of life, primarily because of long hospice stays.[7,9] This study provides evidence of an approach that could potentially lead to timelier hospice enrollment by improving specialty palliative care access to persons in NHs with advanced serious illness. However, this approach is not financially feasible for most palliative care provider organizations (often subsidiaries of hospices) since Medicare Part B visit payments are reported to inadequately cover the personnel and administrative costs associated with specialty palliative care consults.[3,6,10] Hospital-based palliative care programs receive the same Medicare Part B payment but nearly always offset the uncovered costs through savings resulting from reductions in the intensity of care.

Study findings support further consideration and study of the benefits and costs of an enhanced Medicare Part B visit payment for specialty palliative care consults in NHs. As in our study NHs, specialty palliative care consults could primarily be provided by nurse practitioners or physician assistants with palliative care expertise under the supervision of a physician with palliative care training and certification.[31] This consult policy would ensure providers have an adequate level of palliative care proficiency while also resulting in greater availability of specialty palliative care expertise in NHs.[5,6] While the shortage of palliative care physician specialists is a concern,[32] there is a cadre of hospice providers capable of

providing these specialty consults and they may be incentivized to do so if higher payment for specialty palliative care visits were available.

While we did not observe Medicare savings with consults (except in the last seven days of life), accountable care organizations may find cost savings to be present when fee for service incentives are eliminated for Medicare SNF care. Thus, similar to the myriad of studies showing hospital cost savings when patients receive palliative care consults,[15–17,24,25] savings may be experienced by providers accountable for care across settings. With the advent of NH readmission penalties and as CMS begins its bundled care initiative and tests an acute care hospital and (90-day) post-acute care episode bundled payment, NHs much like hospitals may find it financially beneficial to consider provision of specialty palliative care consults to seriously ill residents.

A major strength of this study is our use of rigorous methods. Pscore matching and analysis were by strata representing the time between initial consult and death. Matching corrected substantially for imbalance between residents with and without consults, and any residual confounding was controlled for in multivariate analyses. However, in addition to the observational nature of this study, we are unable to comment on the decision-making around consult referral and on factors associated with referral other than those represented in our secondary data sources. Also, this research had a retrospective cohort design and important concerns about bias with the use of a retrospective study design have been noted.[33] By use of pscore matching and examination of outcomes only in the last 60 days of life, we have attempted to minimize this bias. Additionally, findings are not necessarily nationally generalizable given they focus on NHs in only two states. Still, mean and median rates of hospital death and hospitalization in the last six months of life in North Carolina and Rhode Island are similar to national rates.[34] Furthermore, while research across additional states is desirable, the lack of dedicated palliative care payment or CPT codes make widespread study clearly challenging. This study focused on evaluating the receipt of any PC consult and we did not have data on "the dose" of palliative care (i.e., number of visits). However, as discussed in Methods, at both study sites, initial consult visits are quite similar and included goals of care discussions. Finally, given data limitations, we did not evaluate and thus cannot comment on the value of consults beginning more than six months prior to death.

In conclusion, specialty palliative care consults, especially those done earlier in the disease trajectory, appear to offer a value-added approach to decreasing potentially burdensome end-of-life transitions and acute care use for NH residents. Findings suggest Medicare and provider policy supporting concurrent specialty palliative care consults in NHs may lead to reductions in costly and often unsettling and discretionary hospital use - use that is likely to undermine residents' quality of life. Further study of this model using practical clinical trials is recommended.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Conflict of Interest Disclosures

Elements of Financial/ Personal Conflicts	Author 1 *Susan C. Miller		Author 2 Julie C. Lima		Author 3 Orna Intrator		Author 4 Edward W. Martin		Author 5 Janet H. Bull		Author 6 Laura C. Hanson	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation		x		x		x		x		x		x
Grants/Funds		x		x		x		x		x		x
Honoraria		x		x		x		x		x		x
Speaker Forum		x		x		x		x		x		x
Consultant		x		x		x		x		x		x
Stocks		x		x		x		x		x		x
Royalties		x		x		x		x		x		x
Expert Testimony		x		x		x		x		x		x
Board Member	x			x		x		x		x		x
Patents		x		x		x		x		x		x
Personal Relationship		x		x		x		x		x		x

Dr. Miller was a board member at a Rhode Island nursing home, Tockwotton on the Waterfront, during this study.

References

1. National Quality Forum (NQF). A National Framework and Preferred Practices for Palliative and Hospice Care Quality: A Consensus Report. Washington, DC: NQF; 2006.

2. Institute of Medicine. Dying in America: Improving Quality and Honoring Individual Preferences Near the End of Life. Washington, DC: 2014.

3. Carlson MD, Lim B, Meier DE. Strategies and innovative models for delivering palliative care in nursing homes. J Am Med Dir Assoc. 2011; 12(2):91–98. [PubMed: 21266284]

4. Miller SC, Lima JC, Looze J, et al. Dying in U.S. nursing homes with advanced dementia: how does health care use differ for residents with, versus without, end-of-life Medicare skilled nursing facility care? J Palliat Med. 2012; 15(1):43–50. [PubMed: 22175816]

5. Hanson LC, Ersek M. Meeting palliative care needs in post-acute care settings: "to help them live until they die". JAMA. 2006; 295(6):681–686. [PubMed: 16467237]

6. Meier DE, Lim B, Carlson MD. Raising The Standard: Palliative Care in Nursing Homes. Health Aff (Millwood). 2010; 29(1):136–140. [PubMed: 20048372]

7. Gozalo P, Plotzke M, Mor V, et al. Changes in Medicare costs with the growth of hospice care in nursing homes. N Engl J Med. 2015; 372(19):1823–1831. [PubMed: 25946281]

8. Medicare Payment Advisory Commission (MedPac). Medicare Hospice Policy Issues Report to the Congress: Medicare and the Health Care Delivery System. Washington, DC: Medicare Payment Advisory Commission; 2013.

9. Hamel MB. Investing in better care for patients dying in nursing homes. N Engl J Med. 2015; 372(19):1858–1859. [PubMed: 25946287]

10. Unroe KT, Ersek M, Cagle J. The IOM report on dying in America: a call to action for nursing homes. J Am Med Dir Assoc. 2015; 16(2):90–92. [PubMed: 25512213]

11. Welch LC, Miller SC, Martin EW, et al. Referral and timing of referral to hospice care in nursing homes: the significant role of staff members. Gerontologist. 2008; 48(4):477–484. [PubMed: 18728297]

12. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med. 2010; 363(8):733–742. [PubMed: 20818875]

13. Zimmermann C, Swami N, Krzyzanowska M, et al. Early palliative care for patients with advanced cancer: a cluster-randomised controlled trial. Lancet. 2014; 383(9930):1721–1730. [PubMed: 24559581]

14. Gozalo P, Teno J, Mitchell S, et al. End-of-life transitions among nursing home residents with cognitive issues. N Engl J Med. 2011; 365(13):1212–1221. [PubMed: 21991894]

15. Hanson LC, Usher B, Spragens L, et al. Clinical and economic impact of palliative care consultation. J Pain Symptom Manage. 2008; 35(4):340–346. [PubMed: 18261877]

16. Gonsalves WI, Tashi T, Krishnamurthy J, et al. Effect of palliative care services on the aggressiveness of end-of-life care in the Veteran's Affairs cancer population. J Palliat Med. 2011; 14(11):1231–1235. [PubMed: 21877925]

17. Morrison RS, Penrod JD, Cassel JB, et al. Cost savings associated with US hospital palliative care consultation programs. Arch Intern Med. 2008; 168(16):1783–1790. [PubMed: 18779466]

18. Kelley AS, Deb P, Du Q, et al. Hospice enrollment saves money for Medicare and improves care quality across a number of different lengths-of-stay. Health Aff (Millwood). 2013; 32(3):552–561. [PubMed: 23459735]

19. Amano K, Morita T, Tatara R, et al. Association between early palliative care referrals, inpatient hospice utilization, and aggressiveness of care at the end of life. J Palliat Med. 2015; 18(3):270–273. [PubMed: 25210851]

20. Gozalo PL, Miller SC. Hospice enrollment and evaluation of its causal effect on hospitalization of dying nursing home patients. Health Serv Res. 2007; 42(2):587–610. [PubMed: 17362208]

21. Lepore MJ, Miller SC, Gozalo P. Hospice use among urban Black and White U.S. nursing home decedents in 2006. Gerontologist. 2011; 51(2):251–260. [PubMed: 21076085]

22. Zheng NT, Mukamel DB, Friedman B, et al. The effect of hospice on hospitalizations of nursing home residents. J Am Med Dir Assoc. 2015; 16(2):155–159. [PubMed: 25304181]

23. Zheng NT, Mukamel DB, Caprio TV, et al. Hospice utilization in nursing homes: association with facility end-of-life care practices. Gerontologist. 2013; 53(5):817–827. [PubMed: 23231947]

24. May P, Normand C, Morrison RS. Economic impact of hospital inpatient palliative care consultation: review of current evidence and directions for future research. J Palliat Med. 2014; 17(9):1054–1063. [PubMed: 24984168]

25. Morrison RS, Dietrich J, Ladwig S, et al. Palliative care consultation teams cut hospital costs for Medicaid beneficiaries. Health Aff (Millwood). 2011; 30(3):454–463. [PubMed: 21383364]

26. Austin PC. Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. Stat Med. 2009; 28(25):3083–3107. [PubMed: 19757444]

27. Haukoos JS, Lewis RJ. The Propensity Score. JAMA. 2015; 314(15):1637–1638. [PubMed: 26501539]

28. Bang H, Robins JM. Doubly robust estimation in missing data and causal inference models. Biometrics. 2005; 61(4):962–973. [PubMed: 16401269]

29. Comart J, Mahler A, Schreiber R, et al. Palliative care for long-term care residents: effect on clinical outcomes. Gerontologist. 2013; 53(5):874–880. [PubMed: 23220397]

30. Schulz R, Boerner K, Klinger J, et al. Preparedness for death and adjustment to bereavement among caregivers of recently placed nursing home residents. J Palliat Med. 2015; 18(2):127–133. [PubMed: 25469737]

31. American Academy of Hospice and Palliative Medicine (AAHPM). Certification for Hospice and Palliative Medicine Specialists. Available at: http://aahpm.org/education/certification. Accessed September 8, 2015

32. Schenker Y, Arnold R. The Next Era of Palliative Care. JAMA. 2015; 314(15):1565–1566. [PubMed: 26334719]

33. Bach PB, Schrag D, Begg CB. Resurrecting treatment histories of dead patients: a study design that should be laid to rest. JAMA. 2004; 292(22):2765–2770. [PubMed: 15585737]

34. Inpatient Days per Decedent during the Last Six Months of Life. The Dartmouth Institute; 2015.

Table 1

Baseline Characteristics: Residents with Initial Palliative Care Consults <=7 Days and 8–30 Days Before Death and Their Potential Matched Controls

Characteristics	<=7 Days Before Death			8 to 30 Days Before Death		
	Potential Matches[a] (n=3273)	PC Consult (n=101)	p-value	Potential Matches[a] (n=3374)	PC Consult (n=162)	p-value
Age at baseline (mean)	85.7	83.5	0.01	86.2	85.5	0.33
Male	34.8%	46.5%	0.02	32.1%	38.9%	0.07
Non-White[b]	2.9%	0%	0.75	3.2%	7.4%	0.004
Married	24.0%	29.7%	0.19	22.6%	25.9%	0.32
DNR Order	74.6%	68.3%	0.16	73.7%	74.1%	0.93
DNH Order	15.0%	12.9%	0.56	14.6%	8.0%	0.02
Major Diagnosis Group						
Cancer, No Dementia	14.8%	24.8%	<0.001	13.4%	19.8%	0.11
Cancer and Dementia	10.4%	6.9%		10.3%	11.7%	
Dementia, No Cancer	46.7%	26.7%		51.1%	45.1%	
Other, No Cancer or Dementia	28.0%	41.6%		25.1%	23.5%	
Cognitive Performance Score						
Intact (0–2)	34.7%	49.5%	0.009	35.1%	40.1%	0.38
Moderate Impairment (3–4)	42.6%	33.7%		42.6%	40.7%	
Severe Impairment (5–6)	22.7%	16.8%		22.3%	19.1%	
Short NH Stay (<90 days)	41.0%	80.2%	<0.001	33.6%	48.1%	<0.001
Cognitive/ADL change[c]	71.8%	82.2%	0.02	69.6%	76.5%	0.06
Days between MDS and death (mean)	32.6	17.5	<0.001	44.1	40.53	0.12
Any hospitalizations in 90 days prior to baseline	54.0%	86.1%	<0.001	41.3%	60.5%	<0.001
2+ hospitalizations in 90 days prior to baseline[b]	23.3%	42.3%	<0.001	17.2%	27.2%	0.001

[a] Residents who died in the study nursing homes during the study years, and had the requisite Minimum Data Set assessment

[b] These variables were not included in the 7 day propensity score models.

[c] Cognitive/ADL change represents unstable, worsening, or declining status. ADL score ranges from 0–28 where 0=independent and 28=totally dependent.

ADL, activities of daily living; DNH, Do-Not-Hospitalize; DNR, Do-Not-Resuscitate; MDS, minimum data set; NH, nursing home.

Table 2

Baseline Characteristics: Residents with Initial Palliative Care Consults 31–60 and 61–180 Days Before Death and Their Potential Matched Controls

Characteristics	31 to 60 Days Before Death			61 to 180 Days Before Death		
	Potential Matches[a] (n=2295)	PC Consult (n=84)	p-value	Potential Matches[a] (n=2771)	PC Consult (n=130)	p-value
Age at baseline (mean)	86.8	82.9	<0.001	86.5	83.1	<0.001
Male	28.5%	41.7%	0.01	29.1%	33.8%	0.25
Non-White [b]	3.3%	4.8%	0.45	3.2%	6.2%	0.06
Married	20.4%	22.6%	0.63	20.1%	27.7%	0.04
DNR Order	73.9%	65.5%	0.09	70.9%	62.3%	0.04
DNH Order	11.7%	4.7%	0.05	9.9%	7.7%	0.40
Major Diagnosis Group						
Cancer, No Dementia	11.1%	25.0%	0.001	10.9%	14.6%	0.48
Cancer and Dementia	10.7%	7.1%		10.3%	7.7%	
Dementia, No Cancer	53.6%	41.7%		54.2%	52.3%	
Other, No Cancer or Dementia	24.6%	26.2%		24.5%	25.4%	
Cognitive Performance Score						
Intact (0–2)	35.0%	46.4%	0.04	37.6%	47.7%	0.001
Moderate Impairment (3–4)	43.2%	41.7%		43.2%	45.4%	
Severe Impairment (5–6)	21.8%	11.9%		19.2%	6.9%	
Short NH Stay (<90 days)	23.9%	36.9%	0.006	18.0%	12.3%	0.10
Cognitive/ADL change[c]	69.9%	85.7%	0.002	62.0%	76.9%	0.001
Days between MDS and death (mean)	70.8	66.4	0.15	121.9	137.6	<0.001
Any hospitalizations in 90 days prior to baseline	33.6%	65.5%	<0.001	38.4%	60.0%	<0.001
2+ hospitalizations in 90 days prior to baseline[b]	12.8%	23.8%	0.003	13.3%	27.7%	<0.001

[a] Residents who died in the study nursing homes during the study years, and had the requisite Minimum Data Set assessment

[b] These variables were not included in the 7 day propensity score models.

[c] Cognitive/ADL change represents unstable, worsening, or declining status. ADL score ranges from 0–28 where 0=independent and 28=totally dependent.

ADL, activities of daily living; DNH, Do-Not-Hospitalize; DNR, Do-Not-Resuscitate; MDS, minimum data set; NH, nursing home.

Table 3

Adjusted Rates[a] of Acute Care Use: Residents with Palliative Care in Differing Time Periods and Their Matched Controls

Outcomes	With PC Consult Adjusted Rate, (95% CI)	Without PC Consult Adjusted Rate, (95% CI)	P-value
Hospitalization in *last 7 days* of life			
Days between death and initial PC visit			
7 days[b]	20.8 (16.93 to 24.65)	36.0 (32.97 to 38.97)	.008
8–30 days	11.1 (9.79 to 12.43)	22.0 (20.62 to 23.41)	.002
31–60 days[c]	13.1 (10.45 to 15.74)	21.4 (18.81 to 24.05)	.138[d]
61–180 days	6.9 (5.47 to 8.37)	22.9 (20.48 to 25.42)	<.001
Hospitalization in *last 30 days* of life			
Days between death and initial PC visit			
31–60 days	22.6 (18.61 to 26.63)	32.9 (30.15 to 35.72)	.069
61–180 days	15.4 (12.58 to 18.19)	30.6 (27.80 to 33.49)	<.001
Hospitalization in last 60 days			
Days between death and initial PC visit			
61–180 days	26.9 (22.99 to 30.86)	40.1 (36.98 to 43.28)	.003
ER visits in last 30 days of life			
Days between death and initial PC visit			
31–60 days	8.3 (5.45 to 11.21)	15.9 (13.39 to 18.36)	.023
61–180 days[e,f]	10.8 (8.50 to 13.03)	14.4 (12.51 to 16.21)	.504
ER visits in last 60 days of life			
Days between death and initial PC visit			
61–180 days[f]	16.2 (13.45 to 18.86)	20.3 (18.27 to 22.24)	.265
Burdensome Transitions			
Days between death and initial PC visit			
7 days[b]	41.6 (36.47 to 46.69)	41.6 (38.10 to 45.07)	.995
8–30 days	28.4 (25.77 to 31.02)	25.9 (24.32 to 27.54)	.638
31–60 days[g]	22.6 (19.41 to 25.82)	26.6 (24.40 to 28.78)	.275
61–180 days	16.2 (13.74 to 18.57)	28.2 (25.82 to 30.59)	.004

Abbreviations: PC, palliative care; ER, emergency room

[a] Adjusted rates based on multivariate models controlling for the following variables, unless otherwise noted: For Residents: at baseline, age, marital status, non-White, do-not-resuscitate order, do-not-hospitalize order, 4-category dementia/cancer diagnoses, activities of daily living impairment, cognitive impairment, stability of cognition and functioning; days between baseline assessment and death; 1 or 2 or more hospitalizations in the 90 days prior to baseline assessment and year of death. For nursing homes: percent non-White, resident casemix, chain affiliation, profit status, employment of any nurse practitioner and/or physician assistant, proportion of residents on Medicare or Medicaid as primary payer, distance between nursing home and nearest hospital; and, location of nursing home (Rhode Island or North Carolina).

[b] Models did not include non-White, percent non-White, and 2 or more hospitalizations in 90 days prior to baseline assessment.

[c] Do-not-resuscitate order was removed from the model because it predicted the outcome perfectly.

[d]P-values do not perfectly coincide with 95% CI because p-values were generated from the predicted probabilities while the p-value was taken from the palliative consult estimate of the multivariate model.

[e]Cognitive impairment was removed from the model because it predicted the outcome perfectly.

[f]The 4-category dementia/cancer variable was removed from the model because it predicted the outcome perfectly. Dichotomous measures of dementia and cancer were added.

[g]To achieve model fit, this model did not include non-White, percent non-White, profit status, or presence of a Do-Not-Resuscitate order. It also replaced the 4-category dementia/cancer variable with dichotomous measure of dementia and cancer; collapsed categories of time from baseline assessment to death, year of death, and cognitive status; and added a quadratic term for distance from nursing home to the nearest hospital.

Table 4

Adjusted Medicare Expenditures: Residents with Palliative Care (PC) in Differing Time Periods and Their Matched Controls[a,b]

Outcomes	<u>With</u> PC Consult Adjusted Expenditures, (95% CI)	<u>Without</u> PC Consult Adjusted Expenditures, (95% CI)	P-value
Expenditures in *last 7 days* of life			
Days between death and initial PC visit			
7 days[c]	6365 (5997 to 6734)	9243 (8708 to 9778)	<.001
8–30 days	4414 (4249 to 4579)	5028 (4841 to 5216)	.117[d]
31–60 days	4662 (4395 to 4929)	5042 (4754 to 5331)	.525
61–180 days	3097 (2926 to 3267)	4140 (3912 to 4367)	.008
Expenditures in *last 30 days* of life			
Days between death and initial PC visit			
31–60 days	9784 (9241 to 10327)	9012 (8512 to 9511)	.416
61–180 days	7000 (6609 to 7390)	7000 (6610 to 7390)	1.000
Expenditures in *last 60 days* of life			
Days between death and initial PC visit			
61–180 days	12151 (11443 to 12858)	11496 (10827 to 12166)	.528

Abbreviations: PC, palliative care

[a] Adjusted rates based on multivariate models controlling for the following variables, unless otherwise noted: For Residents: at baseline, age, marital status, non-White, do-not-resuscitate order, do-not-hospitalize order, 4-category dementia/cancer diagnoses, activities of daily living impairment, cognitive impairment, stability of cognition and functioning; days between baseline assessment and death; 1 or 2 or more hospitalizations in the 90 days prior to baseline assessment and year of death. For nursing homes: percent non-White, resident casemix, chain affiliation, profit status, employment of any nurse practitioner and/or physician assistant, proportion of residents on Medicare or Medicaid as primary payer, distance between nursing home and nearest hospital; and, location of nursing home (Rhode Island or North Carolina).

[b] Values represent US dollars standardized to 2007 values.

[c] Models did not include non-White, percent non-White, and 2 or more hospitalizations in 90 days prior to baseline assessment.

[d] P-values do not perfectly coincide with 95% CI because p-values were generated from the predicted probabilities while the p-value was taken from the palliative consult estimate of the multivariate model.