Change in End-of-Life Care for Medicare Beneficiaries

Site of Death, Place of Care, and Health Care Transitions in 2000, 2005, and 2009

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Importance A recent Centers for Disease Control and Prevention report found that more persons die at home. This has been cited as evidence that persons dying in the United States are using more supportive care.

Objective To describe changes in site of death, place of care, and health care transitions between 2000, 2005, and 2009.

Design, Setting, and Patients Retrospective cohort study of a random 20% sample of fee-for-service Medicare beneficiaries, aged 66 years and older, who died in 2000 (n=270 202), 2005 (n=291 819), or 2009 (n=286 282). A multivariable regression model examined outcomes in 2000 and 2009 after adjustment for sociodemographic characteristics. Based on billing data, patients were classified as having a medical diagnosis of cancer, chronic obstructive pulmonary disease, or dementia in the last 180 days of life.

Main Outcome Measures Site of death, place of care, rates of health care transitions, and potentially burdensome transitions (eg, health care transitions in the last 3 days of life).

Results Comparing 2000, 2005, and 2009 shows a decrease in deaths in acute care hospitals and increases in intensive care unit (ICU) use in the last 30 days, hospice use at the time of death, and health care transitions at the end of the life (test of trend $P<.001$ for each).

	2000	2005	2009
No. of decedents	270 202	291 819	286 282
Deaths in acute care hospitals, % (95% CI)	32.6 (32.4-32.8)	26.9 (26.7-27.1)	24.6 (24.5-24.8)
ICU use in last month of life, % (95% CI)	24.3 (24.1-24.5)	26.3 (26.1-26.5)	29.2 (29.0-29.3)
Hospice use at time of death, % (95% CI)	21.6 (21.4-21.7)	32.3 (32.1-32.5)	42.2 (42.0-42.4)
Health care transitions in last 90 d of life per decedent, mean (median) (IQR)	2.1 (1.0) (0-3.0)	2.8 (2.0) (1.0-4.0)	3.1 (2.0) (1.0-5.0)
Health care transitions in last 3 days of life, % (95% CI)	10.3 (10.1-10.4)	12.4 (12.3-12.5)	14.2 (14.0-14.3)

In 2009, 28.4% (95% CI, 27.9%-28.5%) of hospice use at the time of death was for 3 days or less. Of these late hospice referrals, 40.3% (95% CI, 39.7%-40.8%) were preceded by hospitalization with an ICU stay.

Conclusion and Relevance Among Medicare beneficiaries who died in 2009 and 2005 compared with 2000, a lower proportion died in an acute care hospital, although both ICU use and the rate of health care transitions increased in the last month of life.

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PUBLIC OPINION SURVEYS IN THE United States report that a majority of people would prefer to die at home if they were terminally ill.[1] Data indicate an increase in the percentage of people dying at home among those aged 65 years and older, from 15% in 1989 to 24% in 2007.[2] This period saw other changes in the "site of death": nursing homes increased by 7% and acute care hospitals decreased by 14%.[2] At the same time, the use of hospices[3] and hospital-based palliative care services[4] expanded. Is this evidence of the success of hospice- and hospital-based palliative care teams?

Site of death has been proposed as a quality measure for end-of-life care because, despite general population surveys indicating the majority of respondents and those with serious illness want to die at home,[5] in actuality, most die in an institutional setting.[2,6] One study found poorer quality of care in the institutional setting compared with care at home, especially with hospice services.[7] The place of care and site of

See also pp 489 and 491.

Author Video Interview available at www.jama.com.

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death have implications for the grief and posttraumatic stress disorders experienced by family members.[8]

Site of death, as noted on a death certificate, only provides information on where a person was at the moment of death. One patient may have spent the last week of life in a home, hospital, and nursing home, while another patient may have been at home until the day of death, when hospitalized for pain control. Both patients would have an identical site of death, but a convincing argument can be made that the experience was different. To provide a more thorough assessment of end-of-life care, we analyzed Medicare claims data for 2000, 2005, and 2009 to document places of care and health care transitions for Medicare decedents in the last months of life.

METHODS

Using the Medicare denominator file, we identified a cohort of a random 20% of all fee-for-service Medicare beneficiaries who died in 2000, 2005, and 2009. Decedents had to be at least 66 years of age and without health maintenance organization coverage during the last year of life. Medicare Part A and Part B claims were available for all cohort members. Additionally, within this cohort, we identified 3 subcohorts of the Medicare beneficiaries in 2000 and 2009: those with a diagnosis of cancer, dementia, or chronic obstructive pulmonary disease (COPD). Cancer diagnoses were identified in billing data from Part A, Part B, or both for the 180 days prior to death. Berke and colleagues[9] found this method was accurate and specific in identifying an end-of-life cohort with cancer. Similarly, COPD and dementia diagnoses were identified through billing data from Part A, Part B, or both.

Site of Death, Place of Care, and Health Care Transitions

The Residential History File[10] is based on an algorithm that assigns a Medicare beneficiary to a given location each day. With the Residential History File, we were able to determine the site of death, places of care in the last 90 days of life, number of health care transitions, and patterns of transitions that experts would label as burdensome[11] (ie, transitions in the last 3 days of life and ≥3 hospitalizations in the last 90 days of life). A health care transition was defined as a change in institutional health care provider identification number based on the Medicare billing data. Hospice is billed at 4 levels of care (ie, routine hospice care, general inpatient level of care, continuous care, and respite care). General inpatient (GIP) level of care is meant for short-term symptom management. Care at GIP level may be provided in a freestanding hospice inpatient unit, an acute care hospital, or a nursing home. Continuous care provides similar services but in the home or in a nursing home that does not have skilled nursing facility beds. We characterized the use of GIP and continuous care in the last 30 days of life.

Based on location information for each person on each day in the last month of life, we calculated the percentage of time that all decedents spent in various locations. We graphically present these data to illustrate the patterns of transitions. We summarized the rates for these measures for all 2009 decedents and those with cancer, dementia, or COPD.

Individual Characteristics

Sociodemographic characteristics of the Medicare beneficiaries were based on the information contained in the Medicare denominator file, including patient age, race/ethnicity, sex, and state of residence. Race/ethnicity is based on information collected by the Social Security Administration. For this analysis, race/ethnicity was used as a potential confounder to examine the temporal trends between 2000, 2005, and 2009. Medical diagnoses were based on *International Classification of Diseases, Ninth Revision* (*ICD-9*) codes submitted as part of bills to Medicare in the last year of life.

Statistical Analyses

Descriptive statistics were used to characterize the site of death, places of care, and rates and patterns of transitions in the last months of life. Temporal trend comparisons for 2000, 2005, and 2009 were done using variance-weighted least squares model for bivariate associations and a multivariable model that adjusted for age, sex, and race with an indicator variable for year of death. Incidence rate ratios (IRRs) were calculated using a multivariable Poisson regression model for dichotomous outcomes and a negative binomial multivariable regression model for counts such as the number of transitions. Models were done separately for those decedents with a diagnosis of advanced cancer, COPD, or dementia. All models used robust standard errors that adjusted for clustering of decedents within Hospital Referral Regions. Statistical testing was 2-sided with a threshold of $P < .05$. All analyses were done in Stata version 12 (StataCorp).

RESULTS

TABLE 1 reports the sociodemographic characteristics of persons in our 20% random sample of fee-for-service Medicare decedents in 2000, 2005, and 2009 (N=848 303). The mean age of the patients in the sample was 82.3 years; 57.9% were female and 88.1% were white. Sociodemographic characteristics were similar across the years. Consistent with the report from the Centers for Disease Control and Prevention (CDC) based on death certificate data of all decedents 65 years and older,[2] our sample of fee-for-service Medicare decedents 66 years and older experienced a reduction in the rate of hospital deaths (TABLE 2). Medicare beneficiaries with a diagnosis of cancer, COPD, or dementia experienced a substantial decrease in number of times the site of death was an acute care hospital (test of trend $P \leq .001$).

Over time, more Medicare beneficiaries died in locations other than home, acute care hospital, and nursing home. GIP level of hospice care in a freestanding hospice inpatient unit or the hospital accounted for the increase in this category. In 2000, current billing did not allow us to accurately characterize the location of GIP care. However, in

Table 1. Characteristics of Medicare Decedents in Study Sample[a]

	All Decedents			Cancer		COPD		Dementia	
	2000 (n = 270 202)	2005 (n = 291 819)	2009 (n = 286 282)	2000 (n = 49 735)	2009 (n = 55 362)	2000 (n = 79 284)	2009 (n = 91 517)	2000 (n = 59 065)	2009 (n = 67 861)
Age, mean (SD) [IQR]	81.9 (8.2) [76.0-88.0]	82.1 (8.3) [76.0-88.0]	83.0 (8.4) [77.0-89.0]	77.9 (7.0) [72.0-83.0]	78.7 (7.6) [73.0-84.0]	80.2 (7.5) [74.0-86.0]	81.4 (8.0) [75.0-87.0]	85.2 (7.2) [80.0-90.0]	86.2 (7.1) [82.0-91.0]
Female sex, % (95% CI)	57.0 (56.8-57.2)	56.2 (56.0-56.4)	60.6 (60.4-60.8)	49.6 (49.1-50.0)	52.3 (51.9-52.7)	49.6 (49.2-49.9)	56.2 (56.0-56.6)	63.9 (63.5-64.3)	68.8 (68.5-69.2)
Race, % (95% CI)									
White	88.7 (88.6-88.8)	87.5 (87.4-87.7)	88.0 (87.9-88.1)	88.3 (88.0-88.6)	87.6 (87.2-87.7)	90.5 (90.3-90.7)	89.3 (89.1-89.5)	88.5 (88.2-88.7)	87.1 (86.9-87.4)
Black	8.3 (8.2-8.4)	8.7 (8.6-8.8)	8.0 (7.9-8.1)	8.5 (8.3-8.8)	8.4 (8.2-8.6)	6.7 (6.5-6.8)	6.9 (6.7-7.1)	9.1 (8.8-9.3)	9.2 (9.0-9.4)
Hispanic	1.1 (1.0-1.1)	1.5 (1.4-1.5)	1.5 (1.4-1.5)	1.2 (1.1-1.3)	1.3 (1.2-1.4)	1.1 (1.1-1.2)	1.5 (1.4-1.5)	1.0 (1.0-1.0)	1.6 (1.5-1.7)

Abbreviations: COPD, chronic obstructive pulmonary disease; IQR, interquartile range.
[a] All sample sizes correspond to a random 20% sample of all fee-for-service Medicare decedents in each year.

2009, 5.4% of deaths (95% CI, 5.3%-5.5%) were in freestanding hospice inpatient units and 3.2% (95% CI, 3.1%-3.3%) were receiving GIP level of care in an acute care hospital.

Among all decedents, the use of hospice services at the time of death increased from 21.6% in 2000 (95% CI, 21.4%-21.7%) and 32.3% in 2005 (95% CI, 32.1%-32.5%) to 42.2% in 2009 (95% CI, 42.0%-42.4%). Short hospice stays increased from 22.2% (95% CI, 21.8%-22.5%) in 2000 to 28.4% (95% CI, 27.9%-28.5%) of hospice decedents using hospice for 3 days or less (test of trend $P \leq .001$). Of these late hospice referrals in 2009, 40.3% (95% CI, 39.7%-40.8%) were preceded by hospitalizations with an intensive care unit (ICU) stay. In 2009, 59.5% (95% CI, 59.1%-59.9%) of patients with cancer and 48.3% (95% CI, 48.0%-48.7%) of patients with dementia were enrolled in hospice at the time of death. Rates of GIP-level hospice care increased from 3.9% in 2000 (95% CI, 3.8%-4.0%) and 8.0% in 2005 (95% CI, 7.9%-8.1%) to 11.3% in 2009 (95% CI, 11.1%-11.4%; test of trend $P \leq .001$; IRR for 2009 compared with 2000, 2.93; 95% CI, 2.65-3.25). Hospice continuous care level demonstrated a similar increase (Table 2).

Place of Care

Hospitalizations and nursing home stays were examined in the last 90 days of life. The percentage of decedents experiencing a hospitalization only had an increase after 2005, increasing from 62.8% in 2005 (95% CI, 62.7%-63.0%) to 69.3% (95% CI, 69.2%-69.6%) in 2009 ($P \leq .001$ for 2009 compared with 2005) despite the decline in the hospital as the site of death. More decedents in 2009 than in 2000 had an ICU stay in the last month of life (from 24.3%; 95% CI, 24.1%-24.5%, to 29.2%; 95% CI, 29.0%-29.3%; test for trend $P < .001$). As reported in Table 2 and TABLE 3, the number of days spent in a hospital decreased between 2000 and 2009. Nursing home admissions in the last 90 days of life increased slightly from 42.8% (95% CI, 42.6%-43.0%) to 45.0% (95% CI, 44.8%-45.2%). In 2009, about 80% of Medicare decedents with a diagnosis of cancer or COPD had hospitalizations in the last 90 days of life. Nearly 40% of persons with COPD had an ICU stay in the last months of life. Despite a slight decrease in hospitalizations in the last 90 days of life, patients with a diagnosis of dementia had an increase in ICU utilization in the last month of life from 18.6% in 2000 (95% CI, 18.3%-18.9%) to 21.8% in 2009 (95% CI, 21.5%-22.2%; IRR, 1.21; 95% CI, 1.18-1.25). The number of days spent in an ICU increased as well.

Health Care Transitions and Potentially Burdensome Transitions

The mean rate of transitions increased from 2.1 per decedent in 2000 (interquartile range [IQR], 0-3.0) to 3.1 per decedent in 2009 (IQR, 1.0-5.0; test of trend, $P \leq .001$) with an increase in 2 types of potentially burdensome transitions: transitions in the last 3 days of life and multiple hospitalizations in the last 90 days of life. There was a slight increase in the rate of those Medicare beneficiaries who had 3 or more hospitalizations in the last 90 days of life, from 10.3% in 2000 (95% CI, 10.2%-10.4%) to 11.5% in 2009 (95% CI, 11.4%-11.6%). Among persons with a COPD diagnosis in 2009, nearly 1 in 5 had 3 or more hospitalizations in the last 90 days of life.

Transitions in the last 3 days of life increased from 10.3% (95% CI, 10.1%-10.4%) to 14.2% in 2009 (95% CI, 14.0%-14.3%; IRR, 1.36; 95% CI, 1.33-1.40). In 2009, 15.5% of cancer patients (95% CI, 15.2%-15.8%) and 17.1% of COPD patients (95% CI, 16.8%-17.3%) experienced a transition in the last 3 days of life. Of 40 576 decedents in 2009 with a late health care transition, 70.3% of these late transitions were to hospice with about one-third at GIP level of care (31.4% of the 40 576 decedents; 95% CI, 31.0%-31.9%). Nearly 1 in 5 (20.8%; 95% CI, 20.4%-21.1%) of these late transitions were to an acute care hospital and 17.8% were to a nursing home with hospice services (8.5%; 95% CI 8.3%-8.8%) or without hospice services (9.3%; 95% CI, 9.0%-9.6%). Nearly one-half of these late transitions were from an acute care hospital (45.5%; 95% CI, 45.0%-46.0%) with a mean length of stay of 7.7 days (SD, 7.8; IQR, 3-10) at the time of the late transition to another locus of care.

The FIGURE characterizes transitions in the last 30 days of life in 2009 for all Medicare fee-for-service decedents. In 2009, 43.3% (95% CI, 43.1%-43.5%) had a health care transition in the last 2 weeks of life. The site of care at 30 days prior to death varied across Medicare decedents diagnosed with cancer, COPD, or dementia. Regardless of their diagnosis and location at 30 days prior to death, decedents experienced an increased number of transitions as they approached death, particularly in the last 2 weeks of life.

COMMENT

Our results confirm the CDC finding based on death certificate data that more persons aged 65 years and older are dying at home,[2] but the rate of ICU use in the last month of life has increased, with 29.2% of decedents

Table 2. Trends in Site of Death, Place of Care, and Transitions Between 2000, 2005, and 2009[a]

	% (95% CI)								
	All Decedents			Cancer		COPD		Dementia	
	2000 (n = 270 202)	2005 (n = 291 819)	2009 (n = 286 282)	2000 (n = 49 735)	2009 (n = 55 362)	2000 (n = 79 284)	2009 (n = 91 517)	2000 (n = 59 065)	2009 (n = 67 861)
Site of death[b]									
Home	30.7 (30.6-30.9)	34.9 (35.7-35.1)	33.5 (33.3-33.6)	41.5 (41.1-41.9)	43.4 (43.0-43.8)	24.0 (23.7-24.3)	28.0 (27.8-28.3)	19.9 (19.6-20.2)	22.8 (22.4-23.1)
Acute care hospital	32.6 (32.4-32.8)	26.9 (26.7-27.1)	24.6 (24.5-24.8)	30.1 (29.7-30.5)	22.1 (21.7-22.4)	44.2 (43.9-44.6)	31.7 (31.4-32.0)	28.6 (28.3-29.0)	17.5 (17.2-17.7)
Nursing home	27.2 (27.0-27.3)	25.3 (25.1-25.4)	27.6 (27.4-27.8)	17.0 (16.7-17.3)	17.1 (16.8-17.5)	22.3 (22.0-22.6)	24.3 (24.0-24.6)	45.6 (45.1-46.0)	48.8 (48.4-49.1)
Place of care[c]									
Hospice at time of death	21.6 (21.4-21.7)	32.3 (32.1-32.5)	42.2 (42.0-42.4)	45.1 (44.6-45.5)	59.5 (59.1-59.9)	19.5 (19.2-19.8)	39.0 (38.7-39.3)	19.5 (19.2-19.8)	48.3 (48.0-48.7)
Hospice ≤3 d	4.6 (4.5-4.7)	7.6 (7.5-7.7)	9.8 (9.7-10.0)	7.6 (7.4-7.8)	12.7 (12.5-13.0)	5.0 (4.9-5.2)	11.5 (11.3-11.7)	5.2 (5.0-5.3)	10.5 (10.3-10.8)
GIP level of hospice care in last mo	3.9 (3.8-4.0)	8.0 (7.9-8.1)	11.3 (11.1-11.4)	8.4 (8.2-8.7)	17.8 (17.5-18.2)	4.2 (4.1-4.4)	12.6 (12.4-12.9)	3.7 (3.5-3.8)	11.4 (11.1-11.6)
Continuous care level of hospice care in last mo	0.94 (0.91-0.98)	2.3 (2.2-2.3)	3.1 (3.0-3.1)	1.8 (1.6-1.9)	4.2 (4.0-4.4)	0.83 (0.77-0.90)	2.9 (2.8-3.0)	0.91 (0.83-0.99)	3.9 (3.7-4.0)
Nursing home stay in last 90 d	42.8 (42.6-43.0)	42.2 (42.0-42.4)	45.0 (44.8-45.2)	28.6 (28.2-29.0)	31.3 (30.9-31.7)	42.2 (41.9-42.6)	47.4 (47.1-47.7)	70.9 (70.5-71.3)	72.1 (71.8-72.5)
Hospitalization in last 90 d	62.9 (62.7-63.1)	62.8 (62.7-63.0)	69.3 (69.2-69.6)	75.0 (74.6-75.4)	80.3 (80.0-80.6)	81.6 (81.4-81.9)	82.8 (82.6-83.1)	69.9 (69.5-70.2)	65.2 (64.8-65.6)
ICU in last 30 d	24.3 (24.1-24.5)	26.3 (26.1-26.5)	29.2 (29.0-29.3)	19.9 (19.6-20.3)	26.8 (26.5-27.2)	36.6 (36.3-37.0)	39.9 (39.6-40.2)	18.6 (18.3-18.9)	21.8 (21.5-22.2)
Transitions[c]									
Rate in last 90 d per decedent, mean (median) (IQR)	2.1 (1.0) (0-3.0)	2.8 (2.0) (1.0-4.0)	3.1 (2.0) (1.0-5.0)	2.8 (2.0) (1.0-4.0)	4.1 (4.0) (2.0-6.0)	2.8 (2.0) (1.0-4.0)	3.9 (3.0) (1.0-6.0)	2.4 (2.0) (1.0-4.0)	3.1 (3.0) (1.0-5.0)
Transition in last 3 d	10.3 (10.1-10.4)	12.4 (12.3-12.5)	14.2 (14.0-14.3)	11.0 (10.7-11.3)	15.5 (15.2-15.8)	12.1 (11.9-12.3)	17.1 (16.8-17.3)	15.2 (15.0-15.5)	16.5 (16.3-16.8)
≥3 Hospitalizations in last 90 d	10.3 (10.2-10.4)	10.9 (10.8-11.0)	11.5 (11.4-11.6)	13.2 (12.9-13.5)	14.4 (14.1-14.7)	17.9 (17.6-18.1)	19.1 (18.8-19.3)	12.0 (11.7-12.3)	10.7 (10.5-11.0)
Utilization measures[c]									
Mechanical ventilation in last 30 d	8.3 (8.2-8.4)	8.6 (8.4-8.6)	9.3 (9.2-9.4)	5.9 (5.7-6.1)	6.7 (6.4-6.8)	13.3 (13.1-13.5)	13.0 (12.7-13.2)	5.1 (4.9-5.3)	5.2 (5.0-5.4)
Hospital days, mean (median) (IQR)									
Last 30 d	4.9 (1.0) (0-8.0)	4.8 (1.0) (0-7.0)	4.6 (1.0) (0-7.0)	6.0 (3.0) (0-9.0)	5.3 (3.0) (0-8.0)	7.5 (5.0) (0-12.0)	6.6 (4.0) (0-10.0)	5.1 (2.0) (0-8.0)	4.0 (0) (0-6.0)
Last 90 d	8.5 (4.0) (0-12.0)	8.5 (4.0) (0-12.0)	8.2 (4.0) (0-11.0)	10.8 (7.0) (2.0-15.0)	9.7 (6.0) (1.0-13.0)	13.2 (9.0) (3.0-18.0)	12.0 (7.0) (2.0-17.0)	9.5 (6.0) (0-13.0)	7.7 (4.0) (0-10.0)
ICU days, mean (median) (IQR)									
Last 30 d	1.5 (0) (0-0)	1.7 (0) (0-1.0)	1.8 (0) (0-1.0)	1.2 (0) (0-1.0)	1.6 (0) (0-1.0)	2.6 (0) (0-3.0)	2.8 (0) (0-3.0)	0.9 (0) (0-0)	1.2 (0) (0-0)
Last 90 d	2.3 (0) (0-1.0)	2.7 (0) (0-2.0)	2.9 (0) (0-3.0)	1.9 (0) (0-5.0)	2.7 (0) (0-6.0)	4.1 (0) (0-1.0)	4.7 (0) (0-1.0)	1.6 (0) (0-1.0)	2.1 (0) (0-1.0)
Hospice days, mean (median) (IQR)									
Last 30 d	3.3 (0) (0-0)	5.0 (0) (0-4.0)	6.6 (0) (0-9.0)	7.6 (0) (0-14.0)	9.1 (3.0) (0-19.0)	2.8 (0) (0-0)	5.4 (0) (0-6.0)	2.6 (0) (0-0)	7.5 (1.0) (0-13.0)
Last 90 d	6.0 (0) (0-0)	9.8 (0) (0-4.0)	13.2 (0) (0-10.0)	12.7 (0) (0-15.0)	15.7 (3.0) (0-20.0)	4.7 (0) (0-0)	10.0 (0) (0-6.0)	4.4 (0) (0-0)	15.1 (1.0) (0-14.0)

Abbreviations: COPD, chronic obstructive pulmonary disease; GIP, general inpatient; ICU, intensive care unit; IQR, interquartile range.
[a] All sample sizes correspond to a random 20% sample of all fee-for-service Medicare decedents in each year.
[b] Percentages that do not sum to 100% reflect deaths in the emergency department, other types of hospitals, and freestanding hospice inpatient units. In 2009, the difference mainly consisted of decedents with GIP level of hospice care in an acute care hospital (3.2%) or freestanding hospice inpatient unit (5.4%).
[c] Periods of time labeled as "last" refer to days before death.

experiencing an ICU in the last months of life in 2009. Another indicator of change in end-of-life medical care is that 11.5% of 2009 decedents had 3 or more hospitalizations in the last 90 days of life. Hospice use increased, but 28.4% of those decedents used a hospice for 3 days or less in 2009. About one-third of these short hospice stays were preceded by an ICU stay in the last month of life. Although a hospice stay of 1 day may be viewed as beneficial by a dying patient and family,[12] an important yet unanswered research question is whether this pattern of care is consistent with patient preferences and improved quality of life.

In 1995, the Study to Understand Prognosis and Preferences for Outcomes and Risks of Treatment (SUPPORT) drew national attention to care for dying and seriously ill adults, finding a pattern of end-of-life treatment decisions not based on timely discussion of the goals of care.[13] Advocates hoped that the continued spread of hospice and palliative care would reduce the observed patterns of aggressive care. However, our findings in a population of fee-for-service Medicare beneficiaries do not bear this out. The use of hospice services increased from 21.6% in 2000 to 42.2% in 2009, with one-half of the Medicare beneficiaries with a dementia diagnosis and 59.5% of cancer decedents receiving hospice services at the time of death. An earlier report noted similar increases in hospice use for other decedent populations, including Medicare beneficiaries with congestive heart failure.[14] Despite expansion of hospice care and previously reported growth of hospital-based palliative care teams,[4] there were increases in the use of an ICU; hospitalizations in the last 90 days of life; and the rates of transitions, including transitions in the last 3 days of life, from 2000 to 2009.

The National Priorities Partnership identified palliative care as 1 of 6 priorities in improving the quality of US health care.[15] Our research examined the population changes at a time

Table 3. Multivariable Analysis by Overall Decedents and Medicare Beneficiaries Who Died With a Diagnosis of Cancer, Chronic Obstructive Pulmonary Disease, and Dementia[a]

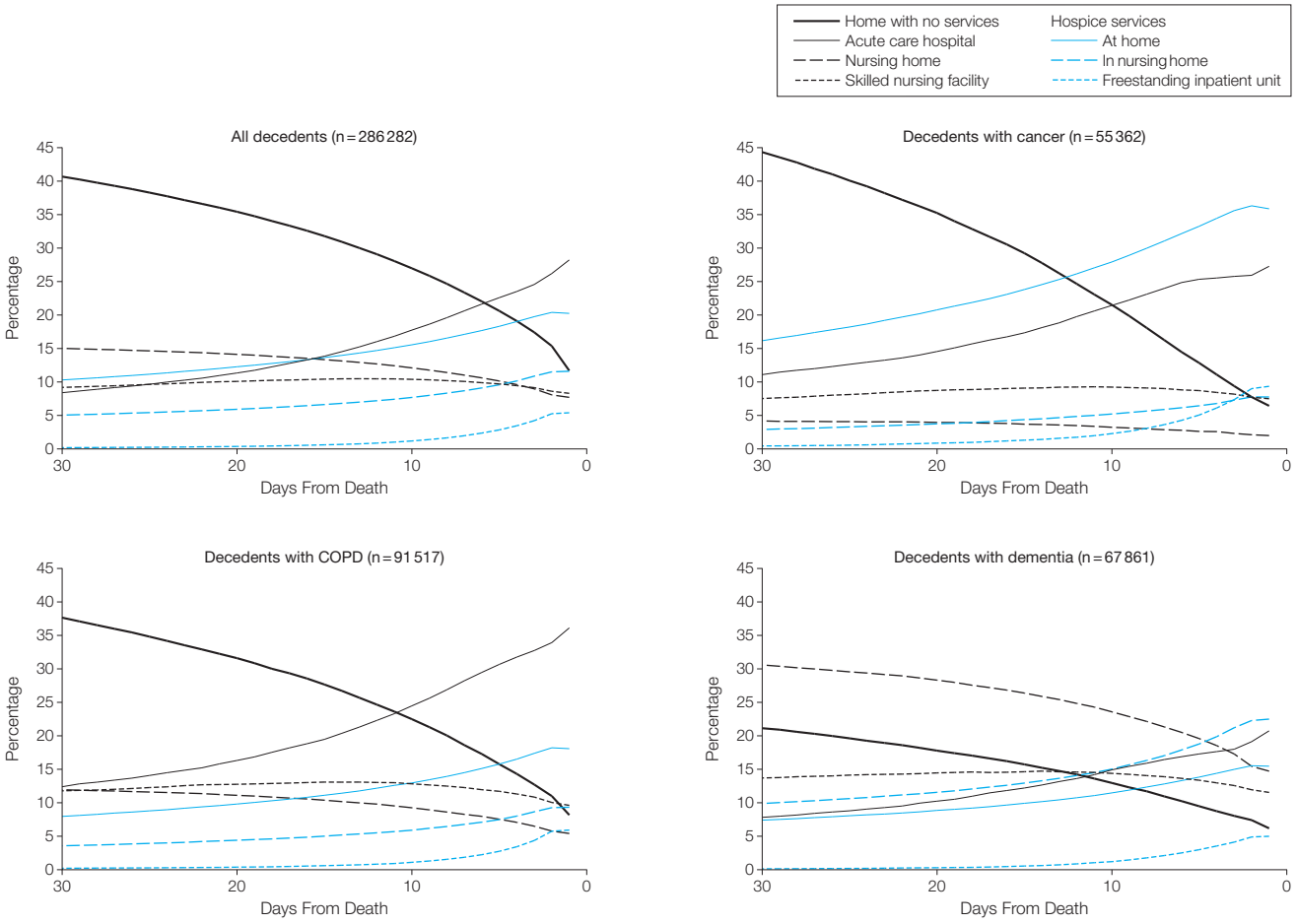
	IRR (95% CI)				
	All Decedents		2009 Compared With 2000		
	2005 Compared With 2000	2009 Compared With 2000	Cancer	COPD	Dementia
Site of death					
Home	1.13 (1.12-1.15)	1.11 (1.09-1.12)	1.05 (1.03-1.08)	1.19 (1.16-1.21)	1.15 (1.10-1.19)
Acute care hospital	0.83 (0.81-0.84)	0.76 (0.75-0.78)	0.74 (0.73-0.76)	0.72 (0.73-0.74)	0.62 (0.60-0.64)
Nursing home	0.93 (0.91-0.94)	0.96 (0.94-0.98)	0.96 (0.93-0.99)	1.02 (0.99-1.05)	1.06 (1.03-1.08)
Places of care[b]					
Hospice	1.50 (1.47-1.53)	1.94 (1.88-2.00)	1.32 (1.30-1.35)	2.00 (1.93-2.06)	2.49 (2.36-2.63)
Hospice ≤3 d	1.66 (1.60-1.72)	2.15 (2.04-2.26)	1.68 (1.60-1.77)	2.28 (2.14-2.42)	2.19 (2.04-2.34)
GIP level of hospice care in last mo	2.07 (1.92-2.26)	2.93 (2.65-3.25)	2.13 (1.94-2.33)	3.02 (2.68-3.40)	3.18 (2.80-3.61)
Continuous hospice care in last mo	2.41 (2.16-2.70)	3.21 (2.80-3.67)	2.37 (2.04-2.76)	3.35 (2.89-3.89)	4.24 (3.56-5.05)
Nursing home stay in last 90 d	0.98 (0.97-1.00)	1.00 (0.99-1.02)	1.05 (1.03-1.08)	1.07 (1.05-1.09)	1.01 (1.00-1.02)
Hospitalization in last 90 d	1.00 (0.99-1.01)	1.11 (1.10-1.12)	1.07 (1.06-1.08)	1.02 (1.01-1.03)	0.94 (0.93-0.95)
ICU in last 30 d	1.08 (1.07-1.10)	1.23 (1.21-1.25)	1.37 (1.33-1.41)	1.12 (1.10-1.14)	1.21 (1.18-1.25)
Transitions					
Rate in the last 90 d, mean	1.36 (1.34-1.37)	1.48 (1.47-1.50)	1.46 (1.44-1.48)	1.42 (1.41-1.44)	1.28 (1.27-1.30)
Transition in last 3 d, %	1.21 (1.19-1.23)	1.36 (1.33-1.40)	1.40 (1.35-1.46)	1.39 (1.35-1.43)	1.09 (1.06-1.12)
≥3 Hospitalizations in the last 90 d, %	1.05 (1.03-1.08)	1.14 (1.12-1.18)	1.11 (1.07-1.15)	1.10 (1.07-1.12)	0.93 (0.89-0.97)
Utilization measures					
Mechanical ventilation in last 30 d	1.02 (1.01-1.04)	1.16 (1.14-1.19)	1.16 (1.11-1.22)	1.02 (0.99-1.05)	1.08 (1.02-1.13)
Hospital days					
Last 30 d	0.98 (0.95-0.97)	0.96 (0.95-0.97)	0.90 (0.88-0.92)	0.89 (0.88-0.91)	0.79 (0.78-0.81)
Last 90 d	1.01 (0.99-1.02)	0.99 (0.97-1.00)	0.90 (0.89-0.92)	0.93 (0.91-0.95)	0.83 (0.81-0.85)
ICU days					
Last 30 d	1.14 (1.11-1.17)	1.28 (1.24-1.35)	1.35 (1.29-1.42)	1.12 (1.09-1.15)	1.31 (1.25-1.38)
Last 90 d	1.20 (1.17-1.23)	1.36 (1.32-1.40)	1.41 (1.36-1.47)	1.20 (1.17-1.24)	1.39 (1.32-1.47)
Hospice days					
Last 30 d	1.51 (1.48-1.54)	1.96 (1.90-2.02)	1.20 (1.17-1.23)	1.93 (1.87-2.00)	2.94 (2.76-3.12)
Last 90 d	1.60 (1.55-1.64)	2.31 (2.23-2.40)	1.22 (1.19-1.26)	2.09 (2.01-2.20)	3.42 (3.21-3.65)

Abbreviations: COPD, chronic obstructive pulmonary disease; GIP, general inpatient; ICU, intensive care unit; IRR, incidence rate ratio.
[a] All sample sizes correspond to a random 20% sample of all fee-for-service Medicare decedents in each year.
[b] Periods of time labeled as "last" refer to days before death.

when there was substantial investment in hospice- and hospital-based palliative care teams. During our study, the number of hospice programs increased from 2300 to more than 3500, with the fastest growth occurring among for-profit hospices.[16] We examined the real-world implementation of hospice- and hospital-based palliative care teams from a population perspective. Previous research studies reported that palliative care reduced resource utilization.[17-22] Taylor and colleagues,[23] using a propensity score–matching analysis, estimated that a maximum savings from hospice care was achieved for cancer patients with a 7-week length of stay. At its onset, the Medicare hospice benefit was based on a cancer disease trajectory. The increased enrollment of noncancer patients with long lengths of stay supports the concern noted in the 1986 National Hospice Study[24] that longer hospice lengths of stay may exceed the costs of conventional care.

Our findings of an increase in the number of short hospice stays following a hospitalization, often involving an ICU stay, suggest that increasing hospice use may not lead to a reduction in resource utilization. Short hospice lengths of stay raise concerns that hospice is an "add-on" to a growing pattern of more utilization of intensive services at the end of life. Short hospice lengths of stay have increased, with 45.5% of late referrals to hospice services coming from an acute care hospital where the referred patient has had a mean hospital length of stay of 7.7 days. Qualitative research studies of short hospice length of stay suggest there is no

Figure. Medicare Service Types and Locations in the Last Month of Life for Medicare Fee-for-Service Decedents in 2009



Overall, nearly one-half of decedents experienced a transition in the last 2 weeks of life. Decedents with a diagnosis of cancer experienced increases in the use of hospice services, especially in the last week of life, while decedents with a diagnosis of chronic obstructive pulmonary disease (COPD) often transitioned to an acute care hospital. Decedents with dementia were predominantly in a nursing home with transitions to hospice services in last week of life.

clear-cut answer. For example, studies by Teno et al[12] and Waldrop et al[25] found that a substantial number of patients experienced a sudden change in their medical condition, causing short stays. The study by Teno and colleagues further found that 8% of the hospice short stays occurred because the patient refused hospice services at an earlier time, while 24% were attributed to concerns with the role of physicians and nurses in end-of-life decision making.

Important limitations should be acknowledged in the interpretation of these results. It should be noted that we relied on *ICD-9* Medicare claims–based diagnosis codes to identify decedents with a diagnosis of cancer, COPD, or dementia. The cause of death is only available on death certificates and is often multifactorial. We used only Medicare claims data and did not have access to clinical data such as disease severity or patient preferences for care. Medicare claims files are only available for fee-for-service Medicare beneficiaries. Thus, our results may not be generalizable to persons enrolled in Medicare managed care plans. Our design is a retrospective case series that provides only information about those who died. A prospective study would be needed to evaluate the benefits of ICU utilization. We relied on administrative data. Our estimation of site of death was based on Medicare billing data with rules in 2000 did not allow us to accurately characterize hospice GIP-level site of care on the day of death. Furthermore, information on patient preference is missing. It is quite possible that observed patterns of care are consistent with patient preferences. However, research suggests this is a unlikely explanation given the important opportunities to improve the process of communication and decision making in geographic regions with higher intensity of care.[26,27] Finally, our research could not determine whether the documented increases would have been even larger without the increase in hospice services.

CONCLUSIONS

Although the CDC reports that decedents aged 65 years and older are more likely to die at home, our results are not consistent with the notion that there is a trend toward less aggressive care. Between 2000 and 2009, the ICU utilization rate, overall transition rate, and number of late transitions in the last 3 days of life increased. Thirty-one percent of these late transitions were to hospice services with GIP level of care. Future research is needed to examine whether these trends are improving the quality of life and are consistent with patient preferences.

Author Contributions: Drs Teno and Gozalo had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Teno, Gozalo, Bynum, Morden, Scupp, Mor.
Acquisition of data: Teno, Gozalo, Scupp, Goodman, Mor.
Analysis and interpretation of data: Teno, Gozalo, Bynum, Leland, Miller, Morden, Scupp, Mor.
Drafting of the manuscript: Teno, Gozalo, Bynum, Leland, Morden, Scupp, Mor.
Critical revision of the manuscript for important intellectual content: Teno, Gozalo, Bynum, Leland, Miller, Morden, Scupp, Goodman, Mor.
Statistical analysis: Teno, Gozalo, Bynum, Leland, Scupp, Mor.
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Study supervision: Teno, Gozalo, Mor.
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Instinct, mind and spirit are all essential to a full life; each has its own excellence and its own corruption. Each can attain a spurious excellence at the expense of the others; each has a tendency to encroach upon the others; but in the life which is to be sought all three will be developed in coordination, an intimately blended in a single harmonious whole.

—Bertrand Russell (1872-1970)