Transitions Between Healthcare Settings of Hospice Enrollees at the End of Life

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[Editorial Comments by Katherine A. Ornstein and Diane E. Meier, pp 330–331]

OBJECTIVES: To characterize the number and types of care transitions in the last 6 months of life of individuals who used hospice and to examine factors associated with having multiple transitions in care.

DESIGN: Retrospective cohort study.

SETTING: One hundred percent fee-for-service Medicare decedent claims data.

PARTICIPANTS: Medicare beneficiaries aged 66 and older who died between July 1, 2011, and December 31, 2011, and were enrolled in hospice at some time during the last 6 months of life.

MEASUREMENTS: Hierarchical generalized linear modeling was used to identify individual, hospice, and regional factors associated with transitions. The sequence of transitions across healthcare settings was described. Healthcare transitions after hospice enrollment included from and to the hospital, skilled nursing facility, home health agency program, hospice, or home without receiving any service in these four healthcare settings.

RESULTS: Of 311,090 hospice decedents, 31,675 (10.2%) had at least one transition after hospice enrollment, and this varied substantially across the United States; 6.6% of all decedents had more than one transition in care after hospice enrollment (range 2–19 transitions). Of hospice users with transitions, 53.4% were admitted to hospitals, 17.7% were admitted to skilled nursing facilities, 9.6% used home health agencies, and 25.8% had transitions to home without receiving the services from the healthcare settings examined. In adjusted analyses, decedents who were younger, nonwhite, enrolled in a for-profit or small hospice program, or had less access to hospital-based palliative care had significantly higher odds of having at least one transition.

CONCLUSION: A notable proportion of hospice users experience at least one transition in care in the last 6 months of life, suggesting that further research on the effect of transitions on users and families is warranted. **J Am Geriatr Soc 64:314–322, 2016.**

Key words: hospice; transitions in care; end-of-life care

Previous research has highlighted that care at the end of life can be fragmented, with poor coordination and communication among health care providers.[1,2] The Institute of Medicine report *Dying in America* raised the concern that people nearing the end of life often experience multiple transitions, which could create burdens for them and their families.[3] Although hospice use has been embraced as an indicator of quality of end-of-life care,[4–6] hospice enrollees may have transitions in care between healthcare settings. Furthermore, hospice disenrollment occurs and has been shown to be associated with substantially greater hospital use and costs.[7–9] Such transitions in care can cause substantial anxiety for hospice users and their family members,[10,11] who are especially vulnerable to chaotic transitions and poor outcomes because of unfamiliar settings and providers and lack of adequate communication regarding goals of care.[12–14]

Despite important concerns about fragmentation in care at the end of life, little is known about the number and types of transitions that hospice users experience before death. A

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small number of studies have examined this issue.[7,15–18] One study found that 6% of individuals with lung or colorectal cancer were admitted to the hospital at least once after hospice enrollment.[15] Two studies reported hospitalization and hospice disenrollment of Medicare hospice users with cancer[7] and heart failure.[17] A recent study analyzed Medicare, Medicaid, and Minimum Data Set data from a single safety net healthcare system and found that 9.9% of 3,771 hospice users were hospitalized during or after hospice.[16] These studies were limited to specific populations or settings and focused on transitions from hospice to hospital. Only one study reported hospitalization and skilled nursing facility (SNF) admission within 30 days after live discharge from hospice.[18] These studies have not identified the number or type of transitions between settings or the factors associated with transitions in care at the end of life.

Accordingly, the current study sought to describe the frequency and types of transitions during the last 6 months of life of decedents enrolled in hospice. To accomplish this aim, Medicare claims data for all fee-for-service Medicare decedents who used hospice in the last 6 months of life and died in 2011 were analyzed, and multivariable analyses were used to identify individual, hospice, and regional factors associated with greater likelihood of transitions. Findings from this research can be useful for understanding patterns of and risk factors for fragmentation in care at the end of life.

METHODS

Overview

All possible transitions between healthcare settings were included because little is known about transition in care after hospice enrollment. Then-current recommendations encouraged transition to hospice and palliative programs, yet hospice is not the end of the care trajectory. Understanding the current patterns of transitions after hospice can identify areas where improvement of hospice programs would further comfort users and their family. Given that hospitalization incurs substantial costs and that hospitalization from hospice directly indicates a larger failure of the healthcare system, the associations between individual and market factors and transitions from hospice to hospital were also examined.

Study Design and Sample

This was a retrospective analysis of all fee-for-service Medicare beneficiaries aged 66 and older who died between July 1, 2011, and December 31, 2011. The sample was limited to Medicare Parts A and B beneficiaries who had enrolled in the Medicare hospice benefit at some time during the last 6 months before death. The institutional review board of Yale University reviewed the study, which was exempt from full review.

Measurement

Outcomes

The primary outcome was a binary variable indicating individuals who had at least one transition in care after initial enrollment in hospice. All inquiries of transition started after the decedent's earliest hospice claim in the 6 months before death. Transitions between healthcare settings were focused on, including transferring from and to the hospital, a SNF, a home health agency (HHA) program, hospice, or "home" without receiving services from the four healthcare settings above. The category home is arbitrary, meaning that individuals were discharged from hospital or SNF or were disenrolled from HHA or hospice (regardless of inpatient hospice or home hospice) and did not receive care from any of the above. "Home" indicates that the individual disenrolled from hospice. These transitions were measured because they would most likely involve changes in the individual's care team, leading to concerns regarding fragmented care. Transitions between inpatient hospice and home hospice were not included because it is likely that a single hospice provider would manage this type of transition and that there would be continuity in the care team. The total number of transitions that each user experienced was calculated, and the healthcare settings of the first and second transitions were identified. For transfers to or from the hospital, emergency department (ED) visits, intensive care unit (ICU) admissions, and in-hospital death were also assessed.

Covariates

Following the Andersen behavioral model,[19] the factors that might be associated with transitions in care were conceptualized into predisposing (e.g., age, education, race), need (e.g., clinical conditions, comorbidities), and enabling (e.g., income, market factors) variables. Predisposing factors included age (66–69, 70–74, 75–79, 80–84, ≥85), race and ethnicity (non-Hispanic white, black, Hispanic, other), sex, and Census-based estimates of percentage of adults with high school education or less at the ZIP code level.

Need factors included primary diagnosis based on *International Classification of Diseases, Ninth Revision*, codes and were categorized as neoplasms; mental disorders; diseases of the nervous system and sense organs; diseases of the circulatory system; diseases of the respiratory system; symptoms, signs, and ill-defined conditions; and other. Chronic conditions, including heart disease (acute myocardial infarction, heart failure, ischemic heart disease), Alzheimer's disease or dementia, kidney disease, diabetes mellitus, chronic obstructive pulmonary disease or asthma, depression, stroke, and cancer (breast, colorectal, prostate, lung, endometrial), were also ascertained using data from the Master Beneficiary Summary File. Decedents were then categorized based on their count of comorbid conditions. Using revenue center code values of 0655 and 0656, whether beneficiaries had used hospice Inpatient Respite Care or General Inpatient Care before the date of the first healthcare transition or the date of death if they did not have a transition was determined.[20] Time from hospice enrollment to death was adjusted for (continuous variable from 0 to 179 days).

Enabling factors including income and market factors were identified using county of residence and hospital referral region (HRR) for each beneficiary. Data pertaining to the county in which the patient resided were identified using the Area Resource File, which included metropolitan residence status; median county-level income; percentage of individuals in health maintenance organizations in the county; and number of physicians, hospital beds, SNF beds, hospices, and home health agencies per 1,000 people aged 65 and older in the county. HRRs were also used to approximate markets. Counties or HRRs have generally been used to define hospice market,[21,22] but results are often insensitive to the choices between HRRs and counties.[23] Another reason HHRs were used was concern about small sample size at the county level. The Herfindahl–Hirschman Index[24] was used as the HRR-level measure of hospice facility market competition (<0.15 = competitive market, 0.15–0.25 = moderately concentrated market, ≥0.25 = highly concentrated market). The characteristics of hospice agency where the decedent first used hospice based on the Provider of Services file, including ownership (for-profit, nonprofit), duration of hospice operation (<10, 10–17, 18–23, ≥24 years), size (number of individuals that the hospice cared for during the study period categorized at quartiles of distribution), and inpatient service provision status (none, provided by staff, under contract arrangement, both) were included. Each hospice's accreditation was included, including none, Joint Commission's Home Care Accreditation Program, Community Health Accreditation Program, and Accreditation Commission for Health Care. Whether the hospice was regulated according to Certificate of Need (CON)[25] and percentage of hospitals reporting palliative care services (≤20%, 21–40%, 41–60%, 61–80%, ≥80%),[26] both state-level characteristics reported in 2011, were also included.

Statistical Analysis

Standard descriptive statistics were used to describe the sample and prevalence of transitions according to type of transition overall and for each state. The trajectories of transitions (proportion of hospice users in terms of first transition healthcare setting among those with at least one transition and second transition healthcare setting according to the first healthcare setting) were described.

Using four-level hierarchical generalized linear models (HGLMs), individual-, hospice-, HRR-, and state-level factors that were significantly associated with having a transition were identified. To reduce variability that low hospice volumes caused, hospices that had fewer than 15 decedents during the study period were excluded from the HGLM analysis. The variance inflation factors of independent variables were determined using multivariate linear regression models to assess potential multicollinearity within the model. The variation was assessed at the hospice, HRR, and state levels using the covariance estimate at each level, derived from the random effect of HGLMs. The same model was used to identify factors associated with hospitalization from hospice directly. All statistical analyses were completed using SAS version 9.3 (SAS Institute, Inc., Cary, NC), and a two-tailed $P < .05$ was used to define statistical significance.

RESULTS

The full study sample consisted of 311,090 decedents who used hospice during the last 6 months of life; 10.2% (n = 31,675) had at least one healthcare transition after hospice enrollment (mean 2.3 ± 1.7, median 2), and 6.6% had more than one transition in care after hospice enrollment (range 2–19 transitions). The most common type of transition was to the hospital; 53.4% of decedents who had healthcare transitions were admitted to a hospital, although many other types of transitions also occurred (Figure 1). Sixteen thousand nine hundred eighteen decedents had at least one hospitalization after hospice enrollment (mean 1.3 ± 0.7, range 1–9). Characteristics of hospice users who had and did not have at least one transition are summarized in Table 1. Hospice users who had transitions were more likely to be younger or nonwhite, have comorbidities, or receive inpatient hospice care than those who did not (all $P < .001$).

The first and second transitions after hospice enrollment were characterized (Figure 2). For the first transition, 41% transitioned from hospice to hospital, 5% to SNF,

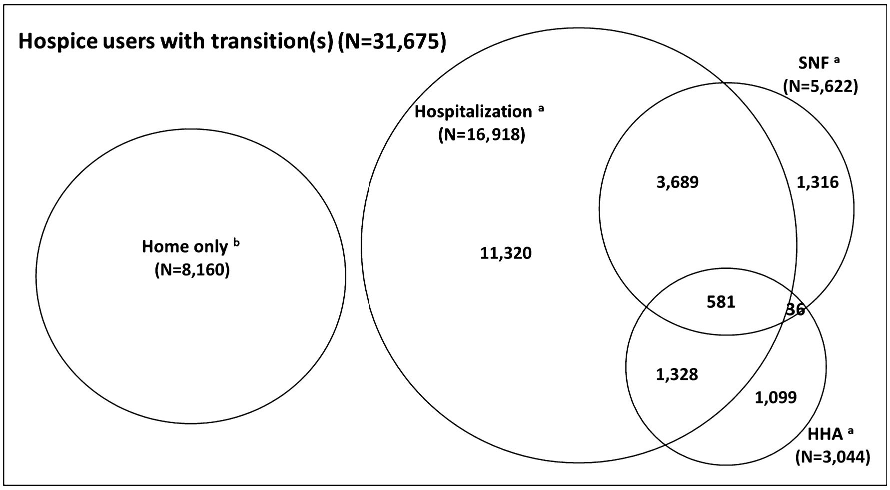

Figure 1. Usage patterns of 31,675 hospice users (10% of all hospice users) with at least one healthcare transition. Transitions shown are the numbers of decedents who had been transitioned to these healthcare settings. [a]Can have transitions to home or hospice reenrollment. [b]Can have hospice reenrollment, but did not have transitions to hospital, skilled nursing facility (SNF), or home health agency (HHA).

Table 1. Subject Characteristics According to Healthcare Transition Status of Hospice Users

	n (%)		
Characteristic	**Having Transitions After Hospice Enrollment**	**Not Having Transitions After Hospice Enrollment**	***P*-Value**
Sample size	31,675 (10.2)	279,415 (89.2)	
Predisposing factors			
Age			
66–69	2,428 (7.7)	18,825 (6.7)	<.001
70–75	3,396 (10.7)	28,787 (10.3)	
75–79	4,500 (14.2)	38,282 (13.7)	
80–84	6,187 (19.5)	54,275 (19.4)	
≥85	15,164 (47.9)	139,246 (49.8)	
Sex			
Male	13,521 (42.7)	116,106 (41.6)	<.001
Female	18,154 (57.3)	163,309 (58.4)	
Race			
White	26,297 (83.0)	246,995 (88.4)	<.001
Black	3,360 (10.6)	17,842 (6.4)	
Hispanic	1,344 (4.2)	9,541 (3.4)	
Other	674 (2.1)	5,037 (1.8)	
Education (≥high school; missing, n = 175)			
<60%	48 (0.2)	262 (0.1)	<.001
60–70	688 (2.2)	4,291 (1.5)	
70–80	5,486 (17.3)	40,010 (14.3)	
80–90	19,625 (62.0)	174,770 (62.6)	
≥90	5,804 (18.3)	59,931 (21.5)	
Need factors			
Number of comorbidities			
0–2	3,192 (10.1)	35,875 (12.8)	<.001
3	4,017 (12.7)	41,286 (14.8)	
4	5,869 (18.5)	55,532 (19.9)	
5	6,719 (21.2)	58,140 (20.8)	
6	5,953 (18.8)	46,865 (16.8)	
7–8	5,925 (18.7)	41,717 (14.9)	
Primary diagnosis for hospice enrollment			
Neoplasms	9,535 (30.1)	88,125 (31.5)	<.001
Mental disorders	3,173 (10.0)	27,910 (10.0)	
Diseases of nervous system	2,534 (8.0)	21,548 (7.7)	
Diseases of circulatory system	6,009 (19.0)	50,950 (18.2)	
Diseases of respiratory system	3,031 (9.6)	23,768 (8.5)	
Symptoms, signs, and ill-defined conditions	6,055 (19.1)	49,024 (17.6)	
Other	1,338 (4.2)	18,090 (6.5)	
Receiving respite or general inpatient hospice care			
No	16,169 (68.8)	204,257 (71.0)	<.001
Yes	7,346 (31.2)	83,318 (29.0)	
Enabling factors			
Median household income, $ (missing, n = 175)			
<33,000	478 (1.5)	2,242 (0.8)	<.001
33,000—39,999	7,128 (22.5)	52,040 (18.6)	
40,000—49,999	12,065 (38.1)	106,660 (38.2)	
50,000—62,999	7,956 (25.1)	77,420 (27.7)	
≥63,000	4,024 (12.7)	40,902 (14.7)	
Metropolitan statistical area			
No	2,992 (9.4)	22,907 (8.2)	<.001
Micropolitan	4,328 (13.7)	35,755 (12.8)	
Metropolitan	24,331 (76.9)	220,602 (79.0)	

and 3% to HHA, and 51% were disenrolled from hospice and received no services from the healthcare settings examined. The second transition depended on the location of the first transition. For example, if the first transition was from hospice to hospital, the second transition was as follows: 52% from hospital to hospice, 19% to SNF, 2% to HHA, and 9% to home, and 18% died in the hospital (no transition).

The proportion of decedents who experienced at least one transition after hospice enrollment varied substantially across states (Table 2). The mean proportion of hospice users in a state who had at least one healthcare transition was 10.3% and ranged from 6.9% in Idaho to 20.6% in Florida. The proportion who had a transition to hospital ranged from 1.6% in North Dakota to 13.4% in Mississippi, the proportion who had a transition to SNF ranging from 0.3% in Hawaii to 4.1% in Alabama, and the proportion who had a transition to HHA ranged from 0.1% in South Dakota to 2.1% in Alabama. The proportion who had a transition to home without receiving any of the services from the healthcare settings examined ranged from 4.6% in South Dakota to 11.6% in Florida. For hospice enrollees, Alabama is the state with the highest proportions of ED visits and ICU admission, and the District of Columbia had the highest proportion of in-hospital death.

In the multivariable analyses, younger individuals, men, those who were not white, and those with more comorbidities were more likely to have healthcare transitions after hospice enrollment than older adults, women, those who were white, and those with fewer comorbidities (Table 3 and Appendix). Hospice users whose primary diagnosis was a mental disorder; disease of the nervous system; or symptoms, signs, and ill-defined conditions were less likely than who had cancer as their primary diagnosis for hospice enrollment to have transitions. Decedents who used hospice inpatient care were more likely to have healthcare transitions than those who did not. Geographic factors such as income and metropolitan residence were not significantly associated with healthcare transitions. Decedents who were enrolled in a nonprofit hospice, a large hospice, or a hospice in business for a long period of time were less likely to have healthcare transitions.

Several market factors were associated with the likelihood of experiencing at least one transition in care in the multivariable analysis. Decedents in areas that were in the second quartile in terms of health maintenance organization penetration rate and number of hospices per 1,000 people aged 65 and older were less likely to have healthcare transitions than those in the corresponding lowest quartile areas. The absence of CON regulations was associated with lower odds of healthcare transitions. Hospice market concentration, county-level physician number, and county-level hospital bed number were not associated with likelihood of transition. Based on the covariance parameter estimates in the four-level HGLM, the variation was much larger at the hospice level than at the HRR or state level. The analyses also showed that the predisposing, need, and enabling factors generally had similar effect on at least one transition and hospitalization from hospice, with differences in terms of magnitude (Table 3).

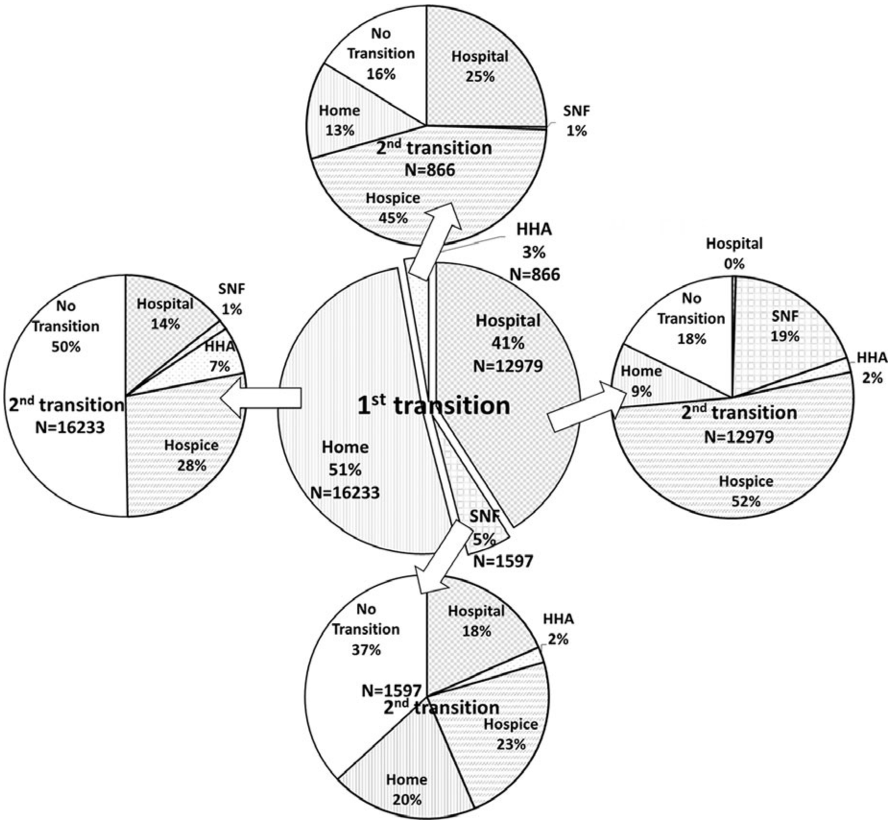

Figure 2. First and second healthcare transitions of 31,675 hospice users who had at least one transition. "No transition" means that user died within the first transition healthcare setting; "home" means that user did not receive any service from hospital, skilled nursing facility (SNF), home health agency (HHA), or hospice.

Table 2. Variations in Healthcare Transition and Use of Hospital-Based Services After Hospice Enrollment Across States

Measure	Mean % ± Standard Deviation	Range
Healthcare transition		
Healthcare transitions after hospice enrollment[a]	10.3 ± 2.9	6.9–20.6
Hospitalization after hospice enrollment	5.2 ± 2.6	1.6–13.4
Skilled nursing facility admission after hospice enrollment	1.7 ± 0.7	0.3–4.1
Home health agency service use after hospice enrollment	0.9 ± 0.5	0–2.1
Transition to home	6.5 ± 1.4	4.6–11.6
Use of hospital-based services		
Emergency department visit after hospice enrollment	4.3 ± 2.4	1.1–11.3
Intensive care unit admission after hospice enrollment	1.8 ± 1.2	0–4.8
In-hospital death after hospice enrollment	1.9 ± 1.1	0.5–5.5

The unit of analysis is state. (Each value represented the mean of state means.) Healthcare transition refers to any transition from or to a hospital, skilled nursing facility, home health agency program, hospice, or home (meaning no services from hospital, skilled nursing facility, home health agency program, or hospice).

[a] Decedents may have had more than one transition.

DISCUSSION

Approximately 10% of the hospice users nationally had at least one transition after hospice enrollment, although in some states, the proportion with at least one transition exceeded 20%. Such transitions may place users at risk of discontinuity of care and medical errors and increase stress for caregivers.[27–30] Because Medicare reimburses for hospice inpatient care to support individuals with complicated needs,[31,32] it is surprising that so many users had a transition in care. Furthermore, the provider- and state-level variation in the proportion of hospice users who had transitions in care suggests that provider and market factors and not solely individual and family preferences may influence transitions. This is the only study of which the authors are aware to document the national patterns of healthcare transitions of hospice enrollees using contemporary data.

This study advances current knowledge about healthcare transitions and care trajectories at the end of life. Although a number of studies pertaining to older adults have examined healthcare transitions from home and nursing home to hospital and then to hospice care, a small number of studies have investigated transitions after hospice enrollment, and most of these have been limited to specific populations, settings, or transitions.[7,9,15–18] Using national data, one study reported that approximately 11% of Medicare decedents disenrolled from hospice before death in 2010, but the authors did not examine transitions

Table 3. Likelihood of at Least One Healthcare Transition or Hospitalization After Hospice Enrollment

Factor	Odds Ratio (95% Confidence Interval)	
	Transition in Care	Hospitalization[a]
Predisposing factor		
Age (reference ≥85)		
66–69	1.38 (1.31–1.46)	1.50 (1.39–1.62)
70–74	1.22 (1.17–1.28)	1.39 (1.31–1.49)
75–79	1.17 (1.12–1.21)	1.33 (1.25–1.40)
80–84	1.11 (1.07–1.15)	1.22 (1.16–1.28)
Male (reference female)	1.19 (1.16–1.22)	1.10 (1.06–1.14)
Race (reference white)		
Black	1.59 (1.52–1.67)	1.93 (1.82–2.05)
Hispanic	1.31 (1.22–1.40)	1.36 (1.23–1.51)
Other	1.37 (1.25–1.51)	1.38 (1.21–1.58)
≤High school education in ZIP code, % (reference ≥90)		
<60	1.04 (0.70–1.55)	1.79 (1.11–2.90)
60–69	1.11 (0.98–1.26)	1.29 (1.08–1.54)
70–79	1.08 (1.00–1.16)	1.17 (1.05–1.31)
80–89	1.06 (1.00–1.11)	1.11 (1.02–1.20)
Need factor		
Number of comorbidities (reference 0–2)		
3	1.01 (0.95–1.06)	1.12 (1.03–1.22)
4	1.02 (0.97–1.07)	1.23 (1.13–1.33)
5	1.06 (1.01–1.12)	1.34 (1.24–1.45)
6	1.10 (1.04–1.15)	1.47 (1.35–1.59)
7–8	1.14 (1.08–1.20)	1.61 (1.48–1.74)
Primary diagnosis for hospice enrollment (reference neoplasms)		
Mental disorders	0.78 (0.74–0.82)	0.66 (0.61–0.71)
Diseases of nervous system and sense organs	0.73 (0.69–0.77)	0.65 (0.60–0.70)
Diseases of circulatory system	1.01 (0.97–1.05)	1.03 (0.97–1.09)
Diseases of respiratory system	1.00 (0.95–1.05)	1.16 (1.09–1.24)
Symptoms, signs, and ill-defined conditions	0.93 (0.90–0.97)	0.82 (0.78–0.87)
Other	0.87 (0.82–0.93)	0.63 (0.57–0.70)
Not receiving hospice inpatient services (reference receiving services)	0.68 (0.66–0.70)	0.57 (0.54–0.59)
Days of hospice enrollment (continuous variable)	1.01 (1.01–1.01)	1.01 (1.01–1.01)
Enabling factor		
Median income of county, $ (reference ≥63,000)		
<33,000	1.12 (0.95–1.33)	1.79 (1.11–2.90)
33,000–39,999	1.04 (0.96–1.13)	1.29 (1.08–1.54)
40,000–49,999	0.99 (0.93–1.06)	1.17 (1.05–1.31)
50,000–62,999	1.01 (0.95–1.07)	1.11 (1.02–1.20)
Nonprofit hospice ownership (reference profit hospice)	0.93 (0.89–0.97)	0.74 (0.69–0.80)
Years of hospice operation (reference <10)		
≥24	0.95 (0.89–1.02)	0.80 (0.73–0.88)
19–23	0.91 (0.86–0.97)	0.78 (0.71–0.85)
10–18	0.93 (0.88–0.97)	0.86 (0.80–0.92)
Number of hospice admissions during study period (reference <241)		
≥1,247	0.76 (0.71–0.81)	0.85 (0.76–0.94)
545–1246	0.78 (0.73–0.82)	0.77 (0.71–0.84)
241–544	0.80 (0.77–0.84)	0.81 (0.76–0.87)
County-level health maintenance organization penetration rate, % (quartile) (reference <11.75)		
≥31.14	0.97 (0.91–1.03)	0.94 (0.86–1.04)
19.47–31.13	0.92 (0.87–0.98)	0.87 (0.80–0.94)
11.75–19.46	0.97 (0.92–1.01)	0.95 (0.89–1.02)
Number of hospices per 1,000 people aged ≥65 in the county (reference <0.020)		
≥0.126	0.96 (0.92–1.01)	0.90 (0.84–0.97)
0.063–0.125	0.89 (0.85–0.94)	0.84 (0.78–0.91)
0.020–0.062	0.95 (0.90–1.01)	0.91 (0.84–0.99)
No state certificate of need health laws (reference having certificate of need)	0.83 (0.76–0.90)	0.72 (0.61–0.86)
State access to palliative care in hospitals, % (reference <21)		
≥81	0.84 (0.68–1.05)	0.59 (0.39–0.91)
61–80	0.91 (0.74–1.11)	0.79 (0.53–1.17)
41–60	0.90 (0.73–1.1)	0.80 (0.53–1.20)
21–40	1.08 (0.86–1.36)	1.11 (0.70–1.77)
Covariance parameter estimates in the four-level hierarchical generalized linear model		
Hospice	0.1256	0.2338
Hospital referral region	0.0146	0.0282
State	0.0055	0.0436

Adjusted for predisposing, need, and enabling factors, clustered according to hospice, hospital referral region, and state. A full set of regression results are available in the Appendix.

[a] Hospitalization directly from hospice.

in care to other providers.[9] Another study described transitions after hospice disenrollment,[18] but transitions in care before disenrollment may have been overlooked. For example, beneficiaries could have transitions such as hospitalization without hospice disenrollment.

The current study adds to the extant literature by examining transition trajectories after hospice enrollment, national variation in transitions, and factors associated with transitions. Some hospice beneficiaries might have numerous transitions between different healthcare settings, and more than 50% of beneficiaries who had at least one transition were admitted to the hospital. These transitions are not only expensive, but also may not lead to better care or quality of life. Many of these transitions may be avoidable through advance care planning, appropriate provider-to-provider communication, and proper hospice inpatient care.[3,33,34] Efforts to reduce posthospice transitions could result in substantial cost saving and improve quality of end-of-life care.

Similar to other studies examining hospice disenrollment, several predisposing factors were associated with transitions.[15,17,30] Individuals who were not white were more likely to have healthcare transitions. Plausible explanations include cultural and religious traditions regarding death, mistrust of the hospice program, and lack of knowledge about hospice care.[15,17,35] Individuals with more comorbidities were more likely to have transitions, reflecting that they and their family had greater need for additional care. In addition to individual characteristics, several hospice characteristics are associated with the likelihood of transitions; individuals were less likely to have transitions if they were enrolled in a nonprofit hospice program or a hospice that had been in business longer or had a larger beneficiary base, consistent with findings in prior studies examining hospice disenrollment.[18,36] States that do not have CON laws were associated with less likelihood of transitions than states with CON laws. This finding appears inconsistent with the expectation, according to the public interest theory, that government policies enhance efficiency and equity,[37] but CON laws could be a marker of access to hospice, which may be associated with hospice behavior. For example, a previous study showed that states without a CON policy were independently associated with greater geographic access to hospice.[38] Additionally, states that have greater access to palliative care in hospitals tended to be less likely to have transitions than states with less access to palliative care, indicating that hospital-based palliative care teams may influence care transitions to and from hospitals for hospice enrollees. Efforts to increase access to palliative care in hospitals may decrease transitions.

This study also expands previous work by finding that substantial variation was observed at the hospice level, rather than at the HRR or state level, indicating that provider behavior may be an important determinant of transitions in care. Given the adverse consequences of transitions, attention to care transitions in the United States has been paid nationally.[3] The current study findings suggest that healthcare transitions after hospice enrollment might be used as a quality indicator for hospice care. The Centers for Medicare and Medicaid Services (CMS) created the Hospice Quality Reporting Program to provide consumer and provider hospice quality, as mandated by the Affordable Care Act of 2010.[39] Transitions in care defined in this study are based on the administrative data and could quickly and efficiently provide a performance measure and support quality improvement efforts.

Although the CMS definition of transitions in care[40] was used in the current study, not all posthospice enrollment transitions are the same. It cannot be ascertained from the data what the cause of the transition was, although some transitions may be more likely to reflect family and user preferences, whereas other transitions may be more indicative of fragmented care. For instance, hospitalization from hospice could indicate a larger failure (because hospice is supposed to minimize hospitalizations), whereas hospitalization from home after being discharged from hospice is more likely to reflect family and individual preferences. Therefore, the analyses specifically examined transitions from hospice to hospital in addition to any transitions in care. The results were qualitatively similar (Table 3). Nevertheless, future research identifying and examining care transitions that deviate from individual preferences is needed.

This study has several limitations. Being a cross-sectional study, it was not possible to make causal inferences, although the descriptive findings are novel. In addition, although transitions in care may be disruptive to individuals and their families, information was not available about individual and family preferences, and hence the full effect of such transitions cannot be assessed. Nevertheless, prior literature has shown that individual preferences explain little of the regional variation in end-of-life healthcare use.[41,42] Also, data were available only on decedents, and hence the trajectories of individuals who were enrolled in hospice but did not die during the study period could not be analyzed and could be a topic for future research. Finally, transitions in care were determined using the admission and discharge dates of Medicare claims. When there was continuity of care within a certain clinical setting, it was not consider a transition in care, even if a beneficiary received care from two different providers within that setting. Thus, the average numbers of transitions would be underestimated.

The Medicare hospice benefit policy at the time of this research was that hospice enrollees were required to forgo curative care for their primary condition. The CMS is launching a pilot program[43] in which Medicare beneficiaries who enroll in hospice can continue to receive curative and palliative treatments at the same time, which may result in more transitions in care. Nonetheless, approximately 10% of hospice users have transitions in care after hospice enrollment. More than 6% had more than one transition, which may be disruptive to end-of-life care. Substantial geographical variation in the proportion of hospice users that have transition in care was also found, suggesting the fragmentation in end-of-life care varies across the United States. Future studies that examine the effect of such transitions in care at the end of life on costs and the experience of individuals and their families are warranted.

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APPENDIX: LIKELIHOOD OF AT LEAST ONE HEALTHCARE TRANSITION OR HOSPITALIZATION AFTER HOSPICE ENROLLMENT, FULL MODEL

Factor	Odds Ratio (95% Confidence Interval)	
	Transition in Care	Hospitalization[a]
Predisposing factor		
Age (reference ≥85)		
66–69	1.38 (1.31–1.46)[b]	1.50 (1.39–1.62)[b]
70–74	1.22 (1.17–1.28)[b]	1.39 (1.31–1.49)[b]
75–79	1.17 (1.12–1.21)[b]	1.33 (1.25–1.40)[b]
80–84	1.11 (1.07–1.15)[b]	1.22 (1.16–1.28)[b]
Male (reference female)	1.19 (1.16–1.22)[b]	1.10 (1.06–1.14)[b]
Race (reference white)		
Black	1.59 (1.52–1.67)[b]	1.93 (1.82–2.05)[b]
Hispanic	1.31 (1.22–1.4)[b]	1.36 (1.23–1.51)[b]
Other	1.37 (1.25–1.51)[b]	1.38 (1.21–1.58)[b]
≤High school education in ZIP code, % (reference ≥90)		
<60	1.04 (0.70–1.55)	1.79 (1.11–2.90)[b]
60–69	1.11 (0.98–1.26)	1.29 (1.08–1.54)[b]
70–79	1.08 (1.00–1.16)	1.17 (1.05–1.31)[b]
80–89	1.06 (1.00–1.11)	1.11 (1.02–1.20)[b]
Need factor		
Number of comorbidities (reference 0–2)		
3	1.01 (0.95–1.06)	1.12 (1.03–1.22)[b]
4	1.02 (0.97–1.07)	1.23 (1.13–1.33)[b]
5	1.06 (1.01–1.12)[b]	1.34 (1.24–1.45)[b]
6	1.10 (1.04–1.15)[b]	1.47 (1.35–1.59)[b]
7–8	1.14 (1.08–1.20)[b]	1.61 (1.48–1.74)[b]
Primary diagnosis for hospice enrollment (reference neoplasms)		
Mental disorders	0.78 (0.74–0.82)	0.66 (0.61–0.71)[b]
Diseases of nervous system and sense organs	0.73 (0.69–0.77)	0.65 (0.60–0.70)[b]
Diseases of circulatory system	1.01 (0.97–1.05)	1.03 (0.97–1.09)
Diseases of respiratory system	1.00 (0.95–1.05)	1.16 (1.09–1.24)[b]
Symptoms, signs, and ill-defined conditions	0.93 (0.90–0.97)	0.82 (0.78–0.87)[b]
Other	0.87 (0.82–0.93)	0.63 (0.57–0.70)[b]
Not receiving hospice inpatient services (reference receiving services)	0.68 (0.66–0.70)	0.57 (0.54–0.59)[b]
Days of hospice enrollment (continuous variable)	1.01 (1.01–1.01)	1.01 (1.01–1.01)[b]
Enabling factor		
Metropolitan statistical area (reference metropolitan)		
No	0.98 (0.92–1.05)	0.96 (0.87–1.05)
Micropolitan	1.02 (0.95–1.09)	1.00 (0.91–1.11)
Median income of county, $ (reference ≥63,000)		
<33,000	1.12 (0.95–1.33)	1.79 (1.11–2.90)[b]
33,000–39,999	1.04 (0.96–1.13)	1.29 (1.08–1.54)[b]
40,000–49,999	0.99 (0.93–1.06)	1.17 (1.05–1.31)[b]
50,000–62,999	1.01 (0.95–1.07)	1.11 (1.02–1.20)[b]
Nonprofit hospice ownership	0.93 (0.89–0.97)	0.74 (0.69–0.80)[b]
Years of hospice operation (reference <10)		
≥24	0.95 (0.89–1.02)	0.80 (0.73–0.88)[b]
19–23	0.91 (0.86–0.97)	0.78 (0.71–0.85)[b]
10–18	0.93 (0.88–0.97)	0.86 (0.80–0.92)[b]
Number of hospice admissions during study period (reference <241)		
≥1,247	0.76 (0.71–0.81)	0.85 (0.76–0.94)[b]
545–1,246	0.78 (0.73–0.82)	0.77 (0.71–0.84)[b]
241–544	0.80 (0.77–0.84)	0.81 (0.76–0.87)[b]
Hospice inpatient service (reference not provided)		
Staff provided	0.98 (0.89–1.07)	0.93 (0.79–1.09)
Provided under contract arrangement	1.06 (0.97–1.16)	1.13 (0.99–1.28)
Provided by both	0.96 (0.85–1.07)	0.88 (0.76–1.01)
Hospice accreditation (reference none)		
Joint Commission Home Care Accreditation	1.07 (1.01–1.13)[b]	1.02 (0.94–1.10)
Community Health Accreditation Program	1.01 (0.96–1.06)	1.03 (0.95–1.11)
Accreditation Commission for Health Care	0.91 (0.78–1.06)	0.89 (0.71–1.12)
Market concentration (reference highly concentrated)		
Competitive market	1.04 (0.97–1.12)	1.08 (0.97–1.19)
Moderately concentrated market	0.98 (0.90–1.06)	1.04 (0.92–1.17)
County-level health maintenance organization penetration rate, % (quartile) (reference <11.75)		
≥31.14	0.97 (0.91–1.03)	0.94 (0.86–1.04)
19.47–31.13	0.92 (0.87–0.98)[b]	0.87 (0.80–0.94)[b]
11.75–19.46	0.97 (0.92–1.01)	0.95 (0.89–1.02)
Number of hospices per 1,000 people aged ≥65 in the county (reference <0.020)		
≥0.126	0.96 (0.92–1.01)	0.90 (0.84–0.97)[b]
0.063–0.125	0.89 (0.85–0.94)[b]	0.84 (0.78–0.91)[b]
0.020–0.062	0.95 (0.90–1.01)	0.91 (0.84–0.99)[b]
Number of physicians per 1,000 people aged ≥65 in the county (reference <9.7)		
≥30.8	0.96 (0.90–1.03)	0.98 (0.88–1.09)
18.9–30.7	0.94 (0.88–1.01)	0.95 (0.87–1.05)
9.7–18.8	0.95 (0.90–1.00)	0.94 (0.87–1.01)
Number of hospitals per 1,000 people aged ≥65 in the county (reference <13.3)		
≥31.0	1.09 (1.02–1.15)	1.08 (0.99–1.17)
21.5–30.9	1.04 (0.99–1.10)	1.11 (1.03–1.2)[b]
13.4–21.4	1.02 (0.97–1.07)	1.07 (1.00–1.14)
Number home health agencies per 1,000 people aged ≥65 in the county (reference <0.10)		
≥0.34	1.00 (0.94–1.06)	1.06 (0.97–1.16)
0.18–0.33	1.03 (0.98–1.08)	1.07 (0.99–1.15)
0.10–0.17	1.04 (0.98–1.09)	1.05 (0.97–1.13)
Number of skilled nursing beds per 1,000 people aged ≥65 in the county (reference <29.7)		
≥52.3	0.98 (0.92–1.04)	0.96 (0.88–1.04)
39.7–52.2	0.96 (0.91–1.02)	0.94 (0.86–1.01)
29.7–39.6	0.96 (0.91–1.01)	0.98 (0.91–1.06)
No state certificate of need health laws (reference having certificate of need)	0.83 (0.76–0.90)[b]	0.72 (0.61–0.86)[b]
State access to palliative care in hospitals, % (reference <20)		
≥81	0.84 (0.68–1.05)	0.59 (0.39–0.91)[b]
61–80	0.91 (0.74–1.11)	0.79 (0.53–1.17)
41–60	0.90 (0.73–1.10)	0.80 (0.53–1.20)
21–40	1.08 (0.86–1.36)	1.11 (0.70–1.77)
Covariance parameter estimates in the four-level hierarchical generalized linear model		
Hospice	0.1256	0.2338
Hospital referral region	0.0146	0.0282
State	0.0055	0.0436

(Continued)

APPENDIX (Contd.)

Adjusted for predisposing, need, and enabling factors, clustered according to hospice, hospital referral region, and state.

[a] Hospitalization directly from hospice.

[b] $P < .05$.