Predictors of Transition to Hospice Care Among Hospitalized Older Adults With a Diagnosis of Dementia in Texas: A Population-Based Study

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Abstract

Background: Decedent older adults with dementia are increasingly less likely to die in a hospital, though escalation of care to a hospital setting, often including critical care, remains common. Although hospice is increasingly reported as the site of death in these patients, the factors associated with transition to hospice care during end-of-life (EOL) hospitalizations of older adults with dementia and the extent of preceding escalation of care to an intensive care unit (ICU) setting among those discharged to hospice have not been examined.

Methods: We identified hospitalizations aged ≥ 65 years with a diagnosis of dementia in Texas between 2001 and 2010. Potential factors associated with discharge to hospice were evaluated using multivariate logistic regression modeling, and occurrence of hospice discharge preceded by ICU admission was examined.

Results: There were 889,008 elderly hospitalizations with a diagnosis of dementia during study period, with 40,669 (4.6%) discharged to hospice. Discharges to hospice increased from 908 (1.5%) to 7,398 (6.3%) between 2001 and 2010 and involved prior admission to ICU in 45.2% by 2010. Non-dementia comorbidities were generally associated with increased odds of hospice discharge, as were development of organ failure, the number of failing organs, or use of mechanical ventilation. However, discharge to hospice was less likely among non-white minorities (lowest among blacks: adjusted odds ratio (aOR): 0.67; 95% confidence interval (CI): 0.65 - 0.70) and those with non-commercial primary insurance or the uninsured (lowest among those with Medicaid: aOR (95% CI): 0.41 (0.37 - 0.46)).

Conclusions: This study identified potentially modifiable factors associated with disparities in transition to hospice care during EOL hospitalizations of older adults with dementia, which persisted across comorbidity and severity of illness measures. The prevalent discharge to hospice involving prior critical care suggests that key discussions about goals-of-care likely took place following further escalation of care to ICU. Together these findings can inform system- and clinician-level interventions to facilitate timely and consistent use of hospice to meet patients' goals of care.

Keywords: Dementia; Hospice; Hospitalization; Intensive care unit

Introduction

Hospice care is increasingly used among patients with dementia [1, 2], though only a minority are referred, even among those with advanced disease [3]. Although the majority of healthcare proxies (HCP) of patients with advanced dementia believe that comfort support is the primary goal of care [3], escalation of care commonly occurs [1, 4]. Thus, do-not-hospitalize orders remain uncommon among nursing home residents with dementia [5]. Moreover, decisions to forgo hospitalization are commonly delayed until death is imminent [6], though transitions of care can be associated with increased patient and family burden and with interventions inconsistent with patients' goals of care [7]. The latter findings may explain in part the reported exponential rise in hospitalization of older adults with dementia in the United States [8], with a recent study [9] suggesting that growth in hospitalization volume of these patients in Texas outpaced the estimated growth rate of state population with dementia [10].

Hospitalized patients with dementia represent, by definition, a subpopulation where HCP generally considered such escalation of care appropriate, at least implicitly. Thus, data on factors and barriers associated with subsequent transition to hospice care during end-of-life (EOL) hospitalizations in these patients would inform interventions to better meet patients' goals of care and limit non-beneficial burdensome interventions. However, there have been no reports, to our knowledge, on the determinants of hospice utilization among patients with dementia, once care has been escalated to hospital setting, and transitions to hospice care among hospitalized patients with dementia were generally not addressed [11].

In addition, further escalation of care is common among hospitalized patients with dementia, often including admission to intensive care unit (ICU). We recently reported a rapid growth of in ICU admissions among hospitalized older adults with dementia in Texas, with findings suggesting that these

patients may account for nearly one in four ICU admissions among older adults in the state by 2020 [9]. However, patients with dementia may be especially vulnerable to accelerated cognitive and physical decline, and with decreased survival following critical illness [12]. Nevertheless, although admissions to ICU can be avoidable when inconsistent with patients' goals of care, such transfers can often occur without preceding discussion about their merit and care alternatives [13]. Finally, although ICU is increasingly used among decedents with dementia in the last 30 days of life [1], there are no data on the extent of transition to hospice care preceded by admission to ICU among hospitalized patients with dementia.

We conducted a population-level examination of hospitalized older adults with a diagnosis of dementia in Texas to identify factors associated with hospice utilization in the inpatient setting, and to quantify temporal patterns of escalation of care to ICU setting preceding discharge to hospice.

Materials and Methods

Data sources

We used the Texas Inpatient Public Use Data File (TIPUDF) to perform a retrospective, population-based cohort study of state residents with a diagnosis of dementia. TIPUDF is an administrative data set maintained by the Texas Department of State Health Services [14] and was previously described [15]. Briefly, the data set includes de-identified inpatient discharge data on the demographic, clinical, resource utilization, and outcome domains from non-federal state-licensed hospitals, and captures 93-97% of all hospital discharges in the state. The Institutional Review Board of Texas Tech Health Sciences Center has determined that the present study is exempt from formal review due to use of publicly available, de-identified data.

Study population

We used previously described International Classification of Diseases, Ninth Edition, Clinical Modification (ICD-9-CM) codes 290.0-290.4, 291.1, 291.2, 292.82, 292.83, 294.0, 294.1, 294.8, 294.9, 331.0, 331.1, 331.2, 331.7, 331.82, 331.9, 797 [16, 17] to identify state residents aged ≥ 65 years hospitalized with a diagnosis of dementia during the years 2001 - 2010. All individual hospitalizations meeting these criteria were included in the analytic cohort and served as denominator for derived descriptive reports, unless stated otherwise.

Data collection

We collected data on patients' age, gender, race/ethnicity (categorized as non-Hispanic black (black), non-Hispanic white (white), Hispanic, and other), primary payer health insurance (categorized as commercial, Medicaid, Medicare, no health insurance, and other), non-dementia comorbid conditions (based

Table 1. The Demographics and Health Insurance Characteristics of Older Adult Hospitalizations With a Diagnosis of Dementia, 2001 - 2010

Group	n = 889,008
Age (years, n (%))[a]	
65 - 79	334,226 (37.6)
≥ 80	554,782 (62.4)
Female (n (%))[a, b]	550,987 (64.4)
Race/ethnicity (n (%))[a]	
White	590,806 (66.5)
Hispanic	141,202 (15.9)
Black	107,746 (12.1)
Other	47,502 (5.3)
Missing	2,035 (0.2)
Health insurance (n (%))[a]	
Private	79,428 (8.9)
Medicare	774,847 (87.2)
Medicaid	16,065 (1.8)
Uninsured	12,971 (1.5)
Other	5,304 (0.6)
Missing	393 (0.04)

[a]Percent figures are rounded. [b]Gender was masked in 33,297 hospitalizations. The denominator used to derive gender percentages for the cohort was based on hospitalizations with available gender designation (n = 855,711) .

on the Deyo modification of the Charlson comorbidity index [18]), type of failing organs (Supplementary Table 1, www.jocmr.org), use of mechanical ventilation (ICD-9-CM codes 96.70-96.72), admission to ICU (defined as presence of an intensive care unit charge greater than $0), in-hospital death and discharge to hospice.

Data analysis

Because TIPUDF provides discharge-level, rather than patient-level information, we reported admissions with a diagnosis of dementia as number of hospitalizations. Hospitalization endings with either in-hospital death or discharge to hospice were described as EOL hospitalizations.

Group data are reported as counts and percentages for categorical variables. The Chi-square test was used to compare categorical data. Multivariate logistic regression models were constructed to examine candidate covariates as predictors of discharge to hospice. Covariates were considered for multivariate regression models if they were either statistically significant (P < 0.10) or had odds ratio (OR) ≥ 1.5 or ≤ 0.66 on univariate analysis. Candidate covariates included age, gender, race/ethnicity, health insurance, comorbid conditions, measures of severity of illness (type and number of failing organs) [19, 20], and use of mechanical ventilation. Separate models

Table 2. Comorbid Conditions of Older Adult Hospitalizations With a Diagnosis of Dementia, 2001 - 2010

Group	n = 889,008
Deyo-Charlson index-based comorbidities (n (%))	
Congestive heart failure	218,508 (24.6)
Peripheral vascular disease	104,925 (11.8)
Lung disease	188,171 (21.3)
Cerebrovascular disease	139,289 (15.7)
Connective tissue disease	15,955 (1.8)
Diabetes mellitus	232,916 (26.2)
Renal disease	110,728 (12.5)
Liver disease	17,656 (2.0)
Malignancy	41,048 (4.6)
HIV infection	980 (0.1)

Table 3. Organ Failure and Use of Mechanical Ventilation Among Older Adult Hospitalizations With a Diagnosis of Dementia, 2001 - 2010

Group	n = 889,008
Type of organ failure (n (%))	
Respiratory	49,481 (5.6)
Cardiovascular	40,678 (4.6)
Renal	77,173 (8.7)
Hepatic	3,758 (0.4)
Hematological	26,438 (3.0)
Metabolic	16,527 (1.9)
Neurological	66,422 (7.5)
Number of failing organs (n (%))	
1	166,418 (18.7)
2	37,556 (4.2)
3	9,067 (1.0)
≥ 4	2,924 (0.3)
Mechanical ventilation (n (%))	15,373 (1.7)

were constructed to examine the predictive roles of individual organ failures and number of failing organs. The state of Texas masks gender data of hospitalizations with a diagnosis of infection with the human immunodeficiency virus (HIV), and ethanol or drug abuse. Thus, analyses of the predictive role of gender were restricted to hospitalizations without the aforementioned three diagnoses. Similarly, models that examined the predictive role of HIV infection did not include gender. Because marked rise has been found in use of hospice during study period, which could have been affected by changing roles of the examined predictive covariates, we performed sensitivity analyses, re-examining modeled covariates among hospitalizations with dementia in the years 2001 and 2010 to assess for changes in the direction of association or statistical significance at the start and end of study period. Adjusted odds ratios (aOR) and corresponding 95% confidence intervals (95% CI) were calculated.

All statistical analyses were performed using MedCalc version 15.6.1 (MedCalc Software, Ostend, Belgium) and SAS version 9.3 (SAS Institute, Cary, NC, USA). A two-sided P value < 0.05 was considered statistically significant.

Results

There were 889,008 hospitalizations with a diagnosis of dementia during study period. The demographic characteristics, health insurance, comorbid conditions, development of organ failure and use of mechanical ventilation of this cohort are detailed in Tables 1-3. The corresponding data for hospitalizations during the years 2001 and 2010 are outlined in Supplementary Tables 2-4 (www.jocmr.org).

The majority of hospitalizations (62.4%) were aged 80 years or older, with about two in three being women. Minorities accounted for 33.3% of hospitalizations. Medicare insurance was the primary payer program for the vast majority, though 1.5% lacked health insurance, and 1.8% had Medicaid. Diabetes (26.2%) and congestive heart failure (24.6%) were the most common comorbid conditions. One or more organ

failures developed in 215,965 (24.3%) hospitalizations, with renal (8.7%), neurological (7.5%), and respiratory (5.6%) systems being the most commonly affected. Mechanical ventilation was used in 31.1% of those with respiratory failure.

On examination of patient attributes in 2001 and 2010, the key noted changes were increasing male and Hispanic hospitalizations, rise in use of commercial insurance, higher rates of most examined comorbid conditions and substantial increase in the rates of all types of examined organ failures and the number of failing organs. The use of mechanical ventilation in the cohort increased two-fold.

There were 44,174 (5.0%) in-hospital deaths and discharge to hospice was reported in 40,669 (4.6%) hospitalizations, thus accounting for 47.9% of EOL hospitalizations for the whole cohort. The corresponding data on hospital mortality and discharge to hospice during 2001 and 2010 are reported in Supplementary Table 4 (www.jocmr.org), with 908 (1.5%) and 7,398 (6.3%) discharged to hospice, respectively. The latter figures correspond to 19.9% (2001) and 57.5% (2010) of EOL hospitalizations. Predictors of discharge to hospice are outlined in Table 4. Hospitalizations aged 80 years or older had increased odds of hospice use, while all examined non-white race groups had lower odds of hospice utilization, being lowest among blacks (aOR (95% CI): 0.67 (0.65 - 0.70); P < 0.0001). Primary insurance other than commercial also predicted lower transition to hospice care, being lowest among hospitalizations with Medicaid insurance (aOR (95% CI): 0.41 (0.37 - 0.46); P < 0.0001). Hospitalizations with non-dementia comorbidities were generally more likely to have discharge to hospice, with the odds being highest among those with malignancy (aOR (95% CI): 3.72 (3.61 - 3.84); P < 0.0001).

Use of hospice was increased with each of the examined organ failures and increasing number of failing organs increased the odds of discharge to hospice from 2.02 to 6.18

Table 4. Logistic Regression Analysis of the Factors Associated With Discharge to Hospice Among Older Adult Hospitalizations With a Diagnosis of Dementia, 2001 - 2010

Covariate	Adjusted odds ratio	95% confidence interval	P
Age ≥ 80 years[a]	1.78	1.73 - 1.82	< 0.0001
Race/ethnicity[b]			
Black	0.67	0.65 - 0.70	< 0.0001
Hispanic	0.80	0.78 - 0.82	< 0.0001
Other	0.81	0.78 - 0.85	< 0.0001
Health insurance[c]			
No health insurance	0.86	0.79 - 0.94	0.0008
Medicaid	0.41	0.37 - 0.46	0.0001
Medicare	0.68	0.66 - 0.70	< 0.0001
Other	0.68	0.59 - 0.78	0.0001
Chronic comorbidity			
Congestive heart failure	1.35	1.32 - 1.38	< 0.0001
Peripheral vascular disease	1.30	1.27 - 1.34	0.0001
Cerebrovascular disease	1.17	1.14 - 1.20	< 0.0001
Lung disease	0.90	0.87 - 0.92	< 0.0001
Liver disease	1.12	1.05 - 1.20	0.0008
Diabetes	0.78	0.76 - 0.80	< 0.0001
Renal disease	1.15	1.12 - 1.18	< 0.0001
Malignancy	3.72	3.61 - 3.84	< 0.0001
HIV infection[d]	1.26	0.95 - 1.68	0.1033
Type of organ failure			
Respiratory	2.54	2.46 - 2.63	< 0.0001
Cardiovascular	1.41	1.36 - 1.47	< 0.0001
Renal	2.13	2.07 - 2.19	< 0.0001
Hepatic	1.58	1.35 - 1.86	< 0.0001
Hematological	1.16	1.10 - 1.22	< 0.0001
Metabolic	1.54	1.46 - 1.62	< 0.0001
Neurological	1.52	1.48 - 1.57	< 0.0001
Number of failing organs[e]			
1	2.02	1.97 - 2.07	< 0.0001
2	3.46	3.33 - 3.59	< 0.0001
3	4.77	4.48 - 5.07	< 0.0001
≥ 4	6.18	5.61 - 6.82	< 0.0001
Mechanical ventilation[f]	1.12	1.06 - 1.18	0.0001

[a]Age 65 - 79 years was used as referent. [b]White race was used as referent. [c]Commercial insurance was used as referent. [d]Human immunodeficiency virus. [e]Lack of organ failure was used as referent. [f]Modeled with the number of failing organs.

among those with one and ≥ 4 organ failures, respectively. Mechanical ventilation was associated with increased use of hospice when modeled with the number of failing organs, being collinear, as expected, with respiratory failure (r = 0.53).

On sensitivity analyses (Supplementary Table 5, www. jocmr.org), generally no changes were noted in the direction of association of patients' demographics or health insurance and hospice discharge between 2001 and 2010. The exceptions have been for gender, showing a non-significant effect and lower odds of hospice discharge among males in 2001 and 2010, respectively, and for those lacking health insurance, with the latter no longer associated with hospice discharge in 2010. Similarly, the association of comorbid conditions, development of specific type of organ failure, or the number of failing organs and discharge to hospice remained mostly unchanged. Exceptions were exclusion on univariate analyses for lung disease, HIV infection (on 2001 and 2010) and liver disease (in 2001), and development of hepatic and metabolic failures in 2001, with the latter four related in part to small number of hospitalizations. In addition, mechanical ventilation was not

associated with hospice discharge in 2001.

Admission to ICU occurred in 276,056 hospitalizations (31.1%). The rate of admission to ICU rose from 21.4% to 37.9% between 2001 and 2010 (P < 0.0001). Discharge to hospice was reported in 16,111 (5.8%) hospitalizations among those admitted to ICU during study period. The rate of discharge to hospice among ICU admissions increased from 1.7% to 7.7% between 2001 and 2010. Finally, discharges to hospice preceded by ICU admissions accounted for 39.6% of all hospice discharges in the cohort, with the rate rising from 24.6% in 2001 to 45.2% in 2010.

Discussion

In this large population-level study, we showed that among hospitalized older adults with a diagnosis of dementia increasing hospice utilization led to its accounting for the majority of EOL hospitalizations by the end of the last decade. Increased transition to hospice care was associated with the presence of non-dementia comorbidities, development of organ failure and the number of failing organs. However, there has been persistent disparate impact of patients' race/ethnicity and type of health insurance on the odds to hospice discharge. In addition, discharges to hospice were increasingly preceded by escalation of care with admission to ICU.

Although hospice utilization among patients with dementia has been extensively reported [1, 3], factors affecting transfer to hospice care have not been examined, to our knowledge, among these patients, once hospitalized. In addition, studies of predictors of hospice care in general did not examine the roles of comorbid conditions, intercurrent organ failure or used life support interventions, with sparse reports to date, which did not address specifically patients with dementia [21].

Our finding of increased odds of hospice discharge with older age among patients with dementia contrasts a recent report by Kiely and colleagues, with the latter showing no impact of age among nursing home residents with advanced dementia in the Boston area [22]. The difference may be related in part to the relatively small sample size of the latter study, different care setting, and focus only on advanced dementia. However, because administrative data do not include information on the severity of dementia, our findings may reflect confounding, with older hospitalizations with dementia being more likely to have more severe disease.

The markedly reduced likelihood of discharge to hospice among minority hospitalizations noted in the present study is consistent with prior reports of disparities in use of hospice services among minority patients, across diagnoses and care settings [23], with increased preference for dying in the hospital among black and Hispanic patients [24]. Our findings contrast reports of adjusted higher odds of hospice care among non-white nursing home residents with advanced dementia [22] and, as noted earlier, the difference may be related to difference of sample size, care setting, and possibly geographical region. The reasons for the noted racial disparities in hospice care remain incompletely understood [23]. The complexities involved in interpreting varying use of hospice care across ra-

cial groups are underscored by a recent study by Elliott and colleagues showing that although hospital-based physicians use similar verbal communication when discussing EOL care with black and white patients, they exhibit significantly fewer rapport-building nonverbal cues with the former [25].

The role of health insurance in hospice utilization among hospitalized older adults with dementia has not been previously examined. Lower use of hospice services among patients with traditional Medicare insurance, as compared with those with commercial insurance was previously described in the general population [26, 27], as was noted consistently in the present cohort, though the underlying explanations remain elusive [26]. Although charity care is offered by many hospice providers [2], this is not the case for about one in five nonprofit or for-profit facilities [28], which may have contributed to the lower odds of hospice use in the present cohort among those lacking health insurance. However, lack of health insurance was no longer significant predictor of hospice use by the end of the last decade, possibly reflecting improved access for these patients. We found, unexpectedly, that Medicaid insurance was associated with the lowest odds of hospice use, even as compared to those lacking health insurance. Our results contrast a recent report by duPreez and colleagues showing no independent impact of Medicaid insurance on use of hospice among elderly decedents following acute stroke [21]. Although patients with Medicaid insurance are eligible for hospice benefits in Texas, those are restricted to patients with full Medicaid insurance [29]. It is unclear how or whether varying insurance coverage has affected clinicians' behavior related to hospice referral and to what extent our findings reflect state-specific barriers to hospice use. However, our findings represent a target for further study to identify means to improve patients' access.

While presence of non-dementia comorbidities generally increased the odds of hospice discharge in our cohort especially, as expected, among those with concurrent malignancy, comorbid conditions generally did not predict hospice use among decedents following acute stroke [21]. The difference between studies may be related to unmeasured factors between hospitalized patients with dementia, at times with other interim complications vs. those specifically following stroke, as well as different study designs.

The association of organ failure with subsequent hospice care among hospitalized patients has not been previously examined. Our findings suggest that development of even a single acute organ failure, regardless of the affected system, was likely among the key factors in considering transition to hospice care during discussions between clinicians and HCP, with the magnitude of association generally higher than that of comorbid conditions. Although development of respiratory failure doubled the odds of patients' referral to hospice care, those decisions often occurred following institution of invasive mechanical ventilation. Thus, finding that institution of mechanical ventilation was associated independently with increased odds of hospice care highlights gaps in timely effective communication about patients' goals of care, once care was escalated to hospital setting.

Our study quantifies for the first time the increasingly prevalent use of ICU among hospitalized older adults with de-

mentia who are subsequently discharged to hospice. Although hospice use rose markedly among hospitalized patients, transition to hospice care was increasingly preceded by further, potentially avoidable, escalation of care to ICU, accounting for nearly one in two hospice discharges by the end of the decade. The latter pattern suggests that increasing proportion of key discussions by clinicians about goals of care and options of palliative care likely took place following admission to ICU and, at times, after institution of invasive life support interventions. Indeed, prior study by Rady and colleagues in the general population showed that communication about alternative care goals was uniformly absent prior to transfer to ICU among hospital decedents in a single-center cohort [13]. Admission to ICU and related life-support interventions may meet short- and long-term goals of some patients with dementia, and lack of patient-centered benefits cannot be assumed arbitrarily. However, the present findings underscore the need to effectively incorporate discussions on ICU admission and related interventions vs. alternative care options early in the hospital course.

The study has several strengths, including use of a high-quality data set in a state with a diverse population, a robust sample size, and a population-based approach, with the latter allowing transcending local variability in care patterns.

Nevertheless, the interpretation of the present findings should be considered in the context of several limitations. We used a retrospective design and administrative data with their attendant limitations. Although we used code-based approach similar to that of other investigators [16, 17], use of ICD-9 codes to identify hospitalizations with dementia may have led to misclassification in some cases. A previous report documented sensitivity and specificity of 85% and 89%, respectively, for diagnosis of dementia using similar ICD-9 codes [30]. In addition, the severity of dementia could not be determined and it has been suggested that administrative data may underestimate milder stages of dementia [31], related in part to prevalent underestimation of pre-existing cognitive dysfunction in the hospital setting [32, 33].

In addition, use of administrative data precluded examination of pre-existing limitations of care among hospitalized patients and their interaction with the identified predictors of hospice discharge. Similarly, the specialties, level of training, and experience of the involved clinicians, though bound to affect the timing and content of communication with HCP and the decision-making by the latter, could not be examined.

Finally, although the present study examined data from a large state with a diverse population, the use of hospice services varies substantially across states [34], as can population characteristics, thus affecting the generalizability of our findings.

In conclusion, decisions about transition to hospice care among hospitalized older adults with dementia appeared generally sensitive to the presence of non-dementia comorbidities and especially to measures of increasing severity of illness. However, even following adjustment for other confounders, disparities in use of hospice services persisted among non-white minorities and hospitalizations with non-commercial primary health insurance. In addition, the marked rise in hospice utilization during EOL hospitalizations was tempered by

concomitant substantial increase in discharges to hospice only following admission to ICU, suggesting common delays in effective communication with HCP.

The findings of the factors associated with increased hospice use and potentially modifiable barriers can inform policy-, healthcare system-, and clinician-level studies and interventions geared to better align in advance patients' goals of care with subsequent interventions.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

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