Association of Diagnosed Dementia with Post-discharge Mortality and Readmission Among Hospitalized Medicare Beneficiaries

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BACKGROUND: Patients with dementia are frequently hospitalized and may face barriers in post-discharge care.
OBJECTIVE: To determine whether patients with dementia have an increased risk of adverse outcomes following discharge.
DESIGN: Retrospective cohort study.
SUBJECTS: Medicare beneficiaries hospitalized in 2016.
MAIN MEASURES: Co-primary outcomes were mortality and readmission within 30 days of discharge. Multivariable logistic regression models were estimated to assess the risk of each outcome for patients with and without dementia accounting for demographics, comorbidities, frailty, hospitalization factors, and disposition.
KEY RESULTS: The cohort included 1,089,109 hospitalizations of which 211,698 (19.3%) were of patients with diagnosed dementia (median (IQR) age 83 (76–89); 61.5% female) and 886,411 were of patients without dementia (median (IQR) age 76 (79–83); 55.0% female). At 30 days following discharge, 5.7% of patients with dementia had died compared to 3.1% of patients without dementia (adjusted odds ratio (aOR) 1.21; 95% CI 1.17 to 1.24). At 30 days following discharge, 17.7% of patients with dementia had been readmitted compared to 13.1% of patients without dementia (aOR 1.02; CI 1.002 to 1.04). Dementia was associated with an increased odds of readmission among patients discharged to the community (aOR 1.07, CI 1.05 to 1.09) but a decreased odds of readmission among patients discharge to nursing facilities (aOR 0.93, CI 0.90 to 0.95). Patients with dementia who were discharged to the community were more likely to be readmitted than those discharged to nursing facilities (18.9% vs 16.0%), and, when readmitted, were more likely to die during the readmission (20.7% vs 4.4%).
CONCLUSIONS: Diagnosed dementia was associated with a substantially increased risk of mortality and a modestly increased risk of readmission within 30 days of discharge. Patients with dementia discharged to the community had particularly elevated risk of adverse outcomes indicating possible gaps in post-discharge services and caregiver support.

INTRODUCTION

Over 11% of Medicare beneficiaries have diagnosed dementia, including Alzheimer's disease- and Alzheimer's disease-related dementias.[1] Older adults with diagnosed dementia have increased rates of hospitalization and post-acute care, resulting in substantially increased Medicare expenditures compared to other older adults.[2–5] Those with dementia are also at increased risk of preventable hospitalizations and in-hospital complications including in-hospital death, delirium, functional decline, and adverse drug events.[6–9] Cognitive impairment creates barriers in self-care after discharge, limiting patients' ability to understand and carry out discharge plans and to seek early outpatient care when problems arise. Thus, after hospitalization, older adults with dementia who are discharged home may be at particularly high risk for adverse outcomes.

Prior research examining the association between dementia and post-discharge outcomes has had conflicting findings, which likely reflect the heterogeneity of studied populations.[8–10] Prior studies have been single-center or focused on small geographic regions,[11,12] or non-US populations.[13–15] Additionally, few studies have accounted for geriatric syndromes such as frailty, multi-morbidity, and delirium, which often occur alongside dementia. The most comprehensive study to date, an examination of national discharge data from Japan, found that readmission rates were higher among patients with dementia overall, but varied by index hospitalization diagnosis.[15] The generalizability of this study to the USA may be limited, as observed readmission rates were less than half of US readmission rates and rates of discharge to nursing facilities were much lower. Furthermore, the availability of caregiver support and resources for caregivers may differ across countries, and in the USA,

caregiver burden is common and contributes to adverse outcomes for patients with dementia.[16,17]

To inform the development of US initiatives to improve discharge planning and post-discharge care for older adults with dementia, we sought to determine the association between dementia and post-discharge mortality and readmissions by examining a national cohort of Medicare beneficiaries hospitalized in 2016. We hypothesized that patients with dementia would have increased risk of adverse outcomes, even after accounting for multi-morbidity and frailty, and that risks would be the highest among those discharged to the community.

METHODS

This study was determined to be exempt from review by the Beth Israel Deaconess Medical Center Institutional Review Board.

Study Population

We used a 20% national sample of Centers for Medicare & Medicaid Services (CMS) Medicare Provider Analysis and Review files to identify acute care hospitalizations of adults aged 65 years and older between January 1, 2016, and November 30, 2016. We included patients enrolled in Medicare fee-for-service for at least 1 year before hospitalization and at least 30 days after discharge. The unit of observation was the hospitalization; thus, patients could contribute multiple hospitalizations and a hospitalization could be both an index hospitalization and a readmission outcome.

We examined index hospitalizations as defined by the CMS readmission and mortality measures, which include an overall hospitalization category and five sub-cohorts defined using *International Classification of Diseases, Tenth Revision* to reflect common conditions commonly cared for by different clinical services in hospitals: cardiorespiratory, cardiovascular, neurology, medicine, and surgery/gynecology.[18,19] Consistent with CMS measures, we excluded index hospitalizations in which patients died during the index hospitalization, were discharged against medical advice, or were discharged to hospice. We also excluded index hospitalizations for psychiatric diagnoses, rehabilitation, and medical treatment of cancer.

Dementia Diagnosis

We used the CMS Chronic Condition Warehouse algorithm for Alzheimer's Disease, Related Disorders, or Senile Dementia to identify patients with a dementia diagnosis based upon the presence of one or more dementia diagnosis codes in the 3 years preceding the index hospitalization.[20]

Outcomes

The primary outcomes were mortality within 30 days of hospital discharge and unplanned hospital readmission within 30 days of hospital discharge. We defined hospital readmissions to include both admissions and observation stays, given evidence suggesting that hospitals may be substituting observation stays for readmissions in response to financial incentives to reduce readmissions and that the distinction between observation stay and admission is often financial rather than clinical.[21,22] Readmissions for planned procedures or medical treatments were excluded in accordance with the CMS planned readmission algorithm.[19,23]

Among patients who were readmitted, we examined discharge diagnoses and subsequent dispositions. Discharge diagnoses were grouped using Agency for Healthcare Research and Quality Clinical Classifications Software (CCS).[24] Disposition following readmission was classified as community discharge, facility discharge (including skilled nursing, inpatient rehabilitation, and long-term care facilities), hospital transfer, discharge to hospice, discharge against medical advice, and death during hospitalization.

Covariates

Covariates included patient demographics, comorbidities, frailty, hospitalization factors, and discharge factors. Demographics included age, sex, race/ethnicity, and eligibility for Medicaid. Comorbidities included 50 common chronic conditions, including both chronic diseases and functional impairments, as defined by CMS Chronic Condition Warehouse algorithms. In addition, we included the AHRQ Elixhauser Comorbidity mortality and readmissions indices, which are derived from 29 Elixhauser comorbidities coded on the index hospitalization as being actively managed during hospitalization.[25] We used a modified version of the validated claims-based frailty index (CFI), which approximates a standard deficit-accumulation frailty index using diagnosis, procedure, equipment, and device coding.[26] We removed the "hereditary and degenerative diseases of the central nervous system" variable from the CFI as it was highly collinear with the primary predictor of dementia. Hospitalization characteristics included state, admission source, specialty cohort, receipt of intensive care unit services, discharge diagnosis (defined by second-level CCS diagnosis categories), performance of major procedures (defined by first-level CCS procedure categories), and presence of delirium (defined by discharge diagnoses using a highly specific but poorly sensitive algorithm[27]). Discharge factors included discharge on a weekend and discharge to a facility (long-term care, inpatient rehabilitation, or skilled nursing facility).

Statistical Analyses

The primary analyses examined the association between dementia and 30-day mortality and 30-day readmissions in the

overall cohort using separate logistic regression models. Multivariable logistic regression models were fitted to estimate odds ratios (ORs) with 95% confidence intervals (CIs) of each outcome among hospitalizations of patients with versus without a dementia diagnosis. Models included the aforementioned covariates to account for differences in characteristics of patients with and without diagnosed dementia and differences in index hospitalization care, and clustered sandwich estimators to account for multiple hospitalizations within patients. The AHRQ Elixhauser Comorbidity mortality index was included in the models estimating 30-day mortality whereas the AHRQ Elixhauser Comorbidity readmissions index was included in the models estimating 30-day readmissions. All analyses were conducted using Stata v.16.1. Statistical tests were 2-sided at a significance level of .05.

We conducted two sets of subgroup analyses defined a priori. First, we examined the primary outcomes in the five specialty cohorts to assess whether the association of dementia with post-discharge outcomes differed by reason for hospitalization. Second, we examined the primary outcomes among patients discharged to the community and those discharged to skilled nursing or inpatient rehabilitation facilities.

Among patients who were readmitted, we used descriptive statistics to explore differences in reasons for readmission and disposition following readmission among patients with and without diagnosed dementia.

Sensitivity Analysis

We conducted two sensitivity analyses. First, we examined unplanned "return-to-hospital" within 30 days of discharge. Return-to-hospital is a combined outcome of readmissions and emergency room visits, which has been proposed as an alternative to readmission measures since it captures visits by patients who lack access to other ambulatory care or are concerned enough to seek emergent care following hospitalization but are not admitted to the hospital.[22] Second, we limited our analyses to patients admitted from the community, excluding those transferred from nursing facilities.

RESULTS

The final study cohort consisted of 1,089,109 hospitalizations by 759,437 Medicare beneficiaries (eFigure 1). In the final cohort, 211,698 (19.3%) hospitalizations occurred in patients with diagnosed dementia (Table 1). Compared to patients without dementia, patients with dementia were older (median age 83 years vs 76 years), and a greater proportion were female (61.5% vs 55.0%), Black (12.7% vs 8.6%), Hispanic (6.6% vs 4.6%), and Medicaid eligible (36.4% vs 17.0%). Patients with dementia were more likely to have nearly all chronic conditions. A greater proportion of patients with dementia were moderately or severely frail (24.8% vs 9.7%) and were admitted from

nursing facilities (8.7% vs 2.3%). Patients with dementia had a longer median length of stay (4 days vs 3 days) and were more likely to have diagnosed delirium (17.7% vs 6.3%). At discharge, 42.1% of patients with dementia were discharged to skilled nursing facilities compared to 21.6% of patients without dementia.

Mortality Following Discharge

At 30 days following discharge, 5.7% of patients with dementia had died compared to 3.1% of patients without dementia (Table 2). After adjustment, patients with dementia had an increased odds of death within 30 days of discharge (OR 1.21; CI 1.17 to 1.24). In subgroup analyses, patients with dementia had higher rates of death in all specialty cohorts and this association persisted in adjusted models, with the highest ORs among patients in the medicine (OR 1.32; 95% CI 1.25 to 1.39) and neurology cohorts (OR 1.33; CI 1.20 to 1.47). Patients with dementia who were discharged to the community had a greater increased odds of death (OR 1.32, CI 1.27 to 1.37) compared to those who were discharged to nursing facilities (OR 1.10, CI 1.06 to 1.14).

Readmission Following Discharge

At 30 days following discharge, 17.7% of patients with dementia had been readmitted compared to 13.1% of patients without dementia (Table 3). After adjustment, patients with dementia had a modestly increased odds of readmission (OR 1.02; CI 1.002 to 1.04). In subgroup analyses, there were modestly increased odds of readmission for patients with dementia following cardiovascular (OR 1.07, CI 1.01 to 1.12) and medicine hospitalizations (1.04, CI 1.01 to 1.07) and no difference following cardiorespiratory, neurology, or surgery/gynecology hospitalizations.

A greater proportion of patients with dementia who were discharged to the community were readmitted compared to those discharged to nursing facilities (18.9% vs 16.0%). Among patients discharged to the community, patients with dementia were more likely to be readmitted within 30 days than those without dementia (18.9% vs 12.6%; OR 1.07, CI 1.05 to 1.09). Among patients discharged to nursing facilities, a greater proportion of patients with dementia were readmitted (16.0% vs 14.8% of patients without dementia), but after adjusting for patient and hospitalization characteristics, patients with dementia had a lower odds of readmission (OR 0.93, CI 0.90 to 0.95).

Figure 1 depicts the primary readmission diagnoses of patients with and without dementia who were readmitted within 30 days of index hospital discharge. A greater proportion of patients with dementia were readmitted for infectious, genitourinary, injury-related, and psychiatric diagnoses while fewer were admitted for circulatory system diagnoses. These observed differences were consistent across subgroups defined by the reason for index hospitalization (eFigure 2).

Table 1 Characteristics of Hospitalizations of Medicare Beneficiaries with and without Diagnosed Dementia

	Patients with dementia (N=211,698)	Patients without dementia (N=886,411)	P
Demographics			
Age, median (IQR), years	83 (76–89)	76 (79–83)	<.001
Female, No. (%)	130162 (61.5)	487668 (55.0)	<.001
Race/ethnicity, No. (%)			<.001
White	163800 (77.4)	736702 (83.1)	
Black	26838 (12.7)	76606 (8.6)	
Asian/Pacific Islander	4293 (2.0)	15288 (1.7)	
Hispanic	13974 (6.6)	41165 (4.6)	
Other	2793 (1.3)	16650 (1.9)	
Medicaid eligible, No. (%)	76976 (36.4)	150605 (17.0)	
Chronic conditions, No. (%)			
Acute myocardial infarction	6185 (2.9)	17147 (1.9)	<.001
Alcohol use disorders	9182 (4.3)	24973 (2.8)	<.001
Anemia	119838 (56.6)	336700 (38.0)	<.001
Anxiety disorders	72012 (34.0)	156022 (17.6)	<.001
Asthma	22259 (10.5)	81226 (9.2)	<.001
Atrial fibrillation	49629 (23.4)	163464 (18.4)	<.001
Attention-deficit hyperactivity disorder	3721 (1.8)	3146 (0.4)	<.001
Benign prostatic hyperplasia	30563 (14.4)	92880 (10.5)	<.001
Bipolar disorder	16437 (7.8)	17179 (1.9)	<.001
Blindness and visual impairment	7608 (3.6)	10410 (1.2)	<.001
Breast cancer	8861 (4.2)	37478 (4.2)	.38
Cataract	36732 (17.4)	180027 (20.3)	<.001
Chronic kidney disease	107662 (50.9)	310144 (35.0)	<.001
Chronic obstructive pulmonary disease	67456 (31.9)	212719 (24.0)	<.001
Colorectal cancer	5165 (2.4)	20823 (2.3)	.01
Deafness and hearing impairment	25030 (11.8)	60478 (6.8)	<.001
Diabetes	100519 (47.5)	354668 (40.0)	<.001
Endometrial cancer	1151 (0.5)	5118 (0.6)	.07
Epilepsy	18732 (8.8)	20701 (2.3)	<.001
Fibromyalgia, chronic pain, and fatigue	52961 (25.0)	181107 (20.4)	<.001
Glaucoma	22138 (10.5)	99417 (11.2)	<.001
Heart failure	99353 (46.9)	267053 (30.1)	<.001
Hip/pelvic fracture	7836 (3.7)	9394 (1.1)	<.001
HIV/AIDS	436 (0.2)	1522 (0.2)	.001
Hyperlipidemia	135880 (64.2)	538921 (60.8)	<.001
Hypertension	185360 (87.6)	677425 (76.4)	<.001
Hypothyroidism	59798 (28.2)	183322 (20.7)	<.001
Ischemic heart disease	127229 (60.1)	419168 (47.3)	<.001
Leukemias and lymphomas	4514 (2.1)	23326 (2.6)	<.001
Liver disease	14225 (6.7)	54765 (6.2)	<.001
Lung cancer	3196 (1.5)	18585 (2.1)	<.001
Migraine and chronic headache	5779 (2.7)	21451 (2.4)	<.001
Mobility impairments	24754 (11.7)	31834 (3.6)	<.001
Multiple sclerosis and transverse myelitis	1555 (0.7)	4338 (0.5)	<.001
Obesity	37581 (17.8)	175557 (19.8)	<.001
Opioid use disorder	6073 (2.9)	15829 (1.8)	<.001
Osteoporosis	30448 (14.4)	78468 (8.9)	<.001
Peripheral vascular disease	81109 (38.3)	192917 (21.8)	<.001
Post-traumatic stress disorder	2008 (0.9)	5329 (0.6)	<.001
Pressure and chronic ulcers	41501 (19.6)	77551 (8.7)	<.001
Prostate cancer	9444 (4.5)	41734 (4.7)	<.001
Rheumatoid arthritis/osteoarthritis	116689 (55.1)	414225 (46.7)	<.001
Schizophrenia and other psychotic disorders	36664 (17.3)	18614 (2.1)	<.001
Spinal cord injury	2968 (1.4)	5178 (0.6)	<.001
Stroke/transient ischemic attack	35007 (16.5)	54419 (6.1)	<.001
Tobacco use	22822 (10.8)	92646 (10.5)	<.001
Traumatic brain injury	4387 (2.1)	3136 (0.4)	<.001
Viral hepatitis	3547 (1.7)	12389 (1.4)	<.001
Frailty category, No. (%)			<.001
Not frail	6768 (3.2)	90172 (10.2)	
Prefrail	56310 (26.6)	444730 (50.2)	
Mildly frail	96062 (45.4)	265501 (30.0)	
Moderately/severely frail	52558 (24.8)	86008 (9.7)	
Hospitalization factors			
Admission source, No. (%)			<.001
Community	181079 (85.5)	801601 (90.4)	
Hospital transfer	11717 (5.5)	62287 (7.0)	
Nursing facility	18327 (8.7)	20726 (2.3)	
Unknown	575 (0.3)	1797 (0.2)	
Length of stay, median (IQR), days	4 (3–6)	3 (2–6)	<.001
Specialty cohort, No. (%)			<.001
Medicine	79412 (37.5)	335452 (37.8)	

Table 1. (continued)			
	Patients with dementia (*N*=211,698)	Patients without dementia (*N*=886,411)	*P*
Cardiorespiratory	37109 (17.5)	141732 (16.0)	
Cardiovascular	17788 (8.4)	120681 (13.6)	
Neurology	18554 (8.8)	64904 (7.3)	
Surgery/gynecology	58835 (27.8)	223642 (25.2)	
Intensive care unit, No. (%)	58741 (27.8)	247813 (28.0)	.05
Delirium, No. (%)	37453 (17.7)	56100 (6.3)	<.001
Discharge factors			
Weekend discharge, No. (%)	35374 (16.7)	178666 (20.2)	<.001
Discharge to skilled nursing facility, No. (%)	89173 (42.1)	191156 (21.6)	<.001

Note: P-values presented for comparison of characteristics of hospitalizations of patients with and without dementia using χ^2 tests for categorical variables and t tests for continuous variables

Following discharge, 167,710 (79.2%) patients with dementia were neither readmitted nor died within 30 days, 37,422 (17.7%) of patients with dementia were readmitted, and 6,566 (3.1%) patients died without being readmitted. Figure 2 depicts the disposition of patients with dementia who were readmitted. Among readmitted patients with dementia, 14.5% died during the readmission and 5.9% were discharged to hospice. Death during readmission was more common among patients initially discharged to the community (20.7%) compared to those initially discharged to nursing facilities (4.4%). Among patients initially discharged to the community, 30.2% were subsequently discharged to a nursing facility following readmission.

Sensitivity Analyses

Analyses examining return-to-hospital for readmission or emergency department visits within 30 days demonstrated similar results to 30-day readmissions, with 26.9% of patients with dementia having a return-to-hospital event compared to 21.2% of patients without dementia (OR 1.05; CI 1.03 to 1.06) (eTable 1).

Analyses restricted to patients hospitalized from the community demonstrated similar results to primary analyses, with an increased risk of mortality, readmission, and return-to-hospital observed among patients with dementia compared to patients without dementia (eTable 2).

DISCUSSION

In this national cohort study of Medicare beneficiaries, diagnosed dementia was associated with a substantially increased risk of post-discharge non-hospice mortality and a modestly increased risk of readmission. Patients with dementia who were discharged to the community had elevated risk of adverse outcomes compared to those discharged to nursing facilities, including a 21% inpatient mortality rate during subsequent readmissions. These findings indicate an urgent need to strengthen and tailor discharge planning, including community and caregiver support services and advanced care planning, for this vulnerable patient population.

Our study builds on prior single-center and disease-specific readmission studies in the USA and internationally which have had conflicting findings on the association between dementia and readmissions.[8–10] A key limitation of prior research has been lack of adjustment for geriatric syndromes, such as frailty and delirium, which frequently co-exist with dementia and have been independently associated with adverse post-hospital outcomes.[28,29] By applying recently developed claims-based measures of frailty,[26] comorbidity,[25] and delirium[27] to a national sample of Medicare beneficiaries, the current study is able to extend this prior work. Our findings are consistent with a recent national study from Japan which found an elevated risk of readmissions among patients with dementia after controlling for clinical variables, but was only

Table 2 Association between Diagnosed Dementia and 30-Day Post-discharge Mortality

	Patients with dementia	Patients without dementia	aOR (95% CI)
	No. died (%)	No. died (%)	
Overall cohort	12015 (5.7)	27175 (3.1)	1.21 (1.17–1.24)
Specialty cohorts			
Cardiorespiratory	2539 (6.8)	6729 (4.7)	1.07 (1.01–1.13)
Cardiovascular	802 (4.5)	2606 (2.2)	1.20 (1.10–1.33)
Medicine	3563 (4.5)	6560 (2.0)	1.32 (1.25–1.39)
Neurology	938 (5.1)	1781 (2.7)	1.33 (1.20–1.47)
Surgery/gynecology	4173 (7.1)	9499 (4.2)	1.20 (1.14–1.26)
Discharge disposition			
Community	5069 (4.1)	14485 (2.1)	1.32 (1.26–1.37)
Facility	6946 (7.8)	12690 (6.6)	1.10 (1.06–1.14)

Notes: Facility discharge includes discharge to skilled nursing facilities, long-term care facilities, and inpatient rehab facilities. Cohorts exclude patients discharged to hospice

Table 3 Association between Diagnosed Dementia and 30-Day Hospital Readmissions

	Patients with dementia	Patients without dementia	aOR (95% CI)
	No. readmitted (%)	No. readmitted (%)	
Overall cohort	37422 (17.7)	116078 (13.1)	1.02 (1.002–1.04)
Specialty cohorts			
Cardiorespiratory	7984 (21.5)	27439 (19.4)	0.98 (0.95–1.01)
Cardiovascular	3309 (18.6)	15269 (12.7)	1.07 (1.01–1.12)
Medicine	11436 (14.4)	29082 (8.7)	1.04 (1.01–1.07)
Neurology	2940 (15.8)	7780 (12.0)	1.05 (0.996–1.11)
Surgery/gynecology	11753 (20.0)	36508 (16.3)	1.01 (0.98–1.04)
Discharge disposition			
Community	23174 (18.9)	87841 (12.6)	1.07 (1.05–1.09)
Facility	14248 (16.0)	28237 (14.8)	0.93 (0.90–0.95)

Note: Readmissions exclude planned readmissions and include hospital observation stays. Facility discharge includes discharge to skilled nursing facilities, long-term care facilities, and inpatient rehab facilities

able to assess readmissions of patients to the same hospital as the index hospitalization.[15]

The observed differences in post-discharge outcomes among patients discharged to the community and those discharged to nursing and rehab facilities have implications for clinicians and policy makers seeking to improve discharge planning. While patients without dementia who were discharged to nursing facilities were more likely to be readmitted than those discharged to the community, likely reflecting higher severity of illness, the converse was true for patients with dementia. This differential finding of patients with dementia who are discharged home being more likely to be readmitted indicates that current processes of care to assess discharge readiness and home support may be poorly suited for assessing home safety for patients with dementia. When coupled with the finding of 21% mortality among readmitted patients with dementia, our results may also suggest a need for earlier advance care planning so that community-based patients nearing the end of life are able to spend their last days at home rather than the hospital, if desired.

Few studies have examined outcomes of patients with dementia discharged to the community. One recent study, not
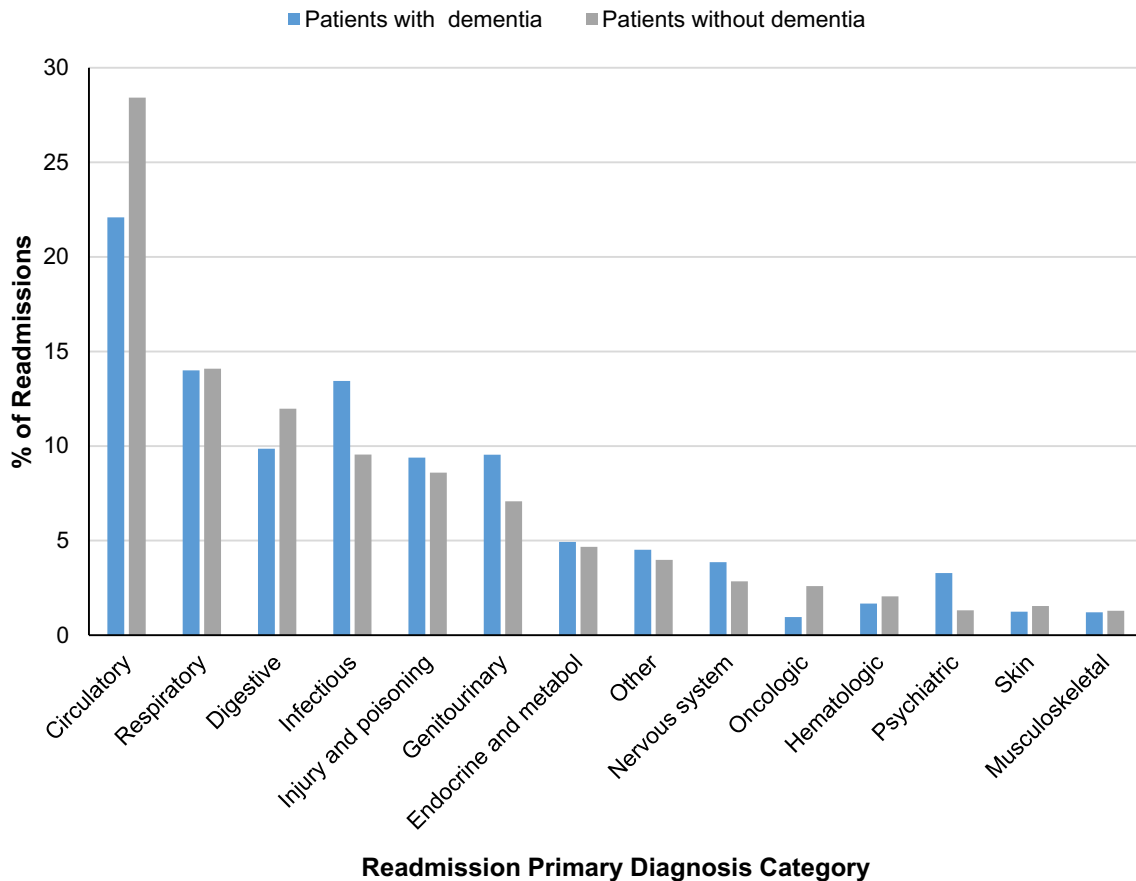

Figure 1 Primary diagnoses of hospital readmissions among Medicare beneficiaries with and without diagnosed dementia.
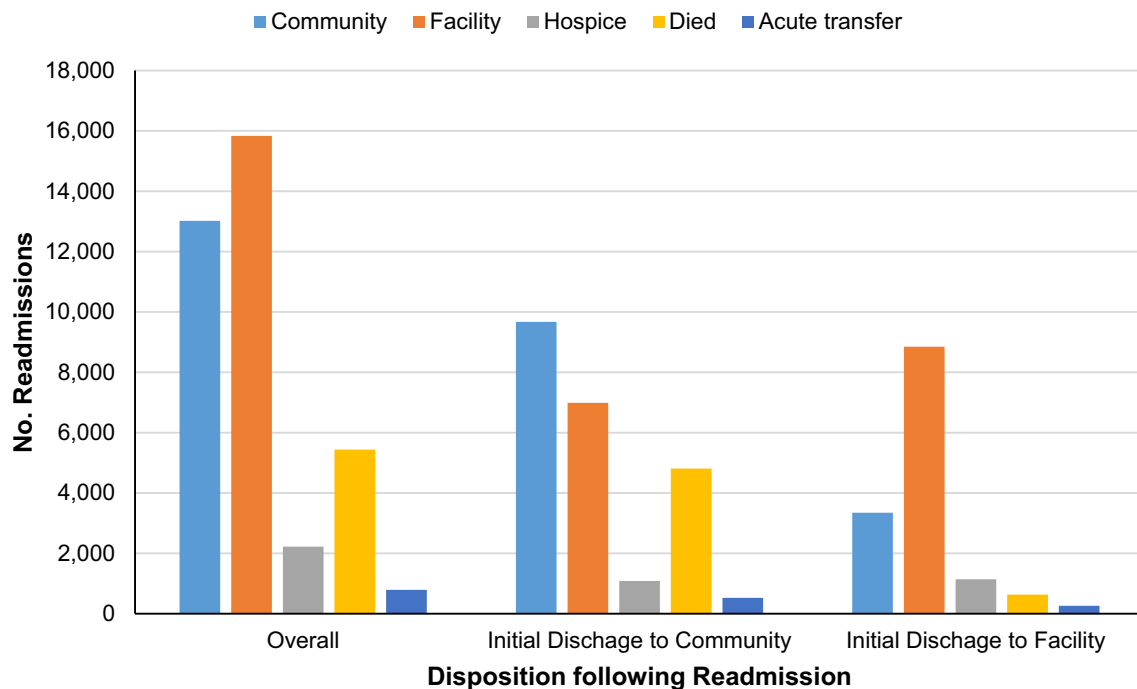
Figure 2 Disposition of patients with dementia following unplanned readmissions. Note: Readmissions exclude planned readmissions and include hospital observation stays. 116 readmissions resulted in patients leaving against medical advice not depicted on graph due to low sample size (98 following initial community discharge; 18 following initial facility discharge). Chi-2 test of difference in proportions of patients initially discharged to the community compared to those initially discharged to a facility $P<0.001$.

focused on patients with dementia, found that Medicare beneficiaries discharged to home with home health care had higher rates of readmission compared to those discharged to skilled nursing facilities.[30] A second study focused on the subgroup of Medicare beneficiaries discharged to skilled nursing facilities found that differences in risk of readmissions among patients with and without dementia were small and varied with the severity of cognitive impairment at the time of skilled nursing facility admission, information not available in the current study.[31] A third study, examining Medicare beneficiaries hospitalized in Rhode Island in 2009, observed dementia was associated with a greater risk of readmissions, particularly for those discharged to nursing facilities, but this study did not control for frailty or delirium.[32] Together with the current study findings, these data highlight important opportunities to improve care for patients with dementia by focusing efforts to safely triage and support patients who are discharged home.

Self-care after hospitalization requires knowledge, planning, and ability to carry out post-discharge care plans and to identify and address early complications.[33] Even among older adults without dementia, understanding of discharge care plans is frequently poor,[34,35] and cognitive impairment can pose barriers to completing discharge plans, particularly if caregivers are not involved at the time of discharge.[36,37] While not all readmissions are preventable,[38] prior research indicates patients with dementia are at high risk of potentially preventable hospitalizations[6] and the high inpatient mortality rate among patients with

dementia readmitted from home observed in this study highlights the possibility of delays in seeking necessary care. Contributing factors may include insufficient home support, barriers to accessing timely outpatient care,[39] and social determinants of health, including neighborhood socioeconomic disadvantage.[40,41]

Our study indicates that targeted efforts are urgently needed to improve post-discharge outcomes for patients with dementia discharged to the community. We find that patients with dementia were more often readmitted for infectious, genitourinary, and injury-related diagnoses, all of which are often preventable. This builds on prior research demonstrating an increase in potentially preventable hospitalizations of individuals with dementia, particularly those hospitalized from the community, over time.[6] Policy efforts to reduce avoidable hospital transfers among nursing home residents with advanced illness, including dementia, have demonstrated early success,[42] as have dementia care management programs.[43] Successful efforts to reduce post-discharge readmissions and mortality will need to adapt current inpatient and post-discharge ambulatory care delivery to the unique needs of patients with dementia and their caregivers as outlined by the National Academies of Sciences, Engineering, and Medicine.[44] Strategies may include developing transitional care management programs[45] and quality improvement interventions[46] tailored to patients with dementia and to improving payment policies to support comprehensive dementia care,[47] family caregiver training,[48] and coverage of home equipment.[49]

Limitations

Our study had several limitations. First, as a study of claims data, we were able to compare only patients with previously diagnosed dementia to those without; thus, individuals with previously undiagnosed dementia or those diagnosed with dementia during hospitalization may have been miscategorized, which would likely have biased our findings towards the null. Second, we were unable to examine patients enrolled in Medicare Advantage or those hospitalized in the Veterans Affairs health system, who may have different patterns of care following hospitalization.[50,51] Third, our findings do not generalize to patients hospitalized for medical treatment of cancer or psychiatric diagnoses. Fourth, while we were able to include measures of multi-morbidity, frailty, and hospitalization characteristics, we were unable to examine functional status at discharge, which is associated with adverse post-hospital outcomes.[52,53] For this reason, we sought to examine outcomes stratified by discharge disposition as functional impairment is associated with discharge to nursing facilities. Fifth, we were unable to assess caregiver presence or use of home services following discharge, which may impact post-discharge outcomes for patients with dementia.

Conclusions

Among hospitalized Medicare beneficiaries, diagnosed dementia was associated with a substantially increased risk of post-discharge mortality and a modestly increased risk of readmission. Rates of adverse outcomes were uniformly worse among patients discharged to the community compared to those discharged to nursing facilities, indicating important opportunities to improve transitions of care for patients with dementia through improvements in discharge planning, including community and caregiver support services.

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Declarations:

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