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Original Research

Medicare costs and home time loss among fee-for-service beneficiaries by frailty and dementia status

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ABSTRACT

Background: Frailty and dementia are associated with adverse health outcomes. Understanding their associated healthcare costs and quality of life can inform care of older adults.
Objective: To assess Medicare costs and home time loss among Medicare fee-for-service beneficiaries across different combinations of frailty and dementia status
Research Design: Retrospective cohort study
Subjects: 5% random sample of Medicare fee-for-service beneficiaries aged 65 and older in 2019
Measures: Frailty and dementia were measured using validated claims-based algorithms. Annualized Medicare costs and home time loss (days) were measured in Medicare claims over one year.
Results: Among 1,148,964 Medicare beneficiaries (mean age 75.2 years, 57.7% female), 10.0% had frailty and 4.0% had dementia. Medicare costs increased with frailty severity. Dementia's association with costs varied by frailty level: higher costs among those without frailty (dementia vs. no dementia: $14,058.1 vs. $12,342.2 and lower costs among those with mild ($24,080.4 vs. $35,166.4) and moderate-severe frailty ($38,446.5 vs. $54,344.3). Both frailty and dementia were associated with greater home time loss, except among those with moderate-to-severe frailty in which home time loss was nearly identical with or without dementia (57.1 vs. 57.2 days).
Conclusions: Medicare costs and home time loss increased with the severity of frailty while dementia's association with cost and home time loss varied by frailty level. Among those with moderate-severe frailty, individuals without dementia incurred higher costs despite similar home time. These findings underscore the importance of improved frailty recognition and care strategies addressing both conditions.

1. Introduction

Frailty and dementia are two prevalent geriatric conditions that are associated with adverse health outcomes, lower quality of life, and greater healthcare utilization and costs [1,2]. Frailty, a clinical state of vulnerability and reduced physiologic reserve, affects about 10% of older adults aged 65 or older in the United States (US) and is associated with increased mortality [3–7], healthcare utilization, and costs [8–12]. Similarly, dementia affects approximately 10% of the US population aged 65 years or older and is likewise associated with increased mortality [14,15] as well as healthcare utilization and costs [13,16–23]. Frailty and dementia often coexist in older adults [24–29], potentially compounding vulnerability to adverse health outcomes and further increasing healthcare utilization and costs beyond the impact of either condition alone. Moreover, quality of life is a critical outcome for older adults, particularly those with frailty and dementia, for whom more healthcare utilization and expenditure may not translate into meaningful improvements in quality of life. Nonetheless, the costs and quality

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of life associated with this combined burden of frailty and dementia remain uncertain in the US Medicare population.

To address this gap, this study examined Medicare fee-for-service expenditures and home time loss, a claims-based measure of quality of life [30], across frailty-dementia categories among Medicare beneficiaries. Determining how combinations of frailty and dementia relate to health care utilization and patient-centered outcomes may lead to a better understanding of how to improve care for the growing number of older adults affected by these conditions.

2. Methods

2.1. Study data and sample

This retrospective study used 2018–2019 Medicare data from a 5% random sample of Medicare fee-for-service beneficiaries. The cohort included individuals aged 65 years and older on January 1, 2019 (index date), who had continuous Medicare Part A and Part B enrollment and had at least one outpatient carrier claim in the previous year (2018) **(Supplementary Figure S1)**. Having an outpatient carrier claim the previous year excludes beneficiaries who systematically have lower costs due to lack of healthcare access or other barriers to care. Beneficiaries were also excluded if they were in long-term care (resided in a nursing home [NH] for more than 100 days) or had hospice claims in the 365 days prior to index date because these individuals have distinct utilization patterns. In addition, beneficiaries with missing Federal Information Processing Standards (FIPS) code (necessary for determining county-level wage index) and those with missing data on baseline covariates were excluded. The final analytic cohort included 1,148,964 beneficiaries. The study was approved by Advarra Institutional Review Board and the waiver of informed consent was obtained.

2.2. Measurements of frailty and dementia

Frailty was measured using the Kim claims-based frailty index (CFI), which estimates deficit-accumulation frailty using claims data 12 months prior to the index date. The CFI ranges from 0–1 (higher score indicates greater severity) with a cut point of 0.25 that has 60% sensitivity and 86% specificity against the comprehensive geriatric assessment frailty index and a 62% sensitivity and 78% specificity against the Fried Frailty Phenotype [31]. CFI has also been shown to predict prevalent disability, and future risks of mortality, long-term NH admission, and health care utilization [32,33]. Based on CFI scores, beneficiaries were classified as having no frailty (CFI <0.25), mild frailty (CFI ≥ 0.25 to <0.35), or moderate-severe frailty (CFI ≥ 0.35).

To identify dementia, we used claims twelve months prior to the index date and applied the Bynum-Standard 1-year algorithm, which has high specificity (98.0%) and positive predictive value (70.3%) [34]. We also conducted a sensitivity analysis using the Centers for Medicare and Medicaid Services Chronic Conditions Data Warehouse (CCW) algorithm as an alternative method to identify dementia. The CCW algorithm requires only one claim, which addresses potential underdiagnosis but has lower specificity [34].

Beneficiaries were then categorized into six frailty-dementia groups: no frailty without dementia, no frailty with dementia, mild frailty without dementia, mild frailty with dementia, moderate-severe frailty without dementia, and moderate-severe frailty with dementia.

2.3. Baseline characteristics

Baseline characteristics at index date included age, sex, race/ethnicity, dual eligibility status, Gagne combined comorbidity score [35], comorbidities from the CCW [36], geographic region, and social deprivation index (SDI) [37]. SDI, an area-level measure of social deprivation (range: 0–100; higher values indicate greater deprivation), was obtained from the 2019 SDI data at the Zip Code Tabulation Area level.

2.4. Outcomes

One-year Medicare costs and healthcare utilization were measured from January 1 (index date) to December 31, 2019, or until disenrollment from Medicare Part A or B, or death. Total Medicare costs per beneficiary were calculated by summing payment by Medicare, payment by beneficiary, and payment by primary payer from inpatient care, skilled nursing facilities (SNFs), home health, hospice, outpatient facilities, non-institutional providers (carrier), and durable medical equipment (DME). Standardized approaches described in Centers for Medicare and Medicaid Services Technical Guidance for Medicare administrative data were followed [38]. To adjust for geographic wage differences, costs were standardized using wage index values determined through beneficiaries' FIPS code [39]. In addition, costs were annualized for beneficiaries censored due to fee-for-service disenrollment by dividing the observed costs by the number of days enrolled and multiplying by 365 days.

Total home time loss over one year was calculated by summing the number of days spent in the acute hospital setting (including emergency department or observation stays), SNF, and long-term care NH, and the number of days lost due to death. Reduction in home time is associated with declines in functional status and quality of life, making it a useful surrogate for patient-centered outcomes in administrative claims data [30].

We further explored secondary outcomes including 1-year survival, preventable inpatient costs, incidence of ICU admission, and incidence of hospice use. Preventable costs were estimated based on inpatient hospitalizations identified as preventable using the Agency for Healthcare Research and Quality Prevention Quality Indicators [40].

2.5. Statistical analysis

Baseline characteristics were compared across the six frailty-dementia categories using one-way analysis of variance for continuous variables and Pearson's chi-square test for categorical variables. To examine Medicare costs and home time loss across the six frailty-dementia categories, a two-step hurdle model and zero-inflated negative binomial regression (ZINB) were used, respectively. The two-step hurdle model was used as it accounts for 1) the presence or absence of any health care use and 2) spending among healthcare users [41]. Home time loss was analyzed using ZINB regression to accommodate overdispersion and excess zeros [42]. An offset variable for days observed was included to adjust for varying observation periods. Cox proportional hazards regression was used to estimate 1-year survival across the six frailty-dementia categories.

All models included the six frailty-dementia categories as a single categorical variable (reference: no frailty without dementia) and were adjusted for age, sex, dual-eligibility status, geographic region, and SDI. To facilitate comparisons across groups, we standardized predicted costs, home time loss, and survival curves to a common demographic profile (using the mean or the largest category): age of 75 years, 42% female, SDI of 43, South geographic region, and non-dual eligible status. Analyses were performed using SAS 9.4 (Cary, NC) and Stata version 17.0 (StataCorp LLC, College Station, TX, USA) and a two-sided p-value <0.05 was considered statistically significant.

3. Results

3.1. Characteristics of study population

The total population had a mean (standard deviation [SD]) age of 75.2 (7.3) years, 57.7% female, 83.4% non-Hispanic White, 6.4% non-Hispanic Black, 4.4% Hispanic, and 9.6% dually eligible. The prevalence of frailty and dementia was 10.0% and 4.0%, respectively. Most

beneficiaries had neither condition (88.7%), 1.3% had dementia only, 6.4% had mild frailty only, 1.9% had mild frailty with dementia, 0.93% had moderate-severe frailty only, and 0.86% had moderate-severe frailty with dementia (Table 1). Compared to beneficiaries without frailty or dementia, those with more severe frailty were older (e.g., mean [SD] comparing those with neither frailty nor dementia vs. moderate-severe frailty only: 74.6 [7.0] vs. 78.3 [8.2] years); included more females (56.9% vs. 66.3%), individuals of Hispanic ethnicity (4.2% vs. 5.8%) and Black (6.2% vs. 9.3%), and dually eligible beneficiaries (8.2% vs. 29.3%). Those with more severe frailty also had higher mean SDI (42.6 [26.7] vs. 49.6 [27.3]) and combined comorbidity score (1.3 [2.2] vs. 8.5 [3.4]). Similar trends were observed for individuals with dementia across levels of frailty.

3.2. Total medicare costs and costs by expenditure category

The mean annualized total Medicare cost per beneficiary in 2019 was $14,664 (95% CI: 14,578.1, 14,749.9), ranging from $12,342.2 (12,266.9, 12,417.5) for those without frailty or dementia to $54,344.3 (53,126.6, 55,562.0) for those with moderate-severe frailty only (Fig. 1A, Supplementary Table S1). More severe frailty was consistently associated with higher annualized total Medicare costs, regardless of dementia status. On the other hand, the association between dementia and total Medicare costs varied by frailty status. Dementia was associated with higher total Medicare costs among individuals without frailty (no dementia vs. dementia: $12,342.2 [12,266.9, 12,417.5] vs. $14,058.1 [13,677.3, 14,438.8]), whereas it was associated with lower costs among those with mild ($35,166.4 [34,779.7, 35,553.1] vs. $24,080.4 [23,629.2, 24,531.7]) and moderate-severe frailty ($54,344.3 [53,126.6, 55,562.0] vs. $38,446.5 [37,568.2, 39,324.8]).

Table 1
Characteristics of Medicare fee-for-service beneficiaries by frailty and dementia status.

Characteristics		No frailty		Mild frailty		Moderate-severe frailty	
	Total Population *n* = 1,148,964 (100%)	Without dementia *n* = 1,018,944 (88.7%)	With dementia *n* = 14,676 (1.3%)	Without dementia *n* = 73,419 (6.4%)	With dementia *n* = 21,327 (1.9%)	Without dementia *n* = 10,740 (0.93%)	With dementia *n* = 9858 (0.86%)
Age, mean (SD)	75.2 (7.3)	74.6 (7.0)	81.8 (7.7)	78.2 (8.1)	82.9 (7.7)	78.3 (8.2)	82.9 (7.9)
Female, n (%)	662,971 (57.7)	579,766 (56.9)	8878 (60.5)	46,965 (64.0)	13,589 (63.7)	7115 (66.3)	6658 (67.5)
Race/ethnicity, n (%)							
Asian / Pacific Islander	30,831 (2.7)	27,956 (2.7)	532 (3.6)	1382 (1.9)	573 (2.7)	185 (1.7)	203 (2.1)
Hispanic	50,038 (4.4)	43,150 (4.2)	755 (5.1)	3824 (5.2)	1078 (5.1)	626 (5.8)	605 (6.1)
Non-Hispanic Black	73,656 (6.4)	63,241 (6.2)	1180 (8.0)	5528 (7.5)	1776 (8.3)	1002 (9.3)	929 (9.4)
Non-Hispanic White	958,262 (83.4)	850,838 (83.5)	11,939 (81.4)	61,218 (83.4)	17,563 (82.4)	8733 (81.3)	7971 (80.9)
Other / unknown	36,177 (3.2)	33,759 (3.3)	270 (1.8)	1467 (2.0)	337 (1.6)	194 (1.8)	150 (1.5)
Geographic region, n (%)							
Midwest	255,819 (22.3)	227,217 (22.3)	2954 (20.1)	16,734 (22.8)	4487 (21.0)	2392 (22.3)	2035 (20.6)
Northeast	206,743 (18.0)	183,484 (18.0)	2667 (18.2)	12,744 (17.4)	4049 (19.0)	1910 (17.8)	1889 (19.2)
South	460,261 (40.1)	404,542 (39.7)	6213 (42.3)	31,070 (42.3)	9027 (42.3)	4903 (45.7)	4506 (45.7)
West	226,141 (19.7)	203,701 (20.0)	2842 (19.4)	12,871 (17.5)	3764 (17.7)	1535 (14.3)	1428 (14.5)
SDI, mean (SD)	43.1 (26.8)	42.6 (26.7)	43.8 (27.5)	47.3 (27.0)	45.3 (27.6)	49.6 (27.3)	47.3 (27.9)
Dual eligibility, n (%)	110,097 (9.6)	83,585 (8.2)	2019 (13.8)	14,583 (19.9)	4146 (19.4)	3150 (29.3)	2614 (26.5)
CCS, mean (SD)	1.9 (2.8)	1.3 (2.2)	3.5 (2.1)	5.9 (3.1)	6.0 (2.8)	8.5 (3.4)	9.1 (3.2)
Comorbidities, n (%)							
Anemia	558,555 (48.6)	451,046 (44.3)	9543 (65.0)	61,479 (83.7)	17,372 (81.5)	9953 (92.7)	9162 (92.9)
Atrial fibrillation	167,912 (14.6)	126,268 (12.4)	2068 (14.1)	25,200 (34.3)	5928 (27.8)	4549 (42.4)	3899 (39.6)
Cancer	185,143 (16.1)	156,812 (15.4)	2682 (18.3)	16,415 (22.4)	4487 (21.0)	2451 (22.8)	2296 (23.3)
Chronic kidney disease	370,461 (32.2)	284,726 (27.9)	5047 (34.4)	51,653 (70.4)	12,311 (57.7)	9024 (84.0)	7700 (78.1)
COPD	259,920 (22.6)	194,221 (19.1)	3288 (22.4)	41,006 (55.9)	8266 (38.8)	7314 (68.1)	5825 (59.1)
Chronic pain	387,353 (33.7)	314,134 (30.8)	4506 (30.7)	45,498 (62.0)	9798 (45.9)	7599 (70.8)	5818 (59.0)
Depression	348,555 (30.3)	263,821 (25.9)	6827 (46.5)	47,319 (64.5)	14,206 (66.6)	8403 (78.2)	7979 (80.9)
Diabetes	403,317 (35.1)	325,423 (31.9)	4877 (33.2)	47,932 (65.3)	10,609 (49.7)	8011 (74.6)	6465 (65.6)
Heart failure	246,093 (21.4)	173,632 (17.0)	3447 (23.5)	44,006 (59.9)	9874 (46.3)	8278 (77.1)	6856 (69.6)
Hearing impairment	169,424 (14.8)	136,171 (13.4)	3375 (23.0)	17,602 (24.0)	6234 (29.2)	2789 (26.0)	3253 (33.0)
Hip/pelvic fracture	33,385 (2.9)	20,250 (2.0)	904 (6.2)	6185 (8.4)	2525 (11.8)	1522 (14.2)	1999 (20.3)
Hypertension	906,658 (78.9)	781,430 (76.7)	12,355 (84.2)	72,011 (98.1)	20,467 (96.0)	10,659 (99.3)	9736 (98.8)
Ischemic heart disease	492,882 (42.9)	393,051 (38.6)	7012 (47.8)	59,680 (81.3)	15,149 (71.0)	9511 (88.6)	8479 (86.0)
Osteoporosis	236,180 (20.6)	189,867 (18.6)	4629 (31.5)	24,823 (33.8)	8145 (38.2)	4196 (39.1)	4520 (45.9)
RA or OA	669,361 (58.3)	561,592 (55.1)	9597 (65.4)	62,591 (85.3)	17,178 (80.6)	9604 (89.4)	8799 (89.3)
Stroke or TIA	143,182 (12.5)	99,436 (9.8)	3294 (22.4)	23,037 (31.4)	7879 (36.9)	4546 (42.3)	4990 (50.6)
Visual impairment	10,964 (1.0)	6721 (0.7)	295 (2.0)	2109 (2.9)	714 (3.4)	538 (5.0)	587 (6.0)

CCS, Combined comorbidity score; COPD, chronic obstructive pulmonary disease; OA, osteoarthritis; RA, rheumatoid arthritis; SD, standard deviation; SDI, social deprivation index; TIA, transient ischemic attack.
Chi-square was used for categorical variables and one-way ANOVA was used for continuous variables. All p-values were <0.001.

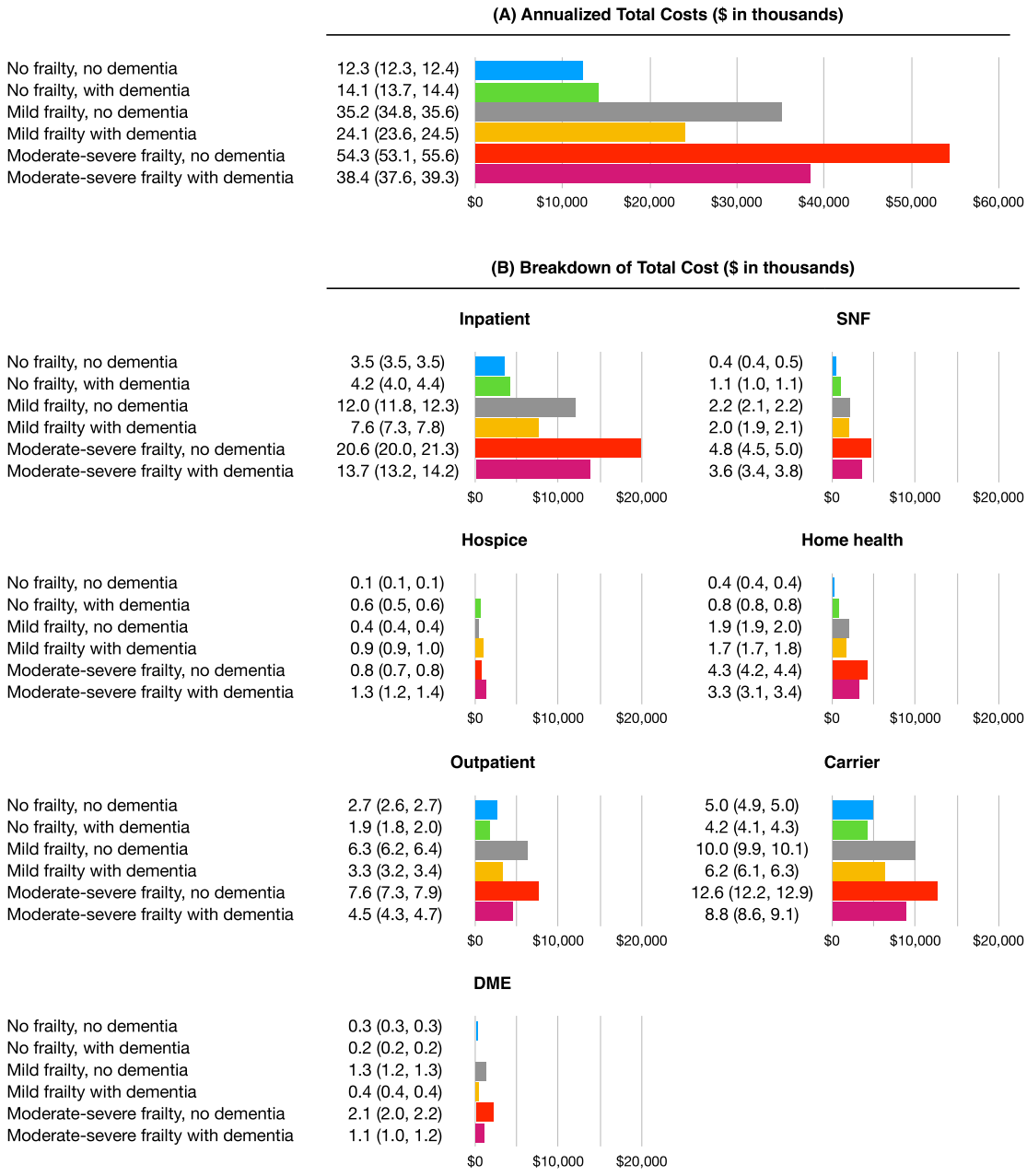


Fig. 1. (A) Adjusted total annualized Medicare costs and (B) breakdown of annualized Medicare costs per frailty-dementia category. Models were adjusted for age, sex, year, SDI, and geographic region.

More severe frailty was associated with greater costs in all expenditure categories (Fig. 1B, Supplementary Table S1). Presence of dementia was associated with greater spending on inpatient, SNF, and home health among those without frailty, while less spending was observed in these categories among those with frailty. In contrast, dementia was associated with greater hospice costs and lower outpatient, carrier, and DME costs, regardless of frailty. Sensitivity analysis using the alternative definition of dementia revealed the same pattern for total Medicare costs and each expenditure category (**Supplementary Table S2**).

Mean preventable inpatient costs were $413.9 [404.6, 423.1], with the highest preventable inpatient costs seen in those with moderate-severe frailty only ($3249.1 [3063.3, 3434.9]) **(Supplementary Table S1 & Supplementary Table S2).** The most common diagnosis for preventable inpatient admission among those without dementia at all frailty severity levels was heart failure, whereas it was urinary tract infection among those with dementia **(Supplementary Table S3).**

3.3. *Home time loss and health care utilization*

Adjusted mean total home time loss per beneficiary over 1 year was 8.7 (95% CI: 8.54, 8.81) days, ranging from 5.6 (5.5, 5.7) days for those without frailty or dementia to 57.2 (55.1, 59.2) days for those with moderate-severe frailty only (Fig. 2A, Supplementary Table S4). More severe frailty was associated with greater home time loss. Dementia was also associated with greater home time loss among those without frailty (no dementia vs. dementia: 5.6 [5.5, 5.7] vs. 18.4 [17.5, 19.3] days) and those with mild frailty (28.3 [27.6, 28.9] vs. 33.7 [32.7, 34.8] days). However, among those with moderate-severe frailty, home time loss was similar for those with and without dementia (57.1 [55.1, 59.0] vs. 57.2 [55.1, 59.2] days).

More severe frailty was associated with greater home time loss due to

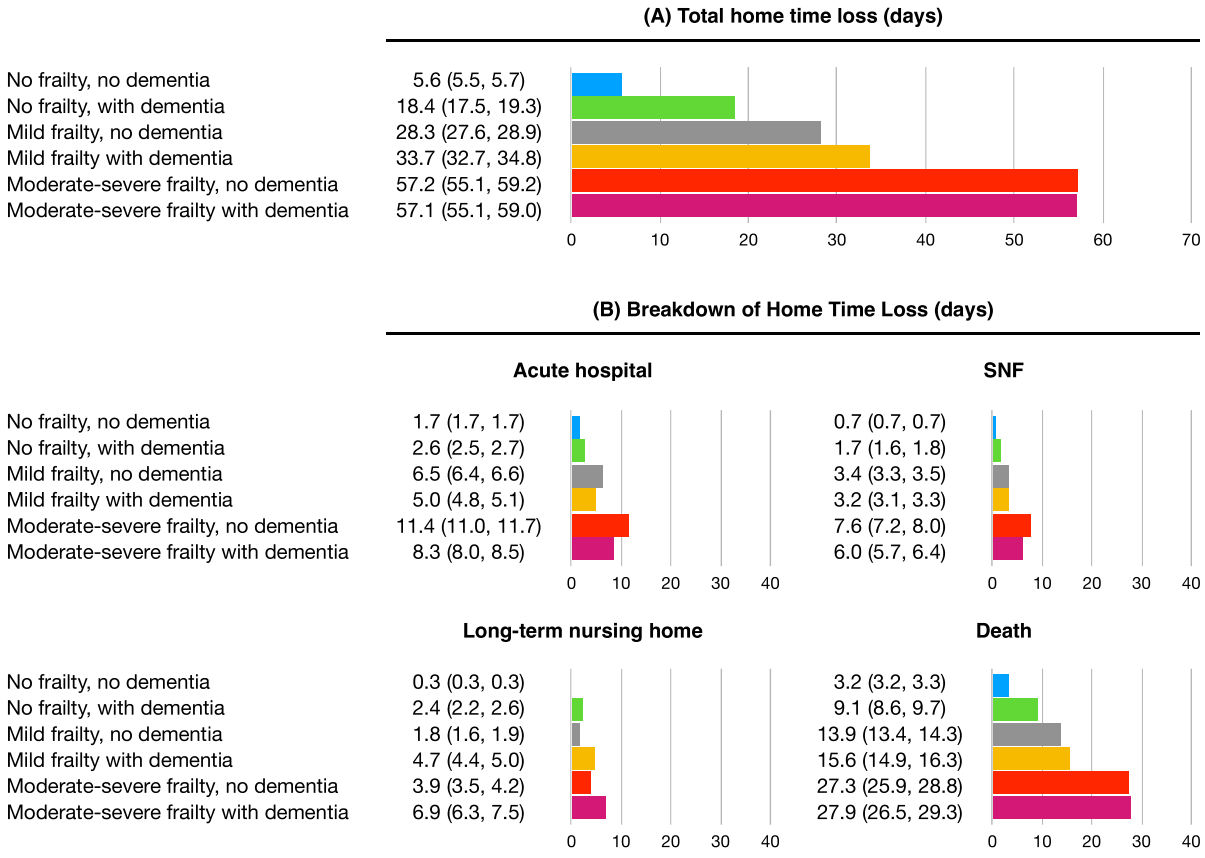


Fig. 2. (A) Total home time loss in days and (B) breakdown of home time loss in days due to acute hospitalization, skilled nursing facility stay, long-term nursing home admission, and death by frailty and dementia status. Home time loss was adjusted for age, sex, year, SDI, and geographic region.

acute hospitalization, SNF admission, long-term care NH, or death (Fig. 2B, Supplementary Table S4). Dementia was associated with greater home time loss attributable to acute hospitalization and SNF admission among those without frailty, whereas it was associated with less home time loss from these causes among those with frailty. Moreover, dementia was associated with greater home time loss from long-term care NH stays, regardless of frailty severity. This was also the case for home time loss from death except for those with moderate-severe frailty. Among beneficiaries with moderate-severe frailty, home time loss from death was similar for those with and without dementia (27.9 [26.5, 29.3] vs. 27.3 [25.9, 28.8] days). Adjusted 1-year survival curves also showed no significant difference in survival probability between moderate-severe frailty with and without dementia **(Supplementary Figure S2)**. Sensitivity analysis for home time loss showed a consistent pattern with one exception: home time loss due to death was greater for moderate-severe frailty without dementia compared to moderate-severe frailty with dementia (**Supplementary Table S2**).

During follow-up, 59,478 (5.2%) beneficiaries had at least one ICU stay and 28,054 (2.4%) received hospice care, with the utilization of both ICU and hospice care increasing with frailty severity **(Supplementary Table S5)**. For beneficiaries without frailty, dementia was associated with an increase in ICU stays (no dementia vs. dementia: 41,072 [4.0%] vs. 882 [6.0%]). In contrast, dementia was associated with decrease in ICU stays among those with mild (10,853 [14.8%] vs. 2306 [10.8%]) and moderate-severe frailty (2573 [24.0%] vs. 1792 [18.2%]). Across all frailty severity levels, dementia was associated with greater hospice use.

4. Discussion

Although frailty and dementia often co-exist in older adults, previous research has not examined patterns of healthcare utilization and patient-centered outcomes across different combinations of these conditions. Examining Medicare fee-for-service expenditures and home time loss across six frailty-dementia categories among older adults, we found that Medicare costs increased with the severity of frailty while dementia was associated with higher Medicare costs among those without frailty but lower costs among those with frailty. Both frailty and dementia were linked to greater home time loss, except among those with moderate-severe frailty, for whom home time loss was similarly high regardless of dementia status.

While increases in total Medicare costs have been reported separately for frailty [3,8–11,43] and dementia [19], few studies have investigated their joint associations. Our study of the US Medicare fee-for-service population reveals that dementia's relationship with costs varies by frailty level. Dementia was associated with increased Medicare costs among those without frailty but lower costs in most Medicare expenditure categories among those with frailty, except for hospice care, in which costs remained higher among individuals with dementia. A Canadian study of long-stay home care clients reported that dementia was associated with higher cost among robust patients, which was similar to our findings [44]. Another Canadian study found that dementia was associated with fewer acute hospitalizations among individuals with frailty [45], which is consistent with our findings of lower inpatient costs and less home time loss due to acute hospitalization among frail individuals with dementia. A possible explanation for these findings is that the growing awareness of dementia in clinical practice has resulted in careful consideration of potential harms and uncertain benefits of intensive interventions, leading to less burdensome and resource-intensive acute care for individuals with both frailty and dementia [46,47]. In contrast, frailty without cognitive impairment appears less consistently recognized and proactively managed in current

practice, despite its vulnerable and complex nature, as evidenced by its association with multimorbidity, polypharmacy, functional impairment, and falls [5,48,49].

Home time, the number of days individuals remain alive and out of healthcare facilities, is an objective, patient-centered outcome that reflects an individual's ability to live in their home—a key priority for older adults. Home time correlates strongly with self-rated health, mobility, mood, social participation, and independence [30]. Generally, increasing frailty severity and the presence of dementia were associated with increasing home time loss, with the reasons for this loss varying across groups. However, among those with moderate-severe frailty, home time loss was nearly identical regardless of dementia status, yet total Medicare costs were substantially higher for those without dementia. The higher Medicare costs among individuals with moderate-severe frailty without dementia appeared to be driven by higher acute and post-acute care utilization (as reflected by higher costs and home time loss due to these), higher ICU admission rates, more hospitalizations due to preventable causes, and lower hospice enrollment. In contrast, lower Medicare costs among those with dementia appeared to be driven by less acute and post-acute care utilization, with more home time lost to long-term nursing home placement. These findings suggest that beneficiaries with moderate-severe frailty without dementia receive more intensive acute care despite comparable mortality and patient-centered outcomes.

These patterns reveal important differences in how frailty and dementia relate to care intensity and outcomes. Our findings suggest that frailty, particularly higher frailty levels, may not yet be recognized as requiring the same thoughtful consideration as dementia. While dementia care has steadily progressed to incorporate patient-centered goals and apply palliative care principles [50,51], evidence-based frailty-guided care remains underdeveloped. Disease-focused and reactive approaches persist for frailty, yet our findings suggest these may not be associated with improved outcomes, especially at more severe frailty levels. There is a critical need to improve awareness of frailty as a state of heightened vulnerability and routinely identify it in clinical practice. Better recognition of frailty can guide care that aligns with patients' prognosis and supports quality of life. For example, early goals-of-care discussions and comprehensive geriatric assessments for beneficiaries with moderate-severe frailty may reduce burdensome interventions and improve patient-centered outcomes. This approach aligns closely with the recent Centers for Medicare & Medicaid Services Age-Friendly Hospital Measures, which promotes high-quality care for older adults through five domains: eliciting patient healthcare goals, responsible medication management, frailty screening and intervention, addressing social vulnerability, and age-friendly care leadership [52].

Our study has several limitations. First, our analysis captures Medicare fee-for-service costs and does not include non-Medicare costs, such as caregiver or long-term nursing home costs. Our findings should therefore be interpreted as reflecting patterns of Medicare expenditures, not total healthcare and societal costs. Second, claims-based algorithms to identify frailty and dementia may result in misclassification. Third, home time may not fully reflect quality of life as it is influenced by factors such as social support and financial resources. Lastly, our findings may not be generalizable to individuals enrolled in Medicare Advantage plans, Medicaid, or other types of insurance [53].

In conclusion, Medicare costs and home time loss increased with the severity of frailty while dementia's association with costs and home time loss varied by frailty level. Among beneficiaries with moderate-severe frailty, those without dementia incurred markedly higher costs despite similar home time loss and 1-year mortality, suggesting treatment intensity that may not align with prognosis or quality of life. These findings highlight the need for improved identification and management of frailty as well as comprehensive care strategies that address both conditions to optimize Medicare spending and improve patient-centered outcomes.

Data sharing statement

This study used Medicare claims data obtained from Centers for Medicare and Medicaid Services (CMS) under a Data Use Agreement, thus the authors are not permitted to share these data directly. Researchers may request similar Medicare data directly from CMS.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT to assist in improving readability. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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CRediT authorship contribution statement

Stephanie Denise M. Sison: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Lily Zhong:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Gahee Oh:** Writing – review & editing, Formal analysis, Data curation. **Sandra M. Shi:** Writing – review & editing. **Chan Mi Park:** Writing – review & editing, Writing – original draft, Formal analysis, Data curation. **Brianne Olivieri-Mui:** Writing – review & editing, Writing – original draft. **Ellen P. McCarthy:** Writing – review & editing, Writing – original draft, Resources, Project administration, Investigation, Formal analysis. **Dae Hyun Kim:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

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Supplementary materials

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