THE BURDEN OF RESTRICTED ACTIVITY AND ASSOCIATED SYMPTOMS AND PROBLEMS IN LATE LIFE AND THE END OF LIFE

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Abstract

Objective: To compare the rates of restricted activity and associated symptoms and problems in the last 6 months of life with the period prior to the last 6 months of life.

Design: Prospective cohort study.

Setting: Greater New Haven, Connecticut.

Participants: 754 community-living persons, 70 years.

Measurements: The occurrence of restricted activity (i.e. staying in bed for at least ½ day or cutting down on one's usual activities) and 24 prespecified symptoms and problems leading to restricted activity were ascertained monthly for nearly 19 years.

Results: The rates of restricted activity per 100 person-months were 36.5 in the last 6 months of life versus 16.1 in the period prior to the last 6 months of life (*P*<.001). Among the 737 participants with 1 month of restricted activity, the rates of restricting symptoms per 100 person-months of restricted activity ranged from 8.0 for frequent or painful urination to 65.6 for been fatigued, while the rates of restricting problems ranged from 0.1 for problem with alcohol to 23.4 for been afraid of falling. Rates were significantly higher in the last 6 months of life than in the prior period for 13 of the 24 restricting symptoms and problems (*P*<.05), most notably for

shortness of breath (38.6 versus 21.8), weakness (37.3 versus 18.9), and confusion (31.2 versus 9.8). The mean [standard error] number of restricting symptoms and problems was significantly higher in the last 6 months of life (6.1 [.1]) than in the prior period (4.7 [.03]), $P<.001$.

Conclusion: The rates of restricted activity and associated symptoms and problems are substantially greater in the last 6 months of life than in the period prior to the last 6 months of life. Enhanced palliative care strategies may be needed to diminish the burden of distressing symptoms and problems at the end of life.

Keywords

Increasing evidence over the past 15 years suggests that restricted activity, defined as staying in bed for at least half a day or cutting down on one's usual activities because of an illness, injury or other problem,[1] is an important source of disability and functional decline in older persons.[2–4] In the setting of restricted activity, the likelihood of developing disability is elevated more than 5-fold, and the population-attributable fraction for new onset disability is 0.19.[3] Restricted activity also increases the likelihood of transitioning from no disability to both mild and severe disability and from mild disability to severe disability.[4] Even in the absence of disability or functional decline, restricted activity has high face validity as a clinically meaningful, patient-centered outcome.[5]

Symptoms leading to restricted activity are highly prevalent in the last year of life, increasing substantially about 5 months before death.[6] Collectively, the occurrence of these symptoms does not differ much according to the condition leading to death. The most common restricting symptoms in the last year of life include fatigue, musculoskeletal pain, dizziness, and shortness of breath.

Little is known about differences in restricted activity and associated symptoms and problems at the end of life relative to earlier periods when death isn't imminent. In a prior study,[7] we found that about three of four nondisabled community-living older persons reported restricted activity during at least one month over a median follow-up of 15 months, and the rate of restricted activity per 100 person-months was 19.0. Among 24 prespecified symptoms and problems leading to restricted activity, the rates per 100 person-months of restricted activity ranged from 0.1 for problem with alcohol to 65.5 for fatigue.

In the current study, we set out to evaluate the burden of restricted activity and associated symptoms and problems over an extended period of time in late life. Our objectives were to compare the rates of restricted activity in the last 6 months of life with the period prior to the last 6 months of life; and to compare the rates for each of 24 prespecified symptoms and problems leading to restricted activity between the two time periods and according to the condition leading to death, respectively. To accomplish these objectives, we used high quality data from a unique longitudinal study of community-living older persons that includes monthly assessments of restricted activity over the course of nearly 19 years. The results from this study should inform discussions about how the burden of restricted activity

and associated symptoms and problems in late life and the end of life can be more effectively managed and reduced.

METHODS

Study Population

Participants were members of the Precipitating Events Project, an ongoing longitudinal study of 754 community-living persons, aged 70 years or older, who were initially nondisabled in their basic activities of daily living.[7, 8] Potential participants were members of a large health plan and were excluded for significant cognitive impairment with no available proxy,[9] life expectancy less than 12 months, plans to move out of the area, or inability to speak English. Based on our initial sample size calculations, persons who were physically frail were oversampled. Only 4.6% of persons refused screening, and 75.2% of those eligible agreed to participate and were enrolled from March 1998 to October 1999. Persons who refused to participate did not differ significantly from those who were enrolled in terms of age or sex. The study was approved by the Yale Human Investigation Committee, and all participants provided informed consent.

Data Collection

Comprehensive home-based assessments were completed at baseline and subsequently at 18-month intervals for up to 216 months (except at 126 months), while telephone interviews were completed monthly through December 2016. When participants were too ill or otherwise unable to complete the monthly interviews, proxy data were obtained using a standard protocol.[9] We required that proxies were cognitively intact and lived with the participant or saw the participant regularly. Of the 84,118 monthly interviews in the current study, 15.9% were completed by a proxy respondent. The accuracy of these proxy reports was substantial,[10] with Kappa=0.66 for the occurrence of restricted activity.[6] Deaths were ascertained from the local obituaries and/or an informant during a subsequent interview. The cause of death was coded, using information from the death certificate, by a certified nosologist. Six hundred sixty-nine (87.7%) participants died after a median of 106 months, while 43 (5.7%) dropped out of the study after a median of 27 months. Data were otherwise available for 99.0% of the monthly interviews.

During the comprehensive assessments, data were collected on demographic characteristics, nine self-reported, physician-diagnosed chronic conditions, cognitive status,[11] and physical frailty, defined on the basis of slow gait speed.[12]

Ascertainment of Restricted Activity—During the monthly interviews, the occurrence of restricted activity and reasons for restricted activity were ascertained using a standard protocol.[7] First, participants were asked two questions related to restricted activity: "Since we last talked (i.e. during the last month), have you stayed in bed for at least half a day due to an illness, injury, or other problem?", and "Since we last talked, have you cut down on your usual activities due to an illness, injury, or other problem?" Second, if participants answered "yes" to either question, they were asked whether they had any of 24 pre-specified symptoms (n=18) and problems (n=6) since the last interview.[13–16] Third, immediately after

each "yes" response to a specific symptom or problem, participants were asked, "Did this cause you to stay in bed for at least half a day or cut down on your usual activities?" Finally, participants with restricted activity were asked to specify any other reasons why they stayed in bed for at least half a day or cut down on their usual activities. The test-retest reliability of the protocol was high, with Kappa=0.90 for the occurrence of restricted activity and 0.75 or greater for the occurrence of 20 of the 24 symptoms or problems leading to restricted activity.[6] The two components of restricted activity are referred to hereafter as bed rest and cut down, respectively.[17]

Condition Leading to Death—Information from death certificates and the comprehensive assessments was used to classify the condition leading to death, according to the protocol provided in Table S1.[18]

Statistical Analysis

Key baseline characteristics were compared between decedents and nondecedents, using the chi-square test for dichotomous variables and *t*-test for continuous variables. The rate of restricted activity was calculated for the overall cohort by dividing the number of months in which participants reported bed rest or cut down by the total person-months of follow-up. Rates were subsequently compared using Poisson regression with generalized estimating equations and an autoregressive covariance structure between two mutually exclusive time periods. The first (i.e. last 6 months of life) included data from only decedents, while the second (i.e. not last 6 months of life, starting at the time of enrollment) included data from decedents and nondecedents. These analyses were repeated for the five combinations of restricted activity components, referred to hereafter as subtypes: any bed rest, any cut down, bed rest and cut down, bed rest alone, and cut down alone, as shown in Figure S1. *P*-values were adjusted for differences in key baseline characteristics.

Next, rates for each of the prespecified symptoms and problems leading to restricted activity were calculated by using person-months with restricted activity as the denominator. These rates were compared between the two mutually exclusive time periods, with adjustment of *P*-values for differences in key baseline characteristics, and across the 6 conditions leading to death. For each set of analyses, *P*-values were adjusted for multiple comparisons using the Hochberg method;[19] and the mean number of restricting symptoms and problems per month of restricted activity were calculated using Poisson regression with a first-order autoregressive covariance structure. Poisson regression, adjusted for differences in key baseline characteristics, and ANOVA were used for the corresponding statistical comparisons.

All analyses were performed using SAS V9.4, and *P*<.05 (2-tailed) denoted statistical significance.

RESULTS

The baseline characteristics of the participants are provided in Table 1. As compared with the nondecedents, the decedents were older, had more chronic conditions and lower MMSE scores, and were more likely to be physically frail.

Based on a median follow-up of 111 (interquartile range, 55–164) months, the overall rate of restricted activity per 100 person-months was 17.1 (95% CI, 16.2, 18.1). The rates for the restricted activity subtypes ranged from 2.0 (CI, 1.7, 2.2) for bed rest alone to 15.1 (CI, 14.3, 16.0) for any cut down. The rates for any bed rest, bed rest and cut down, and cut down alone were 9.9 (CI, 9.2, 10.7), 7.9 (CI, 7.3, 8.5), and 7.4 (CI, 6.9, 7.9). Figure 1 provides the corresponding rates during the two mutually exclusive time periods. For each of the subtypes, rates per 100 person-months were significantly higher during the last 6 months of life, ranging from 6.5 for bed rest alone to 36.5 for restricted activity.

Among the 737 participants with at least one month of restricted activity, the rates of restricting symptoms per 100 person-months of restricted activity ranged from 8.0 for frequent or painful urination to 65.6 for been fatigued, while the rates of restricting problems ranged from 0.1 for problem with alcohol to 23.4 for been afraid of falling. The rates of restricting symptoms and problems by time period are provided in Figure 2. Statistically significant differences were observed for about two-thirds of the restricting symptoms and problems, with higher rates in the last 6 months of life than in the prior period (i.e. not last 6 months of life) except for "cold or flu symptoms" and "family member or friend became seriously ill or had an accident". In contrast, statistically significant differences across the conditions leading to death were observed for only 7 of the restricting symptoms and none of the restricting problems (Table 2). As expected, the rate for "difficulty breathing or shortness of breath" was highest for organ failure, while the rate for "problem with memory or difficulty thinking" was highest for advanced dementia. Overall, the mean [standard error] number of restricting symptoms and problems was 4.8 [.03]. The value was significantly higher in the last 6 months of life (6.1 [.1]) than in the prior period (4.7 [.03]), adjusted $P<.001$, and differed significantly by the condition leading to death ($P=.012$), with the highest value observed for organ failure (6.6 [.2]), lowest value for sudden death (5.3 [.7]), and intermediate values for frailty (6.1 [.2]), cancer (6.0 [.2]), other (6.0 [.3]), and dementia (5.5 [.2]).

DISCUSSION

In this prospective longitudinal study of community-living older persons, we found that the rates of restricted activity and associated symptoms and problems were high over the course of nearly 19 years, but were substantially greater in the last 6 months of life than in the period prior to the last 6 months of life. Relatively few differences were observed, however, in the rates of specific restricting symptoms and problems in the last 6 months of life according to the condition leading to death. These results highlight the need for enhanced strategies to reduce the burden of restricted activity and associated symptoms and problems in late life, especially at the end of life.

The rate of restricted activity in the last 6 months of life exceeded 36 per 100 person-months, a 2-fold increase relative to the period prior to the last 6 months of life. The rates of any bed rest and any cut down, the two primary subtypes of restricted activity, were up to 3 times greater in the last 6 months of life than in the prior period. Given the important role of restricted activity on the disabling process,[2–4] additional efforts are warranted to prevent its occurrence,[20, 21] to manage it more effectively,[22, 23] and to facilitate recovery after its

occurrence.[24] We recognize, of course, that the prevention and management of restricted activity may not be consistent with the goals of care for some older persons, especially those who are at the end of life. When goals of care have not already been established, an increasing burden of restricted activity should prompt advanced-care-planning discussions.

Collectively, the number of restricting symptoms and problems was significantly greater in the last 6 months of life than in the prior period. The largest differences in rates between these two time periods were observed for difficulty breathing or shortness of breath, weakness of arms or legs, and problem with memory or difficulty thinking. Although rates were higher in the last 6 months of life than in the prior period for 13 of the 24 restricting symptoms and problems, no differences were observed for the four pain-related symptoms. While alleviation of pain is often a high priority at the end of life, our results suggest that other restricting symptoms and problems may get less attention.

Differences in rates across the conditions leading to death were observed for only a minority of the restricting symptoms and problems, most notably "difficulty breathing or shortness of breath", which was most common for organ failure, and "problem with memory or difficulty thinking", which was most common for advanced dementia. Other restricting symptoms and problems such as fatigue; dizziness or unsteadiness on feet; nausea, vomiting, diarrhea, or other stomach problem; been depressed; been anxious or worried; and fall or injury, were highly prevalent at the end of life but did not differ significantly according to the condition leading to death.

Our results can be used to inform discussions about how the burden of restricting symptoms and problems in late life and the end of life can be reduced. An increasing number of evidence-based palliative care strategies are now available to ameliorate a myriad of distressing symptoms and problems,[25–27] and these strategies need not be limited to the end of life.[20, 28] The relative paucity of palliative care specialists,[29] however, poses challenges, especially given the projected growth in the population of older persons.[30] Enhanced partnerships between palliative care and other medical specialties, including geriatrics, has been suggested as one mechanism to address these challenges.[31] Despite the high prevalence of multimorbidity in older persons,[32] the provision of palliative care is often disease specific, [33] which may limit its value. Because dying in old age is commonly a multifactorial process, [34] and because restricting symptoms and problems do not differ much according to the condition leading to death, alternative palliative care strategies are needed that are not disease specific, with particular attention to highly prevalent and distressing multifactorial symptoms such as fatigue and nausea.

In an earlier report,[35] we found that the number of restricting symptoms decreased significantly after the start of hospice, a well-established source of palliative care at the end of life, with large reductions in the occurrence of restricting fatigue, depression, anxiety, and arm/leg weakness. Although hospice care is readily available for older persons at the end of life, its short duration diminishes its benefits.[36] Earlier referral to hospice has the potential to significantly reduce distressing end-of-life symptoms. Because some restricting symptoms, such as fatigue, dizziness, nausea, and confusion, could represent medication side effects,

often in the setting of polypharmacy, deprescribing might also be considered, focusing on medications that are no longer indicated, appropriate or aligned with goals of care.[37, 38]

Our study included monthly assessments of restricted activity over an extended period of time, with little missing data and few losses to follow-up for reasons other than death. To our knowledge, comparable data are available in no other study. Additional strengths of the study include the high participation rate and an analytic plan that accounted for multiple comparisons. Our focus on symptoms and problems leading to restricted activity enhances the clinical relevance of our findings because proper management of these symptoms and problems may substantially improve quality of life while reducing caregiver burden.

A limitation of the current study is that information was not available on the use of palliative care. On the basis of its demonstrated benefits,[25, 33, 39, 40] palliative care should have reduced the incidence and number of restricting symptoms throughout the follow-up period, suggesting that our rates of restricted activity and associated symptoms and problems might be conservative. At least four additional limitations warrant comment. First, because participants were members of a single health plan in a small urban area and were oversampled for physical frailty, our results may not be generalizable to older persons in other settings. However, the demographic characteristics of our cohort reflect those of older persons in New Haven County, Connecticut, which are similar to the characteristics of the US population as a whole, with the exception of race/ethnicity.[41] Second, the use of information from death certificates is an imperfect strategy for classifying the condition leading to death. Previous research has shown that the concordance between coding of death certificates by a nosologist and an adjudicated cause of death is high for cancer and moderate for congestive heart failure and chronic lung disease but only fair for dementia,[42] largely because of underreporting of dementia on death certificates. We used data from cognitive testing in addition to coding by a nosologist to classify advanced dementia as a condition leading to death. Third, nearly 16% of the monthly interviews were completed by proxies. This limitation, which is inherent in studies of late life and the end-of-life, is diminished by the relatively high concordance between proxy and participant reports for restricted activity. Fourth, our list of specific symptoms and problems, although more comprehensive than in many prior studies, was not exhaustive. Several of the symptoms on our list were rated as either serious or morbid by a random sample of primary care and emergency medicine physicians from the American Medical Association's Physician Masterfile.[43] Furthermore, we asked all participants with restricted activity to specify other reasons not on the list for their restricted activity.

In summary, the burden of restricted activity and associated symptoms and problems is high in late life, especially at the end of life. Additional efforts are warranted to prevent and more effectively manage restricted activity, a patient-centered outcome that has been linked to new and worsening disability.[2–4] Alternative palliative care strategies may be needed to diminish the burden of restricting symptoms and problems in late life and the end of life.[29]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments:

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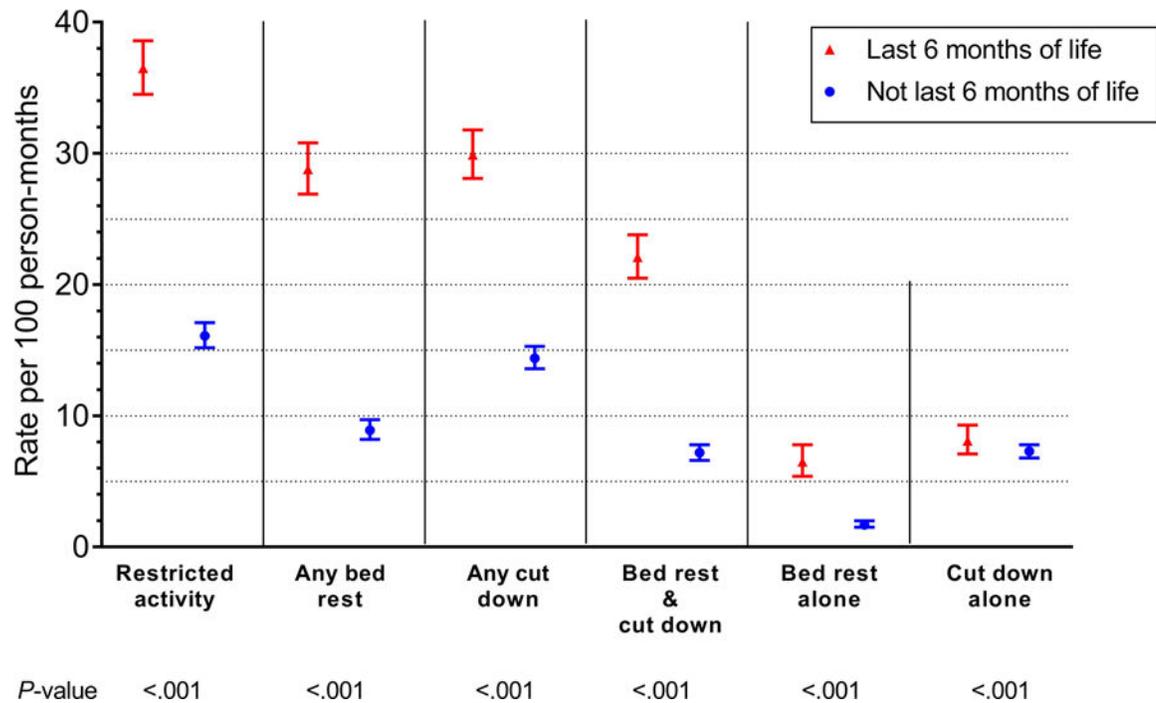
Figure 1.
Rates of restricted activity and five restricted activity subtypes during two mutually exclusive time periods. The first (i.e. last 6 months of life) includes data only from decedents, while the second (i.e. not last 6 months of life) includes data from decedents and nondecedents. The person-months of follow-up for these two time periods are 3,777 and 79,913, respectively. Point estimates are accompanied by 95% confidence intervals (error bars). Rates were compared using Poisson regression with generalized estimating equations and a first-order autoregressive covariance structure, and *P*-values were adjusted for age, number of chronic conditions, MMSE score and physical frailty.
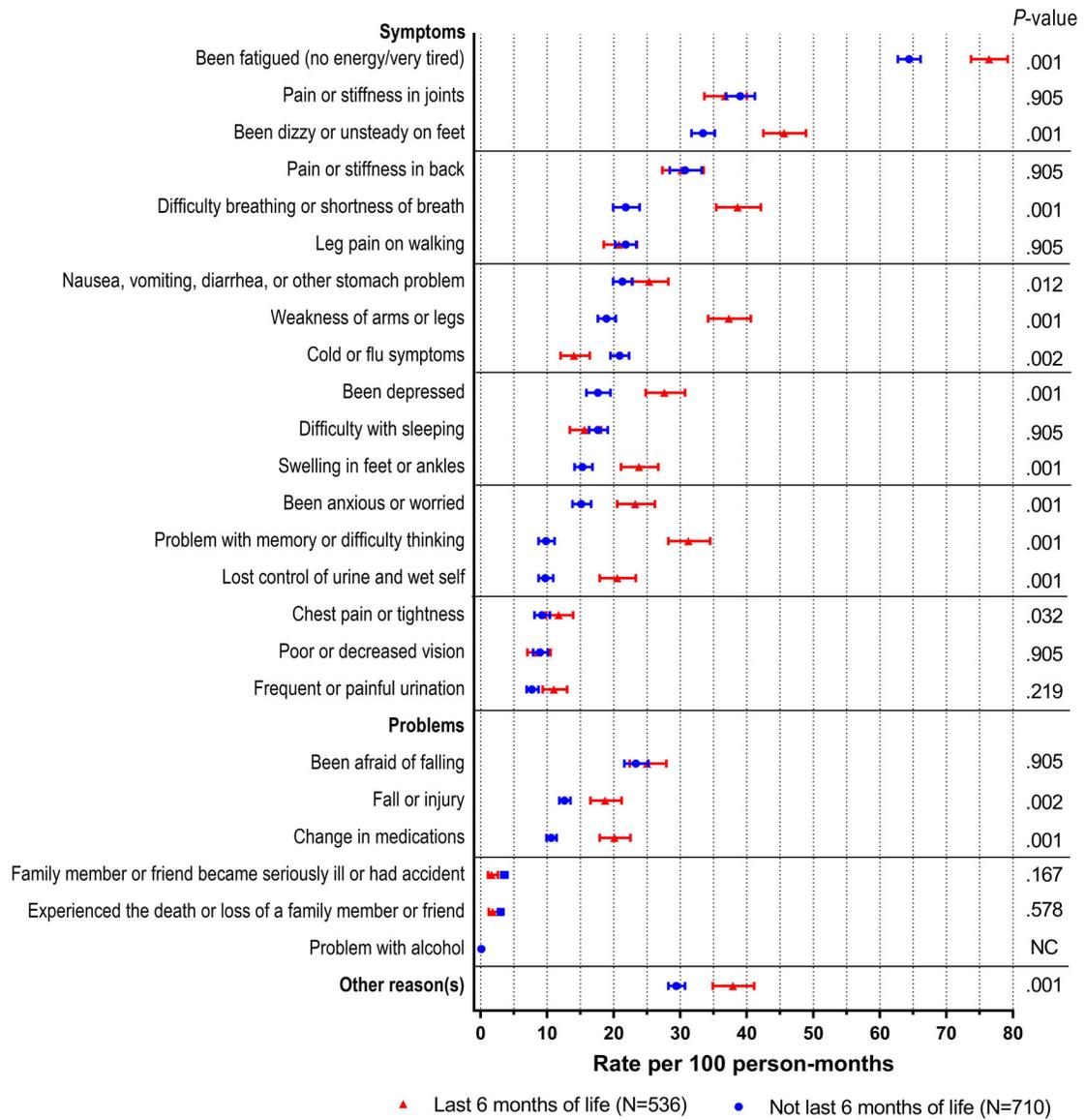
Figure 2.

Rates of symptoms and problems leading to restricted activity during two mutually exclusive time periods. Only participants with at least 1 month of restricted activity are included. Values are the mean rates (95% confidence interval) per 100 person-months of restricted activity. *P*-values were calculated from Poisson models with generalized estimating equations and a first-order autoregressive covariance structure and were adjusted for age, number of chronic conditions, MMSE score and physical frailty and for multiple comparisons using the Hochberg method. The 737 participants with at least 1 month of restricted activity included 653 decedents. Of these, 30 had dropped out of the study prior to their last 6 months of life, and 87 did not have restricted activity in their last 6 months of life, leaving 536 decedents with data on restricting symptoms/problems in their last 6 months of life. Of the 737 participants with at least 1 month of restricted activity, 7 died within their first 6 months of follow-up, and 20 did not have restricted activity prior to their

last 6 months of life, leaving 710 participants in the "not last 6 months of life" group. The person-months of follow-up for the two time periods are 1,346 (last 6 months of life) and 12,797 (not last 6 months of life). NC, not calculated because model did not converge due to small values.

Table 1.

Baseline Characteristics of Study Participants[a]

Characteristic	All Participants N = 754	Decedents N = 669	Nondecedents N = 85	P-Value[b]
Age in years, mean (SD)	78.4 ± 5.3	78.9 ± 5.2	74.3 ± 3.1	<.001
Female sex, n (%)	487 (64.6)	426 (63.7)	61 (71.8)	.141
Non-Hispanic white, n (%)	682 (90.5)	606 (90.6)	76 (89.4)	.693
Education in years, mean (SD)	12.0 ± 2.9	11.9 ± 2.9	12.3 ± 2.5	.285
Living alone, n (%)	298 (39.5)	271 (40.5)	27 (31.8)	.120
Number of chronic conditions, mean (SD)	1.8 ± 1.2	1.8 ± 1.2	1.4 ± 1.0	<.001
MMSE score, mean (SD)	26.8 ± 2.5	26.7 ± 2.5	27.6 ± 2.3	.001
Physical frailty,[c] n (%)	322 (42.7)	308 (46.0)	14 (16.5)	<.001

Abbreviation: SD, standard deviation; MMSE, Mini-Mental State Examination.

[a] Classified based on decedent status as of December 31, 2016.

[b] The chi-square test was used for dichotomous variables, and t-test was used for continuous variables.

[c] Based on slow gait speed

Table 2.

Rates of Symptoms and Problems Leading to Restricted Activity According to Condition Leading to Death [a]

Symptoms	Condition Leading to Death						P-value [b]
	Cancer (n=98)	Advanced Dementia (n=103)	Organ Failure (n=120)	Frailty (n=144)	Sudden Death (n=12)	Other Conditions (n=59)	
	episodes in last 6 months of life per 100 person-months						
Been fatigued (no energy/very tired)	77.8 (72.1, 83.8)	72.5 (65.8, 80.0)	80.8 (75.7, 86.2)	73.9 (68.5, 79.6)	87.1 (71.4, 106)	76.6 (69.2, 84.8)	.862
Pain or stiffness in joints	38.4 (31.4, 47.0)	28.1 (22.5, 35.2)	39.9 (33.5, 47.4)	41.9 (36.1, 48.7)	26.9 (11.8, 61.5)	30.6 (22.6, 41.3)	.087
Been dizzy or unsteady on feet	46.1 (39.2, 54.2)	39.2 (32.7, 46.9)	49.4 (42.9, 56.9)	45.2 (39.2, 52.0)	26.6 (11.8, 59.7)	51.4 (42.9, 61.6)	.862
Pain or stiffness in back	40.6 (34.0, 48.5)	23.7 (18.3, 30.8)	33.7 (27.8, 40.9)	29.8 (24.3, 36.4)	9.5 (2.6, 34.2)	20.2 (13.8, 29.7)	.002
Difficulty breathing or shortness of breath	35.9 (29.1, 44.4)	23.2 (17.2, 31.4)	57.2 (50.4, 64.9)	33.0 (27.5, 39.7)	30.1 (16.9, 53.8)	46.5 (37.7, 57.3)	.002
Leg pain on walking	20.7 (15.5, 27.6)	12.1 (8.3, 17.7)	23.1 (18.4, 29.0)	26.3 (21.6, 32.0)	6.1 (1.4, 27.0)	19.3 (13.3, 28.1)	.013
Nausea, vomiting, diarrhea, or other stomach problem	31.0 (24.9, 38.6)	20.0 (14.9, 26.7)	26.6 (21.9, 32.4)	24.8 (19.9, 31.0)	22.9 (12.1, 43.4)	22.5 (15.4, 33.1)	.862
Weakness of arms or legs	31.7 (25.7, 39.1)	38.6 (32.0, 46.6)	40.3 (33.9, 47.9)	38.6 (32.6, 45.8)	16.8 (7.1, 39.6)	38.4 (30.8, 48.0)	.862
Cold or flu symptoms	14.7 (10.3, 21.0)	12.0 (8.3, 17.5)	15.5 (11.5, 20.9)	14.4 (10.8, 19.3)	9.7 (2.7, 35.4)	12.4 (7.2, 21.2)	.862
Been depressed	23.3 (17.7, 30.7)	27.6 (21.6, 35.2)	30.4 (24.8, 37.2)	27.5 (22.2, 34.1)	33.3 (18.0, 61.9)	28.1 (20.5, 38.6)	.862
Difficulty with sleeping	13.9 (9.9, 19.5)	8.9 (5.9, 13.6)	21.6 (16.6, 28.1)	15.2 (11.2, 20.5)	22.9 (10.7, 49.3)	16.3 (10.9, 24.5)	.045
Swelling in feet or ankles	17.4 (12.9, 23.4)	17.0 (12.2, 23.8)	31.2 (25.2, 38.6)	25.2 (20.3, 31.4)	38.8 (23.8, 63.2)	26.4 (20.1, 34.9)	.006
Been anxious or worried	22.9 (17.5, 29.9)	21.9 (16.2, 29.5)	24.7 (19.4, 31.4)	20.2 (15.3, 26.7)	16.3 (6.2, 42.7)	32.0 (24.7, 41.5)	.862
Problem with memory or difficulty thinking	20.3 (15.0, 27.4)	57.2 (50.0, 65.5)	25.3 (20.4, 31.5)	27.0 (21.7, 33.5)	18.7 (9.3, 37.9)	30.6 (22.8, 41.0)	.002
Lost control of urine and wet self	15.1 (10.4, 22.1)	36.2 (29.8, 44.1)	18.9 (14.2, 25.1)	19.9 (15.5, 25.5)	9.5 (3.1, 29.2)	8.2 (4.4, 15.2)	.002

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			Condition Leading to Death				
	Cancer (n=98)	Advanced Dementia (n=103)	Organ Failure (n=120)	Frailty (n=144)	Sudden Death (n=12)	Other Conditions (n=59)	P-value[b]
	episodes in last 6 months of life per 100 person-months						
Chest pain or tightness	14.2 (9.7, 20.7)	6.7 (3.8, 12.0)	13.4 (9.7, 18.5)	11.5 (8.4, 15.7)	21.2 (7.7, 58.3)	9.5 (5.3, 17.1)	.624
Poor or decreased vision	9.8 (6.2, 15.5)	6.1 (3.4, 10.9)	9.2 (6.1, 14.0)	9.6 (6.6, 13.9)	11.5 (5.0, 26.7)	6.9 (3.8, 12.5)	.862
Frequent or painful urination	11.1 (7.3, 16.8)	12.5 (8.6, 18.1)	9.9 (7.1, 13.7)	11.2 (7.9, 15.9)	4.8 (1.0, 22.7)	11.2 (7.0, 18.0)	.862
Problems							
Been afraid of falling	25.4 (19.7, 32.6)	16.3 (11.5, 23.2)	25.7 (20.6, 32.1)	28.0 (22.8, 34.4)	30.4 (15.7, 58.8)	29.9 (22.8, 39.2)	.557
Fall or injury	16.2 (11.8, 22.1)	16.6 (12.1, 22.8)	19.4 (15.2, 24.8)	21.6 (17.4, 26.7)	9.7 (3.3, 28.7)	19.1 (13.3, 27.3)	.862
Change in medications	21.8 (17.1, 27.8)	17.6 (13.7, 22.6)	24.0 (19.5, 29.5)	17.9 (14.0, 23.0)	16.8 (5.8, 48.3)	18.2 (12.5, 26.6)	.862
Family member or friend became seriously ill or had an accident	2.0 (0.8, 4.5)	1.6 (0.6, 4.2)	1.5 (0.6, 4.3)	0.9 (0.2, 3.0)	9.5 (2.6, 34.2)	1.5 (0.4, 5.9)	.862
Experienced the death or loss of a family member or friend	2.7 (1.4, 5.5)	2.0 (0.7, 5.5)	1.8 (0.7, 4.5)	0.8 (0.3, 2.6)	5.0 (0.7, 36.0)	1.5 (0.4, 5.6)	.862
Problem with alcohol	NC	NC	NC	NC	NC	NC	NC
Other reason(s)	44.6 (37.8, 52.6)	33.6 (27.3, 41.5)	32.8 (27.2, 39.5)	36.5 (31.2, 42.7)	45.3 (25.4, 80.9)	47.1 (38.3, 57.9)	.126

Abbreviation: NC, not calculated because model did not converge due to small values.

[a] Includes only participants with at least 1 month of restricted activity. Values are the mean rates (95% confidence interval) per 100 person-months of restricted activity.

[b] Calculated from chi-square tests of equality of rates across the 6 modes of death and Hochberg adjustment for multiple comparisons.