

Presence of Behavioral and Psychological Symptoms Predicts Nursing Home Placement in Community-Dwelling Elders With Cognitive Impairment in Univariate But Not Multivariate Analysis

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Background. The role of behavioral and psychological symptoms as an independent risk factor of nursing home placement (NHP) in cognitively impaired elders has been controversial.

Methods. A community sample of 449 cognitively impaired elders and their knowledgeable informants (KIs) was followed for 1 year. Subjects were classified as having dementia ($n = 330$) or mild cognitive impairment (MCI) ($n = 119$) using a neuropsychiatric battery of 4 tests. Subject characteristics (behavioral and psychological symptoms, demographic, health related, and health services use) and KI characteristics were entered into the Cox proportional hazard regression analysis.

Results. The incidence rate of NHP was 8.9%. At baseline, 57.7% of subjects had at least 1 behavioral and psychological symptom. Presence of these symptoms was associated with shorter time to NHP only in a univariate analysis. Other factors significant in the multivariate Cox modeling were being white (hazard ratio [HR] = 2.17), having fair or poor physical health rating (HR = 2.12), having greater numbers of difficulties with activities of daily living (HR = 1.46), and having a physician's diagnosis of dementia (HR = 6.76). An interaction was found between the last 2 variables (HR = 0.59), indicating that among those with a diagnosis of dementia, a greater number of difficulties with activities of daily living delayed time to NHP. KI characteristics were not associated with NHP.

Conclusions. Behavioral and psychological symptoms were common, but having these symptoms was not an independent risk factor of NHP. Caregiver characteristics may not play as important a role in determining NHP as subject characteristics. Interventions aimed at improving or maintaining physical or cognitive functioning may have better chances of delaying NHP.

CARING for dementia patients is a stressful process for family members (1). Dementia care also poses substantial economic burdens on families and society, in large part because of the need for nursing home care (2). Estimates are that between half and three quarters of the nursing home population suffers from dementias (3).

The term "behavioral and psychological symptoms of dementia" (BPSD) has been used to describe "a heterogeneous range of psychological reactions, psychiatric symptoms, and behaviors resulting from the presence of dementia" (4, p. 3). These symptoms are common, with community population-based studies reporting a point prevalence of greater than 60% (5,6). The relationship between BPSD and nursing home placement (NHP) has been controversial. Some studies have found a direct association (7–12), others an indirect association (13,14), and still others no association at all (15,16).

Many other factors have been identified as determinants of NHP in elderly people with cognitive impairment. Presence and severity of cognitive or functional impairment are consistently found to be associated with higher risk of nursing home admission (9,10,17,18). Patient's and care-

giver's sociodemographic characteristics also predict NHP in some studies (8,9,16,17), as does caregiver well-being (such as health status, burden, and stress) (7,8,13,14,16). Several studies have identified more use of patient or caregiver supportive services as factors related to placement (7,9,14,19).

Previous studies on determinants of NHP among persons with cognitive impairment have shared several limitations. Most used samples from clinical settings and thus lack generalizability. Furthermore, some studies included only patient characteristics or only caregiver characteristics, not both. The purpose of this study was to determine (a) whether the presence of BPSD is an independent risk factor for NHP, and (b) other patient and caregiver characteristics associated with risk of NHP in a community-dwelling cohort of elders with cognitive impairment.

METHODS

This study used data from the observational longitudinal Memory and Medical Care Study (MMCS) conducted at the Johns Hopkins Medical Institutions. Detailed information on the study design and methods of the MMCS is available

Table 1. Distribution of Baseline Characteristics by First Annual Follow-Up Status

Demographic Characteristics	Follow-Up Available (n = 450)		Loss Follow-Up (n = 32)	
	No.	%	No.	%
Subject				
Age (y)*				
65–74	92	20.4	12	37.5
75–84	217	48.2	9	28.1
≥85	141	31.3	14	34.4
Sex				
male	89	19.8	7	21.9
female	361	80.2	25	78.1
Race				
others	266	59.1	19	59.4
white	184	40.9	13	40.6
Marital status				
others	159	35.3	10	31.3
widowed	291	64.7	22	68.8
Education (y)				
0–8	293	65.1	22	68.8
9–12	137	30.4	9	28.1
≥13	20	4.4	1	3.1
Income				
below poverty line	127	28.2	11	34.4
above poverty line	210	46.7	10	31.2
missing	113	25.1	11	34.4
Knowledgeable informant				
Age (y)*				
<50	127	28.2	7	21.9
50–64	156	34.7	6	18.8
≥65	167	37.1	19	59.4
Sex				
male	114	25.3	10	31.2
female	336	74.7	22	68.8
Marital status				
others	216	48.0	17	53.1
married	234	52.0	15	46.9
Education (y)*				
0–8	58	12.9	9	28.1
9–12	263	58.4	19	59.4
≥13	129	28.7	4	12.5
Income				
below 125% pov. line	173	38.4	16	50.0
above 125% pov. line	171	38.0	8	25.0
missing	106	23.6	8	25.0
Relationship to subject				
others	230	51.1	22	68.8
children/in-laws	220	48.9	10	31.2
Lives with subject				
no	189	42.0	15	46.9
yes	261	58.0	17	53.1
Has paying job*				
no	258	57.3	25	78.1
yes	192	42.7	7	21.9

* $p < .05$ in chi-square tests of significance.

elsewhere (20). The MMCS used previously established, community-based samples from 3 studies, 2 conducted in the Baltimore area (21,22) and the third (23) in rural Maryland, which screened more than 12,000 elders with the Mini-Mental State Examination (MMSE) (24). Among the 1802 subjects scoring less than 24 on the MMSE or having a decline of 4 or more points over 2 administrations, 724

persons were alive and not institutionalized at the start of the MMCS. Of these, 512 (71%) were enrolled. Only subjects classified as having probable dementia ($n = 349$) or mild cognitive impairment (MCI) ($n = 133$) using a neuropsychological battery of 4 tests (described in the paragraphs that follow) were included in this study. The term mild cognitive impairment describes individuals with cognitive impairment that does not meet diagnostic criteria for dementia (25,26), but who may be at a subclinical stage of dementia (27). [Another term for this subset of persons, cognitive impairment no dementia (CIND), has been used, e.g., in the Canadian Study of Health and Aging (25).] The Johns Hopkins Bloomberg School of Public Health Institutional Review Board approved the study.

A knowledgeable informant (KI) was identified for each subject. These KIs completed the baseline and first annual follow-up interviews of the MMCS. At the first annual follow-up, 32 subjects were lost to follow-up. Among the 450 with follow-up information, 41 subjects were admitted to nursing homes (14 of them died after placement), 30 died in the community, and 379 still lived in the community. Most subject and KI demographic characteristics did not vary between those lost to follow-up and those with follow-up information. However, subjects lost to follow-up were younger and their KIs were older, had fewer years of education, and were less likely to have a paying job (Table 1).

Dependent Variable

The dependent variable was time to NHP. It was measured in days from the date of baseline KI interview to the date of NHP. For 14 cases in which month (but not day) of admission was available, day was imputed at random. For 6 cases with complete missing admission dates, dates were imputed on the basis of other persons with admission dates ($n = 20$). Subjects who died in the community and subjects who lived in the community at the first annual follow-up were censored. One subject with the date of NHP coded later than the date of death was excluded from further analysis. The final sample size was 449.

Independent Variables

BPSD determination.—The depression subscale of the Neuropsychiatric Inventory (NPI) (28) and the Behavior Symptom Rating Scale (BSRS) (29) were used to measure the behavioral and psychological symptoms. Dichotomized indicators of presence of specific BPSD—psychotic symptoms, depressive symptoms, and agitated symptoms—and any BPSD were created for subsequent analyses (5).

Subject demographic characteristics.—Subject's age, sex, race, marital status, years of education, and income were derived from the baseline KI interview.

Subject health-related characteristics.—The neuropsychiatric battery of 4 tests consisted of 3 measures selected from a battery used by the Consortium to Establish a Registry for Alzheimer's Disease (30)—the Boston Naming Test, the Word List Memory Test, and the Verbal Fluency Test—and the Digit Symbol subscale of the Wechsler Adult

Intelligence Scale–Revised (31). A determination of dementia was made if the subject scored at or below 2 *SD* from the mean for normal subjects of comparable age and education on at least 2 of 4 tests. A classification of MCI was made if the subject scored at or below 1.5 *SD* from the mean on at least 1 test or scored at or below 1 *SD* from the mean on 2 tests, and did not meet the criteria for dementia. Tests were administered in the same order to all subjects by trained interviewers.

The physician's diagnosis of dementia was based on the KI's answer to the following 2 questions: "Has a doctor ever said that the subject had Alzheimer's disease?" and "Has a doctor ever said that the subject had any other type of dementia or senility?"

Both the study classification and the physician's diagnosis of dementia variables were highly correlated with baseline MMSE scores ($r = .4389, .5307$, respectively; $p < .001$ for both). These 2 variables were used as indicators of severity of cognitive impairment.

Difficulties with 5 basic activities of daily living (ADL) (32), a 5-point rating of general physical health (from excellent to poor), and the number of comorbid conditions from a lists of 9 possible conditions (heart disease, hypertension, diabetes, arthritis, stroke, cancer, chronic obstructive pulmonary disease, vision, and hearing problems) as reported by KIs were used as health status measures.

Subject health service use characteristics.—Pharmacy records from approximately 6 months before the baseline interview were obtained. Subjects were identified as using a psychotropic drug if they were prescribed cognitive enhancers, antidepressants, neuroleptics, anxiolytics–hypnotics, or certain anticonvulsants (gabapentin and divalproex sodium).

The KI was asked about the subject's use of 5 paid in-home services (home-delivered meals, paid housekeepers, shopping services, visiting nurses or home health aides, and paid sitters) and 5 paid community services (senior centers–social events, adult daycare, transportation services, eating together programs, and social clubs) at a frequency greater than once per month.

KI characteristics.—KI characteristics included age, sex, marital status, years of education, income, relationship to subject, living with subject or not, working status, general health, use of caregiver supportive services, and attitudes toward NHP.

Statistical Analysis

Data were analyzed using Stata (33) statistical packages. Survival analyses used Cox proportional hazard regression (34) to identify risk factors for time to NHP. Univariate analyses were performed first. Presence of any BPSD and other variables with $p < .15$ were included in multivariate analysis. A stepwise backward selection procedure based on a likelihood ratio test was performed to delete variables that ceased to be significant at the $p = .05$ level. Presence of any BPSD was included in all models as the main independent variable of interest. Nonlinear and interaction terms were examined. Graphic displays and diagnostic model checking were applied for identifying violations of proportionality

assumptions and influential points. All reported p values were two sided. A hazard ratio greater than 1 indicates shorter time to NHP in a survival analysis.

RESULTS

Description of the Sample

The mean follow-up time for the sample was (383 ± 10) days, ranging from 5 to 680 days. Forty subjects (8.9%) were admitted into nursing homes between baseline and the first annual follow-up. The mean time to NHP for those admitted into nursing homes was (214 ± 122) days, ranging from 5 to 458 days. The median time to NHP was not calculated because of the small number of subjects admitted.

Nearly three fifths (57.5%) of subjects had at least 1 behavioral and psychological symptom in the 4-week period prior to baseline (Table 2): 19.6% had depressive symptoms, 14.3% had psychotic symptoms, and 37.6% had symptoms of agitation.

One fifth of subjects were 65 to 74 years old, 48.4% were between 75 and 84 years old, and 31.2% were older than 85 years. Four fifths of them were female, 40.8% were white, and 20.9% were married. The majority (65.0%) completed fewer than 9 years of education. Nearly 30% had incomes below the poverty line of 1997, and 46.6% had incomes above the poverty line (for 25.2% income data were missing).

Three quarters of the subjects (73.5%) were classified as having dementia, and 26.5% were classified as having MCI. Only 16.3% of cognitively impaired subjects had a physician's diagnosis of dementia. Thirty-seven percent had 1 or more ADL difficulties, and 56.4% had more than 2 comorbid conditions. Almost half (49.2%) had fair or poor physical health.

Nearly one quarter (24.7%) of the subjects were prescribed at least 1 psychotropic drug. However, 17.4% had missing information on psychotropic drug use. Approximately one fourth (24.5%) used at least 1 paid in-home service, and 27.6% used at least 1 community service.

Thirty-seven percent of KIs were aged 65 or older, the majority (74.6%) were female, and 51.9% were married. Only 12.9% of KIs completed fewer than 9 years of education. One third had incomes below 125% of the poverty line, 38.1% had incomes above 125% of the poverty line, and 23.6% had missing income information. Nearly half (48.8%) of the KIs were adult children, 57.9% lived with subjects, 42.8% had paying jobs, and 24% had fair or poor general health. More than one seventh (15.4%) of the KIs used at least 1 caregiver supportive service, and 35.6% had a positive attitude toward NHP for persons with dementia.

Univariate Analysis

Presence of any BPSD and symptoms of agitation were significantly associated with shorter time to NHP at univariate analysis (Table 3, unadjusted). Only presence of any BPSD variable was used in subsequent analysis.

Eight other subject characteristics were associated with shorter time to NHP at the univariate level. They were as follows: being older, being white, having study classification as dementia (compared with MCI), having a physician's diagnosis of dementia, having a greater number of ADL

Table 2. Distribution of Baseline Characteristics of the Sample
(*n* = 449)

Characteristic	Cognitively Impaired Elders	
	%	No.
BPSD		
Any BPSD		
no	42.3	190
yes	57.7	25.9
Any depression		
no	80.4	361
yes	19.6	88
Any psychosis		
no	85.7	385
yes	14.3	64
Any agitation		
no	62.4	280
yes	37.6	169
Subject demographic		
Age (y)		
65–74	20.5	92
75–84	48.4	217
≥85	31.2	140
Sex		
male	19.8	89
female	80.2	360
Race		
others	59.2	266
white	40.8	183
Marital status		
others	79.1	355
married	20.9	94
Education (y)		
0–8	65.0	292
9–12	30.5	137
≥13	4.5	20
Income		
below pov. line	28.3	127
above pov. line	46.6	209
missing data	25.2	113
Subject health-related		
Study class		
MCI	26.5	119
Dementia	73.5	330
Physician's dementia diagnosis		
no	83.7	376
yes	16.3	73
No. of ADL difficulties		
0	63.0	283
1–3	21.8	98
4–5	15.1	68
No. of comorbid conditions		
0–2	43.6	196
3–4	39.9	179
5–9	16.5	74
Phys. health rating		
exc. to good	50.8	228
fair or poor	49.2	221
Subject health service use		
Psychotropics use		
no	57.9	260
yes	24.7	111
missing data	17.4	78
Paid in-home serv.		
no	74.5	339
yes	24.5	110

Table 2. Distribution of Baseline Characteristics of the Sample
(*n* = 449) (*Continued*)

Characteristic	Cognitively Impaired Elders	
	%	No.
Community serv. use		
no	72.4	325
yes	27.6	114
Knowledgeable informant		
Age (y)		
<50	28.3	127
50–64	34.5	155
≥65	37.2	167
Sex		
male	25.4	114
female	74.6	335
Marital status		
others	48.1	216
married	51.9	233
Education (y)		
0–8	12.9	58
9–12	58.4	262
≥13	28.7	129
Income		
below 125% pov. line	33.3	172
above 125% pov. line	38.1	171
missing data	23.6	106
Relationship to subject		
others	34.7	219
spouse	16.5	74
children/children-in-law	48.8	156
Lives with subject		
no	42.1	189
yes	57.9	260
Has paying job		
no	57.2	257
yes	42.8	192
General health rating		
exc. to good	76.0	341
fair or poor	24.0	108
Caregiver supportive serv. use		
no	84.6	380
yes	15.4	69
Attitude toward NHP		
negative	64.6	289
positive	35.6	160

Notes: BPSD = behavioral and psychological symptoms of dementia; NHP = nursing home placements; ADL = activity of daily living; MCI = mild cognitive impairment.

impairments, having fair or poor physical health rating, using any psychotropic drugs, and using paid in-home services. Only 1 KI characteristic (use of caregiver supportive services) was associated with shorter time to NHP at the univariate level.

Multivariate Analysis

Presence of BPSD was no longer significant in the multivariate model controlling for other potential risk factors (Table 3, adjusted). Being white (adjusted hazard ratio = 2.17), having fair or poor physical health rating (2.12), having a physician's diagnosis of dementia (6.76), and having a greater number of ADL difficulties (1.46) were significantly associated with shorter time to NHP in the final model. There was a significant interaction between number

Table 3. Unadjusted and Adjusted Hazard Ratios for Predictors of Time to NHP

Predictor	NHP Time (n = 449)	
	Unadj.	Adj.
BPSD		
Any BPSD (yes = 1)	2.29*	1.11
Any depression (yes = 1)	1.33	NA
Any psychosis (yes = 1)	1.49	NA
Any agitation (yes = 1)	2.58**	NA
Subject demographic char.		
Age (y)	1.06**	NS
Sex (female = 1)	1.11	NA
Race (white = 1)	3.06**	2.17*
Marital status (married = 1)	0.81	NA
Education (y)	1.04	NA
Income (reference = below pov. line)		NA
above poverty line	0.76	
missing data	0.97	
Subject health-related char.		
Study classification (reference = MCI)		NS
Dementia	2.63*	
Physician's dementia diagnosis (yes = 1)	3.98***	6.76***
Interaction between dementia diag. & no. of ADL difficulties	NA	0.59**
No. of ADL difficulties (0–5)	1.35***	1.46**
No. of comorbid conditions	1.09	NA
Physical health rating (fair/poor = 1)	2.57**	2.12*
Subject health service use char.		
Psychotropics use before baseline (ref. = no use)		NS
yes	2.54*	
missing data	1.98	
In-home serv. use (yes = 1)	2.75**	NS
Community serv. use (yes = 1)	1.25	NA
KI char.		
Age (y)	1.01	NA
Sex (female = 1)	0.89	NA
Marital status (married = 1)	1.42	NA
Education (y)	1.05	NA
Income (ref. = below 125% pov. line)		NA
above 125% pov. line	1.17	
missing data	1.55	
Relationship to subject (ref. = others)		NA
spouse	1.36	
children/children-in-law	0.91	
Lives with subject (yes = 1)	1.35	NA
Has a paying job (yes = 1)	1.08	NA
General health rating (fair/poor = 1)	0.68	NA
Caregiver supportive serv. use (yes = 1)	2.18*	NS
Attitude toward NHP (positive = 1)	1.51	NA

Notes: Characteristics significant at the $p < .15$ level in a univariate analysis were entered into the multivariate model. Only characteristics significant at the $p < .05$ level in the multivariate model were reported. A hazard ratio >1 indicates a shorter time to placement. ADL = activity of daily living; MCI = mild cognitive impairment; BPSD = behavioral and psychological symptoms of dementia; NHP = nursing home placement; NS = not significant at the $p < .05$ level; NA = not applicable.

* $p < .05$; ** $p < .01$; *** $p < .001$.

of ADL difficulties and physician's diagnosis of dementia (0.59). Because of this interaction, the effects of these 2 variables could not be interpreted separately. For subjects without a physician's diagnosis of dementia, a greater

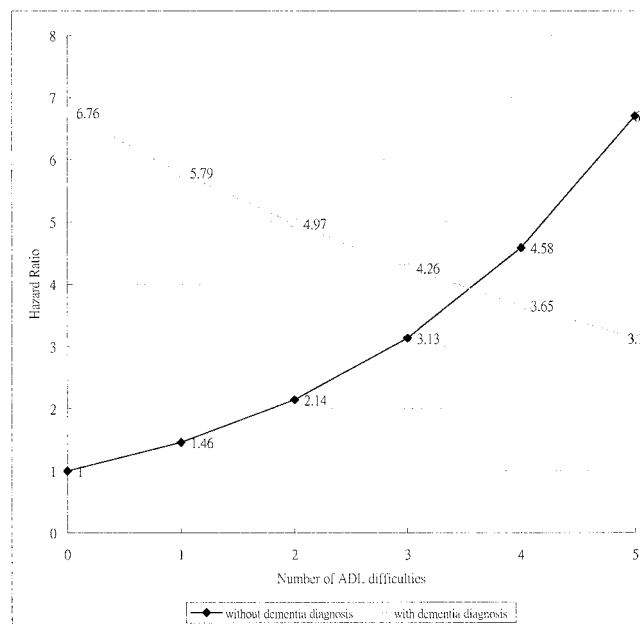


Figure 1. Hazard ratio of time to nursing home placement by number of activities of daily living (ADL) difficulties and dementia diagnosis status (a higher hazard ratio signifies less time to placement).

number of ADL difficulties was associated with shorter time to NHP. For subjects with a physician's diagnosis of dementia, a lower number of ADL difficulties was associated with less time to NHP (Figure 1). Reanalysis with multivariate logistic regression was performed to check the impacts of imputation of some NHP dates on the survival analysis results (data not shown). The statistical significances of variables were the same with 2 statistical techniques.

DISCUSSION

This study examined factors that affect time to NHP in a population-based sample of community-dwelling cognitively impaired elderly people over a 1-year follow-up period. The incidence of NHP was 8.9%. This estimate is lower than that of studies with clinically ascertained dementia samples (7,10,13). However, it was higher than the rates reported by the National Long-Term Care Survey for a sample of functionally impaired but not necessarily cognitively impaired subjects over a 2-year period (9). The present study's inclusion of subjects with MCI might explain the low rate of NHP compared with that reported in the clinical ascertained dementia samples.

Presence of behavioral and psychological symptoms, especially agitation, was associated with shorter time to NHP at the univariate level. Several other previous studies have found that BPSD were predictors of NHP in univariate but not multivariate analyses (13,14). These researchers argued that BPSD were only indirectly associated with NHP. These symptoms may serve as primary stressors for caregivers. They may increase caregiver burden or the caregiver's desire for NHP, and these may be the direct risk factors for NHP.

The only significant subject demographic characteristic in the multivariate model was race. Consistent with the research by Kasper and Shore (9), white subjects were 2 times more likely to have shorter time to NHP than were black subjects. The observed racial differences were not explained by socioeconomic status (education or income).

Subjects with fair or poor physical health were twice as likely to have shorter time to NHP compared with subjects with excellent, very good, or good physical health. This finding was consistent with that from Montgomery and Kosloski (19). Also consistent with other studies (9,10,15,17–19,35), we found both severity of functional and cognitive impairment were predictive of time to NHP. We used 2 variables (study classification as MCI or dementia and physician's diagnosis of dementia) but not MMSE score as indicators of severity of cognitive impairment. A physician's diagnosis of dementia was a stronger predictor of time to nursing home entry than classification as dementia or MCI. Osterweil and colleagues (35) also found that when a dementia diagnosis was in the model, MMSE score was no longer predictive of NHP.

We found an interaction between the number of ADL difficulties and a physician's diagnosis of dementia. This finding suggests that caregivers may have lower expectations of subjects with a clinical diagnosis of dementia, because fewer ADL difficulties were associated with shorter time to entry. A diagnosis may trigger consideration of NHP. Persons with dementia who are functionally intact may also be more likely to show physically aggressive behaviors or wander and thereby receive a diagnosis. They may be more difficult to care for in some respects than those who are bed-bound.

Our findings that use of any psychotropic drug and use of supportive services were associated with shorter time to NHP at the univariate level only is consistent with other studies (11,14). Nursing home placement has increasingly been added as an outcome measure in dementia drug trials (15), and the relationship between supportive services use and NHP has been inconsistent (8,9,14). More research on the effects of health services use on NHP is needed.

Consistent with several studies (9,10), we did not find any caregiver (KI) characteristics to be associated with time to NHP in the multivariate model. Our findings should be interpreted with caution because we did not have information on several often-cited caregiver risk factors such as caregiver burden, stress, and informal care network characteristics (7,13,16,19).

There were several limitations to this study. First, with only 1-year of follow-up data and relatively few ($n = 40$) cases admitted into nursing homes, we may not have enough power to detect several risk factors of interest. Second, with relatively few cases admitted into nursing homes, model overadjustment might be a concern. Third, although it was a population-based study, all subjects were from 1 state, Maryland, and our findings may not be generalizable to other regions. Finally, we have imputed dates on NHP for several cases with missing data. This might affect the precision of the statistical model. However, an analysis with logistic regression models with binary outcomes produced the same sets of risk factors, so the estimation error could be negligible.

Conclusion

In conclusion, the presence of behavioral and psychological symptoms was not an independent risk factor for shorter time to nursing home admission in elderly persons with cognitive impairment. Other characteristics that were predictive to NHP included race, general physical health, severity of functional impairment, and severity of cognitive impairment. The effect of severity of functional impairment differed for those who were and were not diagnosed with dementia. Caregiver characteristics may not play as important a role in determining NHP as subject characteristics. Interventions aimed at improving or maintaining physical or cognitive functioning may have a better chance of delaying NHP, but the role of a dementia diagnosis requires more investigation as well.

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