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Correlates of Functional Dependence among Recently-Admitted Assisted Living Residents with and without Dementia

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Abstract

OBJECTIVES: To describe and contrast functional dependency (FD) levels among recently-admitted AL residents with and without dementia and to assess the differential contribution of cognitive, behavioral, medical, and social factors on FD within each group.

DESIGN: A cross-sectional study.

SETTING: A random sample of 28 AL facilities in the Central Maryland region.

PARTICIPANTS: Two hundred and sixty-two AL residents assessed <1 year after admission.

MEASUREMENTS: Participants were given comprehensive in-person dementia assessments. Cognitive, behavioral, medical, and social factors were also assessed. FD was operationalized as impairment in activities of daily living.

RESULTS: The fifty-nine percent of residents with dementia had higher levels of FD ($p<0.001$) and were more likely to require assistance in all assessed task-specific ADL domains ($p<0.001$) except mobility ($p=0.653$). In multivariate models, global cognition, medical health status, and presence of diabetes explained 43% of the variance in FD in the dementia group. Twenty-five percent of the variance in FD was explained by depression, neuropsychiatric symptoms, and global cognition in those without dementia.

CONCLUSIONS: Recently-admitted AL residents have substantial levels of FD. FD is higher among residents with dementia compared to those without and the association of cognitive, mental health, and medical variables with FD differ as a function of dementia status. Future research should examine how these dimensions affect FD longitudinally and whether they may serve as targets for interventions and quality of care improvement initiatives.

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Keywords

disability; cognitive impairment; long-term care; assisted living

INTRODUCTION

Assisted living (AL) is a residential care setting that typically provides housing, personal care services, health-related services, and supervision[1] to elders who require a supportive environment, but who are not appropriate for the care intensity afforded in NHs. It's role in the continuum of care is expanding, particularly in regard to the provision of care to elders with significant levels of disability.[2] This is attributable to state and private sector interest in reducing long-term care expenditures,[3] the broadening of Medicaid reimbursement policies to include AL,[4] increased pressure for shorter hospital stays and more restrictive NH entry standards,[5] as well as elders' desire to be cared for in a more homelike, less institutional environment.[6] AL serves over one million elders[1] and projections suggest that by the year 2010, more elders will be cared for in ALs than in nursing homes (NHs).[7]

The trend toward greater levels of disability in the context of AL is a significant consideration. Functional dependency (FD), an aspect of disability measured by impairment in activities of daily living (ADLs) (e.g., dressing, bathing, toileting), is the most common reason cited for AL admission[8] and is highly prevalent in AL. The average resident receives assistance with 2.3 basic ADLs[9] and those with dementia appear to have significantly greater overall FD levels than those without.[10] Moreover, FD is related to a number of adverse outcomes such as increased care intensity (e.g. caregiver minutes per day),[11, 12] caregiver stress,[13] worse resident quality of life,[14] and plays a major role in transitions from AL to NH care.[15]

Delay or reversal of FD in AL is a natural goal, yet there is a paucity of empirical data on contributory factors for FD in that setting. Conceptually, health conditions are the foremost etiological contributor to disability.[16] However, the *manifestation* of disability results from complex interactions between health conditions and contextual factors (e.g. psychological, social, environmental factors).[17] Moreover, the clinical presentation and determinants of disability may be disease-specific.[16,18,19] For instance, the course and determinants of disability among individuals with a progressive dementia will likely be quite distinct from individuals suffering from a non-cognitive health condition such as heart disease. This framework is useful in the context of AL because it (1) considers the influence of a range of contextual factors in the manifestation of disability, many of which may be under the facility's control; (2) considers how contributions of contextual factors may differ based on underlying health conditions; and (3) views disability as a dynamic, potentially modifiable state.

Community-based studies of older adults have associated FD with dementia status,[18] cognition,[18,20] executive dysfunction,[21] general medical health,[22] depression,[22,23] frailty,[24,25] behavioral disturbances,[21] and social resources and activities.[26,27] In the few NH studies available, cognitive impairment and behavioral disturbances were predictive of prevalent and incident FD.[12,28,29] However, the effects of factors other than cognition and psychiatric symptoms were not examined. In our previous report,[10] the only study we know of to assess the correlates of FD in AL, we found that cognitive impairment, depression, and general medical health accounted for about 43% of the variance in functional impairment among residents who had been living in AL for an average of 2 years at the time of assessment.

In this report, we present new data from the Maryland Assisted Living Study (MD-AL). In line with models of disease-specific patterns of FD[16] and evidence suggesting that there may be two distinct groups of individuals entering AL based on the etiology of their functional

impairment –cognitive versus medical,[8] this is the first study to examine FD in *a recently-admitted cohort* of AL residents and to explore whether the burden and correlates of FD differ between residents with and without dementia. We extend prior work by examining a fuller range of contextual factors that may contribute to FD. Specifically, we sought to (1) describe and contrast the FD levels of recently-admitted AL residents with and without dementia and (2) assess the differential contribution of cognitive, behavioral, medical, and social factors on FD within each group.

METHODS

We report on cross-sectional data from the first two phases of the MD-AL study. The focus of this ongoing study is to determine the prevalence, incidence, detection, treatment, course, and consequences of dementia and other mental health conditions in a random sample of AL residents living in Maryland. Phase I (9/1/2000—8/31/2003), was a single cross-sectional evaluation of 198 current AL residents (Cohort I) who were residing in one of 22 randomly selected AL facilities in the Central Maryland region.[8] Phase II (06/31/2003—07/1/2009) is a longitudinal evaluation of 203 recently-admitted AL residents (Cohort II) seen semi-annually for 3 years. Twenty-six randomly-selected AL facilities from the same region participated in Phase II. Only permanent stay residents admitted within the last 12 months were asked to participate. The MD-AL study has been approved by the Johns Hopkins Institutional Review Board. Written consent/assent was obtained from all participants and a legal proxy, as appropriate.

Participant Sample

The current study aggregates data from the evaluation in Phase I with the baseline evaluation in Phase II. The procedures and measures used in these evaluations were virtually identical. All residents (Cohort I and Cohort II) evaluated < 1 year after AL admission are included. Sixty-three (of 198) Cohort I and 199 (of 203) Cohort II participants met these criteria and were included. Cohorts did not differ in age, education, race, gender, AL cost per month, or prevalence of dementia. Cohort I participants had been living in AL longer (5.6 months vs. 4.4 months, $p=0.002$) and were more likely to be living in a small facility (<16 beds) (36.5% vs. 14.1%, $p<0.001$) than Cohort II. The total analytic sample was comprised of 262 participants from 28 AL facilities.

Procedure and measures

Comprehensive in-person evaluations were performed and included a physician-directed clinical examination, a neuropsychological battery, a narrative history, and review of the AL medical chart. Data sources included the participant, a family member, and a formal caregiver (i.e. AL staff member). Dementia diagnoses and psychiatric diagnoses were adjudicated by an interdisciplinary consensus panel of experts[8] using DSM-IV-TR criteria.[30] For those who met dementia criteria, the adequacy of the dementia work-up and dementia treatment (i.e., complete vs. incomplete) were also adjudicated.[8]

Overall FD level was operationalized by The Psychogeriatric Dependency Rating Scale-Physical subscale (PGDRS-P),[31] a summative score of the 19 PGDRS-P items which rates impairment in basic ADLs and ranges in score from 0 (completely independent) to 39 (completely dependent). *Task-specific FD* (defined as having any need for human assistance) in 7 ADL domains (i.e., dressing, bathing, toileting, eating, mobility, personal hygiene, continence) was a dichotomous variable (i.e., independent vs. dependent) distilled from PGDRS-P items. Dependency in dressing, bathing, toileting, and eating were based on a single PGDRS-P item, with scores greater than zero being interpreted as dependency. Dependency in mobility was operationalized as having a score greater than 2 (i.e. required assistance with

transfers, a wheelchair, or were bedfast). Dependency in personal hygiene was operationalized as a score a greater than zero in any of the following PGDRS-P items: oral care, washing hands, cleaning after toileting, and caring for one's hair. Dependency in continence was operationalized as a score of greater than zero in any of the following PGDRS-P items: daytime urinary incontinence, nighttime urinary incontinence, daytime fecal incontinence, and nighttime fecal incontinence.

Cognitive function was assessed by The Mini-Mental State exam (MMSE),[32] a scale of global cognitive function and the Trail Making Test (Part A, Part B) (TMT),[33] which captures executive functioning by subtracting number of seconds to complete Part A from seconds to complete Part B. Psychiatric symptoms were assessed by the Cornell Scale for Depression in Dementia (CSDD),[34] which rates the severity of depressive symptoms and the Neuropsychiatric Inventory (NPI).[35] which assesses the frequency and severity of neuropsychiatric disturbances in 12 domains. Physical health was assessed with the General Medical Health Rating (GMHR),[36] a global medical comorbidity rating, with scores ranging from 1 (poor health) to 4 (excellent health).

The presence or absence of heart disease, arthritis, diabetes, history of cerebrovascular accident (CVA) and the total number of routine medications (i.e. continuous variable) was derived from review of the AL chart. Social engagement was quantified by asking residents, or their formal caregiver in cases of more severe cognitive impairment, to approximate the number of hours per month spent visiting with other people (e.g., friends, family members, clergy). Activity participation was approximated in the same way and was the sum of the hours per month participants spent in group activities (e.g., social hour, exercise, bus trips) and in solo activities (e.g., reading, crosswords, sudoku, painting), as done previously.[37] The presence or absence of an active non-cognitive psychiatric diagnosis was recorded for each participant.

Analyses

Descriptive statistics were calculated for all participants and for subgroups stratified by dementia status. The significance of group differences (two-tailed) was evaluated by t-test and non-parametric tests (Pearson's chi-square and Fisher's exact test). Scatterplots of FD level and hypothesis-driven continuous predictor variables with best-fit linear regression lines were first examined to assess interactions by dementia status. Subsequent pooled multiple linear regression models showed a strong interaction between dementia status and some predictors. Thus, separate linear regression models were estimated for the two groups. PGDRS-P score was regressed separately on each predictor variable and covariate for each group in univariate linear regressions. Covariates included age, education, race, months since admission, monthly facility charge (dollars), and facility size (small/large). Marginal correlates of PGDRS-P ($p < 0.10$) were further examined in a series of multivariate linear regression models for each group to isolate the effects of the hypothesis driven predictors after accounting for the influences of significant covariates. TMT was excluded from multivariate analyses due to collinearity with the MMSE and because 54% of residents with dementia could not complete the TMT. Goodness of fit was checked by examination of residual plots for the final models. Analyses were conducted with SPSS 14.0 statistical software.[38]

RESULTS

Descriptive statistics on participant demographic and assessment variables for the entire study sample and for groups are in Table 1. Fifty percent of participants came to AL from an independent living setting, 17% another AL, 13% a rehabilitation facility, 9% a family member's home, 7% a nursing home, and 4% a medical hospital. The most common reasons provided for moving into AL were a decline in independent function (62%) or a medical problem (26%). One hundred and fifty-five (59%) participants met DSM-IV-TR[30] criteria for

dementia. Of these, 38.7% had mild (MMSE ≥ 20), 30% had moderate (MMSE 12-19), and 23.3% had severe (MMSE ≤ 11) cognitive impairment, using standard cut-off scores for dementia staging.[39] Participants with dementia were more likely to have lived in AL longer ($p = 0.003$), and to be living in a smaller facility ($p=0.005$). Non-Caucasians admitted to AL were more likely to have dementia than Caucasians ($p<0.001$).

On average, those with dementia also had lower MMSEs ($p < 0.001$), more impaired TMT score ($p < 0.001$) s, greater neuropsychiatric symptomatology ($p = 0.005$), and were prescribed fewer routine medications ($p < 0.001$). Residents without dementia were more likely to have a current non-cognitive psychiatric disorder ($p<0.029$). On the average, those without dementia spent 17 more hours per month engaged in activities ($p = 0.021$). Participants with dementia had significantly greater PGDRS-P score and a higher prevalence of dependency in specific tasks, with the exception of mobility (Table 1). Participants with dementia received assistance with significantly more tasks than those without (3.2 vs. 1.7; $p < 0.001$).

Univariate correlates of PGDRS-P for both groups are in Table 2. Facility size, MMSE, TMT, CSDD, GMHR, NPI, having diabetes, hours in activities, hours visiting, and facility size were all associated with PGDRS-P in those with dementia. For those without dementia, years of education, facility size, MMSE, CSDD, GMHR, NPI, and having an active non-cognitive psychiatric disorder were associated with PGDRS-P.

Multivariate linear regression models for both groups are in Table 3. For the dementia group approximately 43% of the variance in PGDRS-P score was explained by MMSE, GMHR, and having diabetes. MMSE had the strongest predictive power, explaining nearly 31% of the variance of FD level (Model 1). In Model 2, after adjusting for covariates (Block 1), MMSE, GMHR, and diabetes again emerged as significant predictors and explained 38% of the remaining PGDRS-P score variance. In this model, a 5-point decrease in MMSE score was associated with a 3.4 point increase in PGDRS-P. Similarly, the (3-point) difference between a GMHR score of 1 (poor heath) and a score of 4 (excellent health) was associated with an estimated 11 point increase on the PGDRS-P. Finally, having diabetes increased the PGDRS-P score by an estimated 4-points.

For those without dementia (Table 3), NPI, CSDD, and MMSE were significant predictors in Model 1, explaining almost 25% of the PGDRS-P variance. In Model 2, after entry of covariates (Block 1), NPI, CSDD, and MMSE explained an additional 15% of the PGDRS-P variance. In this model, an increase in the log NPI and CSDD score from 1 to 6 (a 6 fold increase) was associated with a 2.7 and 2.3 point increase in PGDRS-P score, respectively. A 5-point decrease in the MMSE was associated with a 1.3-point increase in PGDRS-P, 2 points less of an increase than estimated for participants with dementia. To illustrate the clinical meaningfulness of these results in an individual without ADL dependency, a 3 point increase might correspond to becoming fully dependent on others for dressing, whereas a 12-point increase might correspond to becoming fully dependent on others for dressing, mobility, and several daily hygiene tasks like grooming and oral care.

DISCUSSION

These data highlight several key points. First, we found that AL residents, assessed an average of 5 months after admission, have significant ADL needs, with the average resident requiring assistance with nearly 3 ADLs. Residents with dementia had significantly higher levels of FD than their counterparts and were more likely to require assistance with nearly all task-specific ADL domains. Compared to our earlier report on residents evaluated an average of 2 years after admission,[10] we note that the large difference in FD between groups is evident soon after arrival in AL. Because discharge is strongly associated with FD,[15] we question whether our

previous study sample may have been comprised of the "survivors" and may have been affected by non-random attrition related to FD. Thus, evaluation of the longitudinal trajectory of FD in this new cohort will be important. Second, the strength of association of hypothesis-driven predictor variables and FD level varied as a function of dementia status. Consistent with literature on community-dwelling elders with dementia,[22,40] worse global cognition, worse general medical health, and having diabetes were associated with greater FD in AL residents *with dementia*, after accounting for covariates. Other studies have also demonstrated the impact of diabetes on risk of developing dementia[41] and the differential impact of comorbid cognitive impairment on development of FD among individuals with diabetes. [42] These results support the hypothesis that there may be a special relationship between cognition, diabetes, and the development of FD.

Among those *without dementia*, psychiatric symptoms were the strongest predictors of FD. In fact, this group was more likely to have an active psychiatric disorder. While the relationship between depression and FD is complex,[43] one possible explanation for this finding is that these symptoms were triggered by the significant life event of moving to a potentially more restrictive setting. Alternatively, depression may have been the debilitating condition that led to the need for AL. Longitudinal data from MD-AL will help to further investigate this finding, but the reversibility of depression raises the possibility of preventing FD through early recognition and treatment of depression. Global cognition appeared to play a role in FD for both groups, but clearly played a more influential role for those with dementia.

There was a large difference in the amount of PGDRS-P variance explained, with about 45% of the variance explained by predictors in the dementia group versus 25% in the no dementia group. This suggests that residents *without dementia* may be a more heterogeneous group or that other factors not examined in these analyses such as frailty, hip fracture, hospitalization, [25] sensory impairment,[44] or impairment of other cognitive domains[10] may contribute.

There are several limitations of the study. Generalizability may be limited because the study was conducted in only one state. However, the demographic make-up of the study sample is similar to national surveys.[9,45] The cross-sectional nature of the study restricts the ability to draw causal inferences. Longitudinal analyses of MD-AL may support stronger conclusions. Our measure of executive functioning (TMT) had a strong floor effect in that it could not be completed by over half of the residents with dementia. Thus, despite support in the literature, we were not able to effectively test the relationship between executive functioning and FD. Finally, the study focused on individual-level variables and did not explore potentially important facility-level factors beyond demographic characteristics. Nonetheless, because processes relating to the detection and management of many individual characteristics such as depression and medical health are conceivably under the control of the facility, these data provide clues for potential areas in which measures might be taken to improve quality of care.

Careful examination of FD and contributory factors, especially in recently admitted AL residents, could have important implications for early interventions and care improvement initiatives. These results demonstrate a high burden of FD in AL and imply that AL residents have diverse needs; those with dementia may benefit from interventions that preserve cognition or delay decline and proper management of comorbid medical problems such as diabetes, while those without may benefit from early detection of mental health problems, as well as programs to maintain cognitive function. We hope to elucidate some of these postulations in future longitudinal analyses from the MD-AL study, placing special emphasis on the examination of modifiable factors that could be addressed by elements of care under facility control.

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Table 1

Characteristics of All Residents, Those without Dementia, and Those with Dementia

	All Residents (*n*=262)	No Dementia (*n*=107)	Dementia (*n*=155)
Variables	**Mean (SD) or Percent of Total (*n*)**		
Sociodemographics			
Age, (years)	84.7 (9.0)	83.6 (9.6)	85.4 (8.6)
Female, % (*n*)	73.7 (193)	71.0 (76)	75.5 (117)
Caucasian, % (*n*)**	85.1 (223)	95.3 (102)	78.1 (121)
Cohort II, *% (n)* †	76.0 (199)	81.3 (87)	72.3 (112)
Months since Admission**	4.7 (2.4)	4.1 (2.4)	5.0 (2.3)
Education, (*years*)	13.8 (3.3)	14.0 (3.0)	13.7 (3.5)
Charge per month *(dollars)*‡	3120.1 (1498.1)	3020.0 (1474.0)	3180.0 (1514.3)
Facility Characteristics			
Living in large facility, % (*n*)**	80.5 (211)	88.8 (95)	74.8 (116)
Assessment Characteristics			
Dementia, % (*n*)	59.0 (155)	---	---
Dementia Full Work-Up, % (*n*)	---	---	69.5 (108)
Dementia Full Treatment, % (*n*)	---	---	59.1 (92)
Active Non-Cognitive Psychiatric Disorder, % (*n*)*	22.2 (58)	29.0 (31)	17.5 (27)
MMSE**	20.6 (7.5)	26.5 (3.9)	16.5 (6.7)
TMT§**	256.0 (159.9)	183.8 (129.1)	349.2 (147.6)
CSDD	3.8 (3.9)	3.9 (4.1)	3.6 (3.7)
NPI Total**	5.1 (8.6)	3.3 (8.4)	6.3 (8.5)
GMHR	3.0 (0.6)	3.0 (0.6)	3.0 (0.7)
CVA, % (*n*)	18.7 (48)	18.1 (19)	19.1 (29)
Heart Disease, % (*n*)	40.2 (105)	44.9 (48)	37.0 (57)
Arthritis, % (*n*)	35.6 (93)	31.8 (34)	38.3 (59)
Diabetes, % (*n*)	17.2 (45)	19.6 (21)	15.1 (23)
Routine Medications**	8.4 (3.8)	9.6 (4.0)	7.5 (3.4)
Activity, *hrs per month**	73.7 (58.5)	83.7 (55.3)	66.5 (59.9)
Visiting, *hrs per month*	20.0 (29.8)	23.5 (38.4)	17.5 (21.5)
Functional Dependency			
PGDRS-P Total**	10.1 (8.4)	7.1 (5.8)	12.2 (9.2)
Dressing, % (*n*)¶**	45.0 (118)	22.4 (24	60.6 (94)
Bath entry, % (*n*)¶**	69.5 (182)	57.0 (61)	78.1 (121)
Mobility, % (*n*)¶	24.8 (65)	24.4 (26)	25.8 (40)
Hygiene, % (*n*)¶**	55.3 (145)	40.2 (43)	65.8 (102)
Toileting,% (*n*)¶**	21.0 (55)	8.4 (9)	29.7 (46)
Incontinent, % *(n)*§**	32.8 (86)	17.8 (19)	43.2 (67)
Eating, % (*n*)¶**	13.7 (36)	4.7 (5)	20.0 (31)

	All Residents (*n*=262)	No Dementia (*n*=107)	Dementia (*n*=155)
Variables		**Mean (SD) or Percent of Total (*n*)**	
Sociodemographics			

Notes: MMSE = Mini-Mental State Exam; TMT=Trail Making Test; CSDD= Cornell Scale for Depression in Dementia; NPI = Neuropsychiatric Inventory; GMHR= General Medical Health Rating; PGDRS-P = Psychogeriatric Dependency Rating Scale-Physical.

* $p < .05$;

** $p < .01$ for comparisons between no dementia and dementia groups

† Trend toward significance (p = 0.092).

‡ Amount in thousands charged to the individual resident per month by the AL facility.

§ TMT: n=165 for all, n=93 for no dementia, n=72 for dementia.

¶ Requiring any human assistance for specific tasks.

Table 2

Results of Univariate Linear Regression Models by Group: Correlates with Functional Dependency (PGDRS-P)*

Independent Variable	B (SE)	*P*	Adjusted R^2
Dementia			
Large Facility	−5.87 (1.65)	<0.001	0.071
MMSE	−0.76 (0.10)	<0.001	0.291
TMT	0.01(0.01)	0.055	0.038
CSDD†	2.71 (0.87)	0.002	0.055
NPI total†	2.41 (0.60)	<0.001	0.089
GMHR	−5.71 (0.95)	<0.001	0.188
Diabetes	6.15 (2.01)	0.003	0.052
Activity, *hrs per month*	−0.04 (0.01)	0.001	0.070
Visiting, *hrs per month*†	−1.10 (0.641)	0.088	0.013
No Dementia			
Education, *years*	−0.33 (0.18)	0.071	0.021
Large Facility	−6.96 (1.64)	<0.001	0.139
MMSE	−0.39 (0.13)	0.004	0.070
CSDD†	2.83 (0.63)	<0.001	0.154
NPI total†	2.51 (0.46)	<0.001	0.210
Active Non-Cognitive Psychiatric Disorder	3.17 (1.19)	0.009	0.054
GMHR	−1.21 (0.95)	0.004	0.070

Notes: MMSE = Mini-Mental State Exam; TMT=Trail Making Test; CSDD= Cornell Scale for Depression in Dementia; NPI = Neuropsychiatric Inventory; GMHR= General Medical Health Rating; PGDRS-P = Psychogeriatric Dependency Rating Scale-Physical. For the dementia group, age, sex, race, cohort, months since admit, cost per month, history of CVA, heart disease, arthritis, number of routine medications, complete dementia work-up, complete dementia treatment, and active non-cognitive psychiatric disorder were found not to be significant. For the no dementia group, age, sex, race, cohort, months since admit, cost per month, TMT, history of CVA, heart disease, arthritis, diabetes, number of routine medications, hours in activity, and hours spent visiting were found not to be significant.

*Variables significant at p<0.10 in univariate regression models.

†CSDD, NPI total and Visiting are log transformed scores.

Table 3

Multivariate Linear Regression Models by Group: Correlates with Functional Dependency (PGDRS-P)

Independent Variables			B (SE)	*P*	Adjusted R^2
Dementia					
Model 1[†]					
		MMSE	−0.68 (0.10)	<0.001	0.307
		GMHR	−3.58 (0.85)	<0.001	0.404
		Diabetes	4.27 (1.67)	0.013	0.427
Model 2[‡]					
	Block 1				
		Large Facility	−2.07 (1.37)	0.133	0.053
	Block 2				
		MMSE	−0.64 (0.10)	<0.001	0.311
		GMHR	−3.54 (0.84)	<0.001	0.408
		Diabetes	4.36 (1.69)	0.011	0.432
No Dementia					
Model 1[†]					
		NPI[*]	1.50 (0.48)	0.002	0.170
		CSDD[*]	1.53 (0.60)	0.013	0.215
		MMSE	−0.27 (0.12)	0.024	0.246
Model 2[‡]					
	Block 1				
		Education	−0.15 (0.16)	0.332	0.089
		Large Facility	−1.22 (2.03)	0.550	
	Block 2				
		NPI[*]	1.26 (0.57)	0.031	0.175
		CSDD[*]	1.48 (0.61)	0.016	0.218
		MMSE	−0.26 (0.13)	0.045	0.242

Notes: MMSE = Mini-Mental State Exam; CSDD= Cornell Scale for Depression in Dementia; NPI = Neuropsychiatric Inventory; GMHR= General Medical Health Rating; PGDRS-P = Psychogeriatric Dependency Rating Scale-Physical.

[*] CSDD, NPI total and Visiting are log transformed scores.

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[†] All significant variables (except TMT) from univariate models entered using stepwise method. Entry at $p \le 0.05$ and removal at $p \ge 0.10$.

[‡] Significant demographic and covariates were entered in Block 1. Significant predictor variables were entered stepwise in Block 2.