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Original article

Functional decline and mortality in long-term care settings: Static and dynamic approach

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ABSTRACT

Background/Purpose: Functional impairment is known to be associated with higher mortality risk and adverse health outcomes. However, little is known about whether functional decline could predict mortality among the elderly in the long-term care setting.
Methods: This is a prospective cohort study in two veteran homes in northern Taiwan with active use of the minimum data set (MDS). Evaluation tools retrieved from the MDS, including MDS Resource Utilization Group-III for Activities of Daily Living (RUG-III ADL), MDS Cognitive Scale, MDS Social engagement, triggers for resident assessment protocol (RAP) and Pain scale, were utilized for the analysis.
Results: A total of 1125 male participants were included in this study. The mean age of the participants was 83.1 ± 5.1 years, and 65 (5.8%) developed physical functional decline within a 6-month period. Participants with functional decline [odds ratio (OR) 2.305, 95% confidence interval (CI) 1.002–5.303], poor baseline functional status (OR 1.116, 95% CI 1.002–1.242), positive RAP triggers for dehydration (OR 13.857, 95% CI 3.07–62.543), and underlying chronic lung diseases (OR 2.279, 95% CI 1.149–4.522), depression (OR 2.994, 95% CI 1.161–7.721), and cancer (OR 3.23, 95% CI 1.078–9.682) were more likely to have an additional 12-month mortality. By contrast, Parkinsonism (OR 3.875, 95% CI 1.169–12.841), increase in sum of RAP triggers (OR 6.096, 95% CI 2.741–13.562), and positive RAP triggers for cognitive loss (OR 3.164, 95% CI 1.612–6.212) and mood (OR 2.894, 95% CI 1.466–5.71) are strong predictors for functional decline within 6 months.
Conclusion: Physical function decline within 6 months predicted the subsequent 1-year mortality, whereas increased sum of RAP triggers and positive trigger for cognitive loss and mood were associated with functional decline.

1. Introduction

Functional deficit, or physical dependence, is a major determinant for short-term mortality and institutionalization among older people because of the increased care need and care complexity.[1–3] Moreover, it is also an important factor for poor quality of life, poor social engagement, and higher healthcare service utilization.[1–3] Longitudinal studies have shown that a rapid decline in physical function is positively correlated with higher risk of mortality,[4–7] whereas limitations in basic activities of daily living (ADLs) and instrumental ADLs were significantly associated with quality of life and clinical outcome among residents of long-term care facilities (LTCFs).[8,9] Several factors may result in functional limitation, such as aging, being male, malnutrition, comorbidities of cancer, diabetes mellitus, coronary artery disease, cerebrovascular disease, chronic lung disease, and low body mass index (BMI).[10–15] A number risk factors for a deterioration of ADL performance among nursing home residents were described using minimum data set (MDS), including poor balance, incontinence, cognitive impairment, depression, low BMI, loss of daily contact with proxies, and impaired vision and hearing.[8,9,16] Furthermore, a higher sum of MDS resident assessments protocol (RAP) triggers, a proxy indicator of care complexity, is associated with higher risk for physical functional decline and mortality.[7,17]

Most previous studies used the baseline characteristics of LTCF residents to predict their short-term health outcomes; however, it

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should be noted that those baseline conditions might be greatly influenced by recent acute illness or injuries, which may improve shortly after appropriate care. In contrast to the static point of view, the dynamic approach used for fall risk assessment had shown significant improvements in risk estimation. However, only a few studies took the same approach through evaluating changes of individual functional measurements in relation to adverse outcomes. In particular, changing individual RAP triggers to evaluate long-term care needs and functional outcomes has not been reported. The main aim of this study was to evaluate the impact of rapid functional decline and the increase in the sum of RAP triggers on 12-month mortality beyond the baseline functional status of LTCF residents.

2. Methods

2.1. Participants

Residents of Banciao and Taipei Veterans Homes in northern Taiwan were invited to participate in the study from January 2006 to December 2010. This study is a substudy of the Longitudinal Older Veterans study, which evaluated the benefits of implementing Minimum data set for Nursing Home, Chinese version 2.1, for health management and care planning in Taiwan.[17] The sociodemographic characteristics of the residents of the two veteran homes were similar because of the universal admission criteria. Only data from participants who were older than 65 years and under regular assessment for 18 consecutive months at the same facilities were included for further analysis. Residents were excluded if they were younger than 65 years, in a completely dependent state, or unable to complete the regular assessment in this period. Every participant was interviewed by the research staff in the beginning and then every 3 months in the following period. The study was approved by the Institutional Reviewing Board of National Yang-Ming University, Taipei, Taiwan.

2.2. Measures

2.2.1. Physical function

The Resource Utilization Group-III for Activities of Daily Living (RUG-III ADL) version 5.2 was used for physical function assessment.[18] The RUG-III ADL score were retrieved from MDS items for toilet use, transfer, bed mobility, and eating, in the range of 4–18. A higher score means more physical dependence and greater need for assistance, whereas a score of 4 means complete independence.

2.2.2. Cognitive function

Cognitive function in this study was evaluated using the MDS Cognitive Scale (MDS COGS). The MDS COGS were calculated from eight items for cognitive patterns, communication patterns, and physical functioning, and classified all residents into four categories of cognitive status—"intact–mild impairment," "mild–moderate impairment," "moderate–severe impairment," and "severe–very severe impairment"—as previously described.[19]

2.2.3. Social engagement

Social engagement indicates the ability to initiate social interaction and to be receptive to social overtures from others, including the formation of social ties, contact, and interactions. MDS social engagement (SocE) is calculated from the six categories of interaction, planned acts, self-initiated act, own-goal, involvement, and group acts. Each item was scored as present versus absent, and the sum ranged from 0 to 6.[20] A higher MDS SocE score indicated better social engagement and also represents better quality of life.

Table 1
Demographic data and clinical characteristics among veterans home residents.

Variables	Mean ± SD, or *n* (%)
Age (y)	83.1 ± 5.1
Body mass index (kg/m^2)	23.7 ± 3.5
Six-month ADL decline	65 (5.8)
Twelve-month mortality	113 (10)
Education (y)	
<6	778 (71.4)
6–9	278 (25.5)
>9	33 (3)
MDS COGS	
Intact–mild	965 (86.5)
Mild–moderate	106 (9.5)
Moderate–severe	42 (3.8)
Severe–very severe	3 (0.3)
Pain scale	
No pain	689 (61.6)
Less than daily pain	285 (25.5)
Mild–moderate daily pain	135 (12.1)
Severe daily pain	9 (0.8)
Baseline RUG-III ADL	4.6 ± 1.9
Baseline SocE	1.7 ± 1.3
Comorbidities	
Amputation	12 (1.1)
Anxiety	8 (0.7)
Arthritis	171 (15.2)
Cancer	38 (3.4)
Congestive heart failure	15 (1.3)
Chronic lung disease	146 (13.0)
Cerebrovascular disease	86 (7.6)
Dementia	69 (6.1)
Depression	42 (3.7)
Diabetes	225 (20.0)
Deep venous thrombosis	3 (0.3)
End-stage renal disease	14 (1.2)
Hip fracture	12 (1.1)
Hypertension	596 (53)
Osteoporosis	12 (1.1)
Peripheral arterial occlusive disease	5 (0.4)
Parkinsonism	40 (3.6)
RAP triggers	
Delirium	25 (2.2)
Cognitive loss	379 (33.7)
Visual function	559 (49.7)
Communication	382 (34.0)
Rehabilitation needs	799 (71.0)
Urinary incontinence	186 (16.5)
Psychosocial well-being	611 (54.3)
Mood states	180 (16.0)
Behavior symptoms	18 (1.6)
Activities	842 (74.8)
Falls	355 (31.6)
Nutrition status	66 (5.9)
Dehydration	13 (1.2)
Dental care	807 (71.7)
Pressure sore	154 (13.7)
Psychotropic drugs	704 (62.6)
Physical restraint	42 (3.7)
Sum of RAP triggers at baseline	5.4 ± 2.5
Increase in sum of RAP triggers within 6 mo	520 (46.2)

ADL = activity of daily living; MDS COGS = Minimum Data Set Cognitive Scale; RAP = resident assessment protocol; RUG-III ADL = Resource Utilization Group-III for Activities of Daily Living.

2.2.4. Pain assessment

Pain scale is categorized for both frequency and intensity constructed from MDS items as four degrees of severity: "no pain," "less than daily pain," "mild/moderate daily pain," and "severe daily pain."[21]

2.2.5. RAP triggers

RAPs are the fundamental components established from different combinations of MDS items to evaluate the care problems of residents.[22] A total of 18 RAP triggers for different situations were