European Geriatric Medicine 7 (2016) 111–116

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Research paper

Transitions in functional status of community dwelling older adults: Impact of physical performance, depression and cognition

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ARTICLE INFO

Article history:
Received 25 July 2015
Accepted 19 January 2016
Available online 8 February 2016

Keywords:
Ageing
Functional status
Older people
Cognitive impairment
Gait speed
Depression

ABSTRACT

Objectives: The aim of this study is to identify transitions in the functional status (FS) of older adults and to assess the influence of physical performance, depression, and cognitive impairment at baseline, and their changes over time, on FS decline.

Methods: This is a population-based cohort with 4 years of follow-up (2008–2011) in "Peñagrande cohort" (Madrid) in Primary care centres, composed of 607 persons aged ≥ 65 years. Transition in FS was classified as no disability, mobility disability and activities of daily living disability based on FS in 2008 and 2011. FS decline was considered as transition to decline, continued disability or death. The Short physical performance battery (SPPB), gait speed (GS), depression and cognitive impairment at baseline and as time-dependent variables (TDVs), were the principal independent variables in logistic regression analysis.

Results: Some 43.3% (95% CI: 39.3–47.4) of the study population experienced FS decline. Low SPPB and depression at baseline were associated with FS decline (odds ratio [OR] 5.79, 95% CI: 3.39–9.90 and OR 2.92, 95% CI: 1.71–5.02, respectively). The OR of FS decline (fully adjusted) were: 2.90 (95% CI: 1.59–5.29) for decrease in SPPB over time, 5.73 (95% CI: 3.36–9.77) for worsening depression, and 1.93 (95% CI: 1.13–3.29) for worsening of cognitive impairment. GS was also associated with FS decline when used as an alternative indicator of physical performance both at baseline (OR 3.26 [95% CI: 2.08–5.11]) and as TDV (OR 5.60 [95% CI: 3.17–9.89]).

Conclusion: The presence of low physical performance, depression and cognitive impairment predicts FS decline. Evaluation of these factors could be helpful in early diagnosis of FS decline.

1. Introduction

Functional limitations may lead to mobility disability or disability in the activities of daily living (ADL). Several studies [1–4] have found that disability is not a static state, but has a dynamic nature, which means that people can move in and out of disability, with continuous transitions between states of disability. Understanding who is more likely to deteriorate and who may remain stable or even revert back to no disability will allow clinicians to focus on those at the highest risk for early interventions [5,6].

Physical performance has become a common summary measure of the overall effect of medical conditions, lifestyle, and age-related physiologic changes in the context of a person's environment and social support system. Poor physical performance has been shown to be strongly associated with disability, short-term mortality, nursing home admission, poor health and quality of life [6–8]. The Short physical performance battery (SPPB) has become a reference instrument for the measure of physical performance [7,8].

Gait speed (GS) is a valid, reliable and sensitive measure appropriate for assessing and monitoring functional status (FS) and overall health in a wide range of populations. These capabilities have led to its designation as the "6th vital sign" [9]. GS can be considered a highly cost-effective tool for early detection of functional limitation and implementation of

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http://dx.doi.org/10.1016/j.eurger.2016.01.006
1878-7649/

appropriate interventions in older adults to reduce their progression to disability mobility and disability [10].

Studies have also shown that sex, chronic disease, physical performance, cognitive impairment and depressive symptoms, among other variables, are considered as contributing to functional decline [3,11–15]. However, these studies have usually focused on cross-sectional associations; to our knowledge, there is a lack of studies investigating the prospective association between transitions in functional status (decline or improvement) and transitions in physical performance and depression.

In this study, we examined transitions between functional status categories in a cohort of older Spanish people. We also attempted to assess the influence of physical performance, depression, and cognitive impairment, and the change in these variables over time, on FS decline.

2. Materials and methods

2.1. Study population, design and sample characteristics

This study used data from the population-based longitudinal study "Peñagrande cohort" of persons age 65 and over with 4 years of follow-up (from January 2008 to December 2011). The methodological characteristics of this study have been described elsewhere [16]. In brief, Peñagrande is an urban neighbourhood of Northern Madrid (Spain). A stratified random sample by sex and 5-year age groups was obtained of individuals aged 65 and over. The baseline cohort (mean age: 77) was launched in 2008. The response rate was 73.3% (419 women and 395 men). In the 2011 follow-up, 122 persons died and 207 (25.4%) were lost due to changes of address or refusal to participate. The baseline characteristics of individuals lost to follow-up were very similar to those of participants for all variables studied except sex (49.8% were women versus 51.5% respectively). The present study was based on the 607 individuals with data at both baseline and follow-up (including deaths).

2.2. Study variables

Based on Keeler and cols' definition [17], we classified FS into three categories:

- no disability (independent in mobility and ADL);
- only mobility disability (but independent in ADL);
- mobility and ADL disability, the latter defined as disability in at least one of a selected list of 8 ADLs [16].

Mobility disability was considered to exist when the response on a Likert scale (four possible responses) to the questions "How much difficulty do you have in (1) going up or down a flight of stairs, or (2) walking one kilometre" was "great difficulty" or "unable to do". Vital status as of 31 December 2011 was confirmed through the National Death Index, ministry of Health of Spain.

We focused on FS decline (2008–2011), which was considered to exist when the transition was declined in FS, continued disability or death. People who had "no disability" in 2008 and continued in this situation in 2011, were considered the reference group.

Physical performance was measured with the SPPB and GS. A SPPB summary score ranging from 0 to 12 was obtained at baseline and in 2011, and was used to create a dichotomous variable (0: ≥ 8 and 1: < 8).

For this study, GS, in addition to being part of the SPPB, was considered as a separate indicator of physical performance. GS was measured at baseline and in 2011 for a 3-meter walk and was expressed in meters/second (m/s). A dichotomous variable was created in which 0: ≥ 0.8 m/s and 1: < 0.8 m/s.

Depressive symptoms were measured in 2008 with the scale developed by the Centre for epidemiologic studies [18], and in 2011 with the self-assessment scale "The hospital anxiety and depression scale" [19].

Cognitive impairment were measured at baseline and in 2011 with the Mini Mental State Examination (MMSE) validated for the Spanish population [20]. Cognitive impairment was considered when the person obtained a score of ≤ 24 on the MMSE.

Four dichotomous time-dependent variables (TDVs) were constructed: decline in SPPB 2008–2011, decline in GS 2008–2011 worsening of depression 2008–2011 and worsening of cognitive impairment 2008–2011 (0: status remained good or improved; 1: status remained poor, declined or death).

2.3. Other covariables

We also analysed age, sex and comorbidity, defined as the presence of three or more chronic diseases from a list of nine, following the proposals of the Peñagrande study [16].

2.4. Data collection

A semi-structured survey instrument was developed, which was completed by trained health personnel in the Peñagrande health centre or in the participant's home. Written informed consent was obtained from all participants. The project was approved by the corresponding Ethics committee.

2.5. Statistical analysis

In this study, FS decline (2008–2011) was considered the dependent variable, and physical performance, depression, and cognitive impairment were the main independent variables. Baseline demographic and health characteristics were presented using descriptive statistics. For the continuous variables, the mean and standard deviation (or median and interquartile range [IQR] where appropriate) were calculated. Categorical variables were expressed as absolute frequencies and their 95% confidence intervals (95% CIs). The descriptive analyses were weighted by age and sex, taking the North Madrid District Population in 2010 as the reference population.

Multiple logistic regression analysis was used to assess the association of physical performance, depression, and cognitive impairment with FS decline, summarized with odds ratios (ORs) and their respective 95% CIs. Separate models were built with independent variables at baseline and as TDV. The models were progressively adjusted for:

- age and sex (model 1);
- plus comorbidity, SPPB (or gait speed), depression, and cognitive impairment or comorbidiry, decline in SPPB (or decline in gait speed), worsening of depression, and worsening of cognitive impairment as appropriate (model 2).

To see whether the previous models with TDV were independent of baseline physical performance, depression and cognitive impairment, we additionally adjusted for these baseline variables (model 3).

Given the close relationship (collinearity) between SPPB and GS, two separate logistic regressions were conducted for each of these physical performance variables. Results with $P < 0.05$ were considered statistically significant. All analyses were performed using SPSS for Windows version 21.0 and EPIDAT 3.1 to calculate