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Physical status and frailty index in nursing home residents: Results from the INCUR study

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ABSTRACT

Aim: The Short Physical Performance Battery (SPPB) is a widely used instrument for measuring physical performance, consisting of 3 sub-tests: a hierarchical test of balance, a gait speed test, and a chair stand test. Although equally considered in the computation of the SPPB score, each of the components may present a specific and different weight in clinical practice. The aim of this study was to estimate the relationship between SPPB and its component of an age-related deficit accumulation index (the so-called Frailty Index [FI] proposed by Rockwood).

Method: Data are from a longitudinal cohort study (ie, the Incidence of pNeumonia and related ConseqUences in nursing home Residents [INCUR]) of 730 older persons (74.29% women) living in 13 French nursing homes. The FI was computed as the ratio between 30 actual and potential deficits the participant might have presented at the baseline visit (range between 0 [no deficit] and 1 [30 deficits]). Physical status was assessed using the SPPB score at baseline. Descriptive statistics and linear regression analyses were used to determine the relationship between the SPPB and FI and estimate which components of the SPPB were most strongly associated with the FI.

Results: Mean age of participants was 86.5 (SD 7.5) years, with a mean FI of 0.37 (SD 0.11) and SPPB of 2.5 (range between 0 and 12). The SPPB and its components were all significantly associated with the FI, but the magnitude of the associations varied. Linear regression analyses adjusted for age, sex, showed that the balance test [beta = −0.045 (95%CI −0.042; −0.028), p < 0.0001] and chair stand test [beta = −0.040 (95%CI −0.054; −0.027), p < 0.0001] was more strongly associated with the FI than the gait speed [beta = −0.015 (95%CI −0.021; −0.008), p < 0.0001].

Conclusion: Of the 3 components of the SPPB, both balance and chair tests seem particularly relevant indicator of frailty among very old and complex elders living in nursing homes.

1. Introduction

Aging has been clearly associated with physical performance and muscle strength decline. Loss of physical function represents a major public health issue, especially considering the growing number of older persons in Western countries (Guralnik, Fried, & Salive, 1996). The Short Physical Performance Battery (SPPB) is one of the most commonly used instruments for measuring physical performance in population studies of aging (Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995). It has been validated in the general population aged 65 years and older as a strong predictor of adverse outcomes such as disability in Activities of Daily Living (ADLs), loss of mobility, hospitalization, duration of stay in the hospital, admission to nursing facilities and mortality. It consists of three sub-tests: a hierarchical test of balance, a gait speed test, and a chair stand test. The SPPB can be safely used to assess functional capacity in outpatient and clinical

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settings and it is easy to administer in older community-dwelling (Ostir, Markides, Black, & Goodwin, 1998; Volpato, Cavalieri, Guerra, Sioulis, Ranzini & Maraldi, 2008) adults. However, this tool has rarely been explored in nursing home (NH) residents (González-Vaca, de la Rica-Escuín, Silva-Iglesias, Arjonilla-García, Varela-Pérez & Oliver-Carbonell, 2014; Sievänen, Karinkanta, Moisio-Vilenius, & Ripsaluoma, 2014). This population represents a highly vulnerable part of the heterogeneous geriatric patients, characterized by a high prevalence of chronic diseases, impaired physical functions and limitations of activities of daily living (Luo et al., 2015). Many risk factors may also increase the risk for (worsening) disability in these subjects, such as polypharmacy and multiple comorbidities (Luo et al., 2015). Yet multidomains interventions have an impact on physical performance in community-dwelling (Ng, Feng, Nyunt, Feng, Niti & Tan, 2015; Pahor, Guralnik, Ambrosius, Blair, Bonds & Church, 2014) and Nursing home residents (Abizanda, Sinclair, Barcons, Lizán, & Rodríguez-Mañas, 2016).

Conversely, frailty has shown to significantly predict negative outcome (including disability and mortality). The frailty index (FI) is a widely used instrument based on the arithmetical computation of deficits occurring with aging (taking into account clinical signs, symptoms, diseases, disabilities, psychosocial risk factors, and geriatric syndromes). The index is strongly associated with negative health-related outcomes (including hospitalizations, institutionalization, and mortality) in community-dwelling older person (Drubbel et al., 2013; Rockwood, Song, MacKnight, Bergman, Hogan & McDowell, 2005) as well as in very old and complex elders, such as nursing home residents (Tabue-Teguo et al., 2015). Because of its continuous nature, the FI is considered a more sensitive measure of the individual's vulnerability to stressors (Rockwood & Mitnitski, 2012).

To date, components of the SPPB have not yet been evaluated in comparison with the FI. It is important to determine the relationship between the FI and the SPPB and which components of the SPPB are most informative to establish frailty in clinical practice in nursing home residents. Although components of the SPPB are considered equal in the computation of the SPPB score, each of them may present a specific and different weight in clinical practice. Determining these weights may help at prioritize interventions (Baert, Gorus, Calleeuw, De Backer, & Bautmans, 2016) according to the specific results of the subtests.

The objective of this study was determine the relationship between SPPB and FI and to estimate the weight of each SPPB component in terms of age-related deficit accumulation (defined according to the FI proposed by Rockwood and colleagues) in a sample of Nursing Home residents. To explore such hypothesis, our study took advantage of the "Incidence of pNeumonia and related ConseqUences in nursing home Residents" (INCUR) study database, a longitudinal cohort study conducted in multiple French nursing homes.

2. Methods

The data used in this study were collected as part of the INCUR study, a French multicenter observational cohort study. The INCUR study was primarily aimed at estimating the incidence of pneumonia events in older persons living in nursing homes in France over a period of 12 months. A detailed description of the INCUR methodology and study design was previously described (Demougeot, Rolland, Gérard, Pennetier, Duboué & Vellas, 2013). Briefly, a total of 800 nursing home residents aged 60 and older were recruited in 13 nursing homes randomly selected in the Midi-Pyrénées region of France between 2012 and 2013. The participants were characterized by presenting a score ranging between 2 and 5 (both included) at the Groupes Iso-Ressources (GIR) scale (Vetel, 1994). This is the French administrative tool used to rate the ability of the person to be independent in his or her daily life. It scores from 6 (fully independent) to 1 (fully dependent, bedridden). Each eligible participant was followed for 12 months with a total of 3 clinical assessments (baseline, 6-month, and 12-month visits). The INCUR visits were conducted by research staff specifically trained at the Gérontopôle of the Centre Hospitalier Universitaire de Toulouse (Toulouse, France). The study personnel collected information from the nursing home medical charts. Collected data included socio-demographic and lifestyle characteristics, chronic diseases, and functional status including the SPPB. If data were missing, the personnel were authorized to use additional medical sources (eg, discharge letters from hospitalizations) and/or obtain them by administering specific tests.

The Ethical Committee of the Centre Hospitalier Universitaire de Toulouse approved the entire study protocol. Because the study was conducted as part of standard care activities, no formal written informed consent was administered (as per the Ethical Committee's exemption). However, all participants and their proxies were informed by the study investigators about the ongoing research activity and left free to accept or refuse their participation. The current analyses were performed in 730 participants after exclusion of 70 individuals with missing data for the main variables of interest.

2.1. Frailty index

In the present analyses, the FI was generated from the data collected at the baseline assessment. Each deficit included in the FI (Table 1) was coded as 0 or 1 accordingly with the absence or presence of the condition, respectively. Overall, 30 variables were considered for the computation of the FI, providing our model a sufficient amount of robustness (Searle, Mitnitski, Gahbauer, Gill, & Rockwood, 2008). Items included the presence and/or severity of current diseases, ability in activities of daily living, and physical signs from the clinical and neurological examinations. For example, an individual scored 1 on the "respiratory disease" if he/she reported Asthma, Chronic Obstructive Pulmonary Disease, Respiratory Insufficiency, and 0 if he/she did not.

Table 1
List of variables used to construct the 30-items INCUR Frailty Index.

1	Hypertension
2	Atrial fibrillation
3	Coronary heart disease
4	Congestive heart failure
5	Diabetes
6	Depression
7	Osteoarthritis
8	Osteoporosis
9	Respiratory disease
10	Lung problems
11	Kidney disease
12	Liver disease
13	Thyroid disease
14	Pain
15	Hearing Loss
16	Decreased Visual Acuity
17	Dementia
18	Parkinson's disease
19	Stroke
20	Cancer
21	Disability in bathing
22	Disability in dressing
23	Disability in toileting
24	Disability in transferring
25	Urinary incontinence
26	Disability in self-feeding
27	Disability in using the telephone
28	Disability in managing money
29	Involuntary weight loss
30	Neuropsychological problems

Footnote: Diagnosis of some measure (for example: Atrial Fibrillation, Hypertension, diabetes, depression, cancer, stroke…) included in the FI means was obtained from chart. "Disability in Bathing = Score of 0 in Katz index".