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Original Study

Incidence of Disability in Frail Older Persons With or Without Slow Walking Speed

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A B S T R A C T

Objective: To identify the differences of incidence of disability between frail older persons with and without slow walking speed.
Design: Prospective cohort study.
Setting: Japanese community.
Participants: A total of l4,081 older adults aged ≥65 years living in the community, participated in a baseline assessment and were followed for incidence of disability for 29.5 months.
Measurements: Care-needs certification in the national long-term care insurance system of Japan, physical frailty (slow walking speed, muscle weakness, exhaustion, low activity, weight loss), adjusted for several potential confounders such as demographic characteristics; Kaplan-Meier survival curves for incident disability by physical frailty with and without slow walking speed.
Results: During the follow-up period, 198 participants (4.9%) were certified as requiring long-term care insurance in accordance with incident disability. Participants who had prefrailty without slow walking speed (hazard ratio 1.86, 95% confidence interval 1.19–2.92), prefrailty with slow walking speed (3.62, 2.19–5.96), frailty without slow walking speed (4.33, 2.00–9.39), and frailty with slow walking speed (4.68, 2.72–8.05) at the baseline assessment had an increased risk of incident disability compared with nonfrail participants. In stratified analyses, frail older men and frail participants with low cognitive performance had the highest risk of incidence of disability.
Conclusion: The presence of frailty or even prefrailty when older adults showed slow walking speed increased the risk of future disability in community-dwelling older adults.

Japan implemented the national social long-term care insurance (LTCI) system on April 1, 2000. Every Japanese person aged 65 and older is eligible for benefits based strictly on physical and mental frailty or disability.[1] Physical frailty increases with advancing age and is a major risk factor for dependency, institutionalization, and mortality in older people.[2–4] People with a disability incur higher health care costs compared with those without a disability.[5] For the purpose of targeting risk factors for future frailty, adequate assessment of individuals is necessary. A feasible and valid screening tool available for research and clinical settings is required to identify frailty in the community.

The well-known frailty phenotype introduced by Fried et al,[6] which classifies people into categories of robust, prefrail, or frail, fits within this physiological approach to frailty. The frailty phenotype postulates that 5 indicators (weight loss, exhaustion, slow walking speed, low grip strength, and low physical activity) are related to each other in a cycle of frailty. A person with none of the indicators is robust, a person with 1 or 2 indicators is prefrail, and a person with 3 or more indicators is frail. Older people who are frail according to the phenotype have a higher risk of disability.[7–9] The Interventions on Frailty Working Group developed recommendations to screen, recruit, evaluate, and retain frail older persons in clinical trials.[10] They reported that most researchers focus on the following domains for the identification of physical frailty: mobility, such as lower-extremity

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performance and gait abnormalities; muscle weakness; poor exercise tolerance; unstable balance; and factors related to body composition, such as weight loss, malnutrition, and muscle loss.[10]

In an effort to select tailored preventive programs in the Japanese LTCI system, those at high risk for subsequent disability are identified with a basic functional status questionnaire. Although the questionnaire is relatively quick to administer, a performance-based assessment could determine actual physical capacity and might more accurately predict subsequent physical disability in community-living older people. Guralnik et al[11] reported that measures of physical performance may identify older persons with a preclinical stage of disability who may benefit from interventions to prevent the development of frank disability. Walking speed has been consistently reported to differentiate between participants with and those without personal care, with frail older persons walking significantly slower,[12,13] and has proved to be a strong predictor of adverse events, such as disability,[14–20] mortality,[15,16,21,22] hospitalization,[15,16,18,23] falls,[23,24] and dementia.[25] We generally agree with the concept of the frailty model and its components to identify frailty including slowness, weakness, exhaustion, low activity, and weight loss. However, previous studies suggest that the separate components do not have equal impacts on the onset of disability in older adults. We hypothesize that slow walking speed has a greater impact on the incidence of disability than the other components of frailty. The purpose of this study was to identify the differences of incidence of disability between frail older persons with and without slow walking speed.

Methods

Participants

This prospective cohort study involved 5104 community-dwelling older adults (≥65 years) enrolled in the Obu Study of Health Promotion for the Elderly (OSHPE).[26] OSHPE participants were recruited from Obu, a residential suburb of Nagoya, Japan. Inclusion criteria were an age of ≥65 years at examination in 2011 or 2012, Obu residency, and no previous participation in other studies. Exclusion criteria were the need for support or care certified by the Japanese public LTCI system, disability in basic activities of daily living, and inability to undergo performance-based assessments.[26] Between August 2011 and February 2012, 5104 community-dwelling older people participated in a baseline OSHPE assessment including a face-to-face interview and measures of physical and cognitive function. Participants were followed monthly and monitored for certification of LTCI for at least 2 years. In this longitudinal study, we included participants who completed baseline assessments and follow-up assessments of disability by the LTIC system. We excluded participants with a history of Parkinson disease, stroke, depression, and dementia, Mini-Mental State Examination (MMSE)[27] scores of <20, or having a disability based on the LTIC system at baseline. Participants who died or who moved to another city during the follow-up period were also excluded. Of 5104 participants who completed a baseline assessment, 1023 older adults were excluded from the present study. The remaining 4081 participants of average age 71.7 ± 5.3 years (women 51.6%) were included in the following analyses.

Informed consent was obtained from all participants prior to their inclusion in the study, and the Ethics Committee of the National Center for Gerontology and Geriatrics approved the study protocol.

Operationalization of Physical Frailty

We considered the frailty phenotype to be characterized by limitations in 3 or more of the following 5 conditions based on those used in Fried's original studies[6]: slow walking speed, weakness, exhaustion, low activity, and weight loss. Participants having none of these components were considered to be nonfrail, and those having 1 or 2 components were considered to be in prefrail. Participants with prefrailty and frailty were divided into the following 4 groups according to frailty status and walking speed (cutoff <1.0 m/s): prefrailty without slow walking speed, prefrailty with slow walking speed, frailty without slow walking speed, and frailty with slow walking speed.

Walking speed was measured in seconds using a stopwatch. Participants were asked to walk on a flat and straight surface at a comfortable walking speed. Two markers were used to indicate the start and end of a 2.4-m walk path, with a 2-m section to be traversed before passing the start marker so that participants were walking at a comfortable pace by the time they reached the timed path. Participants were asked to continue walking for an additional 2 m past the end of the path to ensure a consistent walking pace while on the timed path. Slowness was established according to a cutoff (<1.0 m/s).[26] Weakness was defined using maximum grip strength. Grip strength was measured in kilograms using a Smedley-type handheld dynamometer (GRIP-D; Takei Ltd, Niigata, Japan). Weakness was established according to a sex-specific cutoff (<26 kg for men and <18 kg for women).[28] Exhaustion was considered present if the participant responded "yes" to the following question, which included the Kihon-Checklist, a self-reported comprehensive health checklist that was developed by the Japanese Ministry of Health, Labor, and Welfare[29]: "In the last 2 weeks, have you felt tired without a reason?" We evaluated the role of physical activity by asking the following questions about time spent engaged in sports and exercise: (1) "Do you engage in moderate levels of physical exercise or sports aimed at health?" and (2) "Do you engage in low levels of physical exercise aimed at health?" If participants answered "no" to both of these questions, we considered them to be low activity.[26] Weight loss was assessed by a response of "yes" to the question, "Have you lost 2 kg or more in the past 6 months?"[29]

Investigation for Incidence of Disability

Participants were followed monthly for incident certification of need of care in the national LTCI system during the 2 years following the baseline assessment. We defined onset of disability as the point when a participant was certified as needing care by the LTCI. Every Japanese person aged 65 and older is eligible for benefits (institutional and community-based services, but not cash) based strictly on physical and mental disability. The computer-aided standardized needs-assessment system categorizes people into 7 levels of need. The LTCI certifies a person as "support level 1 or 2" if they need support for daily activities or "care level 1, 2, 3, 4, or 5" if they need continuous care.[1] In this study, the outcome of disability was defined as a new certification of the LTCI service at any level.

Potential Confounding Factors of Activities of Daily Living

With reference to the review article by Stuck et al[30] and a previous longitudinal study by Ishizaki et al,[31] we selected 2 demographic variables, 3 physiological variables, 4 primary diseases or geriatric syndromes, and 6 psychosocial variables as possible confounding factors of activities of daily living (ADL) limitations (Table 1). The physiological variables "overweight" and "underweight" were determined by measuring body mass index, and the cut points of overweight and underweight were set at 27.5 kg/m^2 and <18.5 kg/m^2, respectively.[32] Measurements of the ability to walk continuously for 15 minutes and knee and lumbar pain ("yes" or "no") were recorded from a self-report collected through the interview survey. The nurses who identified the chronic condition from the interview survey