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Original Study

Instruments to Assess Sarcopenia and Physical Frailty in Older People Living in a Community (Care) Setting: Similarities and Discrepancies

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A B S T R A C T

Objectives: Both sarcopenia and physical frailty are geriatric syndromes causing loss of functionality and independence. This study explored the association between sarcopenia and physical frailty and the overlap of their criteria in older people living in different community (care) settings. Moreover, it investigated the concurrent validity of the FRAIL scale to assess physical frailty, by comparison with the widely used Fried criteria.
Design: Data were retrieved from the cross-sectional Maastricht Sarcopenia Study (MaSS).
Setting: The study was undertaken in different community care settings in an urban area (Maastricht) in the south of the Netherlands.
Participants: Participants were 65 years or older, gave written informed consent, were able to understand Dutch language, and were not wheelchair bound or bedridden.
Intervention: Not applicable.
Measurements: Sarcopenia was identified using the algorithm of the European Working Group on Sarcopenia in Older People. Physical frailty was assessed by the Fried criteria and by the FRAIL scale. Logistic regression was performed to assess the association between sarcopenia and physical frailty measured by the Fried criteria. Spearman correlation was performed to assess the concurrent validity of the FRAIL scale compared with the Fried criteria.
Results: Data from 227 participants, mean age 74.9 years, were analyzed. Sarcopenia was identified in 23.3% of the participants, when using the cutoff levels for moderate sarcopenia. Physical frailty was identified in 8.4% (≥3 Fried criteria) and 9.3% (≥3 FRAIL scale criteria) of the study population. Sarcopenia and physical frailty were significantly associated ($P = .022$). Frail older people were more likely to be sarcopenic than those who were not frail. In older people who were not frail, the risk of having sarcopenia increased with age. Next to poor grip strength (78.9%) and slow gait speed (89.5%), poor performance in other functional tests was common in frail older people. The 2 physical frailty scales were significantly correlated ($r = 0.617$, $P < .001$).
Conclusion: Sarcopenia and physical frailty were associated and partly overlap, especially on parameters of impaired physical function. Some evidence for concurrent validity between the FRAIL scale and Fried criteria was found. Future research should elicit the value of combining sarcopenia and frailty measures in preventing disability and other negative health outcomes.

In the past 2 decades, the concepts and definitions of the geriatric syndromes sarcopenia and frailty have been frequently revised. In addition, their application in clinical practice for diagnosis and therapy has been challenged.[1,2] This has resulted in prevalence rates varying between 0.9% and 50.0% for sarcopenia[3] and between 4.0%

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and 59.1% for frailty[4] in the older community-dwelling population. The concept of sarcopenia partly overlaps with the concept of physical frailty (see Appendix 1), and therefore they might cover the same population. Sarcopenia was defined by the European Working Group on Sarcopenia in Older Persons (EWGSOP) as a loss of muscle mass in combination with a loss of muscle strength and/or physical performance.[5] Frailty is defined as a clinical state of increased vulnerability of an older person to a stressor,[6] such as pain or a psychologically stressful event. Therefore, a holistic approach of frailty encompasses a physical, psychological, and social domain; however, most frailty instruments focus on physical frailty only.[7] Experts consider sarcopenia as a key component of physical frailty,[8–10] or as a key pathway between physical frailty and disability.[11] However, little is currently known about the association between the criteria of sarcopenia and physical frailty.[12]

Although valid models of (physical) frailty exist in epidemiological research, more efficient models need to be developed to detect frailty in clinical practice.[9] One of the most known and validated operational definitions of physical frailty in older people is the frailty phenotype [13,14] Fried et al[14] defined physical frailty as the presence of 3 or more of the following criteria (see Appendix 1): (1) unintentional weight loss, (2) self-reported exhaustion, (3) weakness (grip strength), (4) slow walking speed, and (5) low physical activity. Although the criteria are easy to perform, their assessment is not always doable in clinical practice because of a lack of resources, such as dynamometers, lack of space for a walk test, or lack of time to perform multiple measurements.[13] A simple and rapid screening test, the FRAIL scale, has recently been developed and validated by Morley et al.[15] It consists of 5 simple questions to assess physical frailty, related to (1) Fatigue, (2) Resistance, (3) Ambulation, (4) Illnesses, and (5) Loss of Weight. Such a rapid test might be more feasible for physicians to assess physical frailty in clinical practice and thus might facilitate diagnosis and treatment.

Unravelling the association of the concepts and criteria of sarcopenia and physical frailty is needed to boost the development and implementation of an efficient screening tool. This study explored the association between the concepts of sarcopenia (by the EWGSOP, including both moderate and severely low skeletal muscle index) and physical frailty (by the Fried criteria with $\geq$3 positive criteria), and the overlap between their indicators in older people living in different community (care) settings. It is hypothesized that frail older people are more likely to be sarcopenic than those who are not frail. Our secondary aim was to examine the concurrent validity of the FRAIL scale to assess physical frailty compared with the Fried criteria. The Fried criteria will be used as comparison instrument, because it is widely known, validated, and commonly used.[13,14,16,17]

Methods

Design and Setting

Data were retrieved from the Maastricht Sarcopenia Study (MaSS), which was undertaken in older people in different community care settings in an urban area (Maastricht) in the south of the Netherlands. MaSS is a cross-sectional study aiming to characterize sarcopenia by measuring the prevalence; associated factors, such as nutritional status, physical activity, and health; and economic consequences of sarcopenia. More information on study design and recruitment can be found at www.clinicaltrials.gov (NCT01820988).

Participants

The study was conducted in 247 participants aged 65 years or older in the following community settings: independently living without home care, older people receiving home care, and older people residing in an assisted or residential living facility. On request, the municipality of Maastricht provided a random sample of older people. An information letter and informed consent form were sent. Participants were included when they gave written informed consent, were able to understand the Dutch language, and were not wheelchair bound or bedridden. Participants with an implantable cardiac defibrillator/pacemaker, or suffering from a severe heart, joint, or nervous system disease or dementia were excluded, because of safety reasons and/or incapability of performing the physical tests.

Measures

Sarcopenia was assessed according to the EWGSOP algorithm, including muscle mass, strength, and physical performance.[5] Muscle mass was assessed by bioelectrical impedance (BIA Akern Srl, Florence, Italy 101, 50 kHz), complying with the European Society for Clinical Nutrition and Metabolism Guidelines.[18] Skeletal muscle mass was calculated using the equation developed by Janssen et al,[19] because this equation is applicable in an older Caucasian population: skeletal muscle mass (kg) = ([height^2/resistance BIA analysis *0.401] + [gender*3.825] + [age*−0.071]) + 5.102, where height is in centimeters, resistance in ohms, male gender is coded 1 and female 0, and age in years. Muscle mass was then converted to skeletal muscle index (SMI) by dividing muscle mass by height (in m) squared. Muscle strength was assessed by a JAMAR hand-held dynamometer (Sammons Preston, Inc, Warrenville, IL) to measure grip strength. Participants performed one try-out attempt followed by alternately 3 attempts with their left hand and 3 attempts with their right hand. Physical performance was assessed by normal walking speed (m/s) over a 4-meter track. These measures for muscle mass, function, and performance were found to be valid and feasible in community-dwelling older people.[20,21] Participants were classified as sarcopenic when they had a low muscle mass, defined as a low SMI $\leq$10.75 kg/m^2 (in men) and $\leq$6.75 kg/m^2 (in women),[22] and low muscle strength (men <30 kg; women <20 kg), and/or low physical performance (walking speed <0.8 m/s). The cutoff values for low muscle mass include both moderate and severe low muscle mass.[22] Other performance measures included balance testing and a 5 times chair stand, as part of the Short Physical Performance Battery (SPPB).[23]

Physical frailty was assessed by the previously validated Fried criteria[14] and the FRAIL scale.[15,24] The 5 Fried criteria were assessed as follows: (1) a question about unintentional weight loss of more than 4.5 kg in the past year (0 = no, 1 = yes) and (2) a question about self-reported exhaustion (0 = rarely or a little of the time, 1 = a moderate amount of the time or most of the time). Both questions were available in the Dutch language. The third Fried criterion is weakness, measured by a hand-held dynamometer, with normal grip strength = 0, low grip strength = 1; cutoff points were stratified by gender and body mass index according to Fried et al[14] (see Appendix 2). The fourth criterion, walking speed, was measured by timing the participants' normal walking speed over a 4-m track. Normal walking speed = 0, slow walking speed = 1; cutoff points were stratified by gender and height[14] (see Appendix 2). The fifth and last Fried criterion is physical activity, measured by the Minnesota Leisure Time Physical Activity Questionnaire.[25] Normal physical activity = 0, low physical activity = 1; cutoff points for low physical activity are less than 383 kcal/week (men) or less than 270 kcal/week (women). Participants were considered prefrail or frail when they scored 1 to 2 or 3 to 5 points, respectively.

The FRAIL scale[15] consists of 5 questions: (1) fatigue (0 = none of the time, a little of the time, some of the time; 1 = most of the time, all of the time), (2) resistance (difficulty walking up 10 steps; 0 = no,