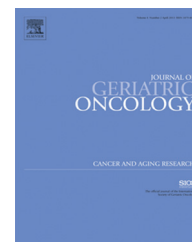


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Associations between a patient-reported outcome (PRO) measure of sarcopenia and falls, functional status, and physical performance in older patients with cancer

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ABSTRACT

Objective: In older patients with cancer, we aimed to investigate associations between a patient-reported outcome measure for sarcopenia (SarcoPRO) and the Short Physical Performance Battery (SPPB), self-reported falls, and limitations in instrumental activities of daily living (IADLs). **Materials and Methods:** Assessments were conducted as part of the initial evaluation of older, often frail, patients with cancer seen in the Specialized Oncology Care and Research in the Elderly (SOCARE) clinic. Univariate associations were evaluated using Spearman's correlation and Wilcoxon sign ranked tests. Logistic regressions were used to identify associations of clinical factors and SarcoPRO scores or SPPB scores with falls and IADL limitations.

Results: In total, 174 older patients with cancer were evaluated. A moderate correlation was found between the SarcoPRO and the SPPB ($\rho = 0.62$). After adjusting for multiple clinical factors, neither the SarcoPRO nor the SPPB were associated with falls. In contrast, both higher SarcoPRO (i.e., worse) and lower SPPB (i.e., worse) scores were associated with limitations in IADLs (odds ratio for one unit change in predictor: SarcoPRO: 1.06, $p < 0.0001$; SPPB: 0.71, $p = 0.003$, respectively). Models using the SarcoPRO and SPPB explained similar amounts of variability in association with IADL limitations (AUC: 0.88 vs. 0.87, respectively). **Conclusions:** The SarcoPRO was moderately associated with the SPPB, an objective measure of physical performance, and was associated with limitations in IADLs. Thus, older patients with cancer who present with IADL limitations should be screened for sarcopenia. The SarcoPRO shows promise as a measure for screening as well as outcome assessment for research on sarcopenia.

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1. Introduction

1.1. Background

Sarcopenia is the degenerative loss of muscle mass, quality, and strength associated with aging. Sarcopenia is commonly accelerated in patients with cancer as a result of upregulation of the inflammatory response, malnutrition, or cancer treatments.¹⁻⁸ Low scores on a lower extremity physical performance test, which can indicate muscle weakness, have been identified as a major risk factor for falls in older adults.^{9,10} The prevalence of falls is higher for patients with cancer compared with their age-matched counterparts without cancer.¹¹⁻¹³ For example, a nationally representative, population-based study of older Medicare beneficiaries found that over 1 out of 5 cancer survivors reported recent falls, which was higher than in an age-matched cohort without cancer.¹¹ Cancer is more common in the elderly population, in which sarcopenia is more common than in younger adults. Furthermore, patients with cancer are more likely to have sarcopenia than individuals of similar age.^{14,15}

In addition to falls, limitations in independent activities of daily living (IADLs) can compromise the patient's ability to live independently and greatly decrease the quality of life of elderly individuals. A longitudinal study in community-dwelling older adults showed that baseline limitations in IADLs predicted an increase in the number of physician visits in the subsequent 3 years.¹⁶ Using the Surveillance Epidemiology and End Results data and the Medicare health outcomes survey linked data set (i.e., SEER-MHOS data set), Stafford et al.¹⁷ found that patients with cancer reported interference in IADLs more often than similar patients without cancer. Patients who experienced chemotherapy toxicity reported a larger decrease in physical function and ability to independently perform IADLs than patients with cancer who did not experience chemotherapy toxicity.¹⁸

Several studies have shown that decreased physical function and/or muscle weakness are associated with IADL deficits and can predict future limitations in IADLs.^{16,19-22} In these studies, sarcopenia or loss of muscle size and strength is usually measured using physical function tests such as the Short Physical Performance Battery (SPPB).²³ These performance tests, which must be administered in the clinic, include timed short distance walks, repetitive chair stands, and balance tests. These tests require trained professionals with adequate time and space; all of which are often unavailable in busy clinics. Deficits in lower extremity physical function, including muscle weakness, are commonly identified as a risk factor for falls and are associated with interference in IADLs in the elderly and cancer patient populations.²⁴ Therefore, identifying a quick, inexpensive self-report tool that can assess sarcopenia and potentially predict falls or limitations in IADLs could help identify patients for falls prevention and interventions designed to preserve IADLs.

The objective of this study was to investigate the utility of a self-reported measure of sarcopenia and generate hypotheses to test in future studies by assessing its association with an objective measure of lower extremity physical performance (i.e., SPPB) as well as falls and limitations in IADLs in frail, older patients with cancer.

2. Methods

Patients and Assessments

The study cohort consisted of patients aged 65 and over who were referred to the Specialized Oncologic Care and Research in the Elderly (SOCARE) clinic for comprehensive evaluation with geriatric assessment (GA). The older patients referred to the SOCARE clinic are generally newly diagnosed and often frail patients who have recently been started on treatment or in the process of deciding which treatments are appropriate. Because chemotherapy has a high risk of toxicity in frail patients, older patients are referred to the SOCARE clinic for the expert advice of geriatric oncologists who provide assessments and counseling for frail patients regularly to help decide whether to initiate chemotherapy. This study was approved by the University of Rochester's Research Subjects Review Board. All patients signed a written informed consent. Upon referral to the SOCARE clinic, patients reported if they had fallen in the last 12 months using a standard questionnaire.²⁵ They then completed the SarcoPRO (patient-reported outcome measure for sarcopenia).²⁶ The SarcoPRO was recently developed using open-ended interviews in which patients with known sarcopenia ($n = 12$) were asked to characterize the functional effects of their reduced muscle strength on their daily lives. A common set of codes was developed to summarize the data and create a preliminary survey. Subsequent cognitive interviews with another cohort of sarcopenia patients ($n = 12$) were used to finalize the measure.²⁶ The originally published measure consists of 14 items, a series of questions (each ranked on a 0–10 numeric rating scale) asking about physical limitations of the lower extremities, including those resulting from muscle weakness. One item, number 10 ["How much difficulty did you have lifting objects that weigh about 10 pounds, for example, a gallon of milk?"], in the original publication was removed from the survey for this study because of close redundancy with number 11 ["How much difficulty did you have carrying objects that weigh about 10 pounds, for example, a gallon of milk?"]. The SarcoPRO score was calculated by adding the individual question scores, with the possible composite scores ranging from 0 to 130. The SPPB was also administered during the geriatric assessment. The performance test is based on the time it takes patients to stand from a seated position five times, how long they can balance in various standing positions, and a timed 4 m walk test. The patients also reported limitations in IADLs including telephone use, travel further than walking distance, grocery shopping, meal preparation, housework, independent medication management, and handling money using Lawton's measure of IADLs.²⁷ Cognitive function was measured using the validated Blessed Orientation-Memory-Concentration Test (BOMC).²⁸ Depression was assessed using the Geriatric Depression Scale (GDS), a validated tool for identifying depression in seniors.²⁹

Age, gender, use of prescription medications that can cause dizziness (i.e., opioid, benzodiazepine, or sleeping medications/hypnotics, e.g., eszopiclone), cancer stage, and treatment history were obtained during in-person interviews and from the medical charts. Opioid, benzodiazepine, or sleeping medication/hypnotic prescription was defined by the patients' report of taking any of these drugs for any length of time and at

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