Research paper

Assessment of muscle mass, muscle strength and physical performance in clinical practice: An international survey

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A R T I C L E   I N F O

A B S T R A C T

Introduction: Several tools are available for the assessment of muscle mass, muscle strength and physical performance in clinical research. However, few data are available on the usage of these tools in clinical practice.
Methods: This study aimed to assess their usage by means of a large online international survey. Since sarcopenia is a specific condition where the assessment of muscle mass, muscle strength and physical performance is important, the survey also assessed the tools used for the diagnosis of this geriatric syndrome.
Results: The survey was completed by 255 clinicians from 55 countries across 5 continents. Among these clinicians with geriatrics, rheumatology and endocrinology as major fields of interest, 53.3% assess muscle mass in daily practice, 54.5% muscle strength and 71.4% physical performance. However, the tools used are very different and no single tool is used by all clinicians. The tools and the cut-off values used by clinicians to diagnose sarcopenia are also heterogeneous.
Conclusion: Because some tools used for the assessment of muscle mass, muscle strength or physical performance in daily practice are less validated than others, a greater awareness from the clinicians of the importance of using appropriate tools is needed.

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1. Introduction

In clinical practice, assessments of muscle mass, muscle strength and physical performance are performed for various medical conditions. Indeed, the ability to perform activities of daily living and recreational activities is determined, in part, by the performance of the muscle function. The number of tools available to perform such assessments is substantial but the reliability and the validity of the tools are not always optimal [1,2]. Even where there are recommendations for the utilisation of specific tools in order to optimize their reliability in clinical research, there are no standards for the use of specific instruments in daily practice [3,4]. Indeed, some tools are not available in all settings of clinical daily practice (e.g. dual-energy X-ray absorptiometry). To date, little information is available about the tools used to assess muscle mass, muscle strength or physical performance in daily practice. The gap between research findings and their translation and implementation into clinical practice is a common problem that affects health care outcomes.

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Sarcopenia is currently defined as the loss of skeletal muscle mass and strength that occurs with advancing age [5]. Currently, no consensual operational definition of sarcopenia exists and therefore it is still a challenge to establish both the actual prevalence of sarcopenia and the direct and indirect impacts of sarcopenia on public health [6,7]. It is now quite widely accepted that the assessment of muscle mass, muscle strength as well as physical performance are components of the diagnosis of sarcopenia [4]. However, currently, no unified recommendation exists on which specific tools or thresholds are to be used [8].

The objective of this study, initiated by the European Union Geriatric Medicine Society (EUGMS) Special Interested Group (SIG) on sarcopenia was to perform a large international survey to collect data on current practice for the assessment of muscle mass, muscle strength and physical performance in usual clinical practice. Since sarcopenia is a specific condition characterized by progressive and generalized loss of skeletal muscle mass and strength, and decline in physical performance where all these parameters have to be measured [5], the survey also collected information on the tools used for the diagnosis of this geriatric syndrome. An overview of the use of which instruments are used would allow professional and scientific societies to better understand the real daily practice of their members and to better communicate and adapt recommendations to improve their applicability and adherence in daily practice.

2. Material and method

An online survey was designed with the objective to collect data on all tools used to assess muscle mass, muscle strength and physical performance. The survey focused on clinical practice rather than the instruments used for clinical research. All potential instruments used to assess muscle mass, muscle strength and physical performance were taken from a systematic review [1]. The survey was restricted to assessment of individuals aged 60 years and older. For the diagnosis of sarcopenia and some particular tools (e.g. assessing grip strength, walking speed), a more detailed protocol with more specific follow-up questions (e.g. number of repetition, walking distance, cut-off points) was used.

The survey was initially designed by OB, CB, JYR, FB, DS and EF and sent to all other authors that critically commented the content. Then, the survey was sent to all members of the SIG on sarcopenia of the EUGMS ($n = 66$) that could give their feedback. The approximate time needed to complete the survey was 10 minutes. The final version of the survey was sent twice, once in June 2015 and once in July 2015 through two different channels. The first was the EUGMS office that forwarded the survey to all their 33 member or observer societies that, in turn, forwarded it to their individual members. The second was a direct contact, via email, to all members of the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Disorders (ESCEO). Clinicians from outside Europe could however be a member of these various societies.

Because of their normal distribution, quantitative variables were expressed as mean and standard deviation (SD) and qualitative variables as number and percentage. Comparisons between groups (e.g. based on gender, age group, fields of interest of the clinicians) were performed with analysis of variance. Results were considered to be statistically significant at the 5% level ($P < 0.05$). All calculations were performed using Statistica 10 software.

3. Results

The survey was completed by 255 clinicians from 55 countries. Most of the respondents were from Spain (27.8%), Belgium (12.2%), Slovenia (5.1%) and Brazil (3.9%). The mean age of the clinicians was 49.1 years ($\pm$ 12.4) and 49.4% of them were women. Most of them were medical doctors (87.8%) with geriatrics (57.6%) and rheumatology (18.8%) as major fields of interest. More than half of the sample (55.7%) worked in a hospital and 24.3% in a University. About a quarter of the respondents (25.1%) participated in the 2015 WCO-IOF-ESCEO congress, 14.9% in the 2014 European League Against Rheumatism (EULAR) meeting and 12.5% in the 2014 EUGMS congress.

Among the whole study population, 53.3% stated that they assessed muscle mass in their daily practice, 54.5% muscle strength and 71.4% physical performance. Around 60% of geriatricians, endocrinologists and rheumatologists assess muscle mass in their daily practice. For muscle strength, the proportion ranged between 53% and 61% for all medical specialities. The field of interest of the respondents was associated with the likelihood of assessing physical performance. Thus, most geriatricians (83.7%) assessed physical performance in their clinical practice whilst this was assessed in approximately half of the endocrinologists and rheumatologists (respectively 53.3 and 54.1%, $P < 0.001$).

Table 1 shows which instruments are used to assess muscle mass, muscle strength and physical performance. Among clinicians assessing muscle mass in clinical practice, around half of them used calf circumference (57.5%) and dual-energy X-ray absorptiometry (45.9%). With regards to muscle strength, the handheld dynamometer was used by 66.4% of respondents whilst the leg press was used by a quarter of them (24.2%). More than half of the clinicians assessed physical performance in daily practice. The most commonly administrated tests were: gait speed, the get up and go test, self-reported physical function, the sit to stand 5 times

Table 1

Tools used to assess muscle mass, muscle strength and physical performance in clinical practice.

Outcomes	Tools	Proportion of users (%)
Muscle mass ($n = 136$)	Calf circumference	57.5
	Dual-energy X-ray absorptiometry (DXA)	45.9
	Skinfold thickness	30.8
	Bioelectrical impedance analysis (BIA)	22.6
	Ultrasonography	18.5
	Magnetic resonance imaging (MRI)	16.4
	CT-scan	14.4
	Other	8.9
Muscle strength ($n = 139$)	Handheld dynamometer	66.4
	Leg press	24.2
	Chest press	9.39
	Isokinetic dynamometer	7.38
	Vigorimeter	2.01
	Other	11.4
Physical performance ($n = 182$)	Gait speed	63.3
	Timed up and go	58.6
	Self-reported physical function	58.1
	Sit to stand 5 times	53.9
	Standing balance	52.9
	Short physical performance battery test (SPPB)	28.8
	Stair climb	25.1
	3-D accelerometer	3.66
	Other	5.76