

# Tools used for the diagnosis of sarcopenia in the elderly: Integrative review

Ferramentas utilizadas para diagnóstico de sarcopenia em idosos: Revisão integrativa

Herramientas utilizadas para el diagnóstico de sarcopenia en el anciano: Revisión integrativa

## RESUMO

Objetivo: levantar dados acerca das principais ferramentas utilizadas para o diagnóstico de sarcopenia em idosos, publicados de janeiro de 2017 a março de 2022. Método: Revisão integrativa, seguindo seis etapas preconizadas e usando PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Foram examinados artigos publicados entre 2017 e 2022 que relacionassem ferramentas para diagnóstico de sarcopenia nas bases de dados Medline e Cochrane em inglês, português e espanhol, sendo organizados conforme título, ano, país de publicação, fator de impacto do periódico. Resultado: Os 10 artigos indicam o papel de várias áreas do conhecimento, enfatizando que a sarcopenia em idosos tem caráter multidimensional, existindo a necessidade de convergência de conhecimentos. Conclusão: Conforme os achados na literatura, as ferramentas ainda estão em aprimoramento e sendo utilizadas para a avaliação em idosos, ainda de forma incipiente, contudo, ferramentas do novo consenso, já estão servindo como unificação das linguagens entre os pesquisadores.

**DESCRIPTORES:** Idoso; Diagnóstico; Saúde do Idoso; Sarcopenia.

## ABSTRACT

Objective: to collect data on the main tools used for the diagnosis of sarcopenia in the elderly, published from January 2017 to March 2022. Method: Integrative review, following six recommended steps and using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Articles published between 2017 and 2022 that listed tools for the diagnosis of sarcopenia in the Medline and Cochrane databases in English, Portuguese and Spanish were examined, being organized according to title, year, country of publication, impact factor of the journal. Result: The 10 articles indicate the role of various areas of knowledge, emphasizing that sarcopenia in the elderly has a multidimensional character, and there is a need for convergence of knowledge. Conclusion: According to the findings in the literature, the tools are still being improved and being used for the evaluation of the elderly, still in an incipient way, however, tools of the new consensus are already serving as a unification of languages among researchers.

**DESCRIPTORS:** Elderly; Diagnosis; Elderly Health; Sarcopenia.

## RESUMEN

Objetivo: recolectar datos sobre las principales herramientas utilizadas para el diagnóstico de sarcopenia en ancianos, publicadas de enero de 2017 a marzo de 2022. Método: Revisión integradora, siguiendo seis pasos recomendados y utilizando PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). Se examinaron artículos publicados entre 2017 y 2022 que listaron herramientas para el diagnóstico de sarcopenia en las bases de datos Medline y Cochrane en inglés, portugués y español, siendo organizados según título, año, país de publicación, factor de impacto de la revista. Resultado: Los 10 artículos señalan el papel de diversas áreas del conocimiento, destacando que la sarcopenia en el anciano tiene un carácter multidimensional, siendo necesaria la convergencia de saberes. Conclusión: De acuerdo con los hallazgos en la literatura, las herramientas aún se están mejorando y siendo utilizadas para la evaluación de los adultos mayores, aún de manera incipiente, sin embargo, las herramientas del nuevo consenso ya están sirviendo como unificador de lenguajes entre investigadores.

**DESCRIPTORES:** Anciano; Diagnóstico; Salud del Anciano; Sarcopenia.

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**INTRODUÇÃO**

The elderly population grows progressively, proportionally to time, due to technological advances and the quality of life that when associated with well-being and health, increasing the longevity of this group. External factors reflect in the population aging process, such as physical activity, food, social inequality and poverty prevailing in developing countries, for this reason it is necessary to monitor public policies to ensure the rights of the elderly.<sup>(1)</sup>

Internal factors result in biological, chemical changes with advancing age. Given the deleterious effects on functional capacity, and the deterioration in mobility exert a gradual decrease in muscle mass, then its strength, the el-

derly lacks effective care, in their entirety they need self-care supported by third parties, family members or not, who ideally should be responsible for providing security, well-being and health with support and social network, material resources. Failure to pay attention to this individual by the family due to the economic conditions that permeate the family, sometimes culminates in the institutionalization of the entity.<sup>(1)(2)</sup>

The reduction in muscle mass and strength, called sarcopenia, interferes with the maintenance of physiological functionality. Associated with a greater risk of falls, as a result of hospitalizations, cognitive impairment, dependence to perform activities of daily living, as well as the occurrence of institutionalization, decreased quali-

ty of life and, in some cases, mortality, with repercussions on socioeconomic aspects. The sarcopenic elderly become frail, susceptible to physiological stress.<sup>(3)(4)</sup>

Sarcopenia, derived from the Greek words for meat (sarx) and loss (penia), is a condition of decreased skeletal muscle mass that can lead to a decline in physical ability. There is no worldwide consensus on the definition of sarcopenia. To define the phenotype of sarcopenia, a risk screening is necessary, first, the SARC-F questionnaire or the presence of clinical suspicion can be applied, then an assessment of strength is performed using the handgrip strength (HS), 5x stand-up test, Mass assessment by means of magnetic resonance imaging (MRI) and computed tomography (CT), body densitometry

(DEXA), bioimpedance (BIA), calf circumference (CC) and Equation of Lee, performance tests are performed to assess the severity of sarcopenia. The presence of sarcopenia can lead to physical disability, hospitalization and death. <sup>(2)</sup>  
(5)(6)

A previous study confirms the association of sarcopenia and adverse health outcomes, such as falls, disability, hospitalization and long-term care, worse quality of life and mortality, which denotes the importance of sarcopenia in health care for the elderly. With the development of science and technological evolution, the symptoms and consequences of sarcopenia gradually became more evident, with therapeutic approaches and clinical investigation procedures developed that are still evolving. <sup>(7)</sup>

Despite the clinical significance of sarcopenia, its operational definition and standardized intervention programs have yet to be established. Different working groups for sarcopenia around the world accept that it must be defined through a combined approach of muscle mass and muscle quality. However, selecting appropriate diagnostic cutoff values for all measurements in populations. <sup>(7)(8)</sup> In view of the various divergences in the literature, the objective of this study is to identify the tools used by various professionals for the diagnosis of sarcopenia in the elderly in the community.

## METHOD

The method chosen for the present study was the integrative literature review, which consists of gathering the results of a search in a systematic and organized way, in order to extract information about the subject studied. The recommended six-step procedure was followed: identification of the theme and selection of the hypothesis, establishment of the research strategy, definition and data collection, analysis of the collected data, interpretation and

presentation of the results. The review process was based on recommendations from the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist. <sup>(9)</sup> The search for articles was carried out through the

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journals portal of the Coordination for the Improvement of Higher Education Personnel (CAPES), with access to the following electronic databases: Medical Literature Analysis and Retrieval System Online (MEDLINE), through PubMed and the Cochrane library por-

tal. Manual searches were also carried out in the reference lists of the selected articles. The searches took place in December 2021 and March 2022.

Inclusion criteria: be a scientific article, available in the databases that addressed findings in elderly people over 60 years old, published from January 2017 to March 2022, written in English, Portuguese and Spanish and also be freely available, with the following Filters applied: Free Full Text, Comparative Study, Meta-analysis, Observational Study, Randomized Controlled Trial, Review, Systematic Review, Validation Study, in the last 5 years. Exclusion criteria: articles outside the search period, master's/doctoral theses or dissertations, editorials, letters and the like that were not freely available. In addition to removing duplicate articles. The selection of articles took place in December 2021 and March 2022 using the Mesh descriptors "Sarcopenia"; "Aged"; "Aging" "Diagnosis", "Elderly Health" connected by the Boolean operators "AND". The pre-selection was carried out after reading the title and abstract, and then the exclusion criteria were applied. The chosen texts were evaluated as to their relevance to the guiding question.

The selected articles were read in full and categorized in a table informing the study location, level of evidence and research objective. From then on, reading was carried out and the main tools used for the diagnosis of sarcopenia were extracted.

## RESULTS

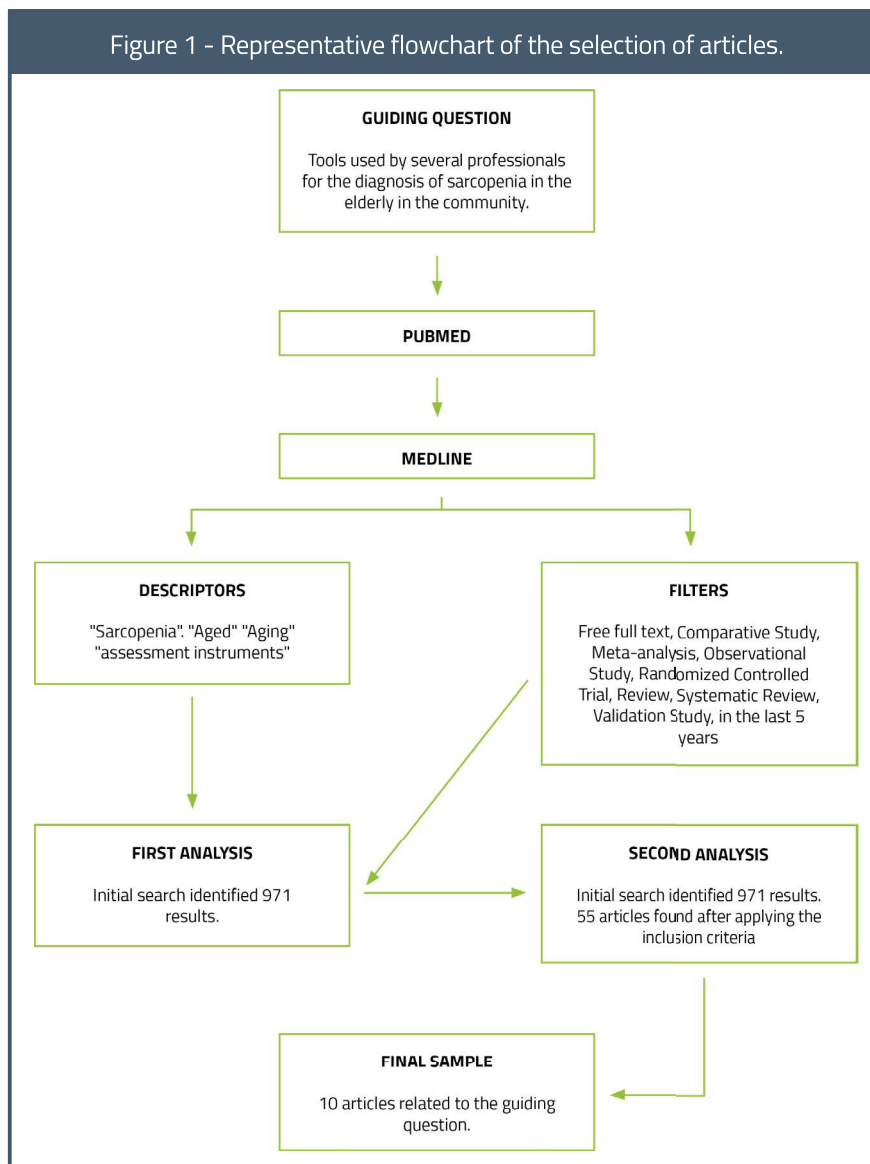
The initial search strategy identified 971 results, of which 916 articles were excluded after applying the inclusion and exclusion criteria. Of the 55 articles found after applying the inclusion criteria (Figure 1), the title, abstract and keywords were read, and 10 articles related to the guiding question were then selected, which was the final sample of this study.

Of the 10 articles selected, (n= 3) did not mention the place of study. The countries United States of America, Singapore, Indonesia, Finland, Austria, Norway, Poland correspond to (n=1), each. From the sample, four were published in 2017, one was published in 2018 (n=01), three in 2019 (n=03), one article in 2021 (n=01) and one in 2022 (n=01). Of the total sample, the systematic review and meta-analysis comprises (n=2), observational studies comprise (02), cross-sectional descriptive correspond to (02), randomized controlled trial corresponds to (n=02), intervention studies (n=01) and (n=01) comprised an analytical cohort study. The articles bring characteristics related to the tools used in the diagnosis of sarcopenia in the elderly, complications and the pathophysiology of the disease.

**DISCUSSION**

From the data collected, we can observe the divergence between the concepts of sarcopenia, and the huge amount of tools used for the diagnosis of this condition, now recognized as a disease and characterized in the ICD-10 as such. The most discussed concept today is the latest European consensus, European Working Group on Sarcopenia in Older People (EWGSOP), published in 2019, where it is concep-

Figure 1 - Representative flowchart of the selection of articles.



Source: Survey data, 2022.

Table 1 - Characterization of selected studies.

TITLE	YEAR	LOCATION	OBJECTIVE	IMPACT FACTOR	TOOLS USED
(1) Nursing care needs and services used by elderly people in residence with complex health problems: an observational study.	2017	Norway	To assess aspects of health and function in a representative sample of the most vulnerable elderly people at home, to identify their needs for nursing interventions and how these needs were met.	2.193	Hand grip strength
(4) Strength training increases skeletal muscle quality but not muscle mass in institutionalized older adults: a multi-arm, parallel, randomized, controlled intervention study.	2018	Austria	To investigate the effect of resistance training and nutritional supply on muscle mass and muscle quality in institutionalized elderly.	2.874	Dual energy X-ray absorptiometry (DXA), isoelectric knee extension, flexion strength, and palm grip strength



(10)	Screening for Frailty and Sarcopenia in the Elderly in Medical Outpatient Clinics and their Associations with Health Burden.	2017	Singapore	To examine whether the SARC-F and Edmonton frailty screening tools are useful in clinical practice to identify patients at risk for negative health outcomes who would benefit from the intervention.	4.669	SARC-F
(11)	Association between Sarcopenia and Functional Status in Liver Transplant Patients.	2019	USA	This study explores the strength of the relationship between Karnofsky Performance Status scores and objective measures of frailty.	1443	Computed tomography of the Psoas muscle.
(12)	Cross-sectional study of nutrient intake and health status among older adults in Yogyakarta Indonesia.	2017	Indonesia	To determine sociodemographic and anthropometric characteristics, nutritional, mental and functional status and energy and nutrient intake of Indonesians residing in the rural and urban community of Yogyakarta.	5.719	Bioelectrical impedance analysis (BIA), Palmar grip strength.
(13)	Randomized controlled trial (RCT) design for a large-scale municipal fall prevention exercise program in community-dwelling older women: study protocol for the Kuopio Fall Prevention Study (KFPS).	2019	Finland	To estimate the effects of exercise at the population level from three different perspectives: (1) Health: falls and injuries, body composition, bone strength and functional capacity, cognitive abilities and SWB; (2) Society: health and social assistance, cost-utility analysis and SWB and (3) Epidemiology: previous lifestyle, medical history and SWB	2.692	Palm grip strength and dual energy X-ray absorptiometry (DXA).
(14)	Study Guided Anesthesia-Related Frailty Bispectral Index (FRAIL): Study protocol for a randomized controlled trial.	2017	***	To compare manual versus automated administration of intravenous anesthetics with respect to 6-month functional decline in people 70 years and older.	2.279	Body mass index (BMI), Hand grip strength.
(15)	Reliability and Simultaneous Validity of SARC-F and its Modified Versions: A Systematic Review and Meta-Analysis.	2021	***	Assess the reliability of the SARC-F and its concurrent validity to identify sarcopenia.	1563	SARC-F
(16)	Recent problems on body composition imaging for the assessment of sarcopenia.	2019	***	To review current knowledge about sarcopenia, its pathophysiological impact, and the advantages and disadvantages of sarcopenia assessment methods with a focus on body composition imaging modalities such as full-body dual-energy X-ray absorptiometry, CT, and MRI.	3.547	Computed tomography; MRI; Dual energy X-ray absorptiometry.
(17)	Identification of Sarcopenia during a comprehensive geriatric evaluation.	2021	Poland	To evaluate the prevalence of sarcopenia in the group of patients undergoing CGA with the updated EWGSP2 algorithm considering muscle strength as a key criterion and using the assessment of muscle mass by bioimpedance (BIA).	3.390	Hand grip strength and body analyzer using bioimpedance analysis (BIA).

Source: table prepared by the authors from the databases mentioned in the methods section. 2022

tualized in addition to reducing muscle mass, reducing strength and worsening physical performance. We found divergences for muscle quantity and quality and for measuring the severity of the disease.

Author Lee takes the direct proportion of the high prevalence of low muscle mass and low muscle function

as strength or performance and links it to the long-term hospitalization of the senior target audience. Tools developed for the identification of sarcopenia help to prevent the installation of the health condition and/or the risk to these elderly people, whether through light and light-hard technologies with protocolized screening or as professional

knowledge to diagnose in advance and intervene. <sup>(14) (15)</sup>

Sarcopenia has been associated with frailty syndrome, with predictors of hospitalization such as falls, dementia, surgery and transplants, seem to be associated with conditions of vulnerability such as older people and female gender, such as pre existing diseases such

as diabetes, hypertension.<sup>(18)</sup> Among the articles that make up this research, 55% (n=41) reported that pre-existing symptoms in pre-frail or frail elderly are more likely to develop the sarcopenia phenotype.<sup>(2) (10) (11) (18-22)</sup>

Only two studies refer to tools that are underused and not mentioned in the new European consensus and published in 2019 by the European Working Group on Sarcopenia in Older People (EWGSOP2), such as the use of computed tomography of the Psoas muscle, in the American study, isoelectric knee extension, in the muscle training study in Austria and in the use of the body mass index (BMI) as a parameter for the amount of body mass in the diagnosis of sarcopenia, the assessment of sarcopenia should be within a larger set of assessment of the elderly such as the comprehensive geriatric assessment (CGA).<sup>(4) (17)</sup>

Recent studies corroborate the European consensus pointing to the need to assess muscle quantity and quality by applying tools such as Bioelectrical Impedance Analysis (BIA), Hand grip strength, the SARC-F self-report questionnaire, Dual Energy X-ray Absorptiometry (DXA) Computed Tomography; Magnetic resonance, studies also found in this review indicate and used these tools as parameters for the diagnosis of sarcopenia.<sup>(1) (4) (5) (12) (13) (15) (16) (17)</sup>

The occurrence of sarcopenia has increased significantly, as already mentioned, because it is a multifactorial disease, the article in the area of nutrition reveals the importance of diagnosis and refers to BIA and Palmar grip strength, which are on the list of the new sarcopenia consensus. Efforts should be made to implement adequate nutrition strategies and physical exercise to combat the situation that is increasingly present in evaluations in the elderly.<sup>(12)</sup>

In this integrative review, the studies pointed to the role of several areas of knowledge, reiterating the statement that sarcopenia in the elderly has a multidimensional character and should

be treated as such. There is a need for a convergence of knowledge and a multidisciplinary team, or moreover, multidisciplinary, whether hospital or outpatient, there is a need for radiological, physiological, biological, genetic knowledge for the development of new tools, and beyond, the need for tools with assertive cut-off points and used on a large scale to obtain less bias in research aimed at improving these tools.<sup>(1) (2) (10) (11) (15) (17) (22)</sup>

## CONCLUSION

According to the findings in the literature, the tools are still being improved and being used for the evaluation of the elderly, still in an incipient way, however, tools of the new consensus are already serving as a unification of languages among researchers.

Among the main tools are the palm grip test, mass measurement through bioimpedance and the SARC-F questionnaire, the other tools determine an exorbitant amount of resources not reaching a large part of the population. Therefore, it is important to carry out early diagnosis and calf circumference measurements, handgrip strength and performance tests as a measure of severity, cover a large part of populations because they are more achievable measures due to the lower financial cost.

It is clear that the early identification of sarcopenia in the elderly age group contributes to the prevention of falls and risk to the quality of life of this population, therefore, in addition to the scales applied to identify decreased strength and muscle mass, the technical preparation of the health professional, responsible for the care, promotion and recovery of human health, is of paramount importance. Thus, training for the health team is essential, especially in primary care, for the implementation of low-technology devices, supporting screening and actions that intervene beforehand.

The scarcity of studies aimed exclu-

sively at diagnostic tools for sarcopenia, mainly carried out in Brazil, demonstrates fragility in terms of quality and quantity in the evidence found.

## EXPECTED IMPACTS

With the proposed research, it is expected to contribute to the knowledge of the tools used in the diagnosis of sarcopenia to modify parameters of this disease through interventions for the elderly population and within their vulnerabilities. It is relevant that due to the aging of the Brazilian population, which is an event that occurs in an accelerated way, and the problems faced daily by the elderly and their families that can generate a great impact, as they reduce the functionality and autonomy of the elderly, requiring increasing assistance to carry out daily activities. Consequently, we must be prepared to plan measures aimed at promoting, preventing and rehabilitating diseases in the elderly.

## LIMITATIONS

This review has some limitations. The pairing procedure was based on the authors' subjective assessments; however, standardized criteria derived from recommended guidelines were used. The main findings of this review were related to the tools identified among the included studies. Sometimes, a clear definition of the study measures was lacking in the methods section of the included articles, therefore based on the researchers' critical assessment of the information provided in the articles, especially considering the study method mentioned in the articles. Only information provided in the included articles was evaluated in this review, although the authors may have used additional or more detailed methodology not stated or unclearly described in the articles.

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