

## REVIEW

## INSTRUMENTS USED IN THE ASSESSMENT OF FUNCTIONAL CAPACITY, FRAILITY AND SARCOPENIA IN THE ELDERLY: INTEGRATIVE REVIEW

### HIGHLIGHTS

1. Identification of the main instruments for the assessment of the elderly person.
2. Most used instruments: Lawton and Brody, and frailty phenotype.
3. Screening clinical conditions by instruments provides comprehensive care.
4. Instruments strengthen interprofessional practice in the health of older adults.

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### ABSTRACT

**Objective:** to analyze the knowledge produced in the scientific literature on the instruments used to assess functional capacity, frailty, and sarcopenia in older adults. **Method:** integrative literature review, in the Cinahl, MEDLINE/PubMed, Embase, Web of Science and Scopus databases, from 2012-2021. Data were extracted: authors, year, country of publication, type of study, sample characteristics, objective, results, and instruments. In addition, the methodological quality and level of evidence were assessed. **Results:** The final sample included 13 articles. The most used instruments were Lawton and Brody Index for functional capacity assessment; conceptual model of the frailty phenotype; and the conceptualization and diagnosis of the European Working Group on Sarcopenia. **Conclusion:** The scientific evidence demonstrated the importance of using instruments to screen for these conditions that can interfere with the health of the elderly population, reinforcing the need to strengthen interprofessional care practices.

**DESCRITORES:** Aged; Activities of Daily Living; Frailty; Sarcopenia; Health of the Elderly.

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## INTRODUCTION

In Brazil, approximately 30 million people are 60 years old or older, with estimates that in 2030 the elderly population will be larger than that of children and adolescents aged 0 to 14 years, in addition, in 2050 the number of elderly people will constitute approximately 30% of the Brazilian population<sup>1</sup>. Aging is considered a dynamic and progressive process, which can lead to psychological and physiological changes, with the potential to cause impairments to functionality and autonomy, in addition to the significant increase in the number of chronic diseases<sup>2</sup>.

Such changes directly affect the quality of life of this population, causing changes in mental health and social aspects<sup>2</sup>. In this sense, specialized health agencies emphasize the need to evaluate and screen geriatric syndromes for identification and intervention in possible future complications, such as physical disability, frailty and early mortality<sup>3</sup>.

Functional capacity is defined by the individual's ability to take care of himself, maintaining his physical and mental abilities in all his Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL). In this sense, the Katz Index was developed to assess the degree of dependence of the elderly based on the need or not for assistance to perform BADL<sup>4</sup>. While the Lawton and Brody Index analyzes the conditions of the elderly person in performing IADLs, examining the degree of autonomy and independence<sup>5</sup>. The decline of this functionality represents one of the main conditions that affect the health of the elderly person<sup>6</sup>.

The frailty syndrome is defined as a condition of physiological vulnerability caused by loss of reserve and resistance to stressors due to cumulative declines in several physiological systems<sup>7</sup>. The main changes related to frailty are decreased handgrip strength, self-reported fatigue, chronic malnutrition and decreased physical activity level<sup>7-8</sup>.

Frailty impacts on nutritional, physiological, psychological, or sociodemographic aspects, and is often associated with sarcopenia. Sarcopenia is a geriatric syndrome that causes a progressive reduction in muscle mass, strength, and function, leading to negative repercussions on health<sup>9</sup>.

The need for early identification and intervention of these conditions, coupled with the demand for rapid and easy screening by assessment instruments, becomes fundamental. Thus, studies that analyze these instruments and their impact on the health of the elderly person are important for the promotion of quality of life<sup>10</sup>.

Regarding the inverse relationship between the promotion of healthy aging and the decline in functional capacity, frailty, and sarcopenia, it is essential to have knowledge and application of screening instruments in the clinical routine at the various points of the care network<sup>2,10</sup>.

Considering the relevance of the theme, further research is needed on the instruments most used in the assessment of functional capacity, sarcopenia, and frailty. This study aims to analyze the knowledge produced in the scientific literature on the instruments used in the assessment of functional capacity, frailty, and sarcopenia of the elderly.

## METHOD

This is an integrative literature review, which aims to synthesize the published theoretical or empirical literature to develop a more comprehensive understanding of the problem studied<sup>11</sup>. For this study, the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses<sup>12</sup> were used. The review protocol was prepared,

submitted, and registered in the Open Science Framework<sup>13</sup>.

To formulate the research question, the PICO strategy (Population, Interest, Context)<sup>14</sup> was used, represented by (P) patient—"elderly", (E) Interest—"assessment of functional capacity, frailty and sarcopenia" and (Co) Context—"health", which resulted in: what evidence is available in the scientific literature on the assessment of functional capacity, frailty, and sarcopenia in the health of the elderly person?

The following inclusion criteria were applied to select the articles: primary studies published in full that addressed at least two assessment instruments related to functional capacity, frailty, or sarcopenia available in Portuguese, Spanish or English; published in the last ten years (2012 - 2021). Publications of course completion papers, dissertations, theses, letters to the reader, experience reports, editorials, case studies, books were excluded.

The search was conducted in the databases: Cinahl, Medical Literature Analysis and Retrieval System Online (MEDLINE) (via US National Library of Medicine - PubMed), Embase, Web of Science and Scopus. Boolean operators AND and OR were used to compose the search strategy. The search for this review was conducted on February 15, 2022, and the proposal for the MEDLINE/PubMed database was exemplified, as described below: ("Aged"[Mesh] OR "Aged" OR "Elderly" OR "Middle Aged"[Mesh] OR "Middle Aged" OR "Middle Age" OR "Oldest Old" OR "Nonagenarian" OR "Octogenarian" OR "Centenarian") AND ("Geriatric Assessment"[Mesh] OR "Geriatric Assessment" OR "Geriatric Assessments") AND ("Activities of Daily Life Daily Living"[Mesh] OR "Activities of Daily Living" OR "Daily Living Activities" OR "Chronic Limitation of Activity") AND ("Sarcopenia"[Mesh] OR "Sarcopenia") AND ("Frail Elderly"[Mesh] OR "Frail Elderly" OR "Functionally- Elderly" OR "Functionally Impaired Elderly" OR "Frail Older Adults" OR "Frail Older Adult").

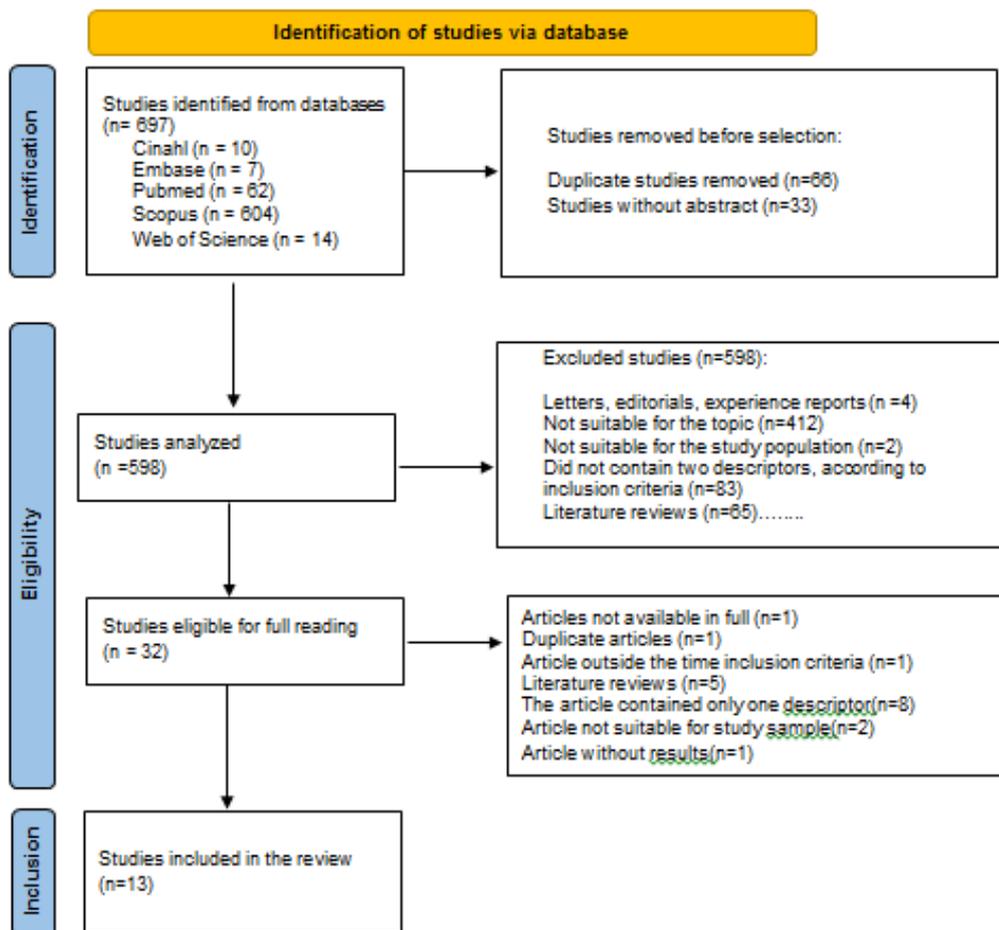
Articles were inserted into the Rayyan software<sup>15</sup>, duplicate studies were removed, and two reviewers were included for selection by reading the title and abstract in a masked and independent manner. Conflict analysis between reviewers was performed by a consensus meeting with a third reviewer.

Next, the main data were extracted and organized in a summary table with the following information: authors, year, country of publication, type of study, sample characteristics, objective, main results, and instruments used to assess functional capacity, frailty, and sarcopenia. This step was also performed by three reviewers. The Guideline Critical Review Form for Quantitative Studies developed by the McMaster University Occupational Therapy Evidence-Based Practice Research Group was used to assess the methodological quality of the selected quantitative studies, analyzing nine topics: reference, literature, design, sample, outcome, intervention, results and conclusions<sup>16</sup>.

To assess the level of evidence, the hierarchical strategy was used according to the research question, related to intervention/treatment or diagnosis/diagnostic test, prognosis/prediction, or etiology and significance<sup>17</sup>.

## RESULTS

The flowchart shows the pathway used to select the scientific evidence, resulting in a final sample of 13 primary studies (Figure 1).



**Figure 1** - Flowchart of selection of studies included in the integrative review, prepared according to PRISMA recommendations. Ribeirão Preto, SP, Brazil, 2022  
 Source: The authors (2022).

Regarding the years of publication, it ranged from 2012 to 2021, with one in 2012 (7.7%), two in 2013 (15.4%), two in 2017 (15.4%), one in 2018 (7.7%), three in 2019 (23%), one in 2020 (7.7%) and three in 2021 (23%). As for the language of publication, 10 were in English (76.9%), two in Spanish (15.4%) and one in Portuguese (7.7%). Of the 13 studies used a quantitative approach (100%), 11 of which were cross-sectional (84.6%) and two longitudinal (15.4%). As for the country, four studies were conducted in Turkey (30.7%), two in Australia (15.39%) and one (7.7%) in each of the following countries: Japan, Colombia, Italy, Mexico, Brazil and South Korea.

Chart 1 presents the characteristics of the included studies: author/year of publication, objectives, type of study and sample characteristics, main results, conclusions, and the level of evidence.

**Chart 1** - Characteristics of the included studies on the assessment of functional capacity, frailty, and sarcopenia in the health of older adults. Ribeirão Preto, SP, Brazil, 2022

Author/ Year of publication	Objective	Study type and sample characteristics	Main results	Conclusion	Level of Evidence
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A <sup>6</sup>	To assess the prevalence of social frailty and its association with physical frailty, geriatric syndromes and BADL disability in community-dwelling older adults.	Cross-sectional Sample: 408 participants Mean age: 74.9 years	Physical frailty increased the risk of BADL disability and sarcopenia.	Social frailty screening can identify frail older people not recognized by demographic characteristics and physical frailty.	VI (Clinical Question: diagnosis)
A <sup>18</sup>	To study the prevalence of fear of falling and its association with physical performance, functionality, frailty, sarcopenia, and a variety of geriatric syndromes.	Cross-sectional Sample: 1021 participants Mean age: 74.9 years.	The prevalence of sarcopenia was 11.6%, pre-frail or frail phenotype 61.3%. Screening was positive for the presence of sarcopenia.	Functionality is impaired due to decreased physical activity and fear of falls.	VI (Clinical Question: diagnosis)
A <sup>19</sup>	To examine the predictive ability of combined frailty and sarcopenia classification on mortality.	Longitudinal Sample: 716 participants Mean age: 74.1 years	2.8% were identified as frail and sarcopenic, 15.5% frail and 3.5% sarcopenic. Classification as frail and sarcopenic resulted in significantly elevated mortality risk.	Frail individuals have benefited from sarcopenia screening and assessment.	VI (Clinical Question: diagnosis)
aA <sup>20</sup>	To quantify the cumulative impact of sarcopenia, frailty, malnutrition, and other geriatric giants in hospitalized older people.	Cross-sectional Sample: 206 participants Mean age: 69.4 years	In the sample, 20.9% were pre-frail and 31.1% frail. Regarding sarcopenia, 20.4% had pre-sarcopenia status, 13.1% had probable sarcopenia, 16.5% had positive sarcopenia and 18.4% had severe sarcopenia. Regarding functional capacity, 23.8% presented moderate dependence, 18.9% severe dependence and 7.3% total dependence.	Sarcopenia and frailty were common among elderly inpatients, occurring concomitantly.	VI (Clinical Question: diagnosis)

A <sup>21</sup>	To assess the sarcopenia and frailty status of older people with distal radius fracture and compare with age- and sex-matched controls without distal radius fracture.	Cross-sectional Sample: 55 participants Mean age: not informed	The prevalence of sarcopenia was similar between groups. Pre-fracture -fragile (non-robust) phenotype was higher in patients with distal radius fracture.	Assessment of frailty and detection of patients with non-robust phenotype may help in fracture prevention strategies.	VI (Clinical Question: diagnosis)
A <sup>22</sup>	To demonstrate the ability of basal metabolic rate (BMR) to detect frailty and sarcopenia in older men.	Cross-sectional Sample: 305 participants Mean age: 74.5 years	In the sample, 31.1% had sarcopenia and 18% frailty. Participants with a low BMR had a higher frequency of frailty and sarcopenia.	Older male patients with sarcopenia and frailty had a greater reduction in BMR.	VI (Clinical Question: diagnosis)
A <sup>23</sup>	To investigate the clinical characteristics and factors relevant to sarcopenia with frailty in community-dwelling older Japanese men.	Cross-sectional Sample: 331 participants Mean age: 71.5 years	The prevalence of sarcopenia with frailty was 3.6% and there was a higher risk of recurrent falls and lower scores on physical and mental assessments.	Sarcopenia with frailty had a higher incidence of falls and poor quality of life.	VI (Clinical Question: diagnosis)
A <sup>24</sup>	To determine the frequency of geriatric syndromes in community-dwelling older adults.	Cross-sectional Sample: 1017 participants Mean age: 76 years	In the sample, 218 were frail, 313 sarcopenic and 53% of the frail patients were also sarcopenic.	The frequency and coincidence of geriatric syndromes increased with age.	VI (Clinical Question: diagnosis)
A <sup>25</sup>	To explore the longitudinal associations between body composition measures, sarcopenic obesity and outcomes of frailty, BADL, IADL, institutionalization and mortality.	Longitudinal Sample: 1705 participants Mean age: 81.4 years	Men with low muscle mass were at increased risk of frailty and IADL disability.	Low muscle mass and sarcopenic obesity were associated with poor functional outcomes.	VI (Clinical Question: diagnosis)

A <sup>26</sup>	To estimate the prevalence of frailty and sarcopenia in a representative sample of older adults in Bogotá.	Cross-sectional Sample: 1442 participants Mean age: 70.7 years	Mean BADL scores of 98.1% indicated high levels of functional independence. The percentage of adults with only zero or one IADL affected was 84.6%. The prevalence of frailty was 9.4% and the prevalence of sarcopenia was 11.5%.	Frailty, sarcopenia, and multi-morbidity are overlapping but distinct conditions in the sample.	VI (Clinical Question: diagnosis)
A <sup>27</sup>	To assess the impact of sarcopenia on the risk of all-cause death in a population of frail older adults living in the community.	Cross-sectional Sample: 364 participants Mean age: 82.2 years	In the sample, 21.8% had sarcopenia. During the 7-year follow-up, 67.4% died among subjects with sarcopenia compared to subjects without sarcopenia.	There was an association with mortality, independent of age and other clinical and functional variables.	VI (Clinical Question: diagnosis)
A <sup>28</sup>	To determine the association between frailty and mortality, functional dependence, falls and hospitalizations in the National Health and Aging Study in Mexico.	Cross-sectional Sample: 4774 participants Mean age: 69.4 years	In the sample, 33% of the elderly had frailty and 43% pre-frailty. Dependence in at least one BADL was 11.4% for the frail group and 5.9% for the pre-frail group.	The state of frailty has a silent and economic impact on the risk of dependence in BADL, hospitalization and mortality.	VI (Clinical Question: diagnosis)
A <sup>29</sup>	To assess whether indirect indicators of sarcopenia and functionality influence the frailty profile in older adults.	Cross-sectional Sample: 53 participants Mean age: 76.7 years	In the sample, 54.7% of the elderly were pre-frail and 15.1% frail. The indicators of sarcopenia, level of physical activity and gait speed were the most prevalent.	The association between sarcopenia, frailty, physical inactivity and gait speed as the most important factors in frailty screening is confirmed.	VI (Clinical Question: diagnosis)

Source: The authors (2022).

Legend: \*BADL=Basic Activities of Daily Living; \*\*IDLA=Instrumental Activities of Daily Living.

The most used instruments for screening functional capacity, frailty and sarcopenia are described in Chart 2.

## Chart 2 - Instruments used to assess functional capacity, frailty, and sarcopenia. Ribeirão Preto, SP, Brazil, 2022

Type of Evaluation	Instruments used
Functional capacity	Katz Index <sup>18,20-21,25,27</sup> Lawton and Brody Index <sup>18,20-22,26,28</sup> Barthel Index <sup>26</sup>
Frailty	Criteria proposed by Fried et al. <sup>6,18-20,22-26,28-29</sup>
Sarcopenia	European Working Group on Sarcopenia in the Elderly People <sup>6,19-22,24,26-27,29</sup> Asian Working Group for Sarcopenia <sup>23</sup> SARC-F <sup>18</sup> Questionnaire

Source: The authors (2022)

Chart 3 presents the assessment of the methodological quality of the quantitative studies identified in this review.

## Chart 3 - Critical review of quantitative studies. Ribeirão Preto, SP, Brazil, 2022

Critical review of quantitative studies	A <sup>6</sup>	A <sup>18</sup>	A <sup>19</sup>	A <sup>20</sup>	A <sup>21</sup>	A <sup>22</sup>	A <sup>23</sup>	A <sup>24</sup>	A <sup>25</sup>	A <sup>26</sup>	A <sup>27</sup>	A <sup>28</sup>	A <sup>29</sup>
Was the objective clear?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Review of relevant literature on this topic conducted?	Y	Y	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y
Describe the design	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sample described in detail	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Provided justification for sample size	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Reliable outcome measures	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Valid outcome measures of Intervention described in detail	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Contamination was avoided	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Concurrent intervention was avoided	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Results reported in terms of statistical significance	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Appropriate methods of analysis	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clinical importance was reported	N	Y	Y	N	N	Y	N	N	N	N	Y	N	N
Reporting of participants who dropped out of the study	N	N	N	N	N	N	N	N	N	N	N	N	N
Conclusions consistent with methods and results obtained	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Source: Law, et al. (1998),

Legend: Y= Yes; N= No; NI= Not informed; NA= Not applicable

Studies that used the concept of functional capacity identified the assessment of variables such as fear of falling, geriatric syndromes, fractures, frailty, sarcopenia and functional dependence<sup>18,20-22,25-28</sup>. Research has also focused on the association between frailty, sarcopenia and functional capacity<sup>6,18-26,28,29</sup>.

## DISCUSSION

From the analysis of the articles chosen for this study, the main instruments for the evaluation of each domain were identified. Regarding functional capacity, the most used instruments were Katz Index<sup>18,20-21,25,27</sup>, Lawton, and Brody Index<sup>18,20-22,26,28</sup>, and Barthel Index<sup>26</sup>.

Functional capacity is characterized by the maintenance of the physical and mental abilities of the elderly person, preserving their ability to make decisions and actions. Any change in their functionality results in a deficit in their self-care. Therefore, objective scales and scores are needed to indicate how well this person can perform their daily activities<sup>30-32</sup>.

The Katz Index is based on primary, biological, and psychosocial functions to assess the performance of the elderly person in BADL<sup>4,30</sup>. Self-care activities related to bathing, toileting, dressing, transferring, eating and sphincter continence are analyzed<sup>30</sup>. Its evaluation shows the severity of processes that the individual may be suffering in the decline of their functional capacities<sup>18,25</sup>. This multifactorial character of decline is identified in the studies of this review, in which low rates in BADL were revealed<sup>18,20,21,25,27</sup>.

The Lawton and Brody index aims to identify the functional condition of the elderly in the execution of activities that relate to the environment<sup>31</sup>. Eight items are evaluated: using the telephone; doing household chores; washing clothes; preparing meals; using transportation; shopping; handling money; and taking medication<sup>5</sup>. It should be emphasized that autonomy is a component of human nature and is usually the first indicator of affected functional capacity<sup>33</sup>.

Thus, the assessment of IADLs favors early intervention for maintenance and/or recovery of functional skills. And, in this context, the Lawton and Brody index has fundamental characteristics such as easy application and understanding, both by the researcher and the participant, low-cost and satisfactory psychometric indices<sup>33</sup>. Although it is measured by the individual's self-perception, it is important to emphasize that the studies that used it presented satisfactory rates of analysis, showing that these are activities that have a greater decline<sup>18,20-22,26,28,33</sup>.

The third instrument identified on the assessment of functional capacity was the Barthel Index, which assesses the individual's functionality in aspects such as eating, bathing, dressing, personal hygiene, bowel and bladder elimination, toilet use, chair-bed transfer, ambulation, and use of stairs<sup>34</sup>. It was designed to assess people with a stroke. Over time, it began to be used in studies with elderly people without a history of stroke and proved to be suitable for functional assessment<sup>35</sup>.

Regarding the instruments that measure frailty, the criteria suggested in the frailty phenotype<sup>7</sup> are well accepted and the most referenced by most studies investigating this condition<sup>28</sup>. Physical conditions such as weight loss, physical activity level, slow gait, exhaustion, and muscle strength are assessed. This screening is essential to identify risk and situations of frailty, helping to provide comprehensive care geared to the needs of the elderly population<sup>25,36</sup>. In the scientific literature there is a variability of concepts on frailty, and because there is no well-defined consensus, it is necessary to consider the characteristics of the target population of the study<sup>25,28,36-37</sup>. In this review, all the studies included used the phenotype criteria<sup>6,18-20,22-26,28,29</sup>.

Sarcopenia is considered a progressive and generalized disorder of skeletal muscles with marked loss of muscle mass and strength, associated with increased adverse outcomes such as falls, functional decline, frailty and mortality<sup>38</sup>.

The instruments identified in this review for sarcopenia screening were: European Working Group on Sarcopenia in Older People (EWGSOP); Asian Working Group for Sarcopenia (AWGS); and the SARC-F Questionnaire, with the EWGSOP being the most widely used in the studies<sup>6,19-22,24,26-27,29</sup>.

The EWGSOP defines probable sarcopenia as when an individual has one of three factors: low muscle strength, quantity, or quality. While severe sarcopenia is characterized by the simultaneity of these three factors, added to low physical performance, which gives the elderly a propensity to falls, disabilities, fractures, dependence and mortality<sup>20,39</sup>.

Another instrument identified for sarcopenia screening was developed by the Asian Working Group on Sarcopenia (AWGS), which defines sarcopenia as low handgrip strength or gait speed and low skeletal muscle mass index<sup>23</sup>. A study conducted in South Korea with 338 elderly people showed that the instrument was suitable for the identification of sarcopenia, and its results can be the basis for the development of a simpler and more reliable diagnosis<sup>40</sup>.

The third instrument was the SARC-F<sup>18</sup> questionnaire. It has five self-reported questions related to muscle function, assistance in walking, getting up from a chair, climbing stairs and presence of falls. It has been validated in various ethnic groups in the elderly community and is recommended for use in clinical practice for early screening of sarcopenia<sup>41-43</sup>. The decline in functional capacity, sarcopenia and frailty are conditions that need to be investigated in the elderly population due to their intrinsic relationship with the impairment of healthy aging and quality of life. The presence of these events is associated with factors such as: advanced age, low quality of life, risk of falls, functional dependence, nutritional deficit, and other comorbidities such as chronic diseases<sup>18,20-22,26</sup>.

Therefore, the implementation of health education programs, screening of risk groups and continuing education for health professionals on the importance of applying these instruments may play an important role in promoting strategies to reduce the risk of functional decline, frailty, and sarcopenia.

The main limitations of the study were time delimitation, use of only primary studies and language restriction, as articles written in Chinese and Japanese were not included, and the risk of bias due to the combination of observational study evidence, which may be biased in cases of inadequate methodological designs.

## FINAL CONSIDERATION

The knowledge produced in the literature on the most applied instruments in the assessment of functional capacity, frailty and sarcopenia were respectively: Katz Index; Lawton and Brody; Barthel; frailty phenotype; European Working Group on Sarcopenia in Older People; Asian Working Group on Sarcopenia; and the SARC-F Questionnaire.

The importance of the theme is emphasized, since the screening of the clinical conditions mentioned in this study is essential for the direction of assertive and integral strategies in the promotion of active and healthy aging. Despite the limitation related to not including all scientific studies published on the subject, this research reinforces the need to use these instruments as urgent. The applicability to the routine of health services can be better explored in future studies with higher levels of evidence.

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