

MODERN GERIATRIC GIANTS: SARCOPENIA AND FRAILITY

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ABSTRACT

A large proportion of older adults visit the family physician's practice within the community. It is imperative for the family physician to be familiar not just with the common geriatric syndromes but also to be aware of modern geriatric giants like sarcopenia and frailty as they are associated with adverse outcomes that can significantly affect the older adult's function. They can be readily identified with simple screening tools like SARC-F and FRAIL scale. Management will consist of multifactorial interventions, focusing especially on resistance exercises and protein supplementation.

Keywords: Older adults, sarcopenia, frailty, management

INTRODUCTION

Professor Bernard Issacs coined the original "Geriatric Giants" of immobility, instability, incontinence and impaired memory in 1965. Since then, the science and the practice of Geriatrics have evolved and the "Modern Giants of Geriatrics" have become frailty¹, sarcopenia², anorexia of aging³ and cognitive impairment.⁴

The importance of these giants lies in their association with common presentations for the older adults like falls, fractures, depression and delirium. In this article, we will discuss frailty and sarcopenia and how practitioners in the primary health setting will be able to recognise them and manage them.

Sarcopenia

Sarcopenia was a term introduced by Rosenberg in 1988. It is derived from the Greek roots sarx for flesh and penia for loss⁵ and refers to the age-related loss of muscle mass. Evidence suggests that after the age of 30 years, muscle mass declines at a rate of approximately one percent per year. This rate of muscle loss increases with age and in those more than 80 years of age, the muscle mass decline is severe and ranges from 11 percent to 50 percent.⁶⁻⁸ It has been debated as to whether sarcopenia is a natural process of ageing or it is a condition that needs to be diagnosed and managed. It was only in the last two decades or so that research has found sarcopenia to be associated with many adverse health outcomes that are common in the older adults that the current consensus is for it to be evaluated and treated for.

The scientific definition of sarcopenia has been challenging for clinicians because of the lack of clear cut-off values for the measurement of muscle mass as well as the quantification of strength. There have been many groups convening aiming to give clinical meaning to the word sarcopenia. The inconsistent research correlating muscle mass and strength⁹ led to the incorporation of strength and physical performance in addition to muscle mass to the definition of sarcopenia.^{6, 9-11} Of interest locally would be the more recent report published by the Taiwanese for the Asian Working Group on Sarcopenia as this is the first report defining diagnostic cut-off values for the Asian population since we know the immense subtle differences that exist between the Caucasians and Asians.¹² Different consensus groups have adopted different cut-offs for the values defining sarcopenia. As a guide, muscle mass is measured using either dual energy X-ray absorptiometry (DXA) or bioimpedance analysis (BIA). Muscle strength is measured by isometric handgrip strength using the dynamometer and physical performance requires either the short physical performance battery (SPPB) or gait speed.¹¹ Table 1 shows the different operational definitions of sarcopenia. Essentially, sarcopenia is a condition that is defined by low muscle mass with low muscle strength resulting in low physical performance.

Table 1: Different workgroups defining sarcopenia

Group	Low muscle mass	Low muscle strength	Low physical performance
ESPEN (2010)	✓		✓
EWGSOP (2010)	✓	✓	✓
International Working Group on Sarcopenia (2011)	✓		
Society of Sarcopenia, Cachexia and Wasting Disorders (2011)	✓		✓
Asian Working Group for Sarcopenia (2013)	✓	✓	✓
Foundation for National Institutes of Health Sarcopenia Project (2014)	✓	✓	✓

Most of the definitions of sarcopenia as detailed in Table 1 are used in the settings of research. It is difficult and impractical for use in the community setting. The 5-item questionnaire SARC-F has been created for use to diagnose sarcopenia in the community setting. It has excellent specificity but poor sensitivity and has been found to be comparable with three consensus definitions in predicting physical limitation and physical performance measures for four years.¹²

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Table 2: SARC-F screen for sarcopenia

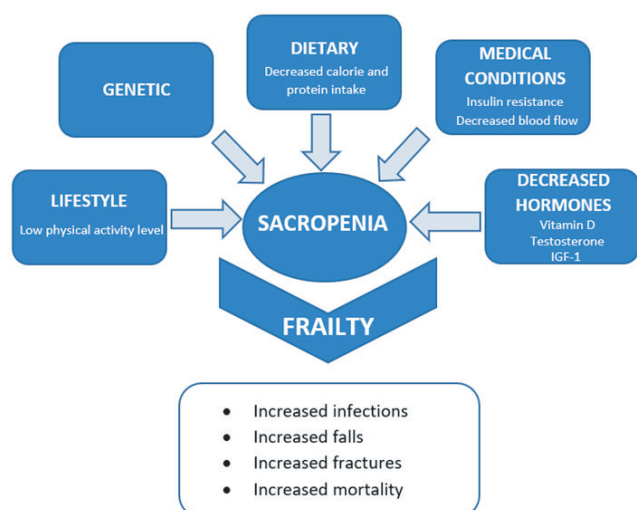
Component	Question	Scoring
Strength	How much difficulty do you have in lifting and carrying 10 pounds?	None= 0 Some =1 A lot or unable = 2
Assistance in walking	How much difficulty do you have walking across a room?	None= 0 Some =1 A lot, use aids, or unable = 2
Rise from a chair	How much difficulty do you have transferring from a chair or bed?	None= 0 Some =1 A lot or unable without help = 2
Climb stairs	How much difficulty do you have climbing a flight of 10 stairs?	None= 0 Some =1 A lot or unable = 2
Falls	How many times have you fallen in the last year?	None= 0 1-3 falls= 1 4 or more falls= 2
≥4: sarcopenia		

Prevalence

The prevalence of sarcopenia varies depending on the geographic regions and the age groups the studies were done in. Using different operational criteria also give rise to different rates. In general, long-term care facilities have the highest proportion of sarcopenia ranging from 14 percent to 33 percent. This proportion drops to ten percent in the acute hospital setting. Within community dwelling older adults, it ranges from one percent to 29 percent.¹³

Etiology

Many factors can kick start the process of sarcopenia. Physical inactivity such as increased sedentary lifestyle and bed rest, protein imbalance from increase protein degradation and decrease protein synthesis predisposes to loss of muscle mass and power in the older adult. Figure 1 shows the rest of the factors contributing to sarcopenia.

Figure 1: Relationship between sarcopenia and its consequences

Associations of sarcopenia

Sarcopenia is associated with sarcopenic obesity which is a clinical condition characterized by reduced muscle mass and excessive fat mass. In this condition, there is not just the burden of disease from the sarcopenia component but also the cardiovascular risk burden from the obesity component. The other condition is sarco-osteoporosis. This is due to the close relationship between muscle and bone. This is associated with adverse health outcomes of fractures and disability.

FRAILITY

In Figure 1, we also see that sarcopenia leads to frailty. Frailty is described as the inability of the body to respond and withstand external stressors. It is characterised by increased vulnerability leading to negative health-related outcomes.¹⁴ In older adults, physiological ageing affects the robustness of various homeostatic and protection mechanisms. When there is an acute insult, the inadequate reserves result in functional decline. With further repetitive insults, the body reserves continue to weaken leading to weaker homeostatic responses and further decline in function. The cumulative deficits result in disability and death when the body is unable to compensate. Frailty is thus intricately linked to comorbidities and disability. This makes it important as it can help to serve as a prognostic tool for patients with severe frailty and guide management towards being more conservative with earlier advance care planning discussions.

Identifying frailty

The identification of frailty has been the subject of much debate and research. Currently, there exist more than 40 operational definitions of frailty.¹⁵ There are three major models of classification: i) The physical phenotype model i.e. Frailty phenotype, FRAIL scale ii) The deficit accumulation model i.e. Frailty index, Clinical Frailty Scale (CFS) and iii) Mixed physical and psychosocial models i.e. Tilburg Frailty indicator, Edmonton Frailty Scale.

The physical phenotype model remains the most popular model and frailty phenotype has been extensively researched upon. It is based on five predetermined criteria (i.e. involuntary weight loss, exhaustion, muscle weakness, slow gait speed and sedentary behavior).¹⁶ The presence of three or more of the criteria will make the individual frail, prefrail if there are one to two of the criteria and robust if there are none. FRAIL scale¹⁷ is a simple tool for evaluating frailty status. It is designed for easy outpatient use. Table 3 shows the FRAIL instrument.

Table 3: FRAIL instrument

Symptom/Sign	Assessment
Fatigue	Are you fatigued?
Resistance	Cannot walk up one flight of stairs?
Ambulation	Cannot walk one block?
Illness	Do you have more than five illnesses?
Loss of weight	Have you lost more than 5 percent of your weight in the last six months?
≥ 3 Frail; 1-2 Prefrail; 0 Robust	

The Clinical Frail Scale is another measurement of frailty that is gaining recognition. It uses clinical narratives and pictures to help stratify older adults according to their level of vulnerability. It is a strong predictor of institutionalisation and mortality and is comparable to the Frailty phenotype in identifying frailty status.¹⁸

Prevalence of frailty

The prevalence of frailty is higher amongst those who are socioeconomically more disadvantaged. It ranges between 3.5 percent - 27 percent in the community dwelling older adults in Asia Pacific and this is comparable to prevalence in Europe and America.¹⁹

Etiology of frailty

Ageing, sarcopenia, polypharmacy, endocrine disorders, social isolation and poverty can all lead to frailty.

Clinical implications of sarcopenia and frailty

The loss of muscle mass and strength in sarcopenia has been found to be correlated with adverse outcomes of physical disability, functional impairment²⁰⁻²¹, falls^{20, 22-23}, increased dependency in activities of daily living²⁴, increased risk of hospitalisation²⁵ and increased mortality.²⁶⁻²⁸ When frailty sets in, there will be increased risk of disability, hospitalisations, institutionalisations and death.²⁹

Prevention and Treatment of Sarcopenia/Frailty

Physical exercise, especially resistance exercises have the most influence on sarcopenia and frailty. Many systematic reviews and meta-analyses have validated the importance of physical activity to maintain and improve physical strength, mobility and function of older frail adults.³⁰⁻³¹ Progressive resistance training results in enhanced strength and is strongly recommended in the treatment of both sarcopenia and frailty.³²

Nutrition is the building block for maintaining muscle mass and muscle capacity. It has been found that protein supplementation has been able to help treat sarcopenia.³³⁻³⁴ Other studies have also found that a protein-enriched diet, amino acid plus leucine supplements and b-hydroxy-b-methylbutyrate supplements all have a positive effect on muscle mass, strength and performance.³⁵ It is recommended that an average 60kg older adult should have 16 grams of high-quality protein per meal to maximally stimulate skeletal muscle protein synthesis.

However, the role of protein supplementation in treating frailty is more controversial as it has been found that improvement in nutritional status does not always translate into improved function or reduced mortality.³⁶

Other management strategies that could potentially target frailty are i) reducing poly pharmacy by reviewing and deprescribing inappropriate medications and ii) vitamin D replacement.³⁷

SUMMARY

Sarcopenia and frailty are new geriatric giants that we need to be familiar with when we manage the older adults. Like the old 'giants', they too result in consequences that can potentially be dire to the older adults. It is pertinent for them to be identified and managed early in order to prevent adverse health outcomes.

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LEARNING POINTS

- **Sarcopenia and Frailty are modern geriatric giants and they need to be identified and managed because they can lead to serious consequences of falls, disability, institutionalisation and death.**
 - **There is currently no consensus on the best screening tool to diagnose sarcopenia and frailty. It generally depends on the site and purpose of use.**
 - **Progressive resistance exercises and adequate protein intake can help to manage sarcopenia and frailty.**
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