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MODERN GERIATRIC GIANTS: SARCOPENIA AND FRAILTY

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ABSTRACT

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

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INTRODUCTION

In 1965, Professor Bernard Issacs coined the original "Geriatric Giants" of immobility, instability, incontinence, and impaired memory. Since then, the science and the practice of Geriatrics have evolved and the "Modern Giants of Geriatrics" have become frailty,[1] sarcopenia,[2] anorexia of ageing,[3] and cognitive impairment.[4]

The importance of these giants lies in their association with common presentations for older adults such as falls, functional decline, 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" is a term introduced by Rosenberg in 1988. It is derived from the Greek roots "*sarx*" for flesh and "*penia*" for loss[5] 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; in those above 80 years of age, the muscle mass decline is severe and ranges from 11 to 50 percent.[6-8] Whether sarcopenia is a natural process of ageing or a condition that needs to be diagnosed and managed has been widely debated. It is in the last two decades that research has uncovered its association with many adverse health outcomes that are common in older adults, hence driving the current movement for early evaluation and intervention to halt the onset of these outcomes.

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 consensus groups aiming to give a clinical meaning to the word "sarcopenia". The inconsistent research correlating muscle mass and strength[9] led to the incorporation of strength and physical performance in addition to muscle mass in the definition of sarcopenia.[6,9-11] The European Workgroup for Sarcopenia in Older Adults (EWGSOP) was instrumental in paving the way for sarcopenia diagnosis by proposing a clinical algorithm for evaluating sarcopenia, while the Asian Working Group for Sarcopenia (AWGS) provided diagnostic cut-off values for the Asian population, given the differences in body composition between Caucasians and Asians.[12] While local cut-offs are yet to be developed, a workgroup in Singapore has developed clinical practice guidelines to contextualise the current evidence in our own setting to facilitate the adoption of the above consensus statements into our clinical practice.[13]

Different consensus groups have proposed different operational definitions for sarcopenia as shown in **Table 1**. Essentially, sarcopenia is a condition that is defined by low muscle mass with low muscle strength resulting in low physical performance. 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: Different workgroups defining sarcopenia

Group	Low muscle mass	Low muscle strength	Low physical performance
ESPEN (2010)	√		√
EWGSOP (2010)	√	√	√
International Working Group on Sarcopenia (2011)	√		

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Society of Sarcopenia, Cachexia and Wasting Disorders (2011)	√		√
Asian Working Group for Sarcopenia (2013)	√	√	√
Foundation for National Institutes of Health Sarcopenia Project (2014)	√	√	√

Most definitions of sarcopenia as detailed in **Table 1** are used in the context of research. It is difficult and impractical for community use due to the lack of accessibility to relevant measurement tools. The 5-item questionnaire SARC-F has been developed as a rapid diagnostic tool for 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]

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 predicts sarcopenia		

Prevalence

The prevalence of sarcopenia varies depending on the geographic region and age group where the studies were conducted. Using different operational criteria also gives rise to different rates. In general, long-term care facilities have the highest proportion of sarcopenia, ranging from 14 to 33 percent. This proportion drops to 10 percent in the acute hospital setting. Within community-dwelling older adults, it ranges from 1 to 29 percent.[14]

Aetiology

Numerous factors can accelerate the process of sarcopenia. Physical inactivity from a sedentary lifestyle and bed rest, and negative protein balance from increased degradation and decreased synthesis, contribute to loss of muscle mass and power in the older adult. **Figure 1** shows the rest of the factors contributing to sarcopenia.

Manifestations of Sarcopenia

Sarcopenia can manifest as sarcopenic obesity, a clinical condition characterised not just by reduced muscle mass but also excess fat mass. In this condition, complications can arise both from sarcopenia and the cardiovascular risk burden from obesity. The other related condition is osteosarcopenia (the co-existence of sarcopenia with osteoporosis) due to the close interaction at the muscle-bone interface. Osteosarcopenia further worsens physical performance and the risk for falls, fractures, and disability compared to either osteoporosis or sarcopenia alone.[15]

FRAILTY

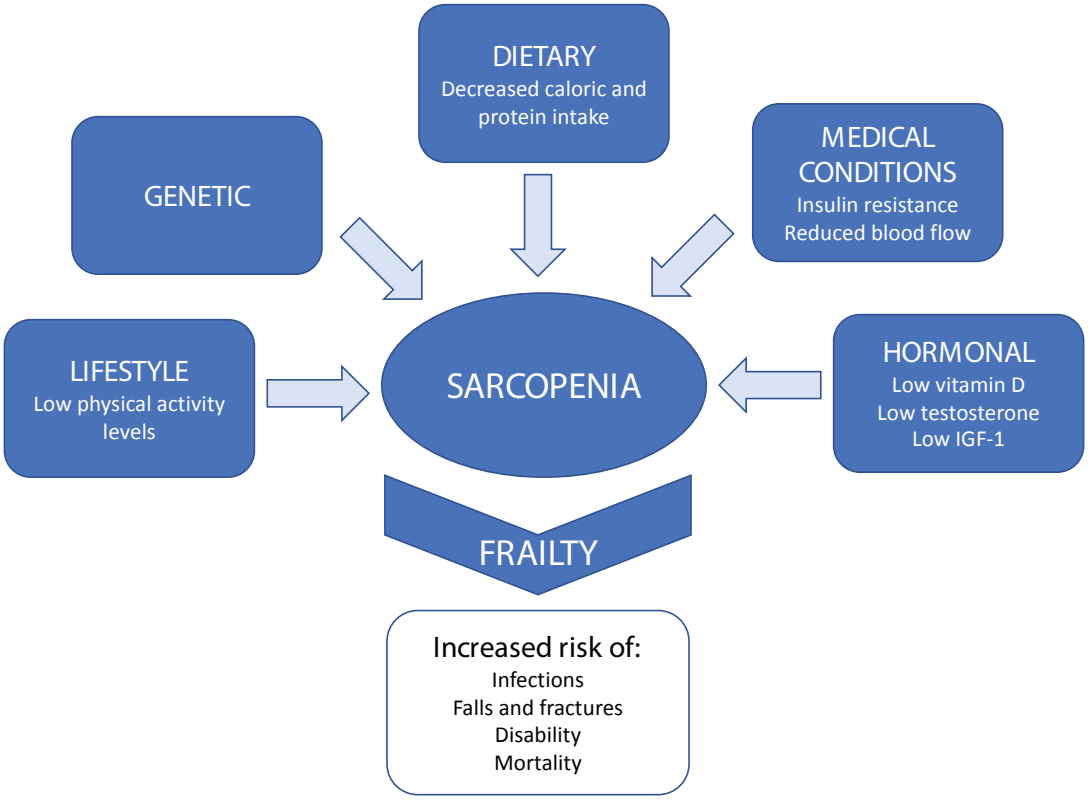
In **Figure 1**, we can see that sarcopenia is a precursor to frailty. Frailty is described as the inability of the body to respond to and withstand external stressors. It is characterised by increased vulnerability leading to negative health-related outcomes.[16] In older adults, physiological ageing affects the robustness of various homeostatic mechanisms. When faced with an acute insult, the inadequate physiological 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 highlights its importance as it can aid in prognostication for patients with severe frailty and guide management towards being more conservative with earlier advance care planning discussions. On the other hand, patients at a pre-frail or mildly frail stage may potentially be able to revert to a more robust state if the acute insults are addressed early and reversed.

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.[17] There are three major models of classification: 1) The physical phenotype model, i.e., Fried's frailty phenotype, FRAIL scale; 2) The deficit accumulation model, i.e., Frailty Index, Clinical Frailty Scale (CFS); and 3) Mixed physical and psychosocial models, i.e., Tilburg Frailty indicator, Edmonton Frailty Scale.

The physical phenotype model remains the most popular model, and Fried's frailty phenotype has been extensively researched upon. It is based on five predetermined criteria

Figure 1: Relationship between sarcopenia and its consequences



(i.e., involuntary weight loss, exhaustion, muscle weakness, slow gait speed, and sedentary behaviour).[18] The presence of three or more of the criteria will make the individual frail; prefrail if there are one or two criteria present; and robust if there are none.

The FRAIL scale[19] is a simple tool to evaluate frailty status for outpatients. **Table 3** shows the FRAIL instrument.

Table 3: FRAIL instrument

Symptom/Sign	Assessment
Fatigue	Are you fatigued?
Resistance	Can you walk up one flight of stairs?
Ambulation	Can you 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 Fried's frailty phenotype in identifying frailty status.[20]

Prevalence of Frailty

The prevalence of frailty is higher amongst those who are socioeconomically more disadvantaged. It ranges between 3.5-27 percent in community-dwelling older adults in Asia-Pacific, comparable to that in Europe and America.[21]

Aetiology 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 impairment,[22-23] falls,[22,24-25] increased dependency in activities of daily living,[26] increased risk of hospitalisation,[27] and increased mortality.[28-30] When frailty sets in, there will be increased risk of disability, hospitalisations, institutionalisation, and death.[31]

PREVENTION AND TREATMENT OF SARCOPENIA AND FRAILTY

Physical exercise, especially resistance exercise, has the most impact 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.[32-33] Progressive resistance training results in enhanced strength and is strongly recommended in the treatment of both sarcopenia and frailty.[34]

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.[35,36] Other studies have also found that a protein-enriched diet, amino acid plus leucine supplements, and b-hydroxy-

b-methyl butyrate supplements all have a positive effect on muscle mass, strength, and performance.[37] It is recommended that older adults should have 25-30 g of high quality protein per meal to maximally stimulate skeletal muscle protein synthesis.[38]

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.[39] This highlights the need for a multimodal approach in managing frailty.

Other management strategies that could potentially target frailty are 1) reducing polypharmacy by reviewing and deprescribing inappropriate medications, and 2) vitamin D replacement in those who are deficient.[40]

CONCLUSION

Sarcopenia and frailty are new geriatric giants that we need to be familiar with when we manage older adults. Like the old "giants", they too result in consequences that can potentially be dire to 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 as 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 in the management of sarcopenia and frailty.**