



TEHRAN UNIVERSITY
OF
MEDICAL SCIENCES



Muscle and Bone Interaction

Osteosarcopenia

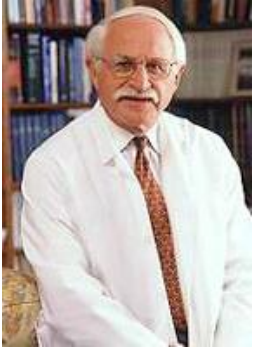


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SARCOPENIA



Irwin Rosenberg (1989)

Sarcopenia : the observed age-related decline in muscle mass

- ▶ “Sarcopenia” (Greek ‘sarx’ or flesh + ‘penia’ or loss)
refers to the decline in skeletal muscle mass caused by ageing.
- It is a geriatric syndrome characterized by the progressive loss of muscle mass, strength and function.
- ▶ It is associated with dependency and fall and imposes a high cost to health systems.

SARCOPENIA Working Group

Definition & Diagnosis of Sarcopenia

Age and Ageing 2010; **39**: 412–423
doi: 10.1093/ageing/afq034
Published electronically 13 April 2010

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REPORT

Sarcopenia: European consensus on definition and diagnosis

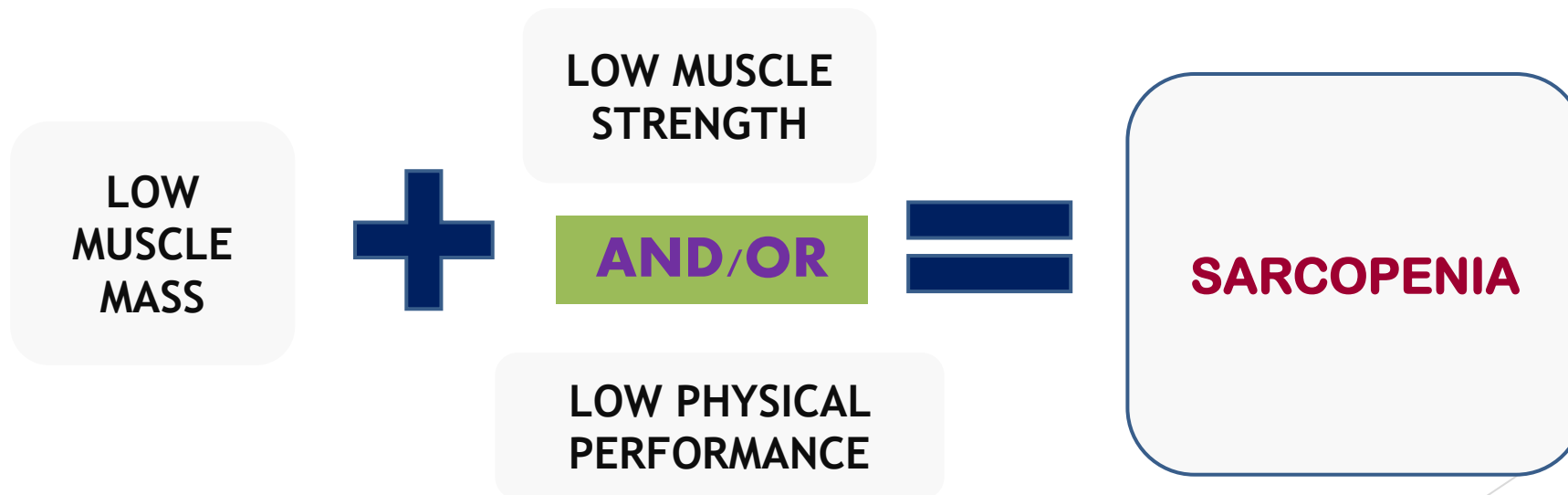
Report of the European Working Group on Sarcopenia in Older People

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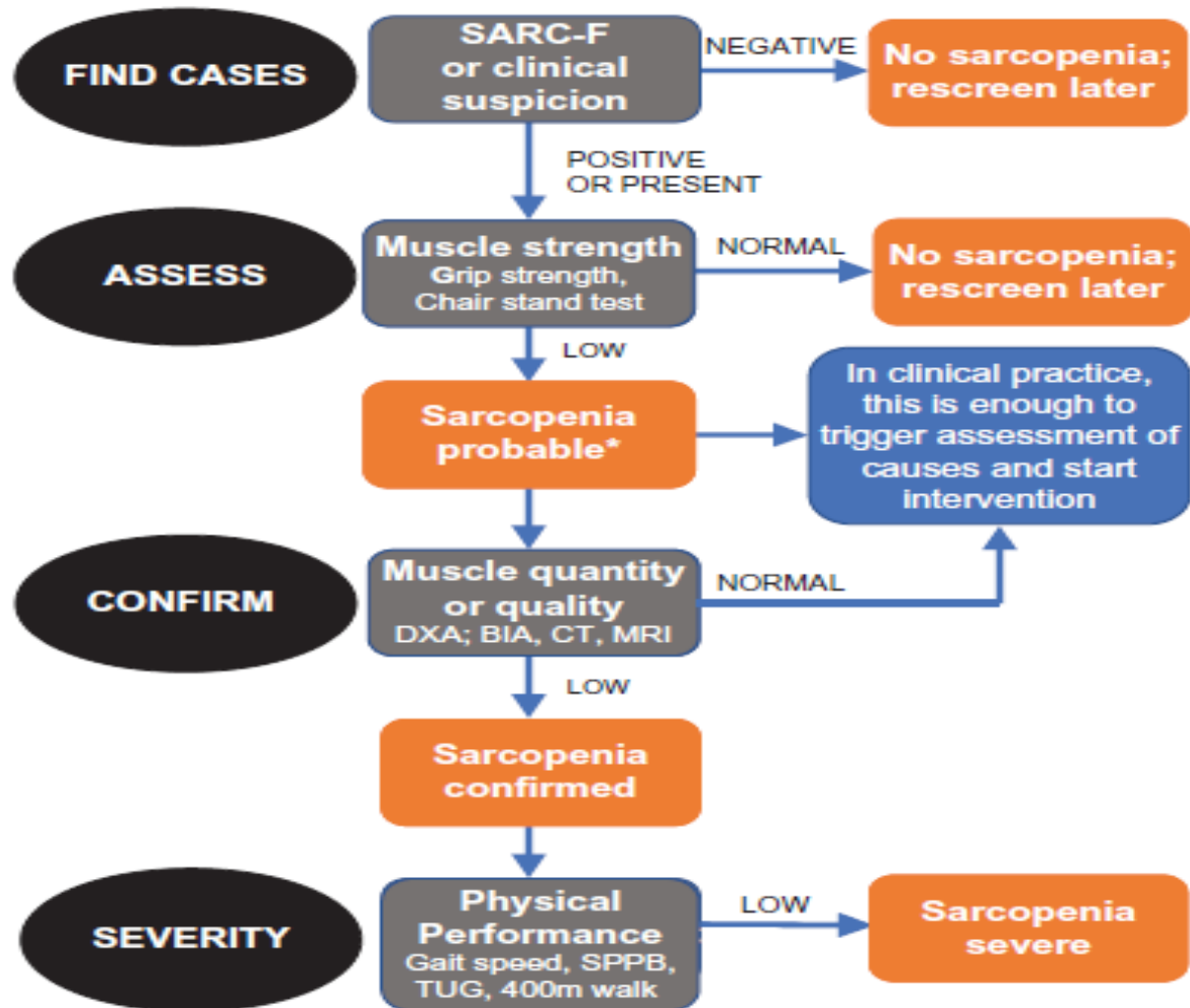
EWGSOP Definition (2010)

Sarcopenia is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength with a risk of adverse outcomes such as physical disability, poor quality of life and death.

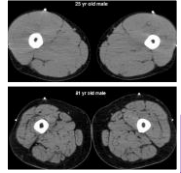
CRITERIA FOR THE DIAGNOSIS OF SARCOPENIA



EWGSOP2 algorithm for case-finding (2019)



SARCOPENIA Diagnosis



MUSCLE MASS

- DEXA
- BIA

- CT
- MRI



MUSCLE STRENGTH

- Handgrip strength

- Knee flexion-extension
- PEF



PHYSICAL PERFORMANCE

- Gait speed
- Get up&Go
- SPPB

- Stair climbing

SARCOPENIA Categories

Primary
Age-related

Secondary

**Activity
related**

- Bed rest
- Sedentary lifestyle
- Deconditioning

**Disease
related**

- Advanced organ failure
- Inflammatory diseases
- Malignancy
- Endocrine diseases

**Nutrition
related**

- Inadequate diet
- Malabsorption
- Gastrointestinal disorders
- Drug induced anorexia

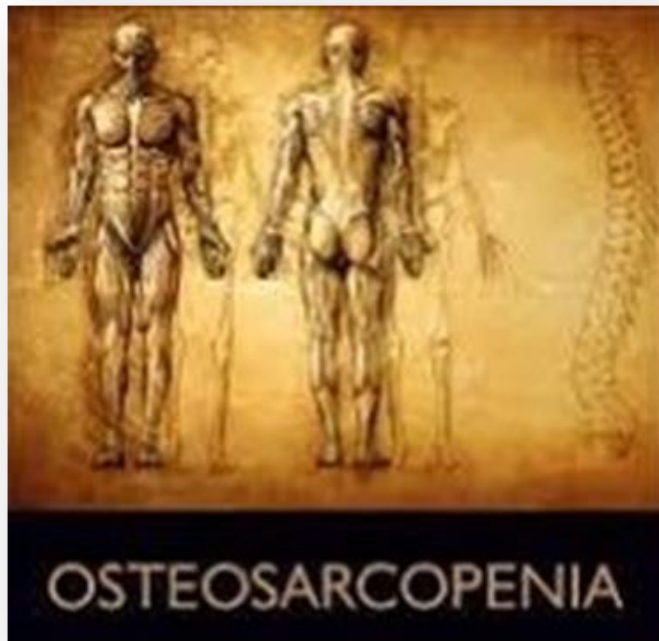
Life Style Risk Factors



**Faulty
diet**

**Lack of
physical
activity**

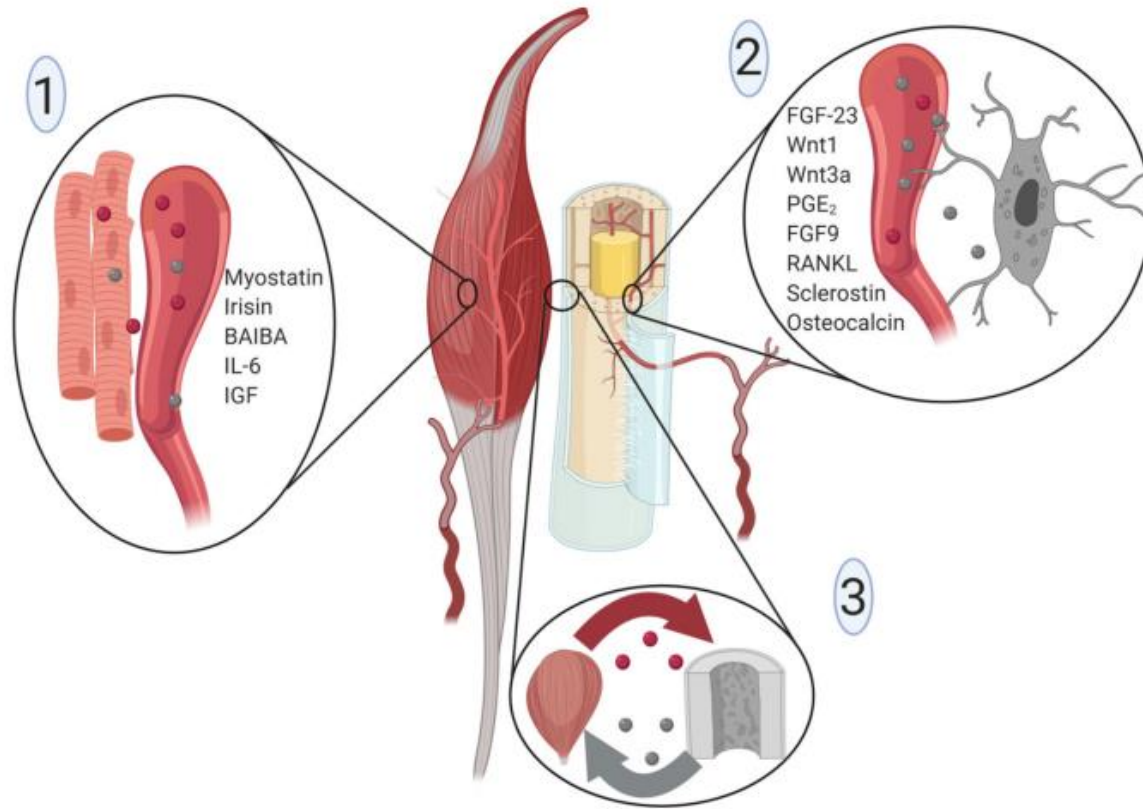
Muscle and Bone Interaction



Pathophysiology: Bone muscle interaction

- ▶ Muscle and bone are anatomically and functionally closely connected. The traditional concept that skeletal muscles serve to load bone and transform skeletal segments into a system of levers has been further refined into the **mechanostat theory**, according to which striated muscle is essential for bone development and maintenance, modelling and remodeling.
- ▶ Besides biomechanical function, skeletal muscle and bone are **endocrine organs** able to secrete factors capable of modulating biological function within their microenvironment, in nearby tissues or in distant organs.
- ▶ **Paracrine interactions** particularly at the periosteal interface can be hypothesized. These mechanisms can assume particular importance during bone and muscle healing after musculoskeletal injury.

Several signaling factors produced by muscle and bone have emerged as potential mediators of these biochemical/molecular interactions.



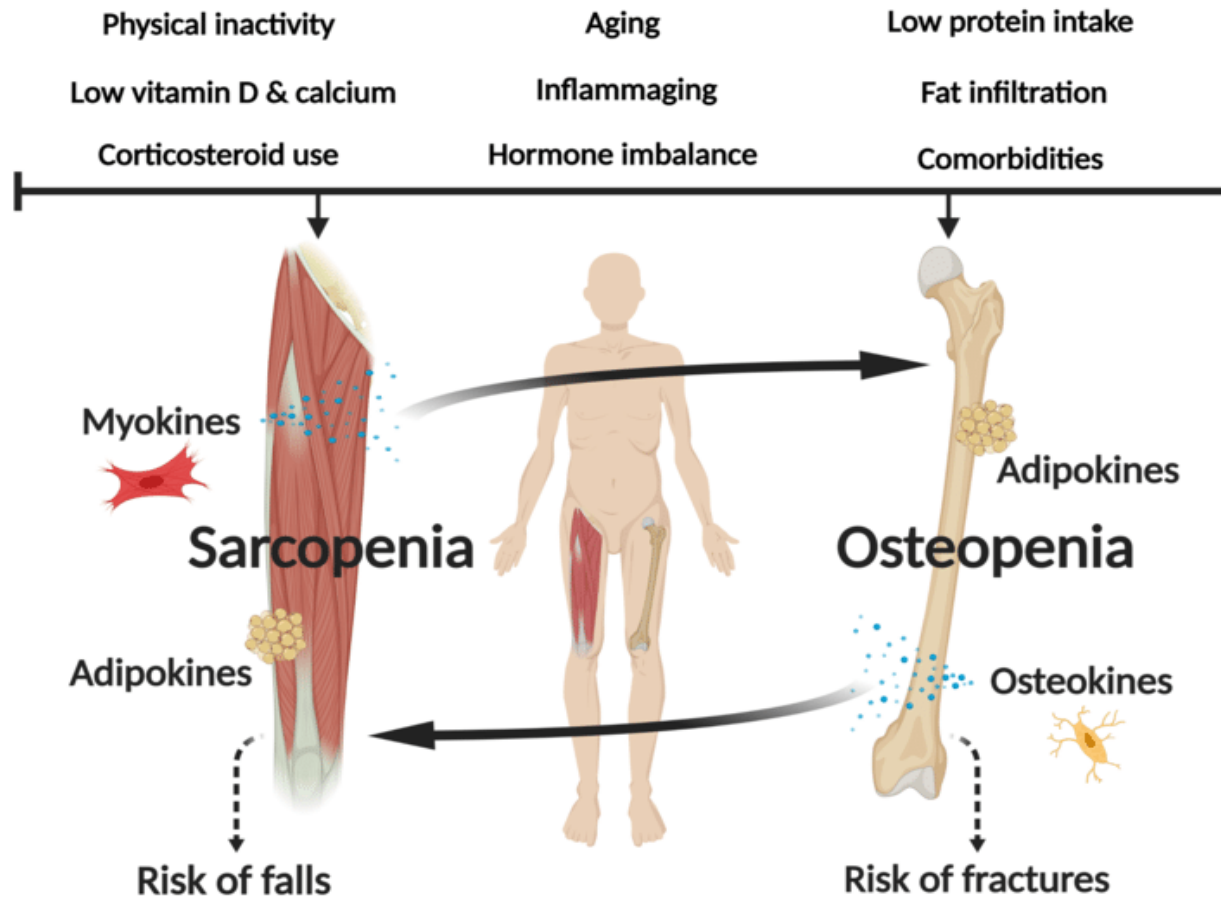
Sarcopenia / Osteoporosis Interaction

- ▶ In **post-menopausal women**, those with sarcopenia had a **13 times** higher risk of having osteoporosis vs. those without sarcopenia.
- ▶ Among **community-dwelling older persons**, those with sarcopenia had a **5 fold** higher risk of developing osteoporosis.
- ▶ Cross-sectional and longitudinal studies showed that osteoporosis **strongly increases** the risk of sarcopenia and vice versa.

Sjöblom S, Suuronen J, Rikkinen T, Honkanen R, Kröger H, Sirola J. Relationship between postmenopausal osteoporosis and the components of clinical sarcopenia. *Maturitas* 2013;75:175-180.

Locquet M, Beaudart C, Reginster J-Y, Bruyère O. Association between the decline in muscle health and the decline in bone health in older individuals from the SarcoPhAge cohort. *Calcif Tissue Int* 2019;104:273-284.

Risk factors and muscle-bone crosstalk (myokines, osteokines, adipokines)



Osteosarcopenia

- ▶ Osteosarcopenia is an increasingly recognized geriatric syndrome with a considerable prevalence which increases morbidity and mortality.
- ▶ **Osteosarcopenia: Osteopenia/Osteoporosis + Sarcopenia**
- ▶ From age 60 onwards, people experience a natural progressive decline in bone mineral density (~1-1.5% per year), muscle mass (~1% per year) and strength (~2.5-3% per year).
- ▶ These patients have greater risk of falls, fractures, institutionalization, and significant socioeconomic costs.

1. Kirk B, Zanker J, Duque G. Osteosarcopenia: epidemiology, diagnosis, and treatment-facts and numbers. *J Cachexia Sarcopenia Muscle*. 2020 Jun;11(3):609-618. doi: 10.1002/jcsm.12567. Epub 2020 Mar 22. PMID: 32202056; PMCID: PMC7296259.

2. Paintin J, Cooper C, Dennison E. Osteosarcopenia. *Br J Hosp Med (Lond)*. 2018 May 2;79(5):253-258. doi: 10.12968/hmed.2018.79.5.253. PMID: 29727228; PMCID: PMC5963675.

Epidemiology of Osteosarcopenia

- ▶ Unlike osteopenia/osteoporosis, several clinical definitions of sarcopenia have been proposed (see sarcopenia for details).
- ▶ Hence, the prevalence of osteosarcopenia varies depending on the definitions of sarcopenia considered.
- ▶ Generally, the prevalence of osteosarcopenia is estimated to range from **5 to 37%** among community-dwelling older people with the highest rates observed in those with fractures (low-trauma fracture: **~46%**; hip fracture: **~ 96.3%**).
- ▶ With the global population ageing, the proportion of individuals with osteosarcopenia is projected to increase, irrespective of the definition of sarcopenia considered.

Excess Risk

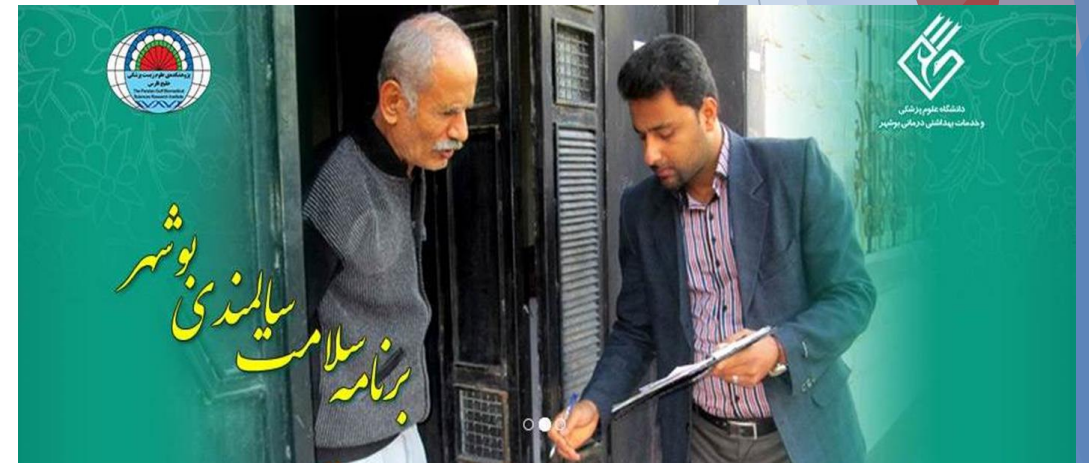
- ▶ Osteosarcopenia is associated with impaired balance and functional capacity [ORs: 2.56-7.19; $P < 0.05$] vs. non-osteosarcopenia.
- ▶ Osteosarcopenia also associates with:
 - ▶ Falls (ORs: 2.83-3.63; $P < 0.05$),
 - ▶ Fractures (ORs: 3.86-4.38; $P < 0.05$),
 - ▶ Earlier death [hazard ratio (1-year follow-up): 1.84, $P = 0.023$].

Osteosarcopenia in **IRAN**

- ▶ This is a report of cross-sectional study that has been conducted within the framework of Bushehr Elderly Health (BEH) program stage II in which participants aged ≥ 60 years were included.
- ▶ Osteopenia/osteoporosis was defined as a t-score ≤ -1.0 standard deviation below the mean values of a young healthy adult.
- ▶ Sarcopenia was defined as reduced skeletal muscle mass plus low muscle strength and/or low physical performance employing both the **2010 and 2019** European definition of sarcopenia (EWGSOP 1 & 2) and national cut-offs for muscle mass and strength.
- ▶ Osteosarcopenia was considered as the presence of both osteopenia/osteoporosis and sarcopenia.

Osteosarcopenia in **IRAN**

- ▶ Among 2353 participants, 1205 (51.2%) were women.
- ▶ Age-standardized prevalence of osteosarcopenia was **33.8%** based on EWGSOP1 definition for Sarcopenia and **22.4%** based on EWGSOP2 definition for Sarcopenia.



Risk Factors of Osteosarcopenia

- ▶ Older Age: men: 14.3% (60-64 years) to 59.4% (≥ 75 years);
women: 20.3% (60-64 years) to 48.3% (≥ 75 years),
- ▶ Physical Activity: OR= 0.64, 95% CI: 0.46-0.88,
- ▶ BMI: men: OR = 0.84, 95% CI 0.81-0.88;
women: OR = 0.77, 95% CI 0.74-0.80,
- ▶ Higher Fat Mass: men: OR = 1.46, 95% CI 1.11-1.92;
women: OR = 2.25, 95% CI 1.71-2.95
- ▶ Type 2 Diabetes: men: OR = 1.33, 95% CI 1.04-1.69.

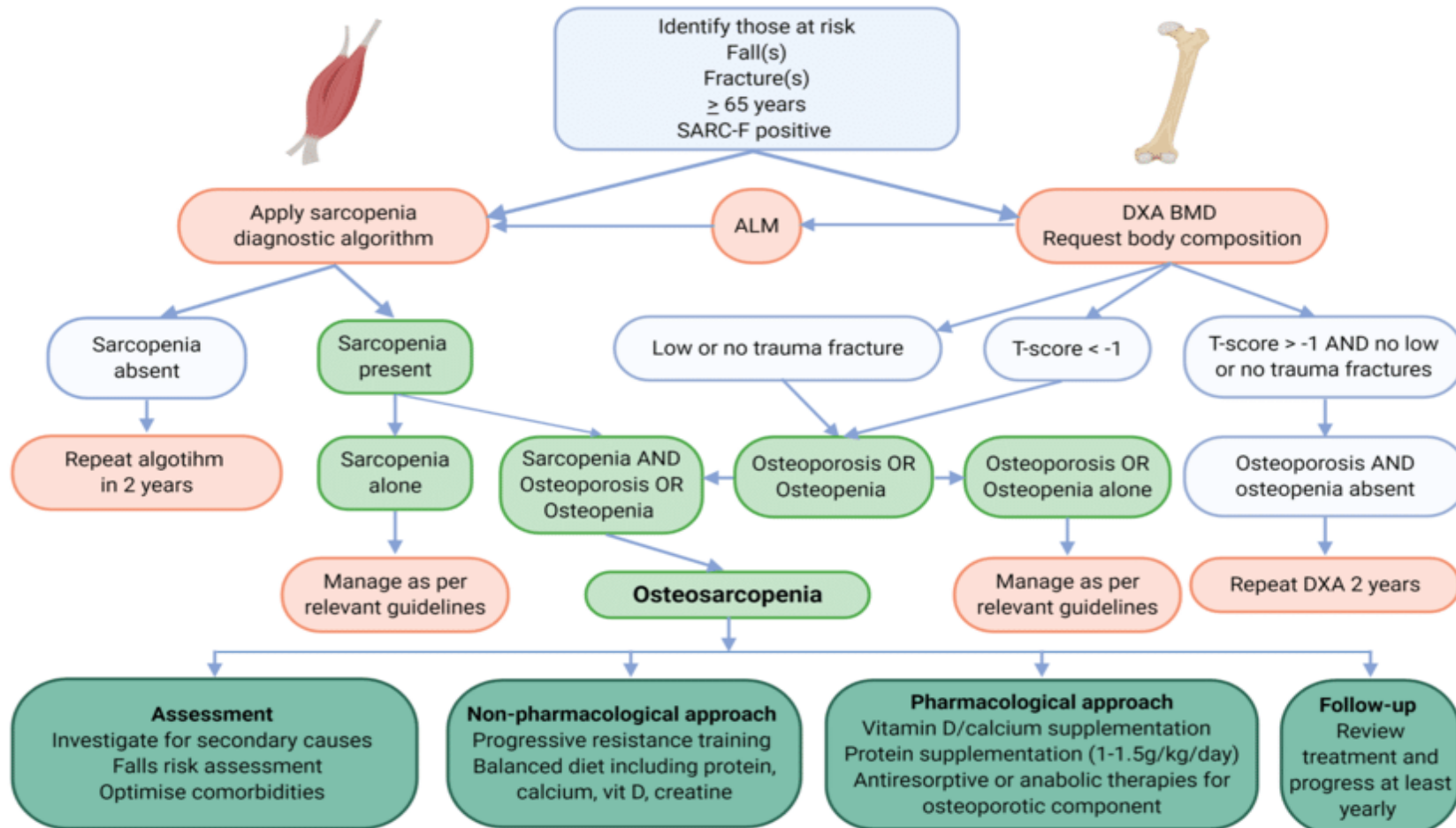


Osteosarcopenia Consequences

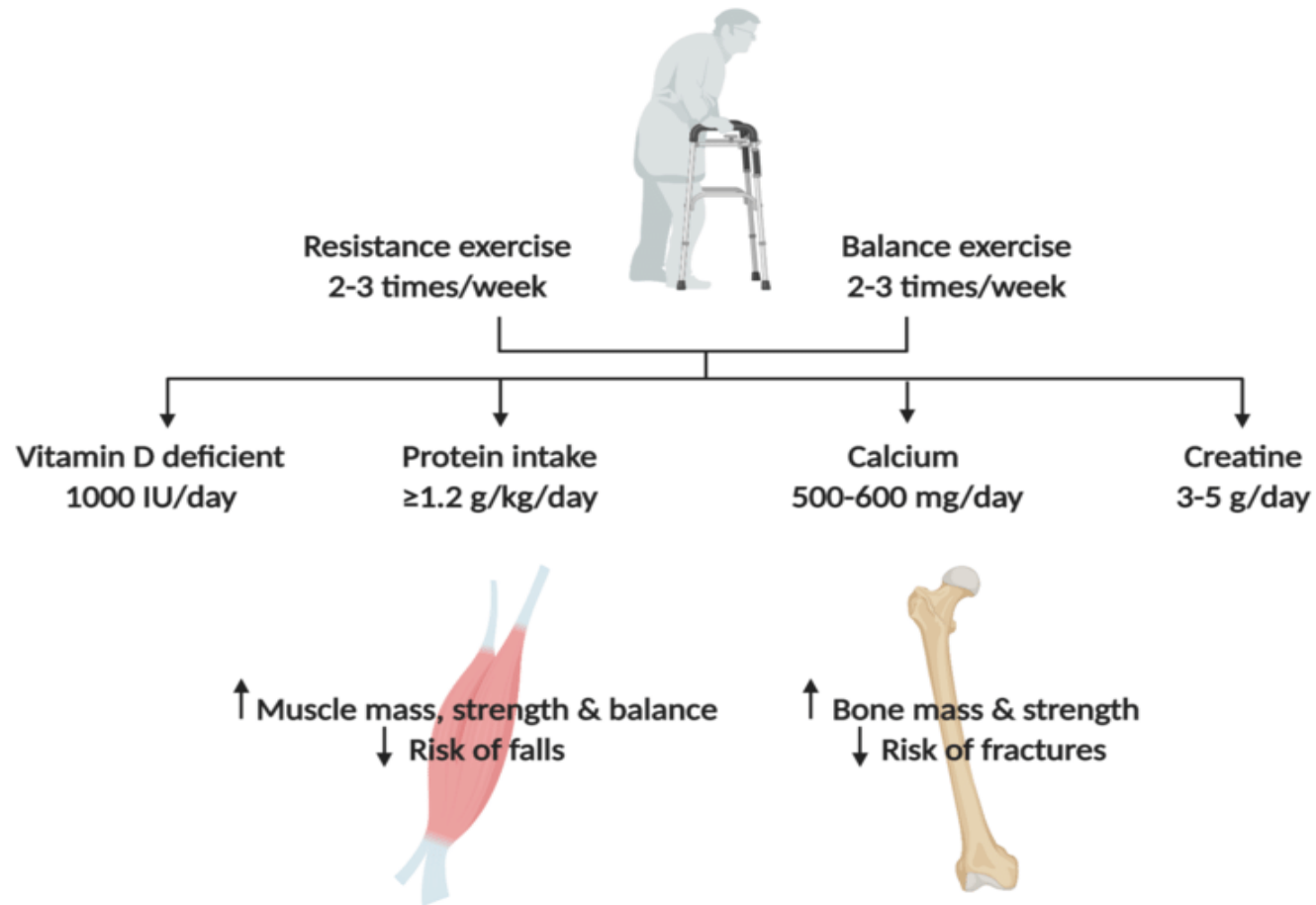
- ▶ Individuals with osteosarcopenia are at higher risk of:
 - ▶ Falls,
 - ▶ Frailty,
 - ▶ Fractures, and
 - ▶ Institutionalization.
- ▶ It is also associated with significantly increased mortality:
 - ▶ Study on elderly Korean patients with hip fracture: 1-year mortality rate of 15% in the osteosarcopenic patients, more than that of osteoporotic (5%)
 - ▶ Earlier death [hazard ratio (1-year follow-up): 1.84, $P = 0.023$].



Clinical algorithm to assess and manage Osteosarcopenia



Lifestyle treatments for Osteosarcopenia



Multidisciplinary Osteosarcopenia Care



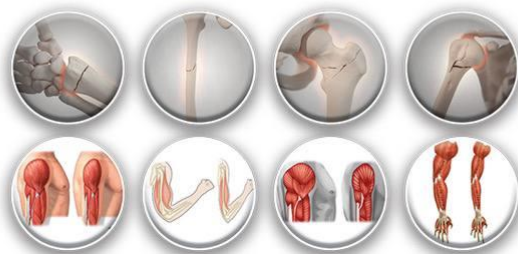
افتتاح کلینیک پوکی استخوان و سارکوپنی

دانشگاه علوم پزشکی تهران

روزهای

یکشنبه و چهارشنبه

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■ تشخیص و درمان پوکی استخوان (استئوپروز)

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OsteoSarcopenia in Iran

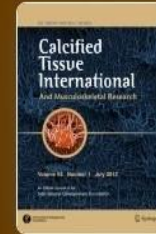
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Prevalence of Osteosarcopenia and Its Association with Cardiovascular Risk Factors in Iranian Older People: Bushehr Elderly Health (BEH) Program

Original Research | Published: 17 December 2019

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[Noushin Fahimfar](#), [Farbod Zahedi Tajrishi](#), [Safoora Gharibzadeh](#), [Gita Shafiee](#), [Kiarash Tanha](#), [Ramin Heshmat](#), [Iraj Nabipour](#), [Alireza Raeisi](#), [Ali Jalili](#), [Bagher Larijani](#) & [Afshin Ostovar](#) 



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OsteoSarcopenia in Iran

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Overlap between Osteosarcopenia and Frailty and their Association with Poor Health Conditions: The Bushehr Elderly Health Program

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OsteoSarcopenia in Iran

Fathi et al. *BMC Geriatrics* (2021) 21:654
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BMC Geriatrics

RESEARCH

Open Access

Association between biomarkers of bone health and osteosarcopenia among Iranian older people: The Bushehr Elderly Health (BEH) program



Maryam Fathi^{1,2}, Ramin Heshmat¹, Mehdi Ebrahimi², Ahmad Salimzadeh³, Afshin Ostovar⁴, Ali Fathi⁵, Farideh Razi⁶, Iraj Nabipour⁷, Maryam Moghaddassi^{3*} and Gita Shafiee^{1,6*}



thank you