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03 · 04 · 05
APRILE 2025

# L'OBESITA' SARCOPENICA NELL'ANZIANO

## Il rischio cardio-metabolico


**Prof. P. Abete**

Dipartimento di Scienze Mediche Traslazionali
Università di Napoli Federico II


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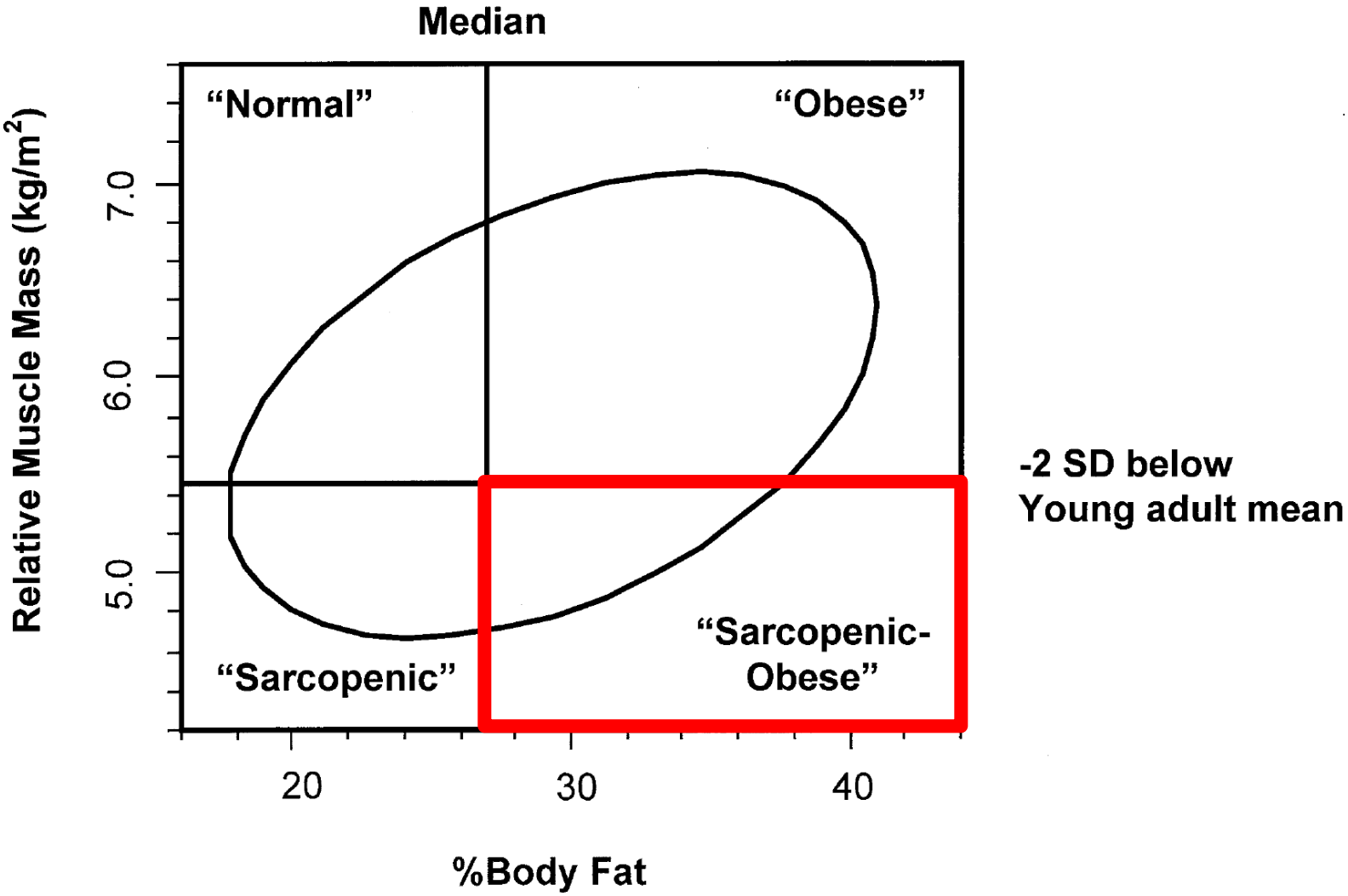
# Body Composition in Healthy Aging




*Baumbartner R et al., Ann Ac NY SC 2000*

AGING

SARCOPENIC OBESITY

SARCOPENIA

Metabolic syndrome

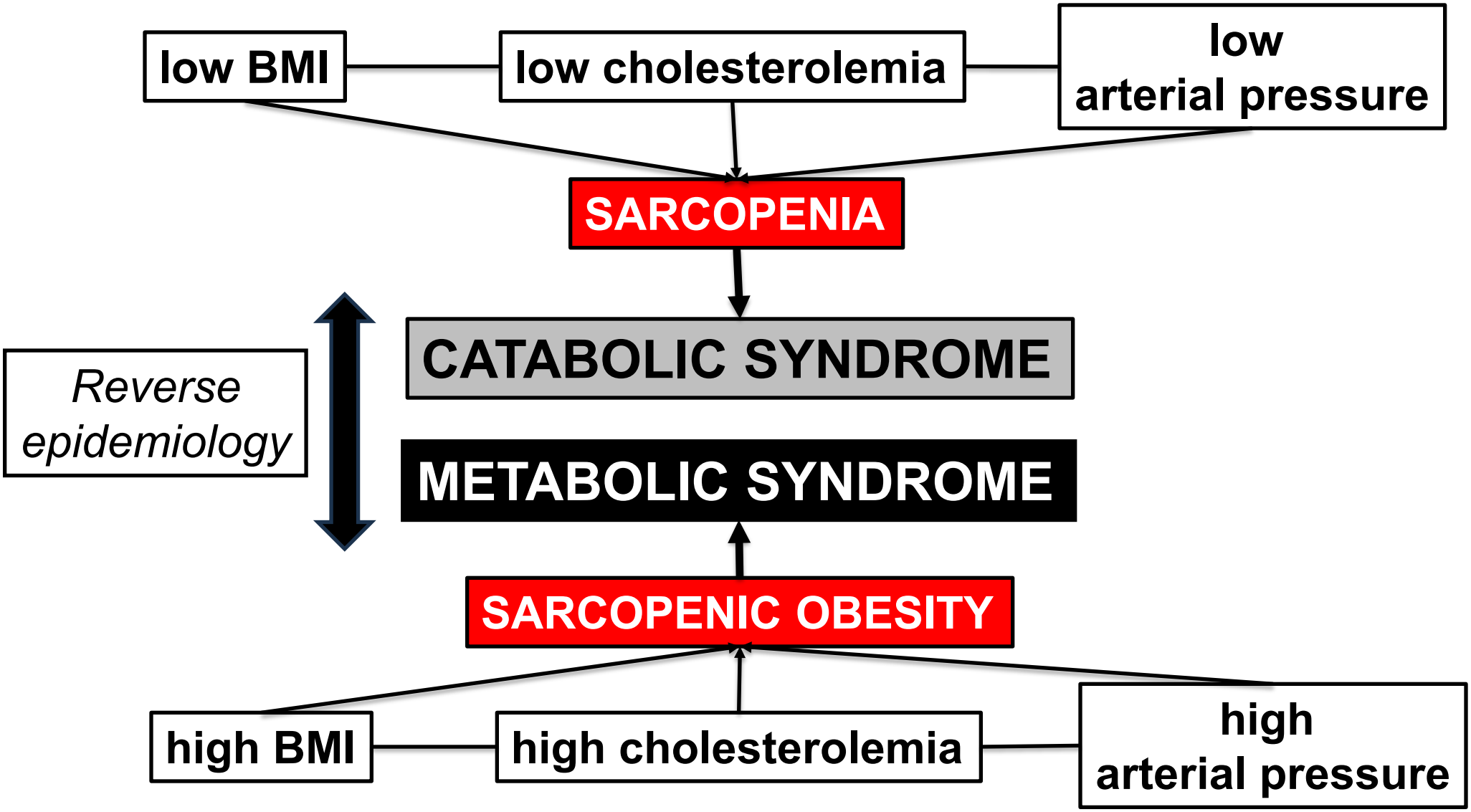
Catabolic syndrome

Aging Clin Exp Res (2018) 30:547–554
DOI 10.1007/s40520-017-0815-7

REVIEW

# The reverse metabolic syndrome in the elderly: Is it a "catabolic" syndrome?

**Francesco Curcio[1] · Giuseppe Sasso[1] · Ilaria Liguori[1] · Gaetana Ferro[2] · Gennaro Russo[1] · Michele Cellurale[1] · David Della-Morte[3,4] · Gaetano Gargiulo[5] · Gianluca Testa[1,6] · Francesco Cacciatore[1,7] · Domenico Bonaduce[1] · Pasquale Abete[1]**


low BMI
low cholesterolemia
low
arterial pressure
SARCOPENIA
CATABOLIC SYNDROME
Reverse
epidemiology
METABOLIC SYNDROME
SARCOPENIC OBESITY
high BMI
high cholesterolemia
high
arterial pressure

# Simplified diagram of the self-perpetuating cycle linking obesity with muscle wasting


Mirzai S et al. Current Obesity Reports 2024

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**L'OBESITA' SARCOPENICA NELL'ANZIANO**
**Il rischio cardio-metabolico**

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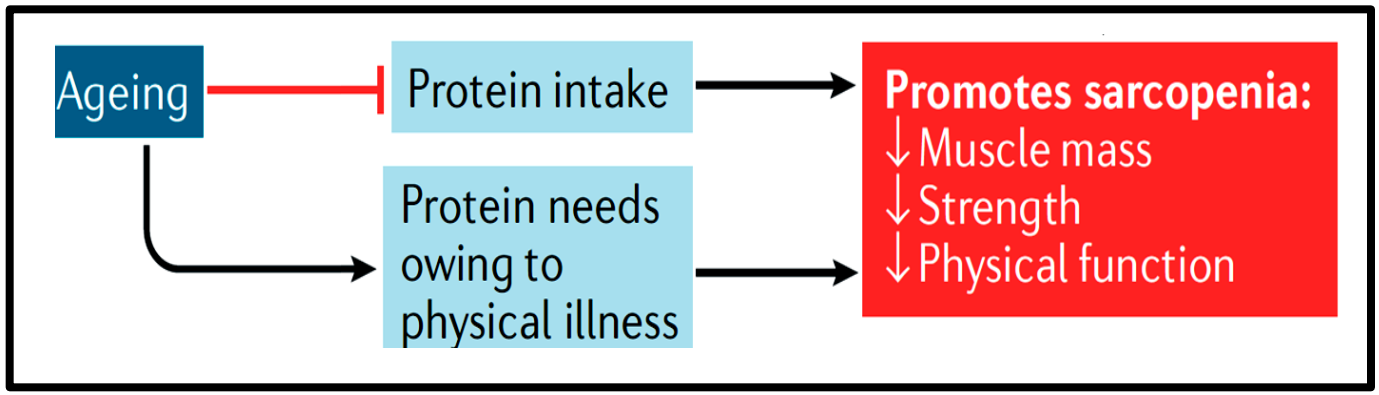
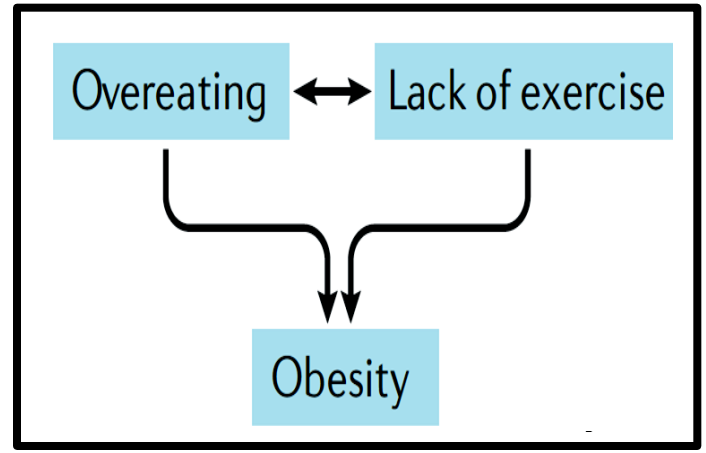
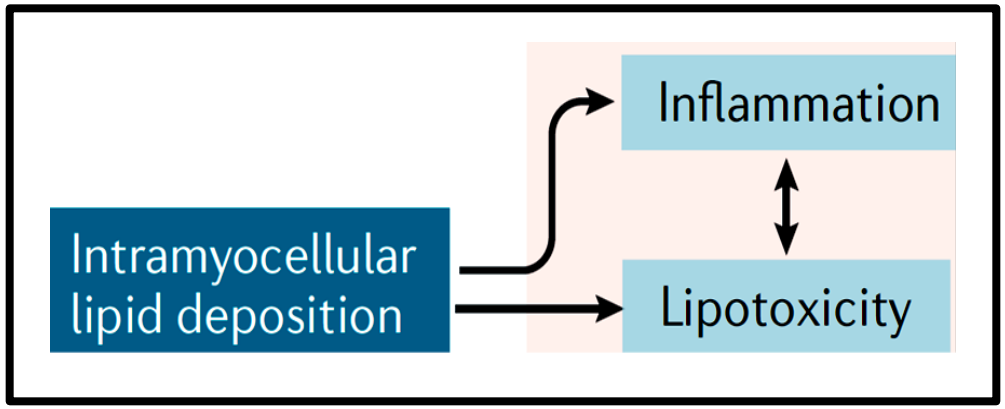
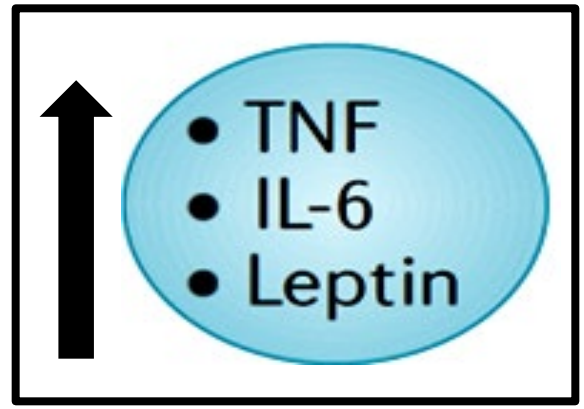
- **Biological pathways to sarcopenic obesity**
- Assessing sarcopenic obesity
- Prevalence of sarcopenic obesity
- Cardiometabolic risk of sarcopenic obesity
- Treatments for sarcopenic obesity

# A proposed model of mechanisms leading to *sarcopenic obesity*



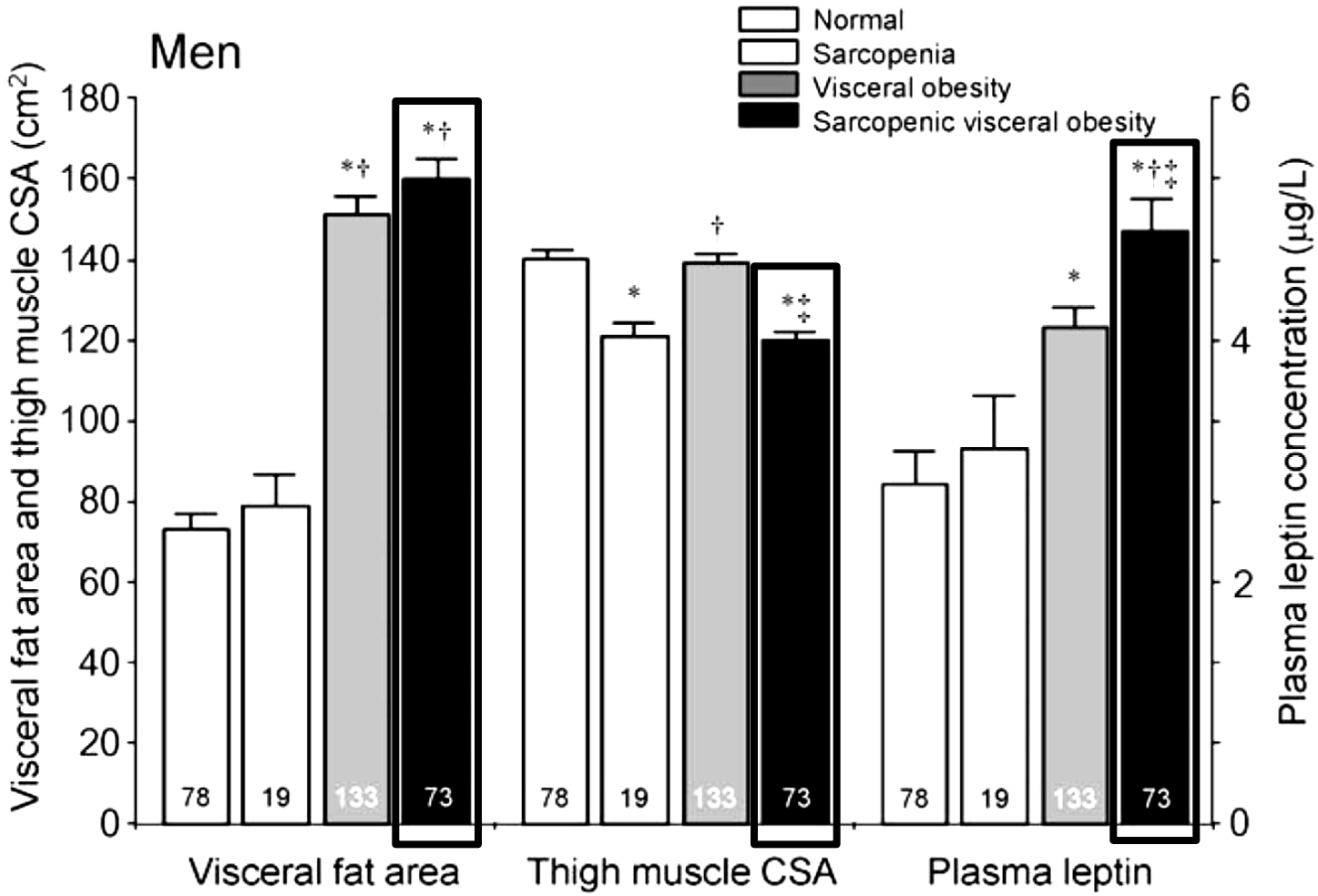




*Batsis JA, & Villareal DT. Nat Rev Endocrinol. 2018*

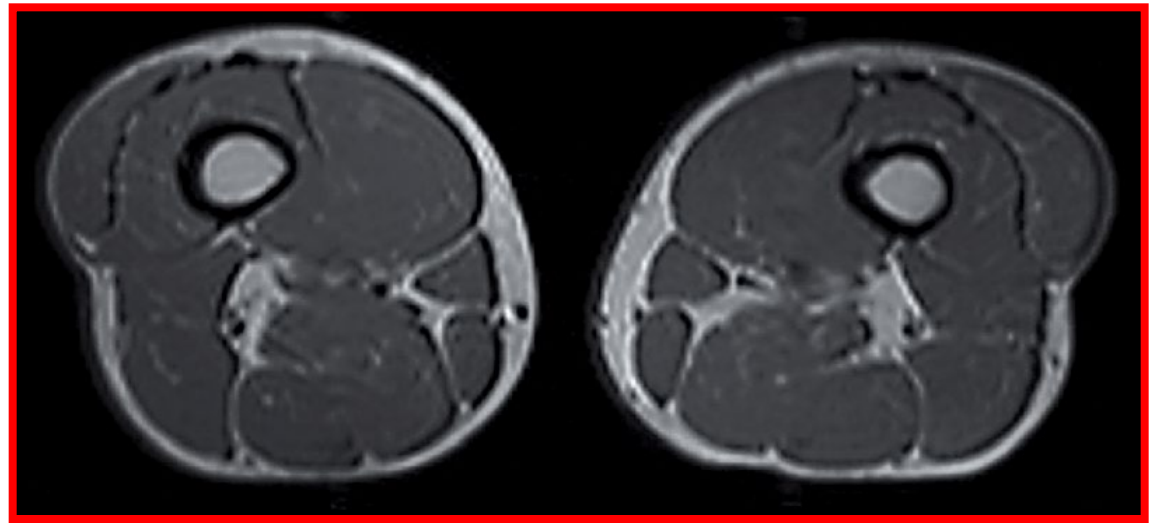
# Plasma levels of LEPTIN were higher in subjects with sarcopenic visceral obesity than in those with either sarcopenia or visceral obesity alone.



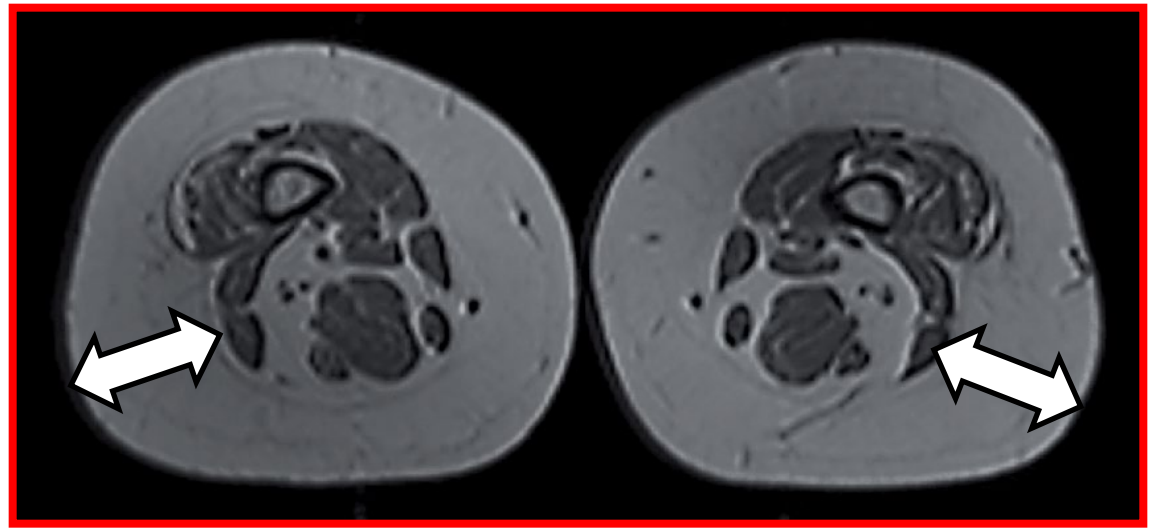

*Kohara K et al., PlosOne 2011*

# Magnetic Resonance of individuals with and without *obesity*

**Individual without obesity with normal muscle**

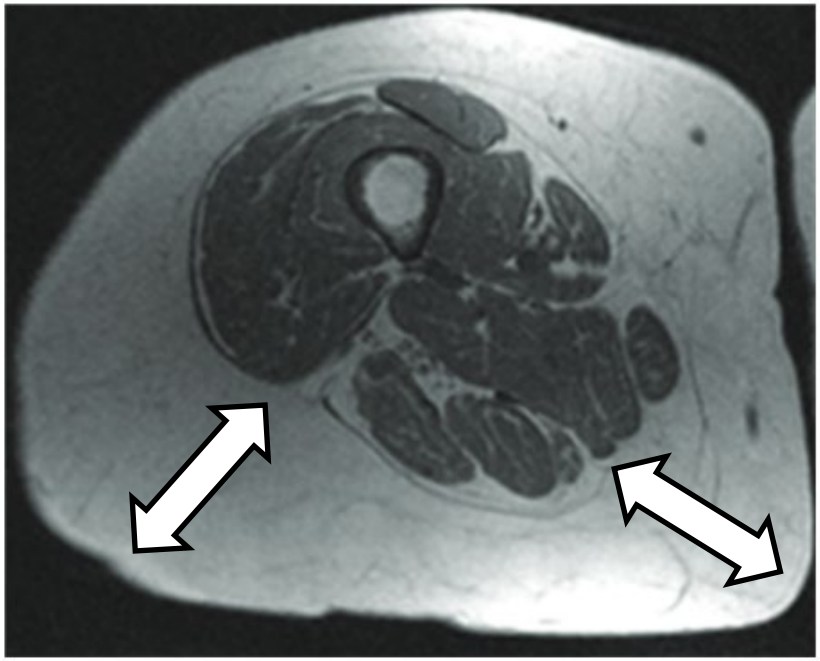


**individual with obesity with small muscles and infiltration by adipose tissue**



*Batsis JA, & Villareal DT. Nat Rev Endocrinol. 2018*

# Correlations between muscle and mobility variables



| | 6 MW (m) | Stair A (s) | Stair D (s) | TUG (s) |
|---|---|---|---|---|
| Strength (N/BMI) | 0.50** | −0.55** | −0.49** | −0.45** |
| Thigh IMAT CSA ($cm^2$) | −0.33** | 0.39** | 0.36** | 0.30** |
| Thigh muscle CSA ($cm^2$) | 0.38** | −0.32** | −0.30** | −0.23* |

** $P < 0.01$, * $P < 0.05$.

Intramuscular adipose tissue (IMAT), cross-sectional area (CSA)
six minute walk (6 MW), stair ascent (stair A), stair descent (stair D), timed up and go (TUG).

*Marcus RL et al., Journal of Aging Research, 2012*

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## L'OBESITA' SARCOPENICA NELL'ANZIANO
## Il rischio cardio-metabolico

- Biological pathways to sarcopenic obesity
- **Assessing sarcopenic obesity**
- Prevalence of sarcopenic obesity
- Cardiometabolic risk of sarcopenic obesity
- Treatments for sarcopenic obesity

# Diagnostic procedure and cutoffs for the assessment of sarcopenic obesity

*based on information from the ESPEN/EASO consensus definition*

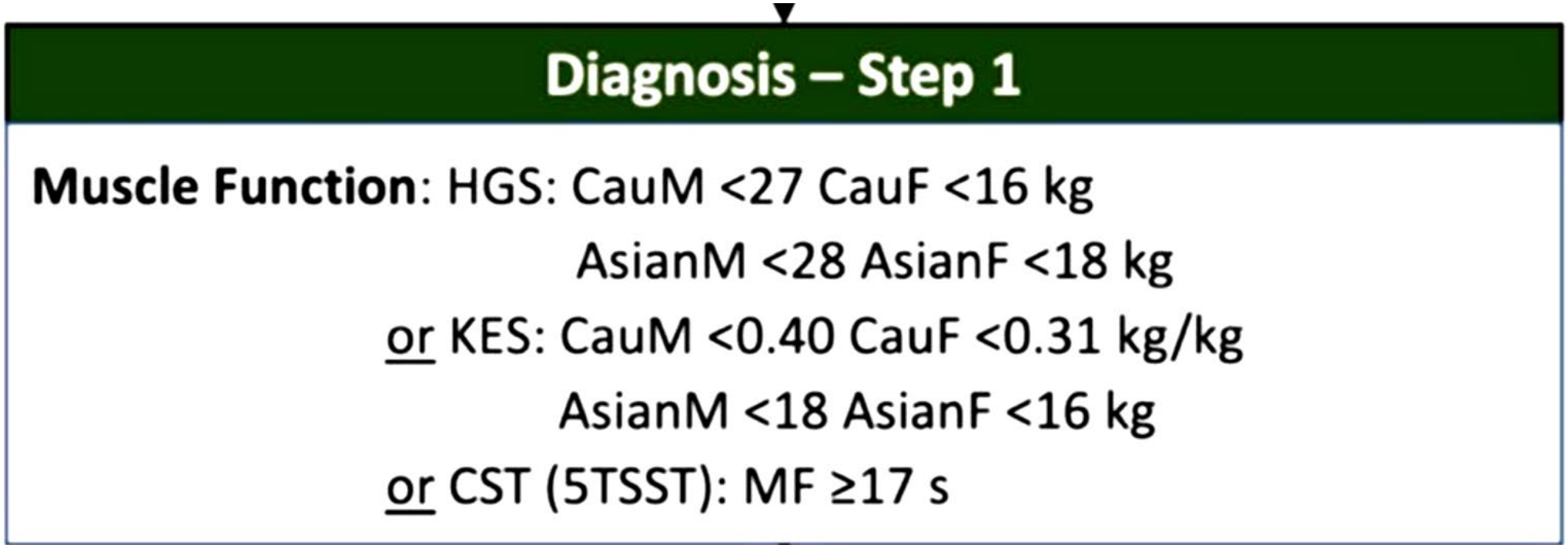
| Screening |
| --- |
| (1) **Obesity:** BMI: CauMF ≥30 kg/m$^2$<br>AsianMF ≥27.5 kg/m$^2$<br>or WC: CauM ≥90 CauF ≥80 cm<br>AsianM ≥78 AsianF ≥72 cm |
| (2) **Sarcopenia:** Clinical suspicion or symptoms (age >70 years; chronic diseases; recent acute disease or nutritional events; reported physical limitations)<br>or SARC-F ≥4 |

BMI = body mass index; Cau = Caucasian; M = male; F = female;
WC = waist circumference; SARC-F = strength, assistance with walking, rising from a chair climbing stairs and falls;

*Donini LM et al. Obes Facts 2022*

# Diagnostic procedure and cutoffs for the assessment of sarcopenic obesity

*based on information from the ESPEN/EASO consensus definition*




HGS = handgrip strength; KES = knee-extension strength; CST = chair stand test; STSST = 5-times Sit- to-Stand Chair test.

Donini LM et al. Obes Facts 2022

# Diagnostic procedure and cutoffs for the assessment of sarcopenic obesity

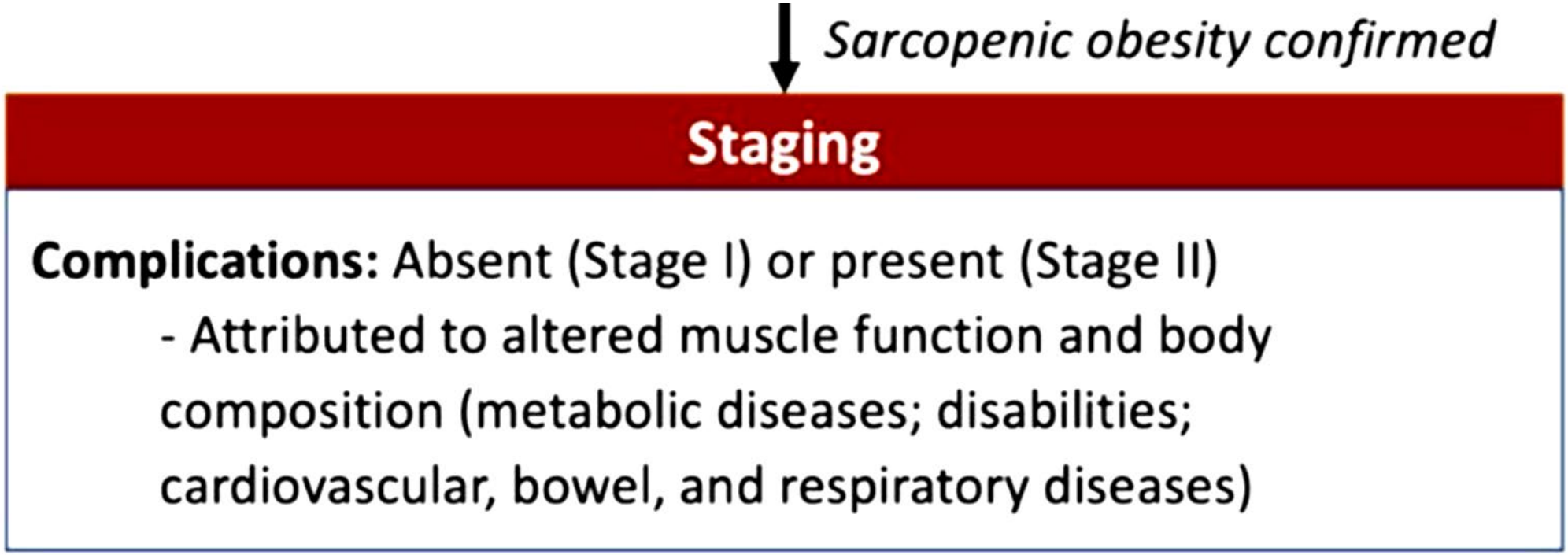
*based on information from the ESPEN/EASO consensus definition*

| Diagnosis – Step 2 |
| --- |
| **Body Composition**: (1) FM%: 20-39y CauM >26 CauF >39 % |
| AsianM >28 AsianF >40 % |
| AfrAmM >26 AfrAmF >38 % |
| 40-59y CauM >29 CauF >41 % |
| AsianM >29 AsianF >41 % |
| AfrAmM >27 AfrAmF >39 % |
| 60-79y CauM >31 CauF >43 % |
| AsianM >29 AsianF >41 % |
| AfrAmM >29 AfrAmF >41 % |
| **AND** (2) ALM/W (DXA): M <25.7 F <19.4 % |
| or SMM/W (BIA): M <31.5 F <22.1 % |

FM% = fat mass percent- age; AfrAm = African-American; ALM/W = appendicular lean mass adjusted to body weight; DXA = dual X-ray absorptiometry; SMM/W = total skeletal muscle mass adjusted by weight; BIA = bioelectrical impedance analysis

*Donini LM et al. Obes Facts 2022*

**Diagnostic procedure and cutoffs for the assessment of sarcopenic obesity**
*based on information from the ESPEN/EASO consensus definition*




*Donini LM et al. Obes Facts 2022*

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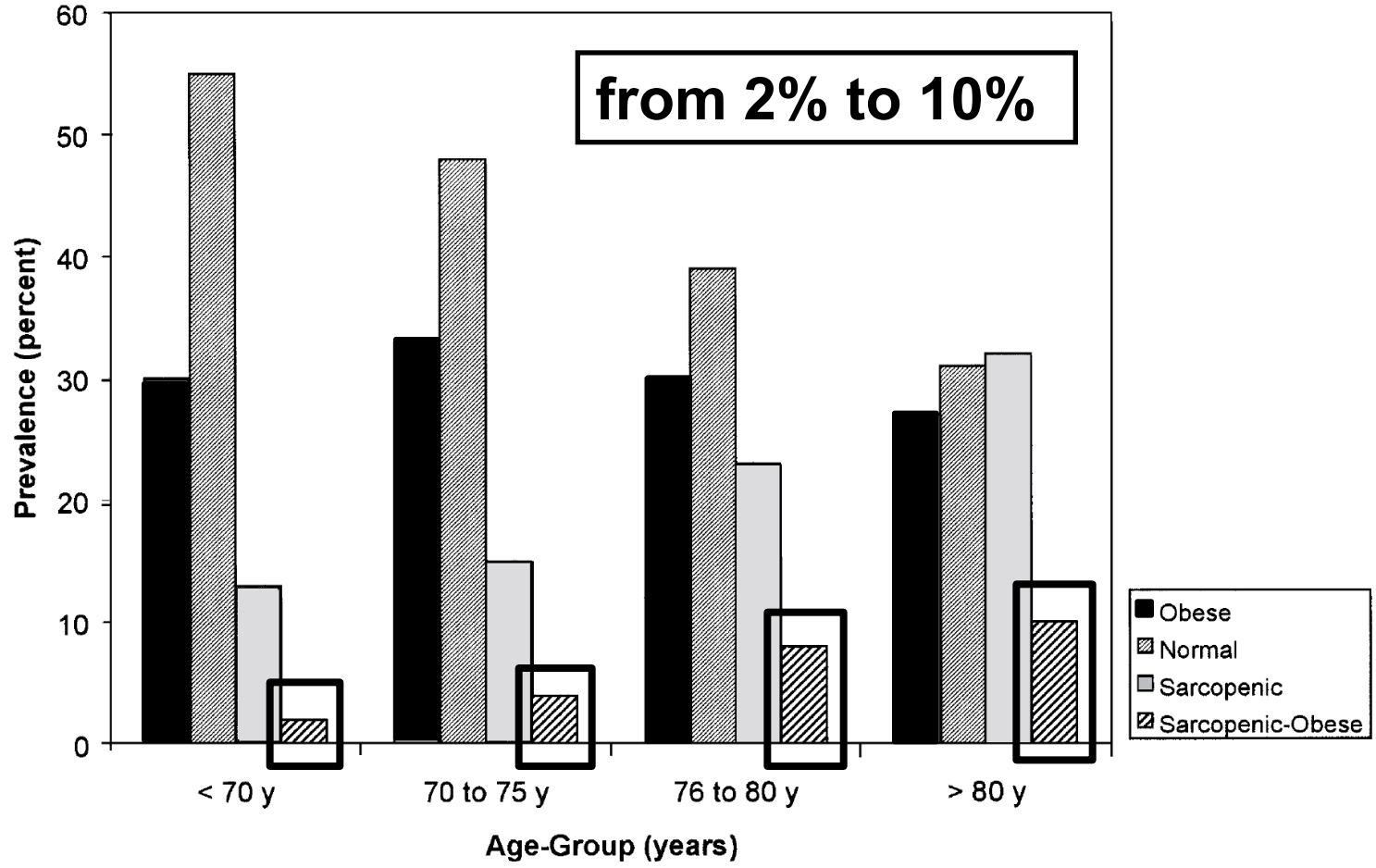
# PREVALENCE OF SARCOPENIC OBESITY: a mistery….

1) Cutoffs for obesity and sarcopenia varied considerably between studies
2) Lack of agreement over whether sarcopenia should be determined using appendicular or total body skeletal mass
3) Limitations of applying mathematical distributions
4) Different sex-specific cutoffs
5) Importance of ethnicity
6) Obese middle-aged adults may acquire greater muscle reserves to compensate for body habitus
7) Using DXA to ascertain body composition may have influenced the results because it can overestimate fat in lean individuals but underestimate fat in obese individuals

*Batsis JA et al. ,J Am Geriatr 2013.*

# Prevalences of obesity, sarcopenia, and sarcopenic-obesity by age in the combined New Mexico *Elder Health Survey and New Mexico Aging Process Study.*




*Baumbartner R et al., Am J Epidemiol, 1998*

# Global PREVALENCE of sarcopenic obesity in older adults: A systematic review and meta-analysis

| Subgroup | Meta-analysis | |
|---|---|---|
| | No. of studies | Prevalence (95% CI) |
| Diagnostic criteria of sarcopenia | | |
| Muscle mass alone | 40 | 15% (12%, 17%) |
| Muscle mass plus muscle strength and/or physical function | 10 | 4% (4%, 5%) |
| Assessme | | |
| DXA | | |
| BIA | | |
| Diagnosti | | |
| WC | | |
| BMI | | |
| BF | 27 | 10% (8%, 12%) |
| WC/BMI/BF | 1 | 7% (5%, 9%) |
| Age | | |
| ≥75 years | 3 | 23% (15%, 30%) |
| Gender | | |
| Female | 41 | 14% (11%, 16%) |
| Male | 35 | 10% (9%, 12%) |

**PREVALENCE of sarcopenic obesity**
**From 4% to 23%**

*Gao Q et a., Clin Nutr. 2021*

Aging Clinical and Experimental Research (2022) 34:113–120
https://doi.org/10.1007/s40520-021-01949-1

ORIGINAL ARTICLE

# Prevalence of obesity and diabetes in older people with sarcopenia defined according to EWGSOP2 and FNHI criteria

Francesca Remelli[1] · Elisa Maietti[1,14] · Pasquale Abete[2] · Giuseppe Bellelli[3] · Mario Bo[4] · Antonio Cherubini[5] · Francesco Corica[6] · Mauro Di Bari[7,8] · Marcello Maggio[9] · Maria Rosaria Rizzo[10] · Andrea P. Rossi[11] · Francesco Landi[12] · Stefano Volpato[1,13] · the GLISTEN Group Investigators

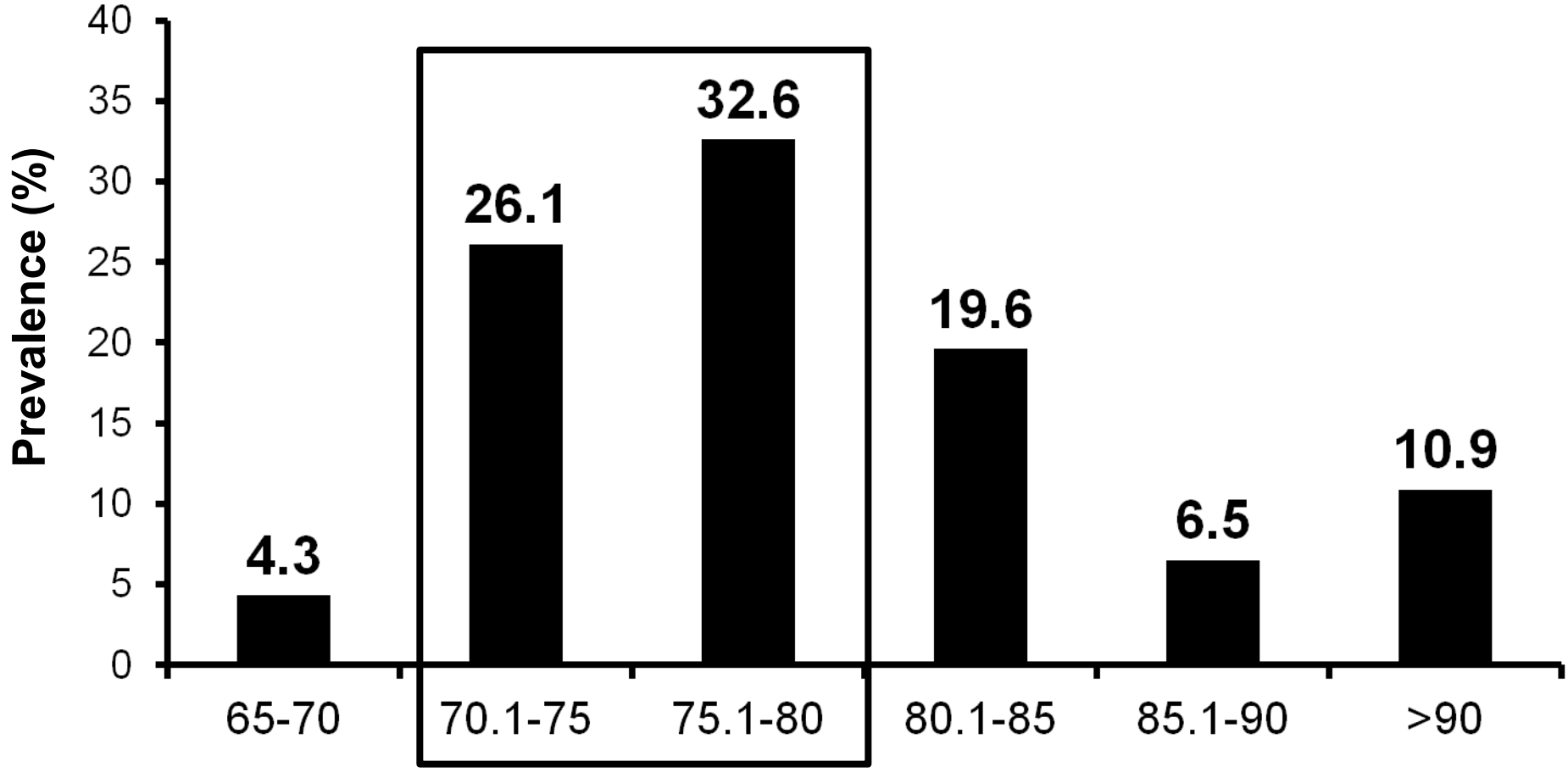
**GLISTEN Group Investigators**
**SIGG**

# Prevalence of Sarcopenic obesity

## *Results From "GLISTEN" study*

### *In elderly hospitalized patients*

BMI ≥ 30 kg/m$^2$



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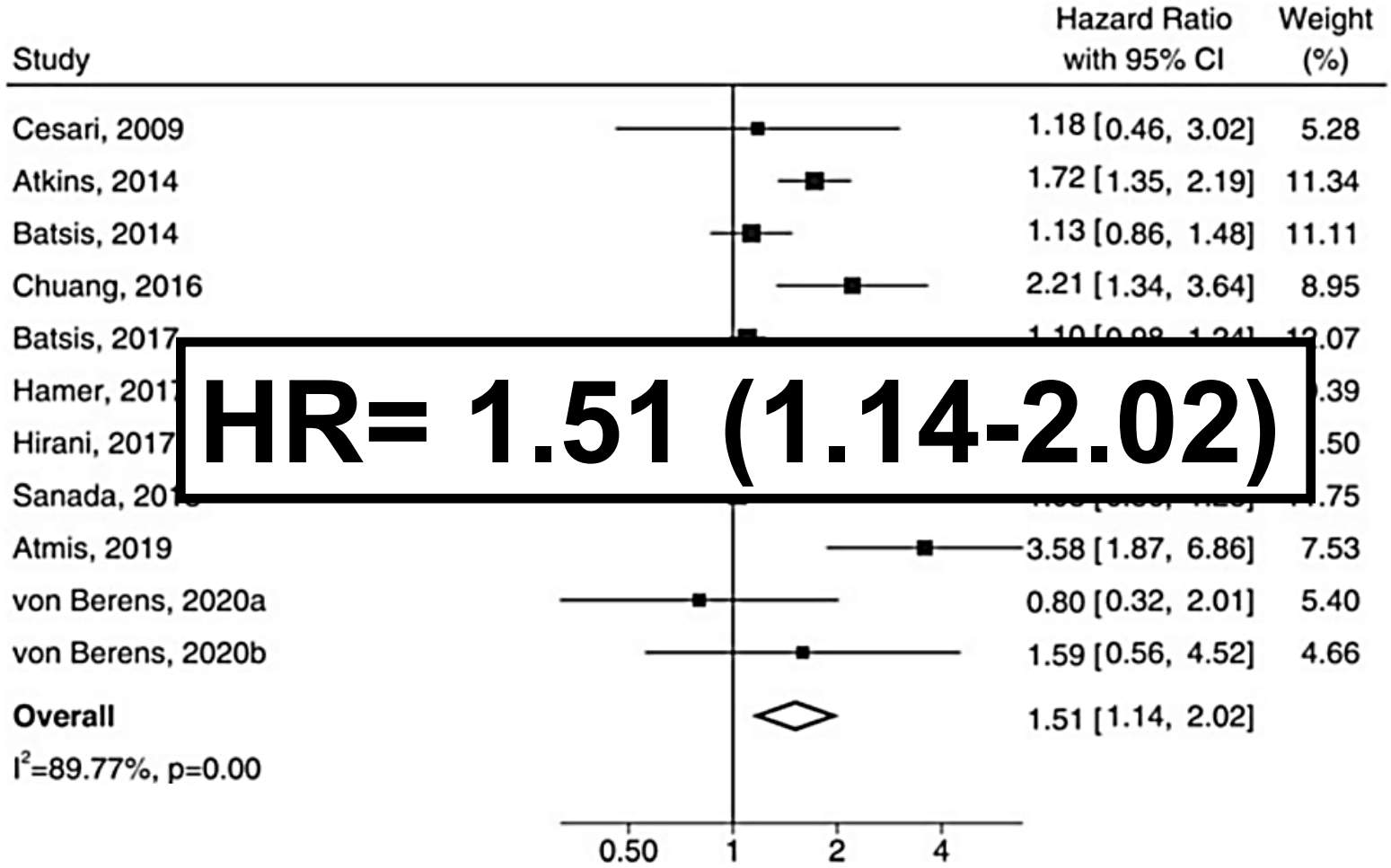
# Random-effects meta-analysis showing the hazard ratio for ALL-CAUSE MORTALITY in patients with sarcopenic obesity.

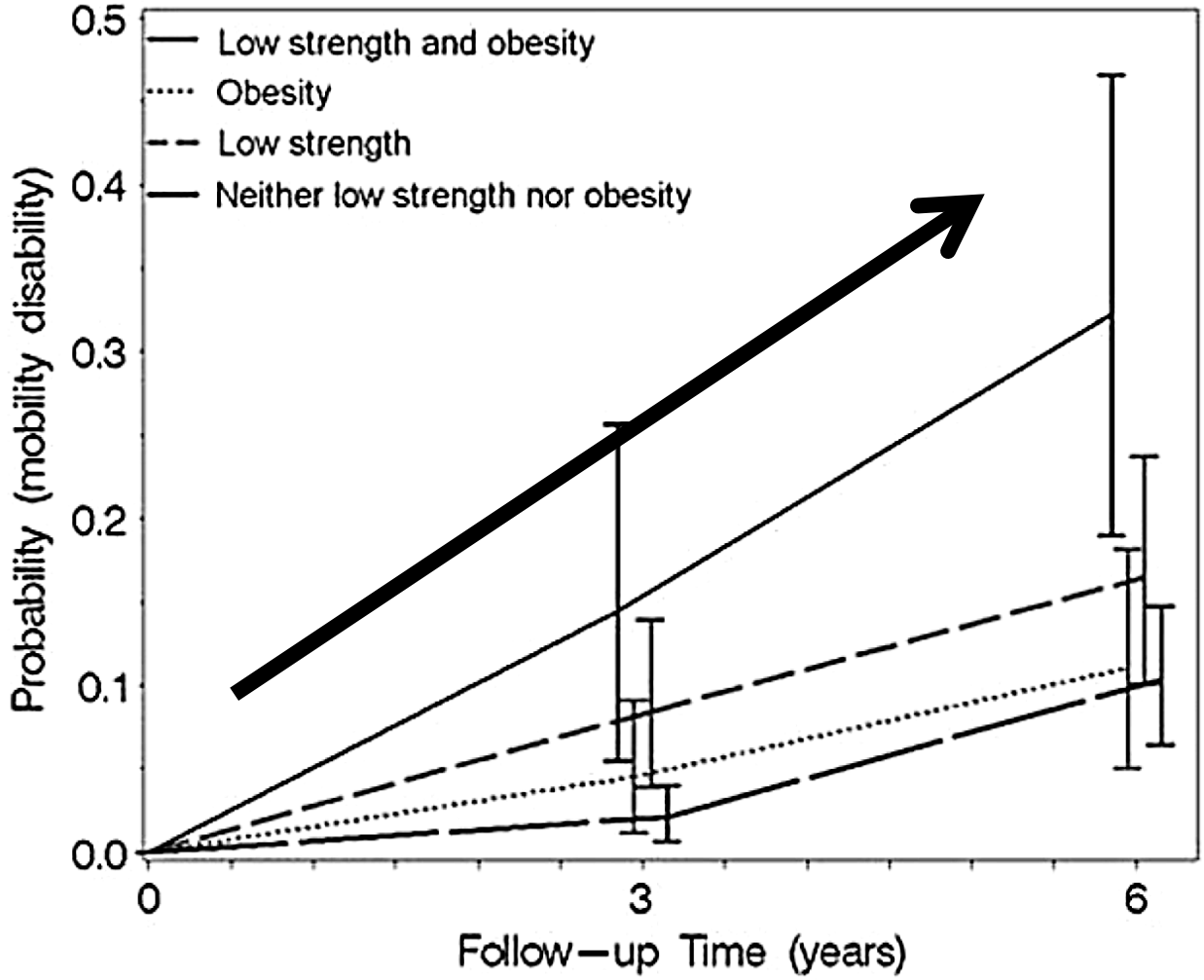



**HR= 1.51 (1.14-2.02)**

*Liu C et al. Obesity Reviews. 2023*

# Probability rate of *DISABILITY* among persons aged 65–85 years with low muscle strength and obesity

## *InCHIANTI Study*




*Stenholm S et al., Intern J Obesity 2009*

# Association between obesity, low muscle mass and sarcopenic obesity with *FRAILTY*

## CHAMP Study

**Sarcopenic obesity**

▼

**FRAILTY**

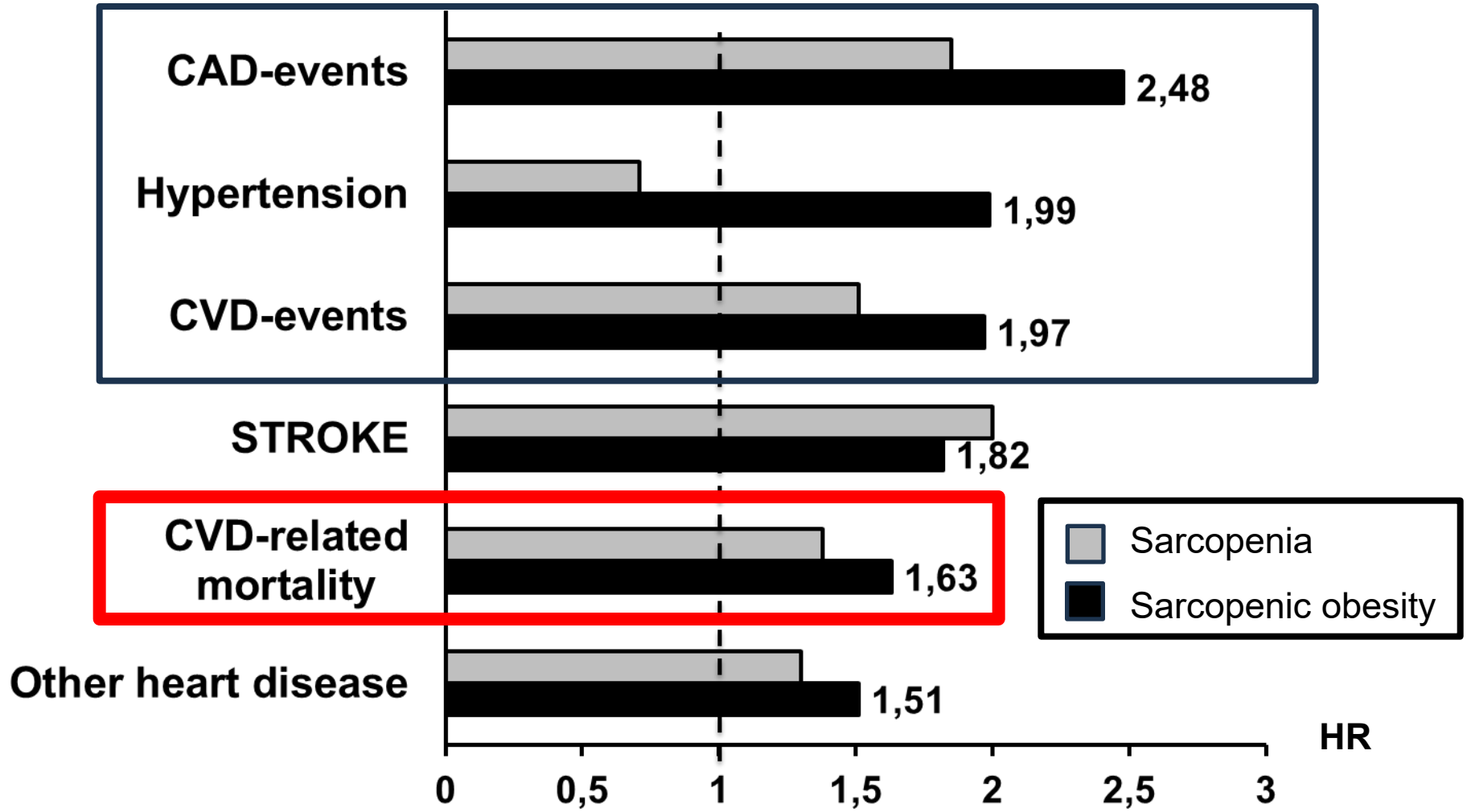
**OR= 2.00 (95% CI 1.42-2.82)**

| | 3 adjusted |
|---|---|
| *Frailty* | |
| No obesity nor low m | |
| 0.789 and fat mass < | |
| Obesity alone (fat ma | 0.56,1.76), $P = 0.94$ |
| Low lean mass alone = $ALM_{BMI} < 0.789$ | 2.12 (1.42,3.18), $P < 0.0001$ |
| Sarcopenic obesity (low lean mass = $ALM_{BMI} < 0.789$ and fat mass > 30.0%) | 2.00 (1.42,2.82), $P < 0.0001$ |

Model 3: adjusted for: age, income, smoking status, physical activity, no of comorbidities, myocardial infarction, dementia, depressive symptoms, low haemoglobin, polypharmacy and white cell count.

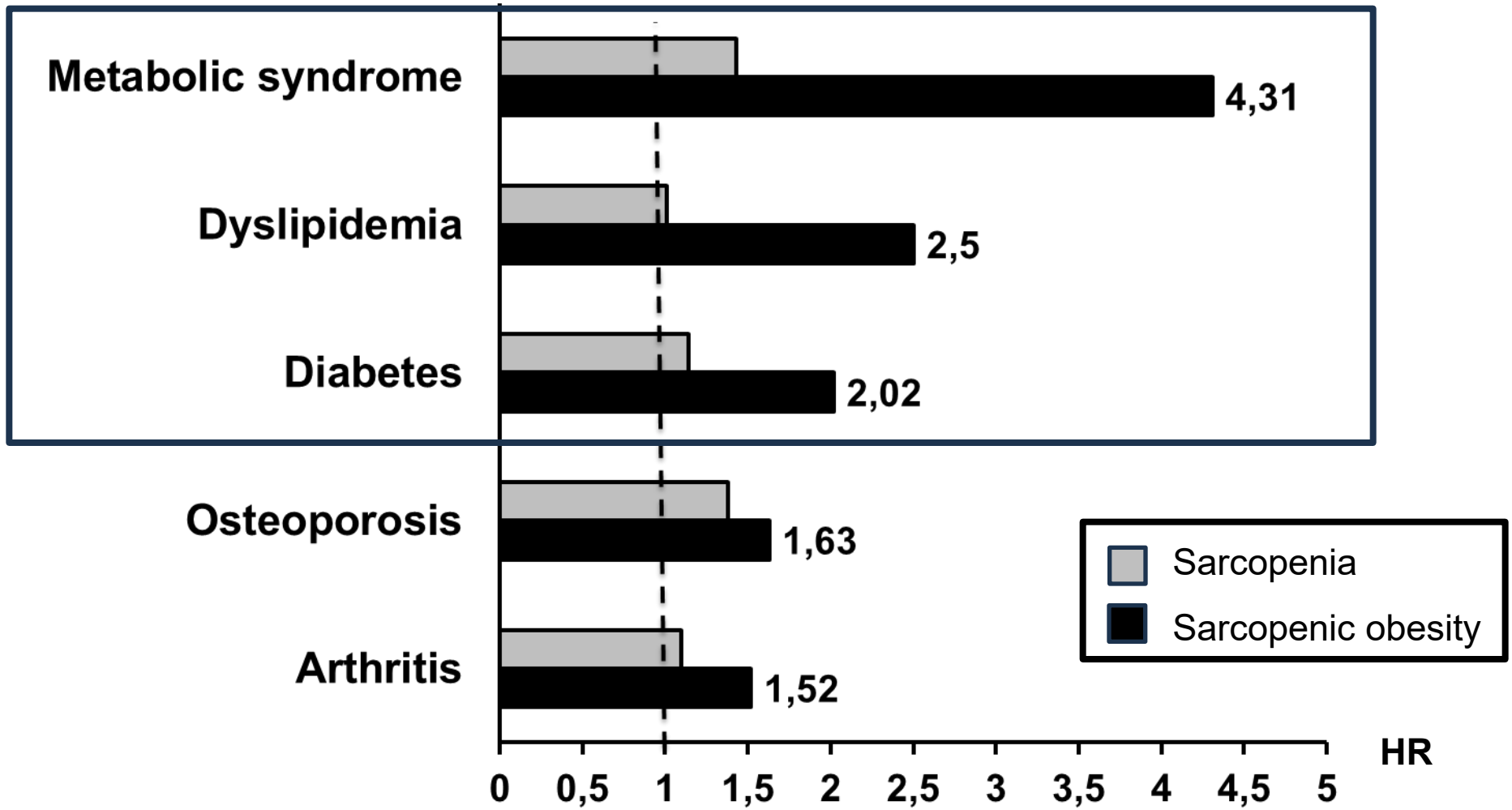
*Hirani V et al., Age and Ageing 2017*

# Quantitative analyses of sarcopenic obesity -related CARDIO-adverse events

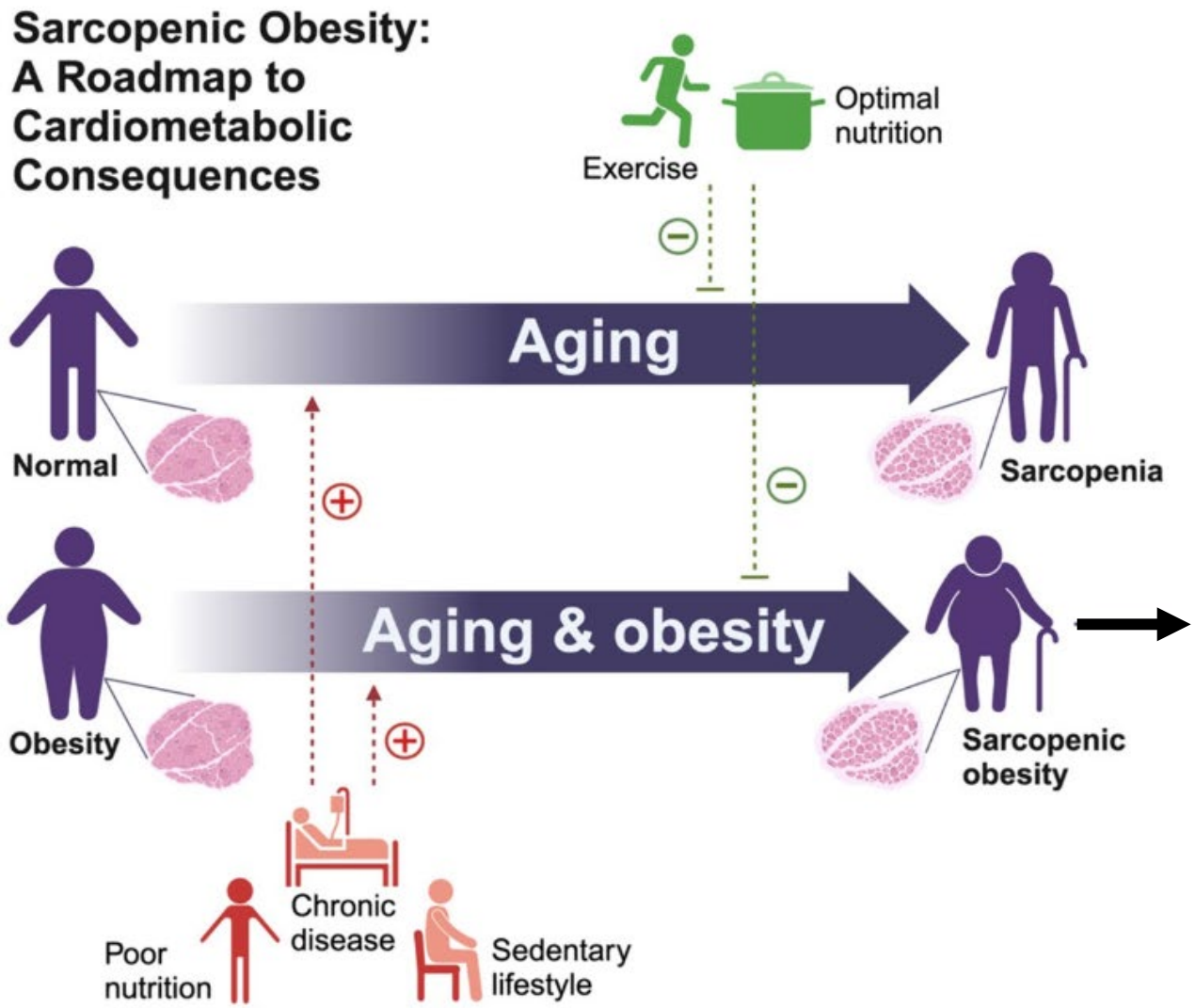



*Liu C et al., Obesity Reviews. 2023*

# Quantitative analyses of sarcopenic obesity related METABOLIC-adverse events




*Liu C et al., Obesity Reviews. 2023*


Sarcopenic Obesity:
A Roadmap to
Cardiometabolic
Consequences
Exercise
Optimal
nutrition
Aging
Normal
Sarcopenia
Aging & obesity
Obesity
Sarcopenic
obesity
Chronic
disease
Poor
nutrition
Sedentary
lifestyle

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# Potential approved therapies in sarcopenic obesity

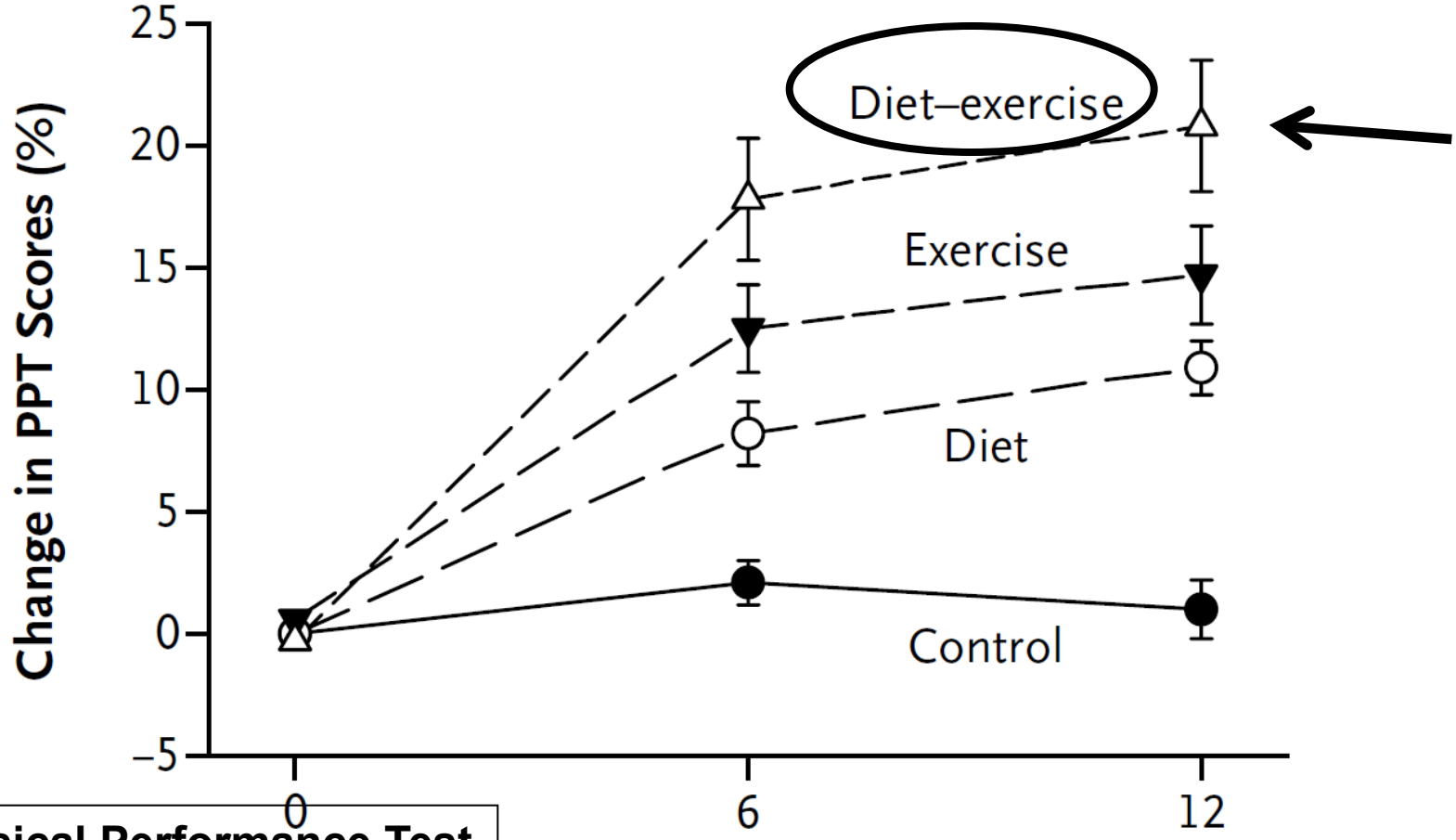
| Component | Goal | Suggested approach |
|---|---|---|
| Calorie restriction | Lose body fat and improve physical function | 500–1,000 kcal per day |
| | | ~0.5 kg per week aiming for 8–10% weight loss at 6 months followed by weight loss maintenance |
| | | No specific diets are proven in this population |
| Aerobic exercises | Improve cardiorespiratory fitness | 150 min per week of moderate to vigorous aerobic exercise |
| Resistance exercises | Improve muscle strength and mass; attenuate loss of muscle and bone during weight loss efforts | 60–75 min of resistance training 3 times weekly, separated by one day focusing on strength, balance and flexibility |
| Protein supplementation | Mitigate loss of muscle mass and strength | 1.0–1.2 g/kg per day of protein in divided doses (25–30 g daily) |
| | | 2.5–2.8 g leucine daily |
| Calcium supplementation | Prevent potential disturbances in bone metabolism | 1,200 mg per day of supplemental calcium, preferably through dietary measures |
| Vitamin D supplementation | Prevent potential disturbances in bone metabolism | 1,000 IU vitamin D per day, ideally maintaining blood levels ≥30 ng/ml |

*Batsis JA, & Villareal DT. Nat Rev Endocrinol. 2018*

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

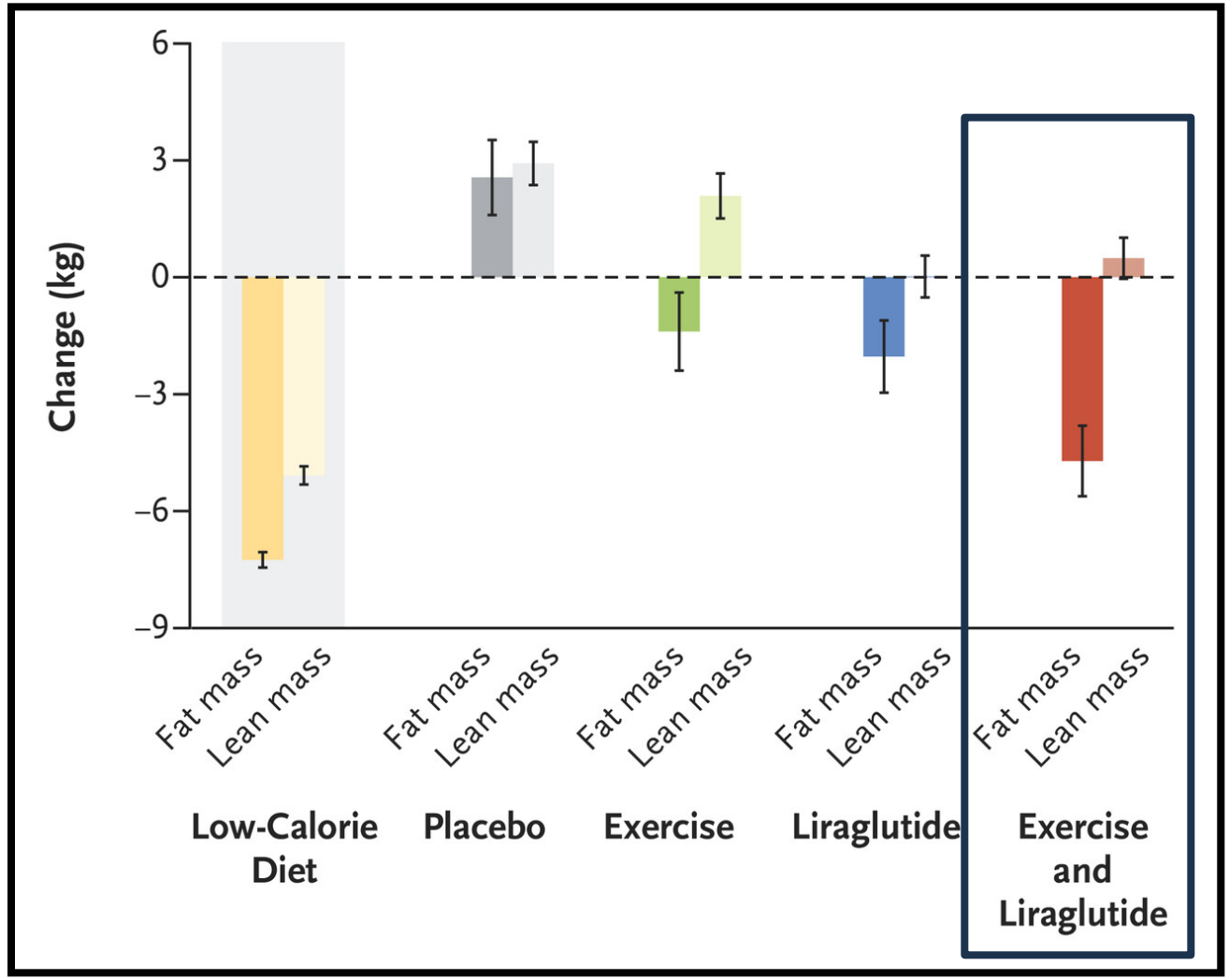
# Weight Loss, Exercise, or Both and Physical Function in Obese Older Adults




**PPT = Physical Performance Test**

*Villareal DT et al., N Engl J Med 2011*

# Healthy Weight Loss Maintenance with Exercise, LIRAGLUTIDE, or Both Combined




*Julie R Lundgren JR et al, NEJM 2021*

# TAKE HOME MESSAGES

- *"Sarcopenic obesity"* is a peculiar condition biologically characterized by **aging, obesity and inflammation**.
- *"Sarcopenic obesity"* can be considered within the **metabolic syndrome phenotype** in older adults.
- The prevalence of *"sarcopenic obesity"* largely varies **depending on different diagnostic approches and clinical setting**.
- *"Sarcopenic obesity"* **is associated to an elevate CARDIO-METABOLIC risk and DEATH.**
- **Caloric restriction and physical activity** remain the more powerful tools to antagonize the *"sarcopenic obesity" .*