Simposio SIGG-ESPEN-SINPE

Dal Nutrition Day al Sarcopenia Day
nell'anziano ospedalizzato e nelle strutture residenziali

# *La valutazione di malnutrizione e sarcopenia nel paziente anziano in RSA ed ospedale*

**Stefano Volpato**

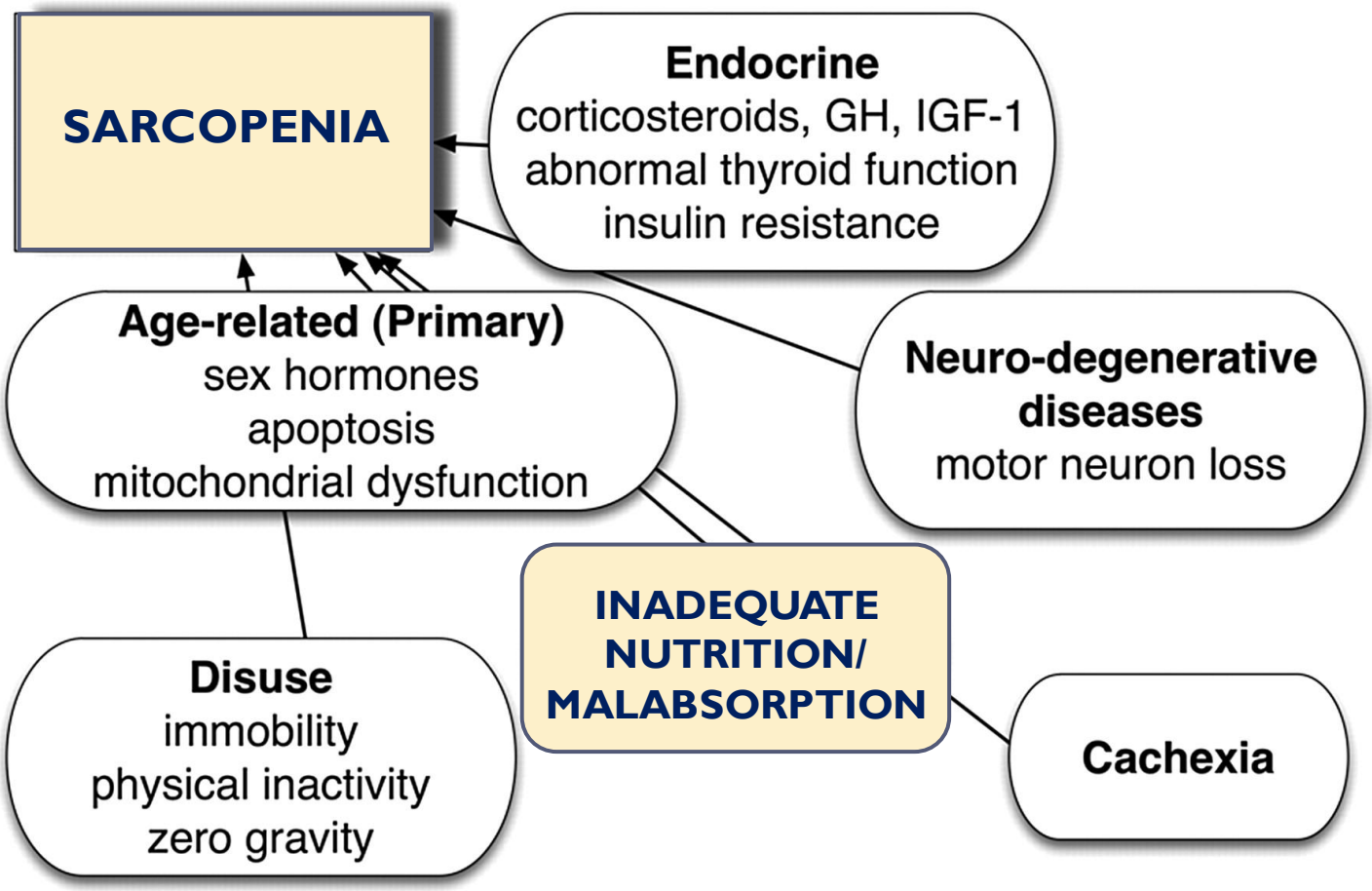
Dipartimento di Scienze Mediche – UNIFE
Dipartimento Medico ad Attività Integrata – OSPFE

SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Ospedaliero - Universitaria di Ferrara

università di ferrara
DA SEICENTO ANNI GUARDIAMO AVANTI.

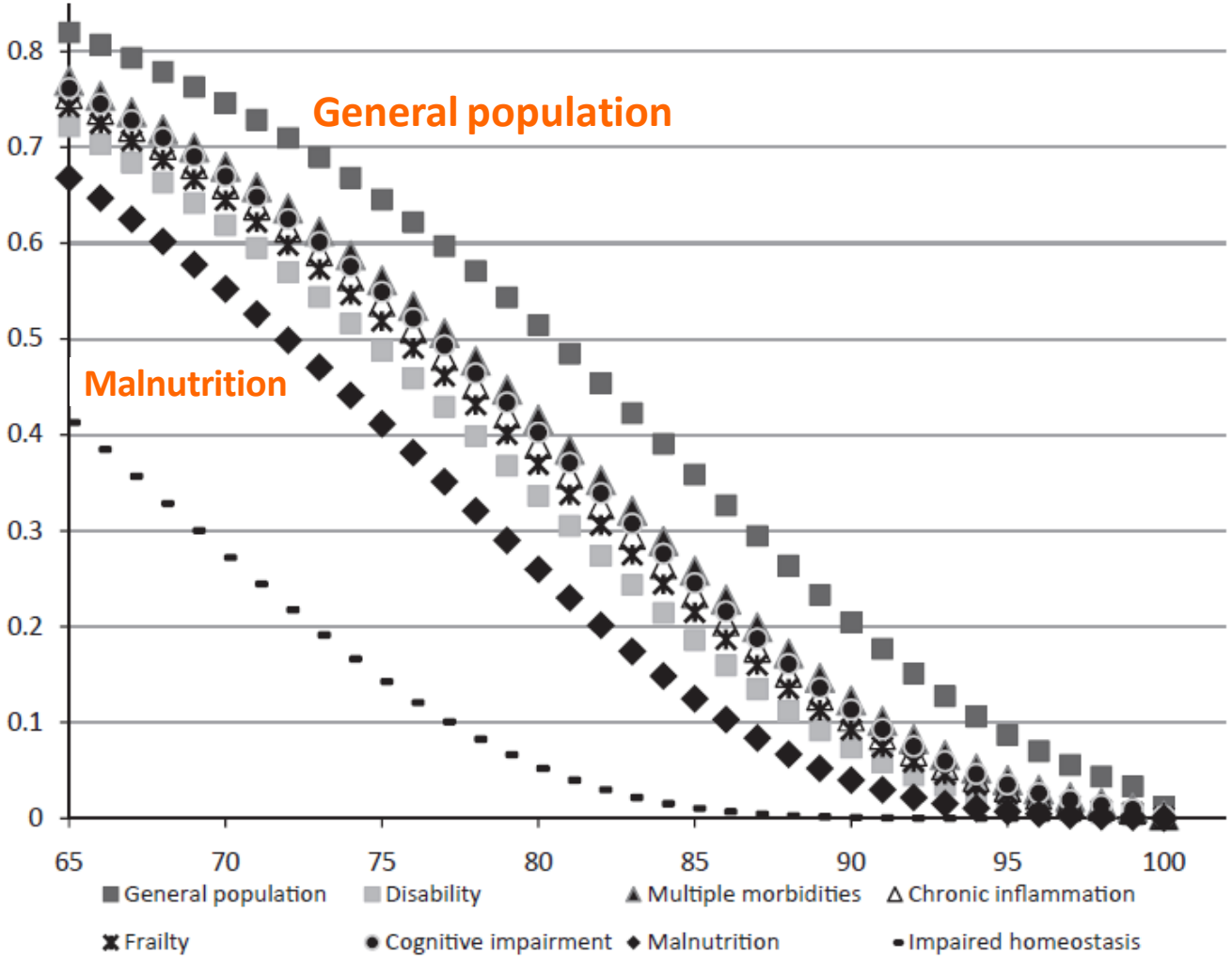
58° Congresso Nazionale
Società Italiana di Gerontologia e Geriatria

# Patogenesi della sarcopenia




Cruz-Jentoft A J et al. Age Ageing 2010;39:412-423

# The Association Between Geriatric Syndromes and Survival




Kane R et al J Am Ger Soc 2012;60:896-904

# Che cos'è la malnutrizione…?

- Stato di alterazione funzionale, strutturale e di sviluppo dell'organismo conseguente alla discrepanza tra fabbisogno, introito ed utilizzo dei nutrienti
- La malnutrizione proteico-calorica è, insieme con il deficit di minerali e vitamine, particolarmente frequente nell'anziano

- **Può essere in eccesso o, più spesso, in difetto**

# Come la definiamo e la misuriamo …?

- **Misure antropometriche**
  - BMI (<18.5)
  - Calo ponderale involontario
  - Pliche
  - Circonferenza braccio, vita
- **Biomarcatori**
  - Albumina plasmatica(< 3.5 g/dl)
  - Linfociti (<1.800/$mm^3$)
  - Prealmbumina
  - Transferrina
- **Valutazione strumentale**
  - BIA
  - Dexa
  - RMN

- **Strumenti multidimensionali:**
  - MNA
  - Subjective Global Assessment
  - Prognostic Nutritional Index
  - Nutrition Risk Index
  - Prognostic Inflammatory and Nutritional Index

**Non esiste una definizione operativa standardizzata**

Gallagher CR et al. J Am Diet Ass 1996;69:361-369

# Mini Nutritional Assessment MNA®

## Screening

**A** **Presenta una perdita dell' appetito? Ha mangiato meno negli ultimi 3 mesi? (perdita d'appetito, problemi digestivi, difficoltà di masticazione o deglutizione)**
0 = grave riduzione dell'assunzione di cibo
1 = moderata riduzione dell'assunzione di cibo
2 = nessuna riduzione dell'assunzione di cibo ☐

**B** **Perdita di peso recente (<3 mesi)**
0 = perdita di peso > 3 kg
1 = non sa
2 = perdita di peso tra 1 e 3 kg
3 = nessuna perdita di peso ☐

**C** **Motricità**
0 = dal letto alla poltrona
1 = autonomo a domicilio
2 = esce di casa ☐

**D** **Nell' arco degli ultimi 3 mesi: malattie acuteo stress psicologici?**
0 = sì 2 = no ☐

**E** **Problemi neuropsicologici**
0 = demenza o depressione grave
1 = demenza moderata
2 = nessun problema psicologico ☐

**F** **Indice di massa corporea (IMC = peso / (altezza)$^2$ in kg/ m$^2$)**

**J** **Quanti pasti completi prende al giorno?**
0 = 1 pasto
1 = 2 pasti
2 = 3 pasti ☐

**K** **Consuma?**
- Almeno una volta al giorno dei prodotti lattiero-caseari? sì ☐ no ☐
- Una o due volte la settimana uova o legumi? sì ☐ no ☐
- Oni giorne della carne, del pesce o del pollame? sì ☐ no ☐

0.0 = se 0 o 1 sì
0.5 = se 2 sì
1.0 = se 3 sì ☐.☐

**L** **Consuma almeno due volte al giorno frutta o verdura?**
0 = no 1 = sì ☐

**M** **Quanti bicchieri beve al giorno? (acqua, succhi, caffé, té, latte...)**
0.0 = meno di 3 bicchieri
0.5 = da 3 a 5 bicchieri
1.0 = più di 5 bicchieri ☐.☐

## Valutazione dello stato nutrizionale

| | | |
|---|---|---|
| 24-30 da 24 a 30 punti | ☐ | stato nutrizionale normale |
| 17-23.5 da 17 a 23,5 punti | ☐ | rischio di malnutrizione |
| meno 17 punti | ☐ | cattivo stato nutrizionale |

Per una valutazione più approfondita, continuare con le domande G-R

## Valutazione globale

**G** **Il paziente vive autonomamente a domicilio?**
1 = sì 0 = no ☐

**H** **Prende più di 3 medicinali al giorno?**
0 = sì 1 = no ☐

**I** **Presenza di decubiti, ulcere cutanee?**
0 = sì 1 = no ☐

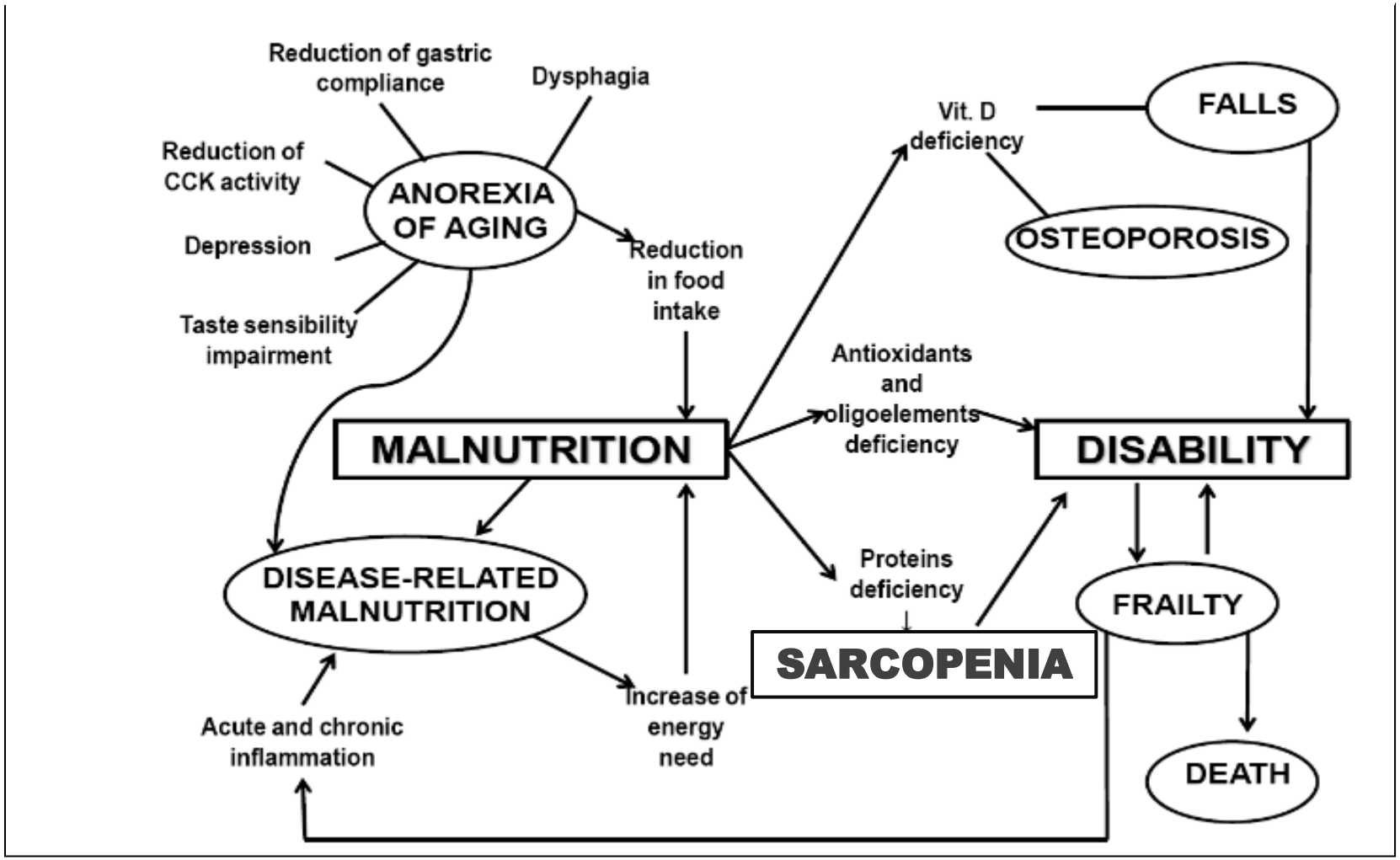
0.0 = meno buono
0.5 = non sa
1.0 = uguale
2.0 = migliore ☐.☐

**Q** **Circonferenza brachiale (CB, cm)**
0.0 = CB < 21
0.5 = CB ≤ 21 CB ≤ 22
1.0 = CB > 22 ☐.☐

**R** **Circonferenza del polpaccio (CP in cm)**
0 = CP < 31
1 = CP ≥ 31 ☐

# The Role of Malnutrition in Older Persons with Mobility Limitations

T. Cederholm[1], A. Nouvenne[2,*], A. Ticinesi[3], M. Maggio[3], F. Lauretani[4], G.P. Ceda[3], L. Borghi[3] and T. Meschi[3]




Curr Pharmaceut Design 2014, in press

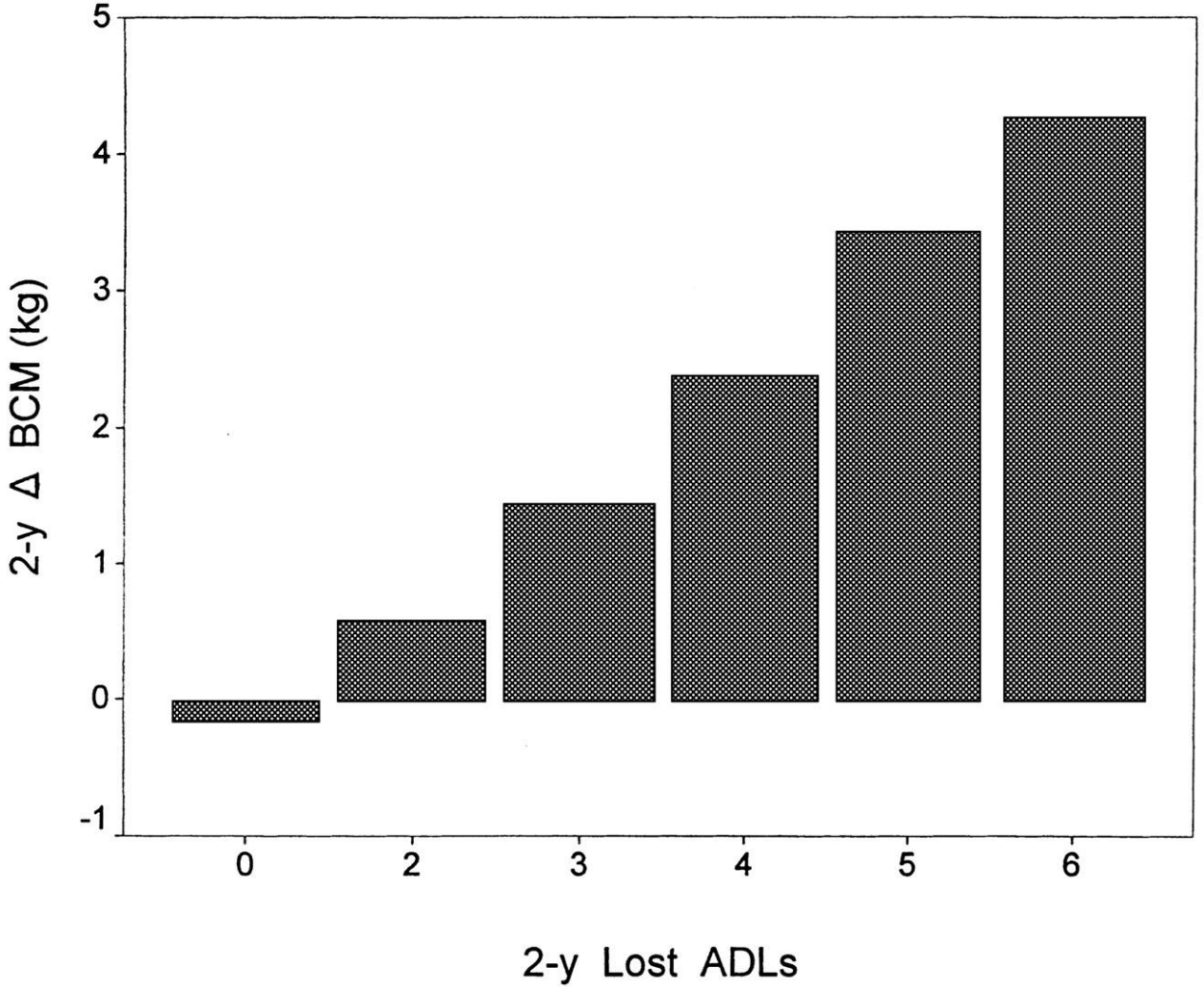
# Nutritional Parameters, Body Composition, and Progression of Disability in Older Disabled Residents Living in Nursing Homes

Table 1. Principle Characteristics of Disabled Nursing Home Residents

| Baseline Variables | Group 1 (2-y ADLs constant or improved) | Group 2 (≥2-y ADLs worsened) | *p* Value† |
|---|---|---|---|
| Gender, % female | 74% | 85% | .18 |
| Age (yr) | 79.8 ± 7.8 | 82.7 ± 6.6 | .05 |
| No. Chronic Diseases | 3.0 ± 1.3 | 3.4 ± 1.3 | .35 |
| No. Drugs | | | |
| Baseline | 2.9 ± 1.7 | 4.2 ± 2.3 | .01 |
| After 2 y | 3.4 ± 1.8 | 4.4 ± 2.3 | .03 |
| No. Lost ADLs | | | |
| Baseline | 1.6 ± 0.9 | 2.0 ± 1.1 | .34 |
| After 2 y | 1.4 ± 0.9 | 5.0 ± 1.0 | .001‡ |
| Albumin (g/dl) | 4.48 ± 0.4 | 4.27 ± 0.35 | .01 |
| Transferrin (mg/dl) | 260 ± 59 | 228 ± 38 | .003 |
| Total Cholesterol (mg/dl) | 226 ± 42 | 205 ± 43 | .03 |
| HDL-C (mg/dl) | 51.2 ± 17 | 44.8 ± 11.5 | .04 |
| Hemoglobin (g/dl) | 13.9 ± 1.3 | 13.1 ± 1.3 | .009 |
| SST (mm) | 15.8 ± 4.9 | 12.9 ± 5.5 | .01 |
| WHR | 0.97 ± 0.1 | 0.91 ± 0.1 | .01 |
| BMI (kg/m$^2$) | 26.9 ± 3.9 | 25.1 ± 4.6 | .07 |
| BCM (kg) | 17.9 ± 5.2 | 15.9 ± 3.5 | .05 |

Zuliani G et al. J Gerontol A Biol Sci Med Sci 2001;56:M212-M216

# La riduzione di BCM si associa alla perdita dell'autonomia funzionale




Zuliani G et al. J Gerontol A Biol Sci Med Sci 2001;56:M212-M216

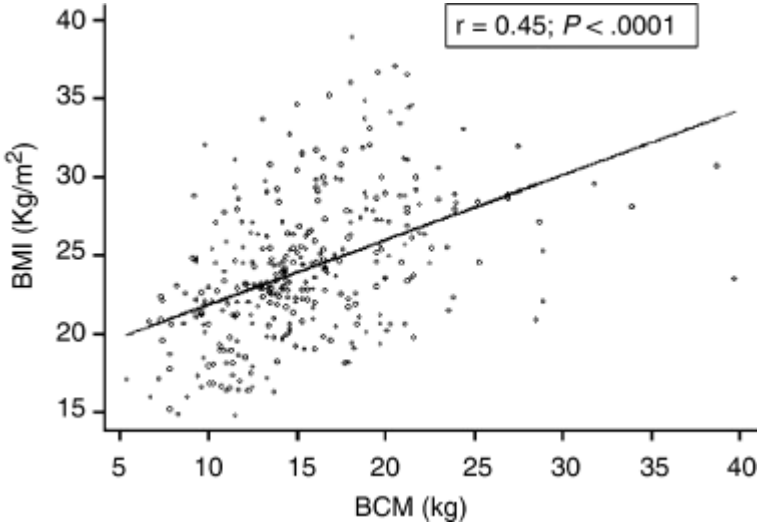
# Che cos'è il Body Cell Mass?

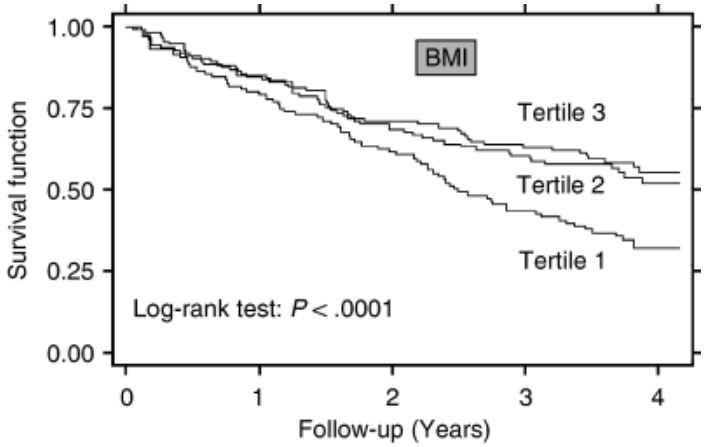
- E' la massa complessiva di tutti gli elementi cellurari del corpo che costituiscono la componente tessutale metabolicamente attiva dell'organismo.

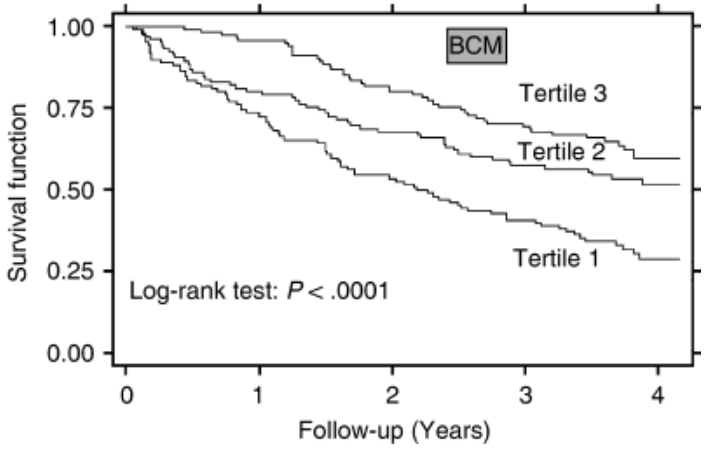
- Condizioni cliniche caratterizzata da importante deplezione del BCM sono: malattie croniche, AIDS, neoplasie terminali.

- Nel soggetto sano:
  - 60%: tessuto muscolare
  - 20%: tessuto organico
  - 20%: globuli rossi e altre cellule tessutali.

# BMI, Body Cell Mass, and 4-Year All-Cause Mortality Risk in Older Nursing Home Residents




Volpato S et al. J Am Geriatr Soc. 2004; 52:886-891

# BMI, Body Cell Mass, and 4-Year All-Cause Mortality Risk in Older Nursing Home Residents

Table 2. Unadjusted Death Rates and Adjusted Relative Risks of All-Cause Mortality by Baseline Body Mass Index (BMI) and Body Cell Mass (BCM) Tertiles

| Tertile | N | Deaths | Unadjusted Rate (1,000 person-years) | All-Cause Mortality Relative Risk (95 % Confidence Interval) | | |
|---|---|---|---|---|---|---|
| | | | | Model 1* | Model 2† | Model 3‡ |
| BMI | | | | | | |
| I | 114 | 76 | 272.6 | 1 | 1 | 1 |
| II | 113 | 52 | 164.7 | 0.59 (0.41–0.85) | 0.70 (0.48–1.03) | 0.72 (0.49–1.06) |
| III | 117 | 51 | 152.3 | 0.61 (0.43–0.88) | 0.88 (0.58–1.35) | 0.94 (0.61–1.43) |
| BCM | | | | | | |
| I | 116 | 81 | 311.2 | 1 | 1 | 1 |
| II | 110 | 52 | 173.7 | 0.64 (0.44–0.93) | 0.71 (0.48–1.04) | 0.93 (0.61–1.40) |
| III | 118 | 46 | 120.9 | 0.44 (0.30–0.65) | 0.47 (0.30–0.73) | 0.55 (0.35–0.87) |

* Model 1: BMI and BCM included separately, adjusted for age, sex, and height.
† Model 2: BMI and BCM simultaneously included and adjusted for age, sex, and height.
‡ Model 3: BMI and BCM simultaneously included, adjusted for age, sex, height, smoking, number of diseases, Katz index, dementia, depression, albumin level, and blood urea nitrogen/creatinine ratio.

Volpato S et al. J Am Geriatr Soc. 2004; 52:886-891

# Sarcopenia: consensus definitions

- 2010 – **S**pecial **I**nterest **G**roup

  …condizione caratterizzata da perdita di massa muscolare e forza…

- 2010 – **E**uropean **W**orking **G**roup on **S**arcopenia in **O**lder **P**eople

  *…una sindrome caratterizzata da perdita pregressiva e generalizzata della massa e forza muscolare scheletrica associata ad un aumentato rischio di eventi avversi quali disabilità, scarsa qualità di vita e morte…*

- 2011 – **I**nternational **W**orking **G**roup on **S**arcopenia

  …è la perdita di massa e funzione muscolare età-correlata. La sarcopenia è una sindrome complessa che è associata a perdita di massa muscolare isolata o associata ad incremento della massa grassa…

SIG. 2010: Clinical Nutrition 2010;29:154-159.
EWGSOP : Age Ageing 2010;39:412-23.
IWGS: JAMDA 2011;12:249-256

# Definizione Operativa

(*EWGSOP*: The European Working Group on Sarcopenia in Older People )

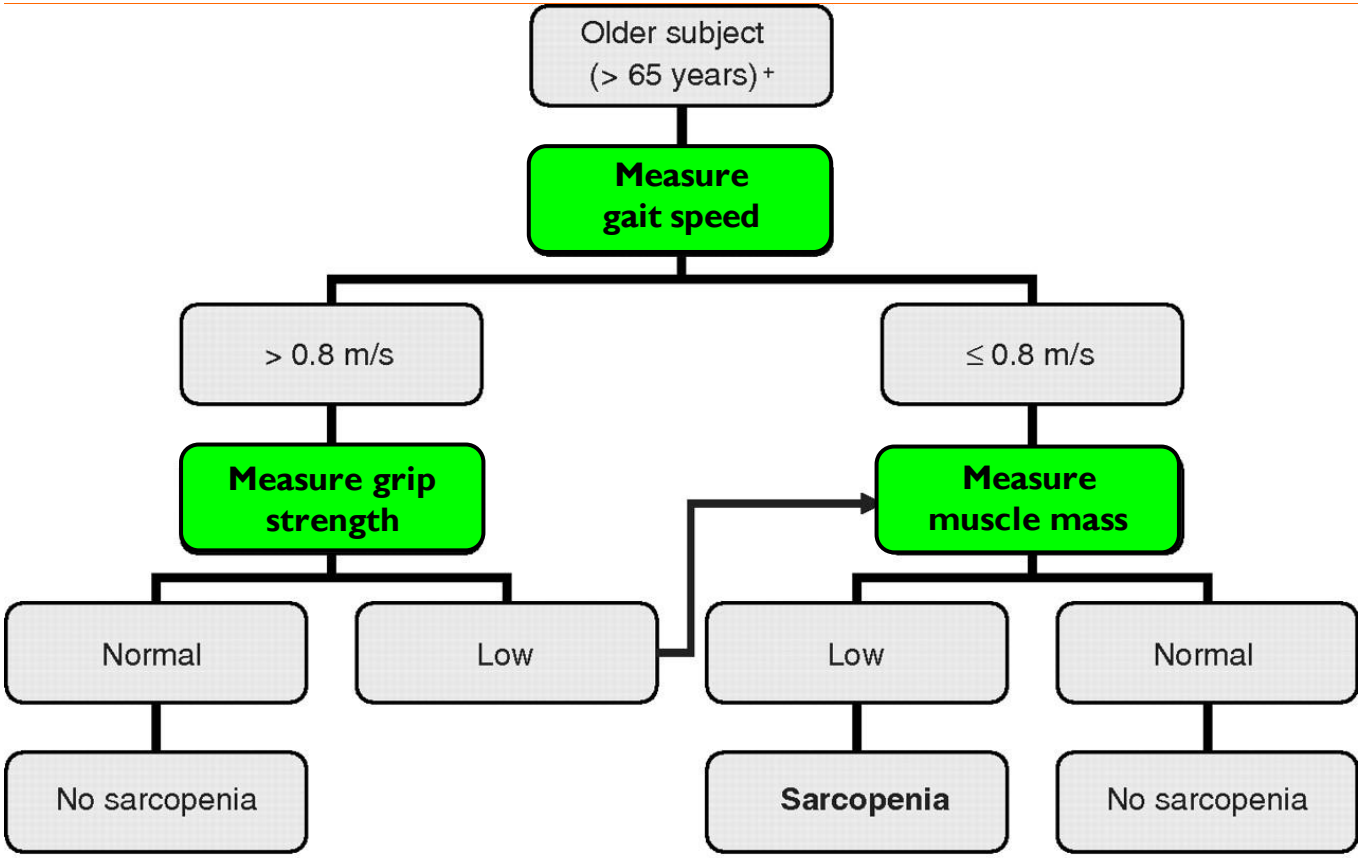
1. Riduzione della massa muscolare
2. Riduzione della forza muscolare
3. Riduzione delle performance fisiche

*La diagnosi si basa sulla presenza di:*
*criterio 1 + il criterio 2 o 3*

# Valutazione della sarcopenia in ricerca e pratica clinica

| Variable | Research | Clinical practice |
|---|---|---|
| Muscle mass | Computed tomography (CT) | BIA |
| | Magnetic resonance imaging (MRI) | DXA |
| | Dual energy X-ray absorptiometry (DXA) | Anthropometry |
| | Bioimpedance analysis (BIA) | |
| | Total or partial body potassium per fat-free soft tissue | |
| Muscle strength | Handgrip strength | Handgrip strength |
| | Knee flexion/extension | |
| | Peak expiratory flow | |
| Physical performance | Short Physical Performance Battery (SPPB) | SPPB |
| | Usual gait speed | Usual gait speed |
| | Timed get-up-and-go test | Get-up-and-go test |
| | Stair climb power test | |

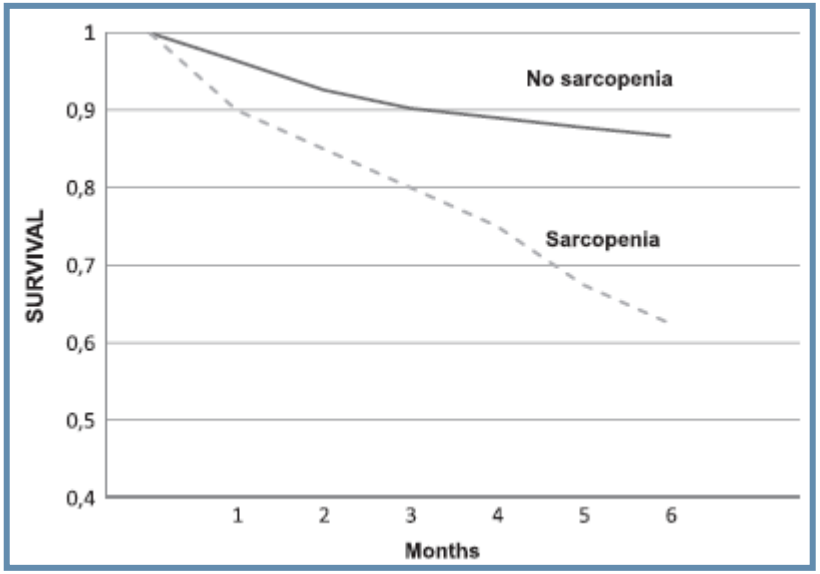
# Algoritmo diagnostico nell'anziano




Cruz-Jentoft A J et al. Age Ageing 2010;39:412-423

# Sarcopenia and Mortality among older Nursing Home residents

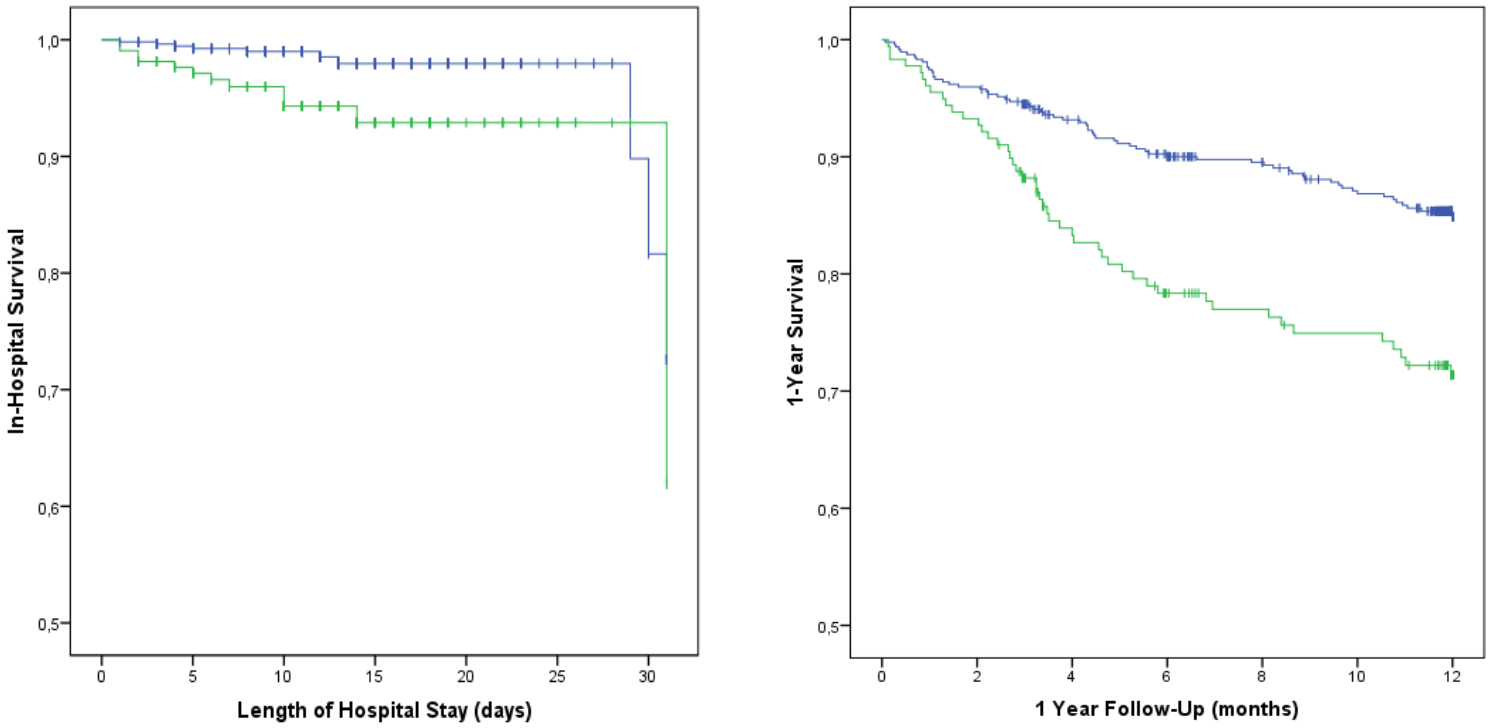
| Characteristic | Total Sample (n = 122) |
|---|---|
| Age, y | 84.1 ± 6.9 |
| Gender | |
| Female | 91 (75) |
| Male | 31 (25) |
| Marital status | |
| Married | 22 (20) |
| Widowed | 72 (60) |
| Never married | 28 (20) |
| Activity of Daily Living score | 4.2 ± 2.4 |
| Cognitive Performance Scale score | 3.9 ± 1.9 |
| Number of diseases | 3.2 ± 1.3 |




| | Unadjusted | Fully Adjusted |
|---|---|---|
| | Hazard Ratio | |
| Sarcopenia | 3.87 (1.57–9.54) | 2.34 (1.04–5.24) |
| Age | | 1.01 (0.96–1.06) |
| Gender, male | | 1.54 (0.69–2.10) |
| Cerebrovascular diseases | | 0.91 (0.39–2.10) |
| Chronic obstructive pulmonary disease | | 0.83 (0.28–2.41) |
| Osteoarthritis | | 1.05 (0.50–2.21) |
| Activity of daily living impairment | | 1.26 (1.05–1.52) |
| Body mass index | | 1.03 (0.93–1.13) |

Landi F et al. JAMDA 2012;13:121-126

# Kaplan Meier curves of in-hospital and 1 year survival according to the presence of sarcopenia (Crime study)




Vetrano D et al, submitted

# Association between sarcopenia and mortality (in-hospital and 1-year) (Crime study)

| Outcomes | Events | | Unadjusted Model | | Age and Gender Adjusted Model | | Totally Adjusted Model † | |
|---|---|---|---|---|---|---|---|---|
| **Total sample (N = 770)** | | | | | | | | |
| | | p | HR | 95% C.I. | HR | 95% C.I. | HR | 95% C.I. |
| **In-Hospital Mortality** | | | | | | | | |
| No Sarcopenia | 12/556 (2 %) | 0.007 | 1 | - | 1 | - | 1 | - |
| Sarcopenia | 10/214 (6 %) | | 3.19 | 1.38 – 7.38 | 3.00 | 1.23 – 7.28 | 3.51 | 1.41 – 8.75 |
| **1-Year Mortality** Ω | | | | | | | | |
| No Sarcopenia | 47/474 (14 %) | < 0.001 | 1 | - | 1 | - | 1 | - |
| Sarcopenia | 66/176 (26 %) | | 2.12 | 1.45 – 3.10 | 1.56 | 1.10 – 2.30 | 1.66 | 1.09 – 2.51 |
| **Subgroup 1 (N = 602)** α | | | | | | | | |
| | | p | HR | 95% C.I. | HR | 95% C.I. | HR | 95% C.I. |
| **1-Year Mortality** | | | | | | | | |
| Non Sarcopenia | 48/449 (12 %) | 0.002 | 1 | - | 1 | - | 1 | - |
| Sarcopenia | 32/153 (24 %) | | 2.09 | 2.34 – 3.27 | 1.57 | 1.10 – 2.50 | 1.69 | 1.02 – 2.78 |
| **Subgroup 2 (N = 550)** β | | | | | | | | |
| | | p | HR | 95% C.I. | HR | 95% C.I. | HR | 95% C.I. |
| **1-Year Mortality** | | | | | | | | |
| Non Sarcopenia | 29/408 (8 %) | 0.001 | 1 | - | 1 | - | 1 | - |
| Sarcopenia | 25/142 (20 %) | | 2.62 | 1.53 – 4.45 | 1.97 | 1.14 – 3.41 | 2.04 | 1.12 – 3.70 |

*† Adjusted for: age, gender, smoking habit, living alone, compromised activities of daily living, body mass index, infectious diseases and Charlson Comorbidity Index.*

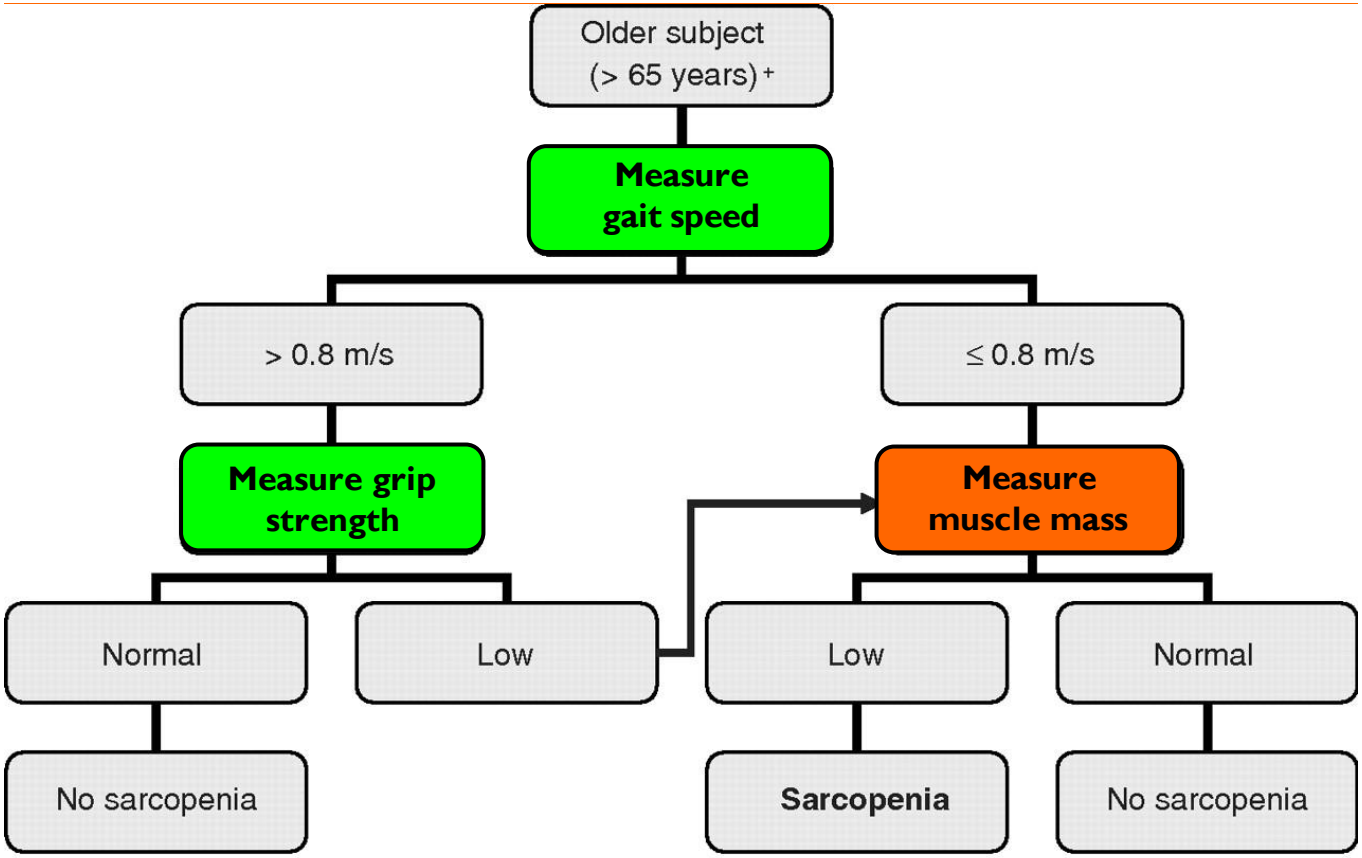
*Ω 22 patients died during hospital stay and 98 with incomplete follow up data were excluded from this analysis.*

*α Analysis performed excluding 168 patients with diagnosis of dementia. Results on in-hospital mortality were omitted due to insufficient events.*

*β Analysis performed excluding 220 patients with > 4 impaired activities of daily living. Results on in-hospital mortality were omitted due to insufficient events.*

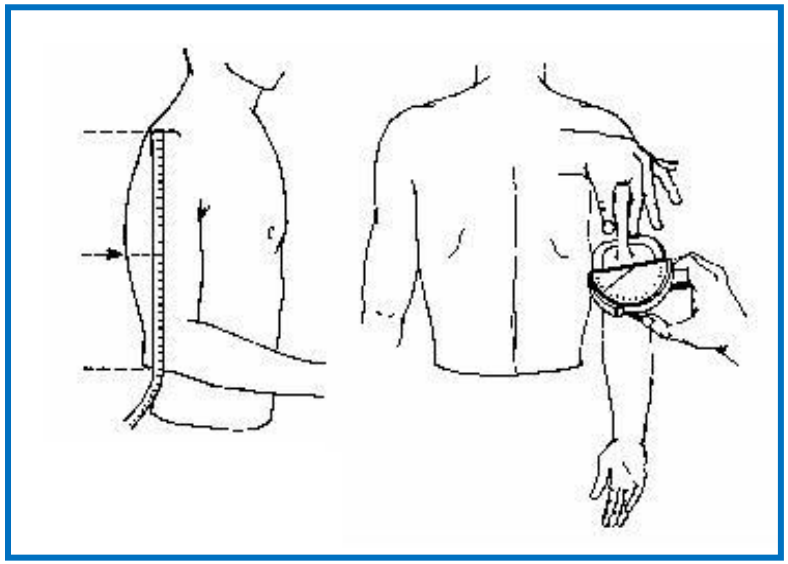
Vetrano D et al, submitted

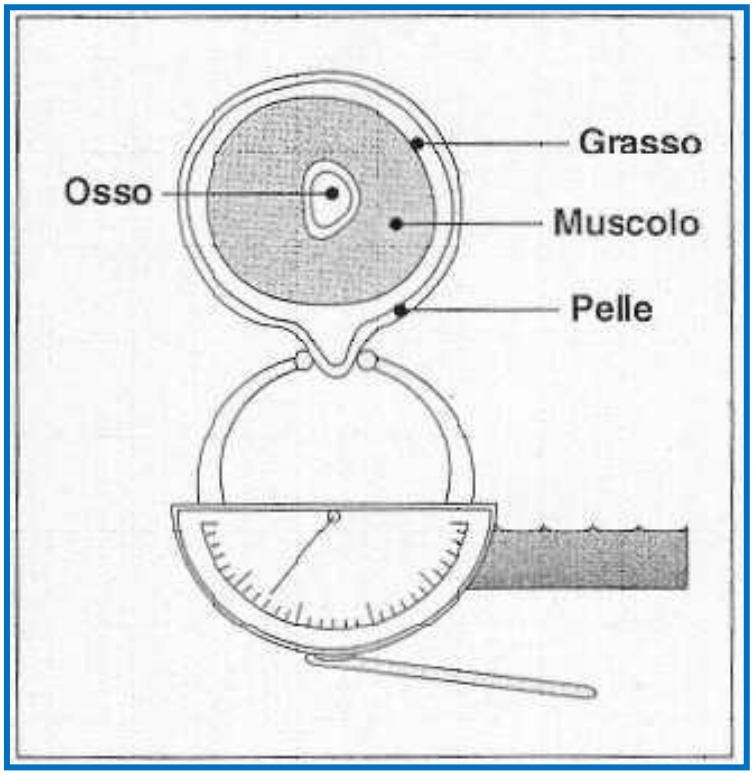
# Algoritmo diagnostico nell'anziano




Cruz-Jentoft A J et al. Age Ageing 2010;39:412-423

# Valutazione della massa muscolare mediante misure antropometriche

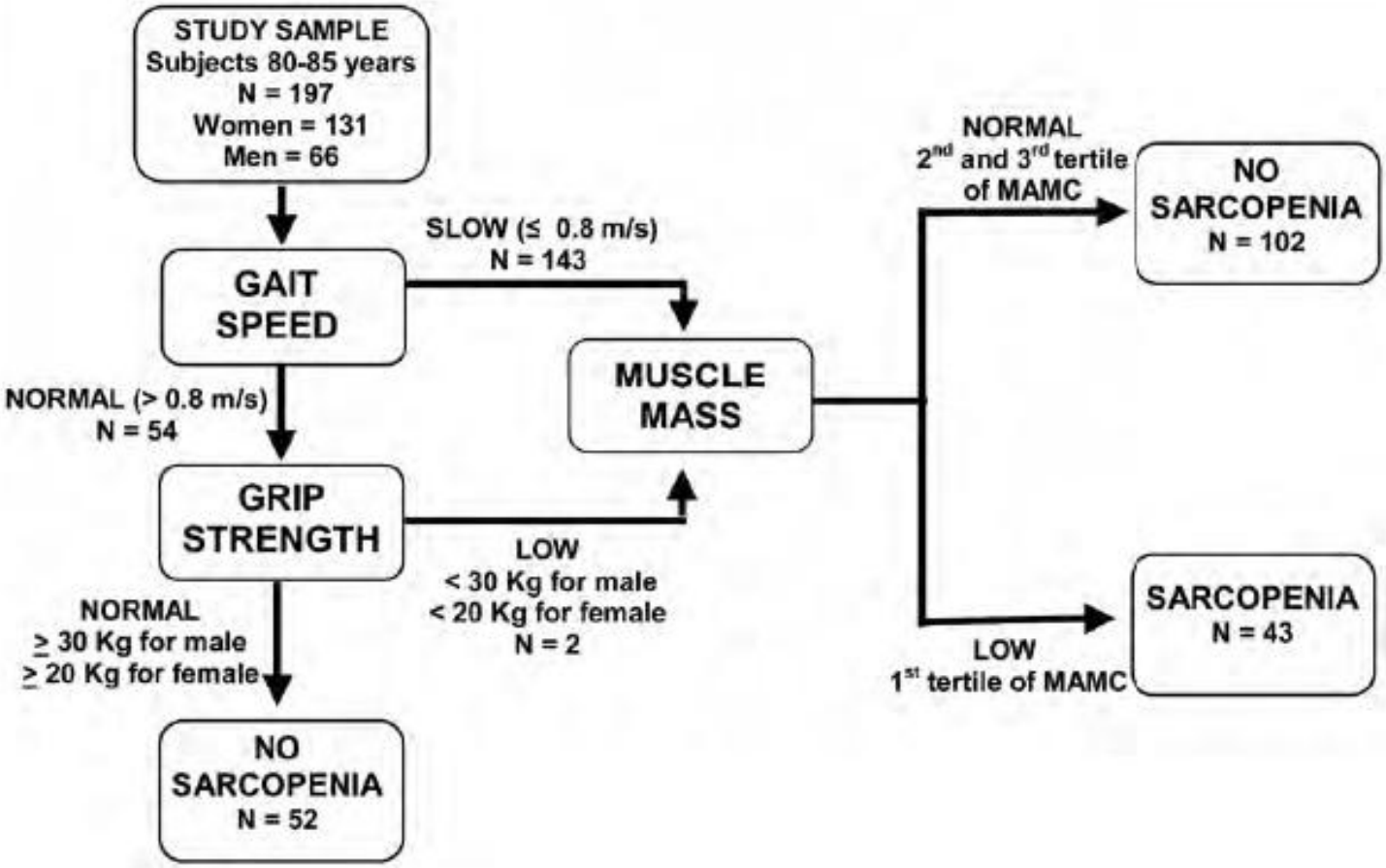





**Circonferenza muscolare del braccio (AMC) = Cb - πP**
**dove: Cb = circonferenza del braccio P = spessore della plica tricipitale π = 3,14**

**Non esistono cut-off standardizzati per uso clinico**

# Sarcopenia and mortality risk in frail older persons aged 80 years and older: ilSIRENTE study




Landi F et al. Age Ageing 2013;42:203.209

# Sarcopenia and mortality risk in frail older persons aged 80 years and older: ilSIRENTE study

Table 2. Association between sarcopenia and all-cause mortality, after adjustment for various confounders (hazard ratios and 95% confidence intervals)

| | Unadjusted | Model 1 | Model 2 | Model 3 |
|---|---|---|---|---|
| | Hazard ratio (95% confidence interval) | | | |
| Sarcopenia | 2.95 (1.44–6.04) | 2.89 (1.40–5.96) | 2.40 (1.07–5.42) | 2.32 (1.01–5.43) |
| Age | | 1.15 (0.93–1.42) | 1.08 (0.85–1.36) | 1.12 (0.87–1.43) |
| Gender (female) | | 0.55 (0.29–1.03) | 0.49 (0.25–0.99) | 0.49 (0.23–1.04) |
| Education | | | 0.87 (0.72–1.04) | 0.87 (0.72–1.05) |
| ADL impairment | | | 1.91 (1.29–2.83) | 1.75 (1.20–2.56) |
| Body mass index | | | 0.92 (0.86–0.99) | 0.93 (0.86–1.01) |
| Hypertension | | | | 0.60 (0.26–1.35) |
| Congestive heart failure | | | | 6.71 (0.70–64.1) |
| COPD | | | | 1.46 (0.50–4.21) |
| Number of diseases | | | | 1.29 (0.92–1.80) |
| TNF-α | | | | 0.99 (0.85–1.15) |

Model 1: adjusted for age, gender.

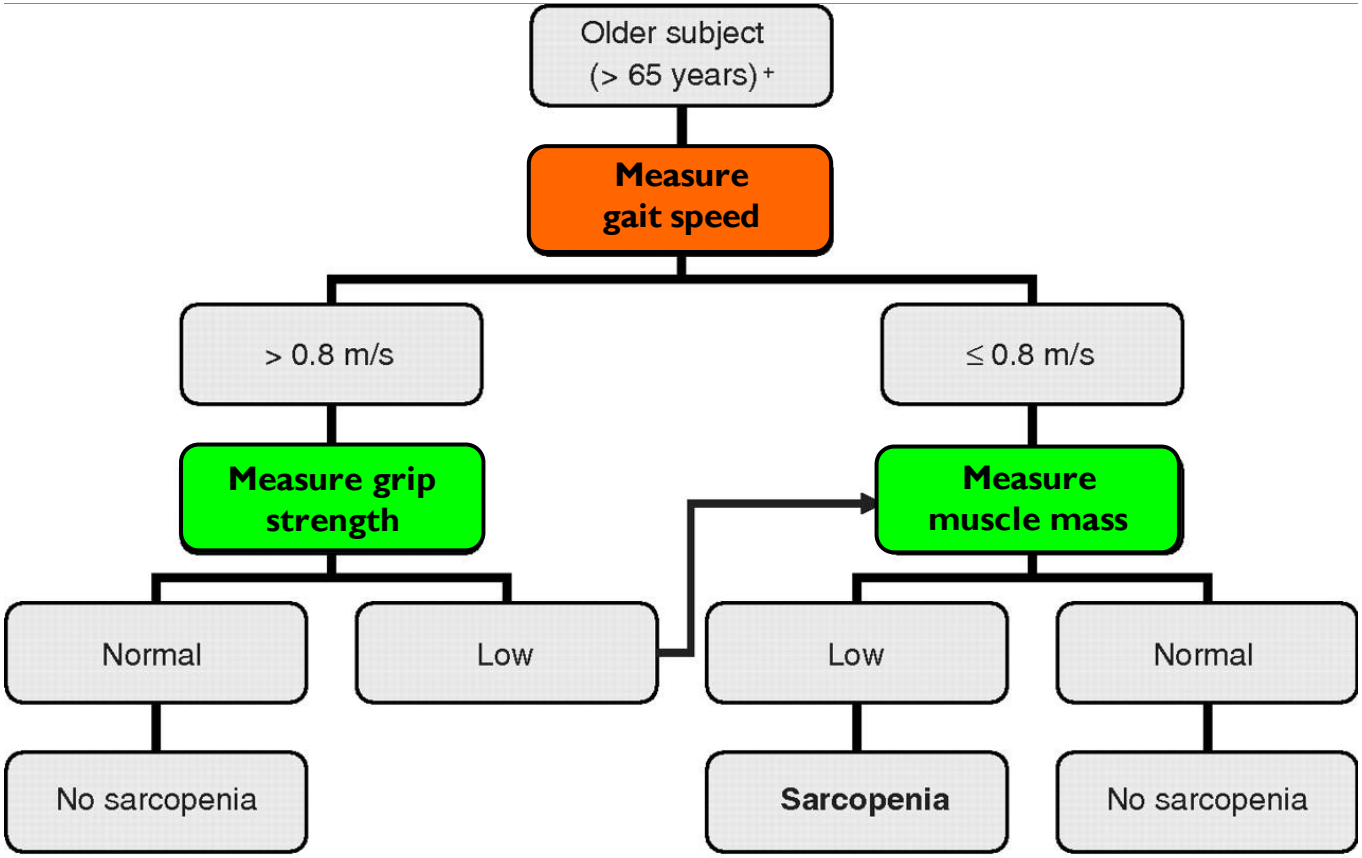
Model 2: adjusted for age, gender, education, ADL impairment, body mass index.

Model 3: adjusted for age, gender, education, ADL impairment, body mass index, hypertension, congestive heart failure, chronic obstructive pulmonary disease (COPD), number of diseases, TNF-α.

Age, education, ADL impairment, body mass index, number of diseases, TNF-α was treated as a continuous variable.

Landi F et al. Age Ageing 2013;42:203.209

# Algoritmo diagnostico nell'anziano



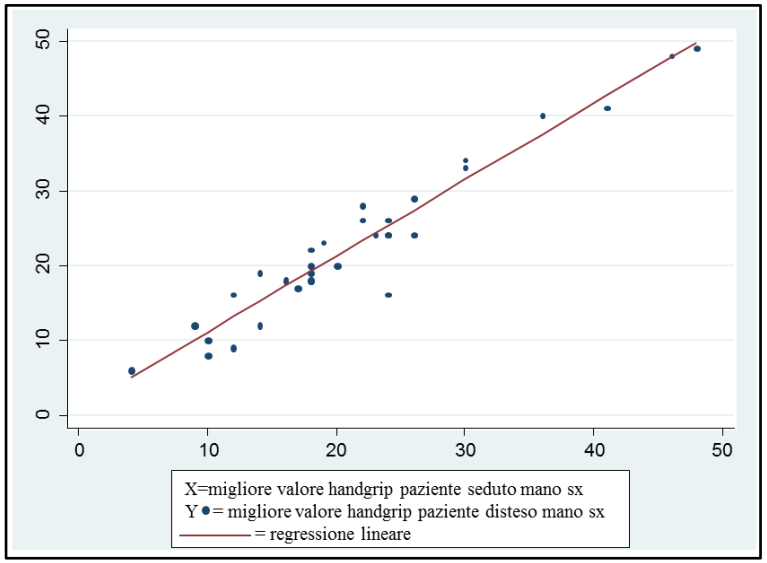

Cruz-Jentoft A J et al. Age Ageing 2010;39:412-423

39

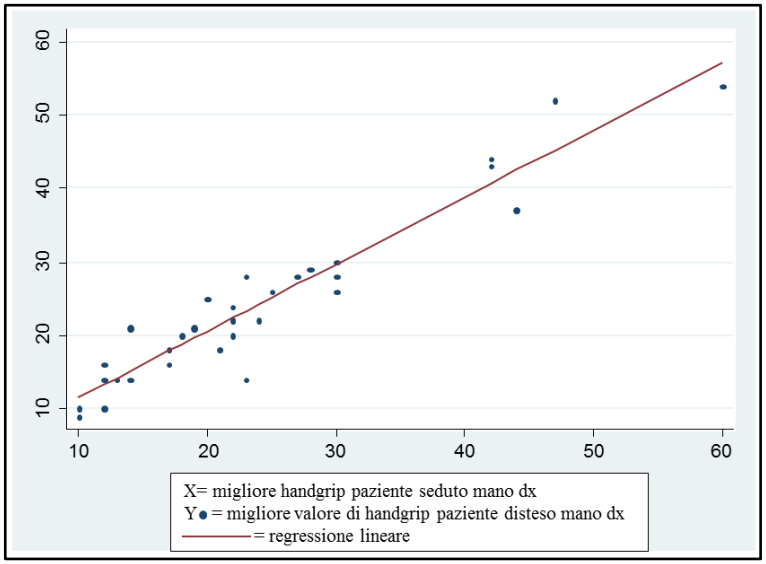
39

# Regressione lineare: relazione tra i valori migliori di handgrip strength a paziente seduto e a paziente disteso

***Mano sinistra***




***Mano destra***



# Coefficiente di correlazione intraclasse: confronto tra la handgrip strength a paziente disteso e a paziente seduto

| | Coeff. Correlazione intraclasse | [95% IC] |
|---|---|---|
| **GS disteso/GS seduto mano *sinistra*** | **0.978** | **0.950-0.990** |
| **GS disteso/GS seduto mano *destra*** | **0.976** | **0.952-0.988** |

# Handgrip Strength Predicts Persistent Walking Recovery After Hip Fracture Surgery

**Table 1** Selected General and Clinical Characteristics of the Sample by Gender-specific Handgrip Strength Tertiles

| | Handgrip Strength Tertiles (N = 504) | | | |
|---|---|---|---|---|
| | Lowest (n = 172) | Intermediate (n = 173) | Highest (n = 159) | *P* Value |
| Age (mean ± SD) | 86.5 (5.7) | 85.6 (5.5) | 83.8 (4.8) | <.001 |
| Men, n (%) | 45 (26.2) | 40 (23.1) | 39 (24.5) | .81 |
| Married, n (%) | 41 (23.8) | 28 (16.2) | 53 (33.3) | .02 |
| Home residents, n (%) | 154 (89.5) | 159 (91.9) | 153 (96.2) | .20 |
| Caregiver assistance, n (%) | 123 (71.5) | 114 (65.9) | 74 (46.5) | <.001 |
| Cognitive impairment, n (%) | 117 (68.0) | 87 (50.3) | 48 (30.2) | <.001 |
| Depressive symptoms, n (%) | 85 (49.4) | 69 (39.9) | 54 (34.0) | <.001 |
| Charlson Index, median (IQR) | 2 (1-4) | 2 (1-3) | 1 (0-3) | <.001 |
| No. of medications at admission, median (IQR) | 5 (3-7) | 4 (2-6) | 4 (3-5) | .04 |
| BADL difficulty, n (%) | 129 (75.0) | 95 (54.9) | 36 (22.6) | <.001 |
| IADL difficulty, n (%) | 170 (98.8) | 172 (99.4) | 159 (100) | .39 |
| Vitamin D (25-OH) ng/mL, median (IQR) | 7.5 (4.3-13.2) | 9.0 (6.1-13.2) | 9.0 (5.7-14.1) | .03 |
| C-reactive protein mg/L, median (IQR) | 4.2 (2.3-9.8) | 5.3 (2.6-8.0) | 4.1 (1.8-9.1) | .19 |
| Hemoglobin g/dL, median (IQR) | 12.0 (10.9-13.3) | 12.4 (10.9-13.5) | 12.2 (11.0-13.3) | .55 |
| Type of fracture: n (%) | | | | |
| Intracapsular | 77 (44.8) | 83 (48.0) | 81 (50.9) | |
| Trochanteric | 87 (50.6) | 82 (47.4) | 60 (37.7) | .03 |
| Subtrochanteric | 8 (4.6) | 8 (4.6) | 18 (11.3) | |
| Days before surgery, median (IQR) | 2 (2-4) | 3 (2-4) | 3 (2-5) | <.001 |
| Type of surgery, n (%) | | | | |
| Endoprosthesis | 75 (43.6) | 71 (41.0) | 76 (47.8) | |
| Arthroplasty | 3 (1.7) | 6 (3.5) | 3 (1.9) | <.001 |
| Other | 94 (54.7) | 96 (55.5) | 80 (50.3) | |
| Early rehabilitation, n (%) | 157 (91.3) | 162 (93.6) | 136 (85.5) | .04 |

Savino et al. Am J Med, 2013, ;126:1068-1075

# Handgrip Strength Predicts Persistent Walking Recovery After Hip Fracture Surgery

**Table 3** Multivariable Logistic Regression Analyses Predicting Persistent Walking Recovery in Patients with Independent Walking Before Fracture (N = 409)

| | | Odds Ratio (95% CI) | | | |
|---|---|---|---|---|---|
| | No. of Events (%) | Model 1 | Model 2 | Model 3 (Fully Adjusted) | Model 3* (Most Parsimonious) |
| Grip strength, tertiles | | | | | |
| Lowest | 66 (49.6) | 1 | 1 | 1 | 1 |
| Intermediate | 103 (70.1) | 2.83 (1.64-4.90) | 2.12 (1.16-3.87) | 2.40 (1.24-4.62) | 2.33 (1.25-4.34) |
| Highest | 99 (76.7) | 4.07 (2.11-7.85) | 2.09 (1.00-4.37) | 2.46 (1.11-5.44) | 2.79 (1.35-5.79) |
| *P* value of test for trend | | <.001 | .04 | .02 | .005 |
| Age, y | | 0.95 (0.91-0.99) | 0.95 (0.91-1.00) | 0.98 (0.93-1.03) | |
| Gender, m | | 0.78 (0.47-1.30) | 0.57 (0.33-0.99) | 0.50 (0.27-0.92) | 0.51 (0.29-0.92) |

Model 3 includes age, gender, medical center, cognitive decline, depressive symptoms, BADL difficulty, caregiver assistance, time before surgery, type of surgery, early rehabilitation, Charlson Index, and vitamin D levels.

Savino et al. Am J Med, 2013, ;126:1068-1075

# Conclusioni

- Malnutrizione e sarcopenia sono frequenti e associate nella popolazione geriatrica
- La sarcopenia è la complicanza clinica funzionale più importante della malnutrizione in età geriatrica
- La valutazione quantitava e qualitativa della massa muscolare deve far sempre parte dell'assessment nutrizionale
- Esistono strumenti e algoritmi diagnostici che permettono questa valutazione in qualsiasi setting assistenziale e in qualunque tipo di paziente

58 Congresso Nazionale

stefano.volpato@unife.it

Università di Ferrara
-Ex Labore Fructus-