



68° CONGRESSO NAZIONALE SIGG

Ritorno al futuro

FIRENZE, 13-16 DICEMBRE 2023
PALAZZO DEI CONGRESSI



SARCOPENIA: DIAGNOSI E FATTORI DI RISCHIO

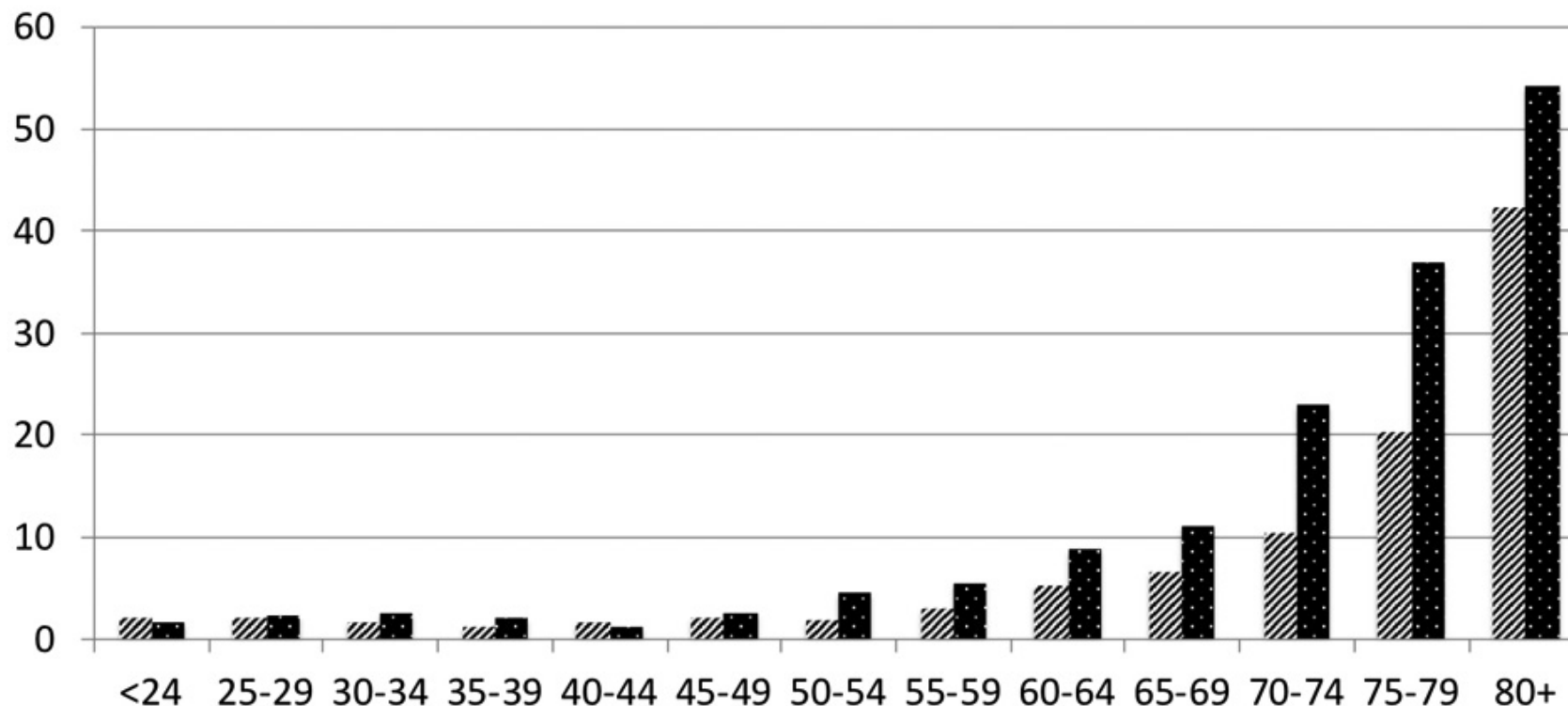
Maria Beatrice Zazzara

Gli strumenti di screening nei diversi setting



The Longevity Check-up 7+ project

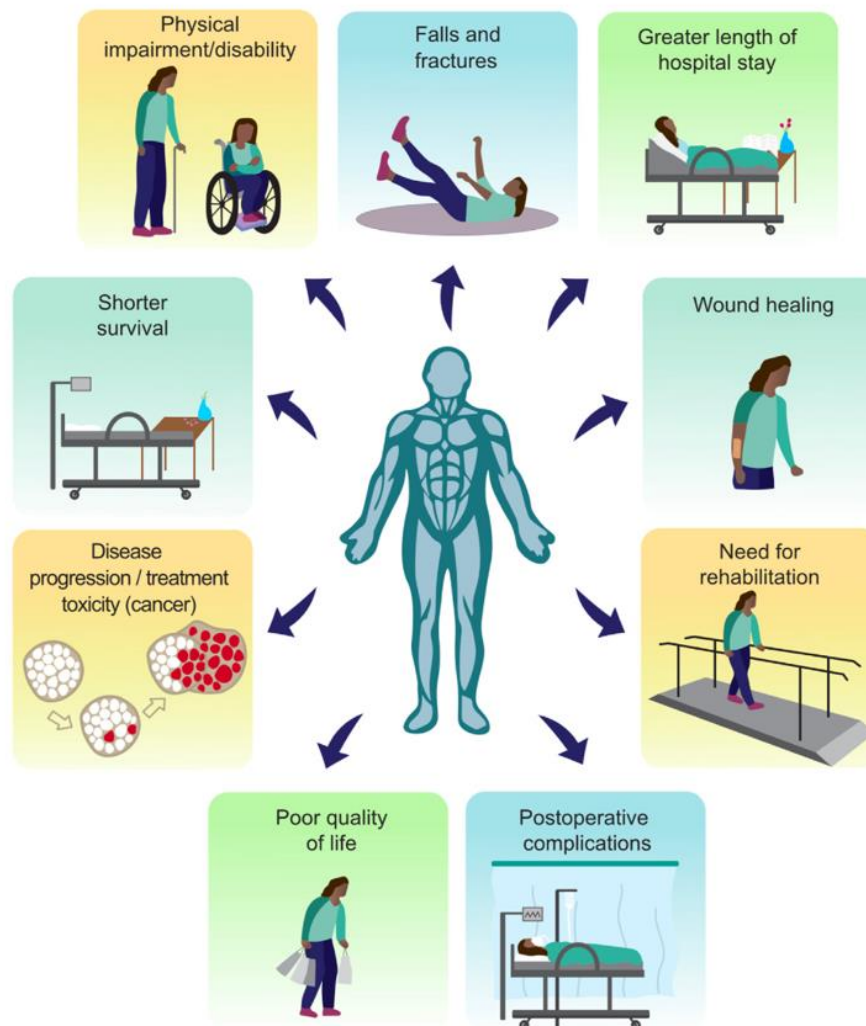
▨ Male ■ Female



- Overall prevalence of probable sarcopenia 8,6%
- Prevalence in women and men aged < 24 years old: 1.7% and 2.1%
- Prevalence in women and men aged > 80 years old: 54.2% and 42.4%



Consequences of Sarcopenia





Age and Ageing 2013; **42**: 203–209
doi: 10.1093/ageing/afs194
Published electronically 15 January 2013

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Sarcopenia and mortality risk in frail older persons aged 80 years and older: results from the SIRENTE study

FRANCESCO LANDI^{1,2}, ALFONSO J. CRUZ-JENTOFT^{3,†}, ROSA LIPEROTTI^{1,†}, ANDREA RUSSO¹, SILVIA GIOVANNINI¹,
MATTEO TOSATO¹, ETTORE CAPOLUONGO⁴, ROBERTO BERNABEI¹, GRAZIANO ONDER¹

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.

Anthropometry
measurements



European Geriatric Medicine

<https://doi.org/10.1007/s41999-019-00233-w>

REVIEW



Sarcopenia and health-related outcomes: an umbrella review of observational studies

Nicola Veronese¹ · Jacopo Demurtas² · Pinar Soysal³ · Lee Smith⁴ · Gabriel Torbahn⁵ · Daniel Schoene⁶ · Lukas Schwingshackl⁷ · Cornel Sieber^{5,8} · Jurgen Bauer⁹ · Matteo Cesari¹⁰ · Oliviere Bruyere¹¹ · Jean-Yves Reginster¹¹ · Charlotte Beaudart¹¹ · Alfonso J. Cruz-Jentoft¹² · Cyrus Cooper^{13,14} · Mirko Petrovic¹⁵ · Stefania Maggi¹ on behalf of the Special Interest Groups in Systematic Reviews and Meta-analyses for healthy ageing Sarcopenia and Frailty and resilience in older persons of the European Geriatric Medicine Society (EuGMS)

Received: 21 May 2019 / Accepted: 23 August 2019

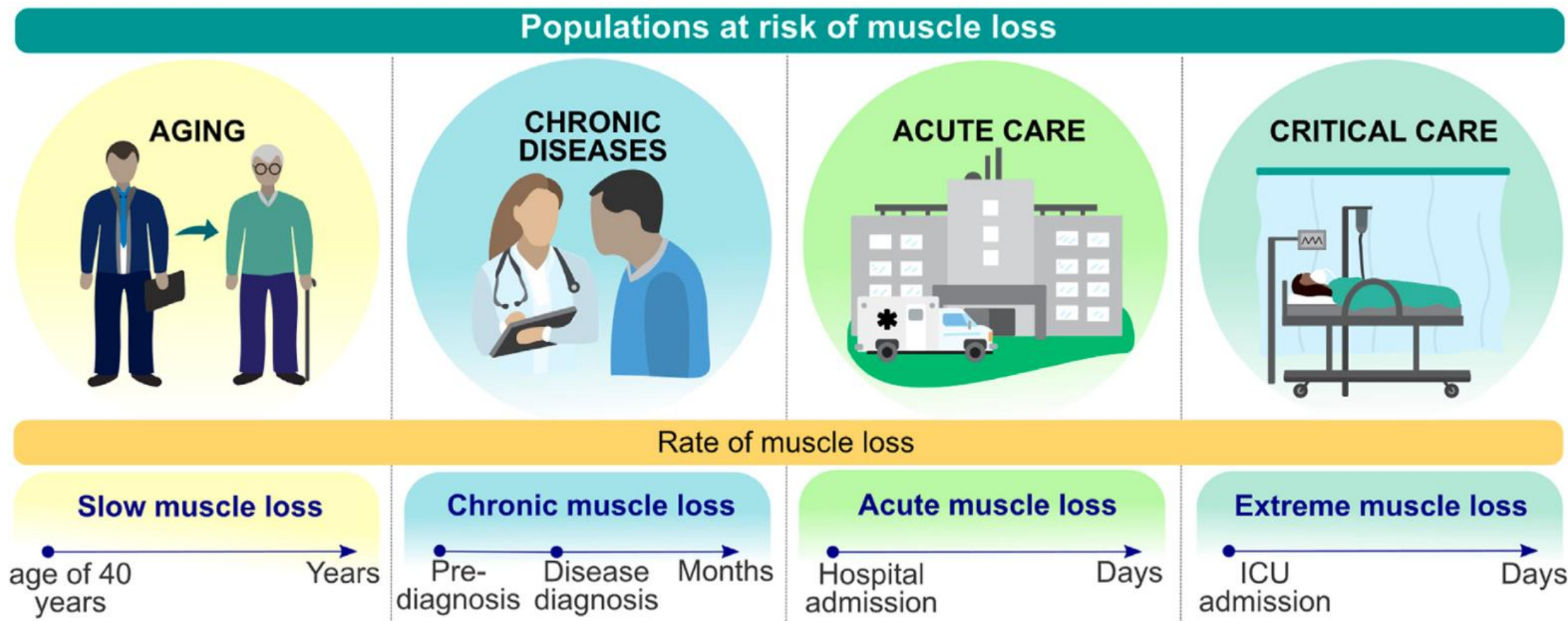
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- Mortality
- Disability
- Falls

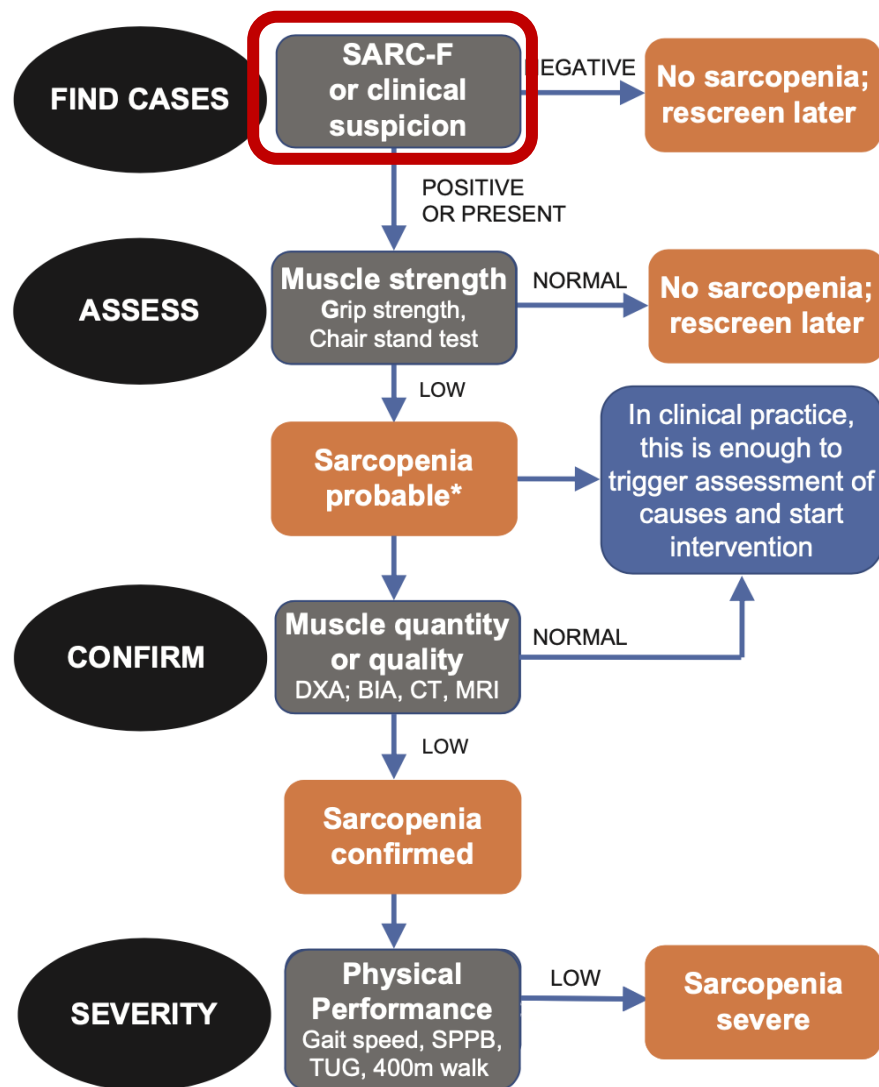
- Post-operative complications



Populations at risk of sarcopenia



ICU- Intensive Care Unit



A simple algorithm to diagnose sarcopenia in clinical practice

Age and Ageing 2018; 0: 1–16
doi: 10.1093/ageing/afy169

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GUIDELINES

Sarcopenia: revised European consensus on definition and diagnosis

ALFONSO J. CRUZ-JENTOFT¹, GÜLISTAN BAHAT², JÜRGEN BAUER³, YVES BOIRIE⁴, OLIVIER BRUYÈRE⁵, TOMMY CEDERHOLM⁶, CYRUS COOPER⁷, FRANCESCO LANDI⁸, YVES ROLLAND⁹, AVAN AIHIE SAYER¹⁰, STÉPHANE M. SCHNEIDER¹¹, CORNEL C. SIEBER¹², EVA TOPINKOVA¹³, MAURITS VANDEWOUDE¹⁴, MARJOLEIN VISSER¹⁵, MAURO ZAMBONI¹⁶, WRITING GROUP FOR THE EUROPEAN WORKING GROUP ON SARCOPENIA IN OLDER PEOPLE 2 (EWGSOP2), AND THE EXTENDED GROUP FOR EWGSOP2



Table 2 The Red Flag method

	Red flags
Clinician's observation	General weakness of the subject
	Visual identification of loss of muscle mass
	Low walking speed
Subject's presenting features	Loss of weight
	Loss of muscle strength, in arms or in legs
	General weakness
	Fatigue
	Falls
	Mobility impairment
	Loss of energy
Clinician's assessment	Difficulties in physical activities or activities of daily living
	Nutrition
	Body weight
	Physical activity

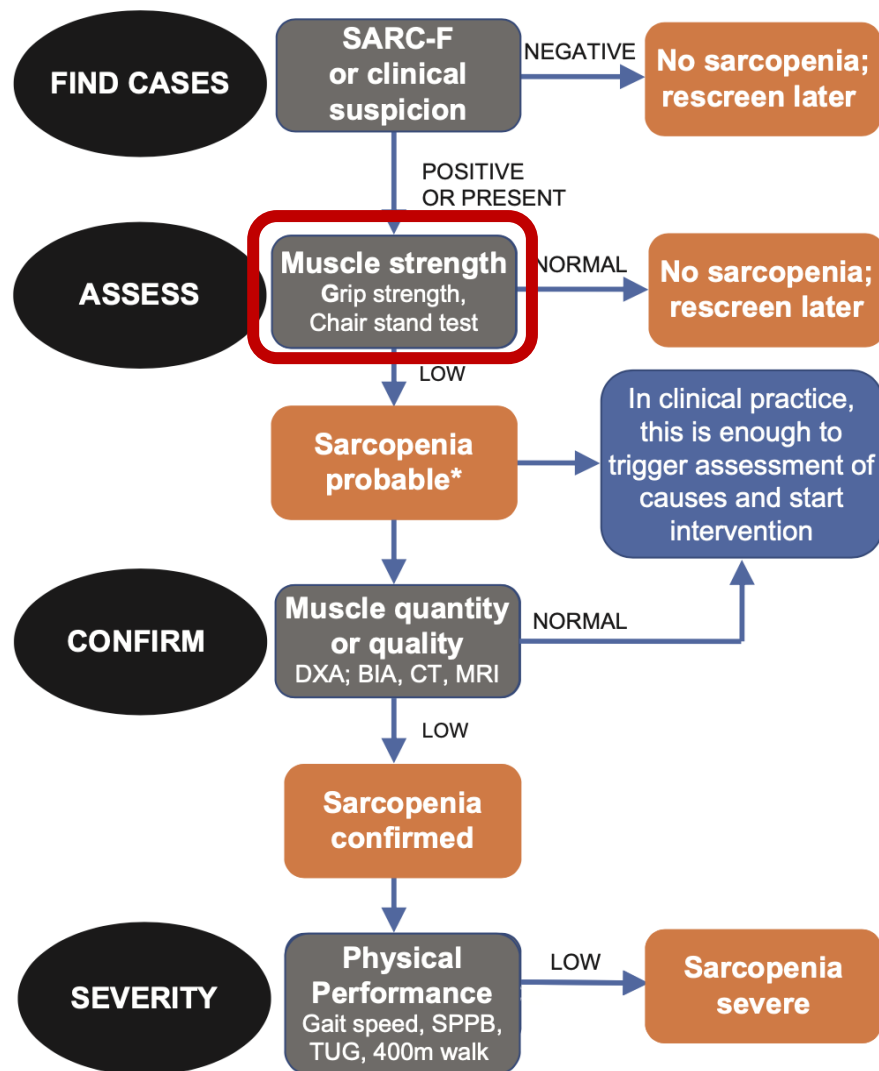
Nb. Red flags have been identified through reviewed papers identified by members of the group



SARC-F: A Simple Questionnaire to Rapidly Diagnose Sarcopenia

Table 1
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 past year?	None = 0 1–3 falls = 1 4 or more falls = 2



A simple algorithm to diagnose sarcopenia in clinical practice

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Tools to assess sarcopenia in daily practice

Table 1

Tools used to assess muscle mass, muscle strength and physical performance in clinical practice.

Outcomes	Tools	Proportion of users (%)
Muscle mass (n=136)	Calf circumference	57.5
	Dual-energy X-ray absorptiometry (DXA)	45.9
	Skinfold thickness	30.8
	Bioelectrical impedance analysis (BIA)	22.6
	Ultrasonography	18.5
	Magnetic resonance imaging (MRI)	16.4
	CT-scan	14.4
	Other	8.9
	Muscle strength (n=139)	Handheld dynamometer
Leg press		24.2
Chest press		9.39
Isokinetic dynamometer		7.38
Vigorimeter		2.01
Other		11.4
Physical performance (n=182)		Gait speed
	Timed up and go	58.6
	Self-reported physical function	58.1
	Sit to stand 5 times	53.9
	Standing balance	52.9
	Short physical performance battery test (SPPB)	28.8
	Stair climb	25.1
	3-D accelerometer	3.66
	Other	5.76

➤ **Survey completed by 255 clinicians from 55 countries across 5 continents**

➤ **53.3% assessed sarcopenia in daily practice**



Tools to assess sarcopenia in daily practice

Muscle strength
(n = 139)

Handheld dynamometer	66.4
Leg press	24.2
Chest press	9.39
Isokinetic dynamometer	7.38
Vigorimeter	2.01
Other	11.4



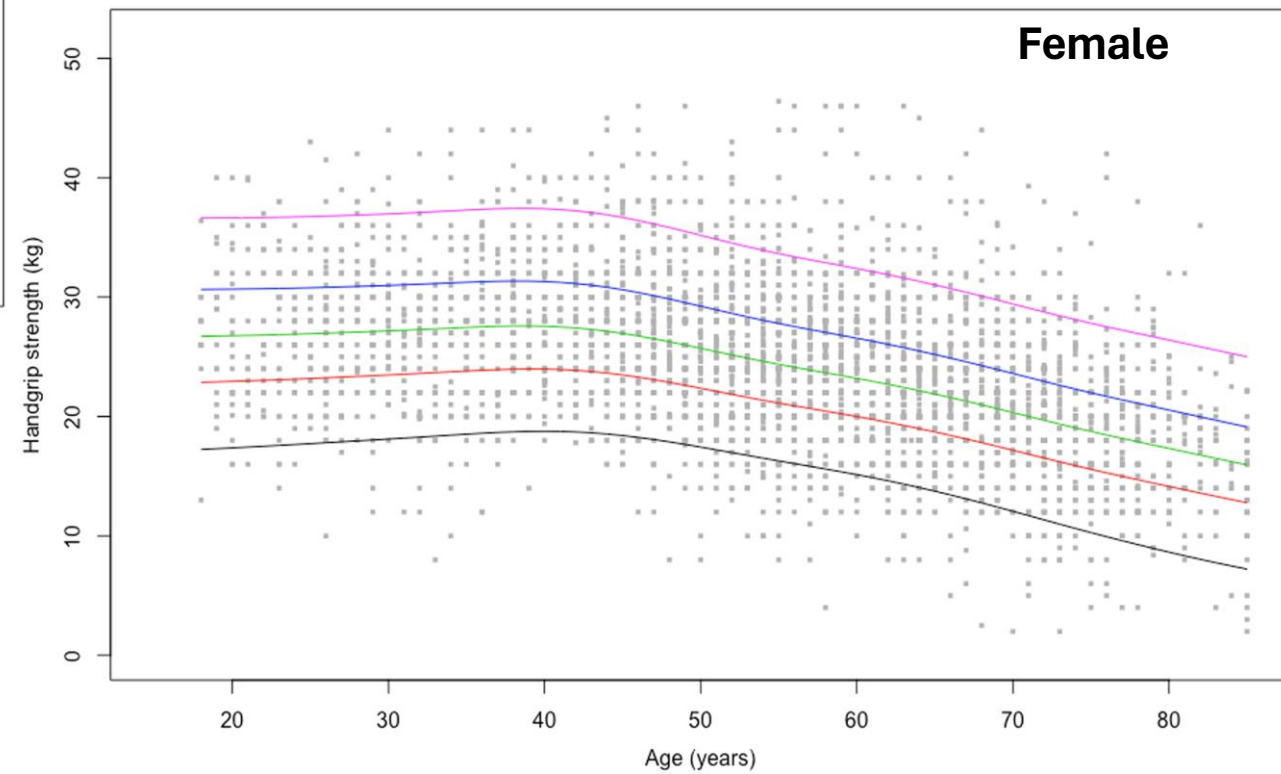
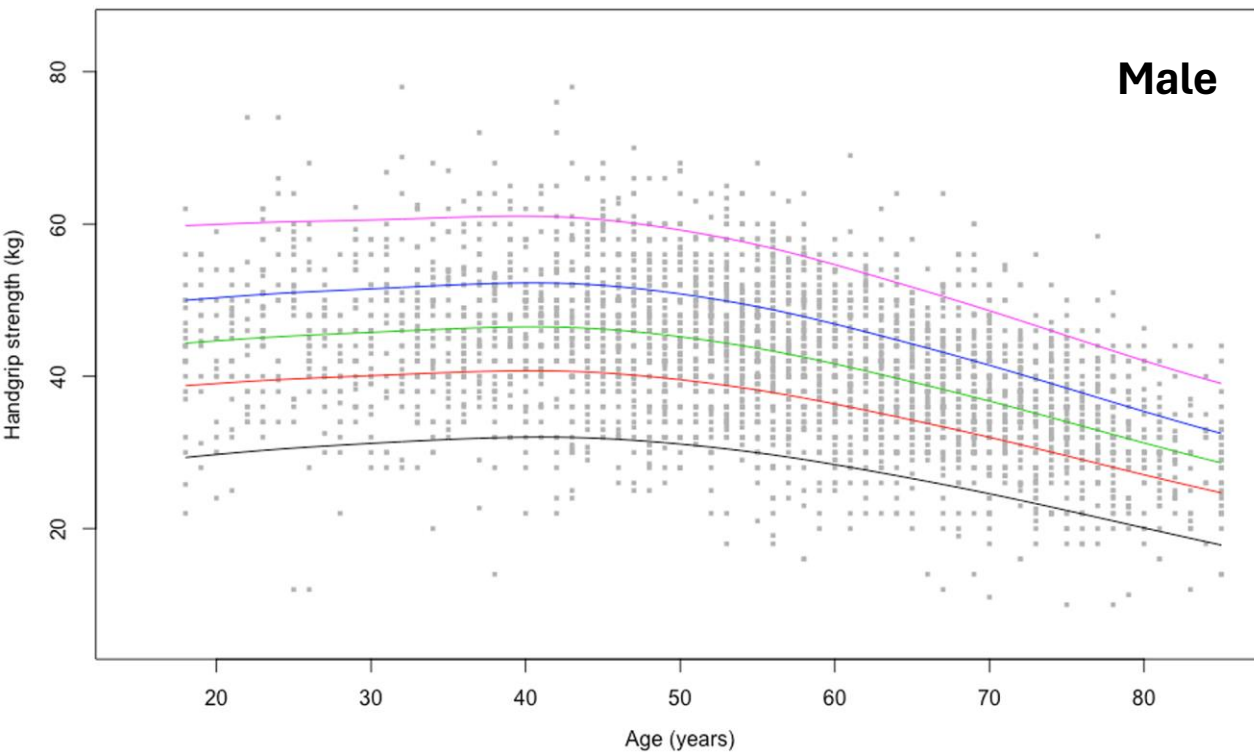
Journal of Cachexia, Sarcopenia and Muscle (2020)

Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/jcsm.12610

Normative values of muscle strength across ages in a 'real world' population: results from the longevity check-up 7+ project

Francesco Landi^{1,2}, Riccardo Calvani¹, Anna Maria Martone¹, Sara Salini¹, Maria Beatrice Zazzara¹, Matteo Candeloro³, Hélio José Coelho-Junior², Matteo Tosato¹, Anna Picca^{1*}  & Emanuele Marzetti^{1,2} 

¹Center for Geriatric Medicine (CEMI), Fondazione Policlinico Universitario 'Agostino Gemelli' IRCCS, Rome, Italy, ²Università Cattolica del Sacro Cuore, Institute of Internal Medicine and Geriatrics, Rome, Italy, ³Dipartimento di Medicina e Scienze dell'Invecchiamento, Università G. D'Annunzio, Chieti, Italy

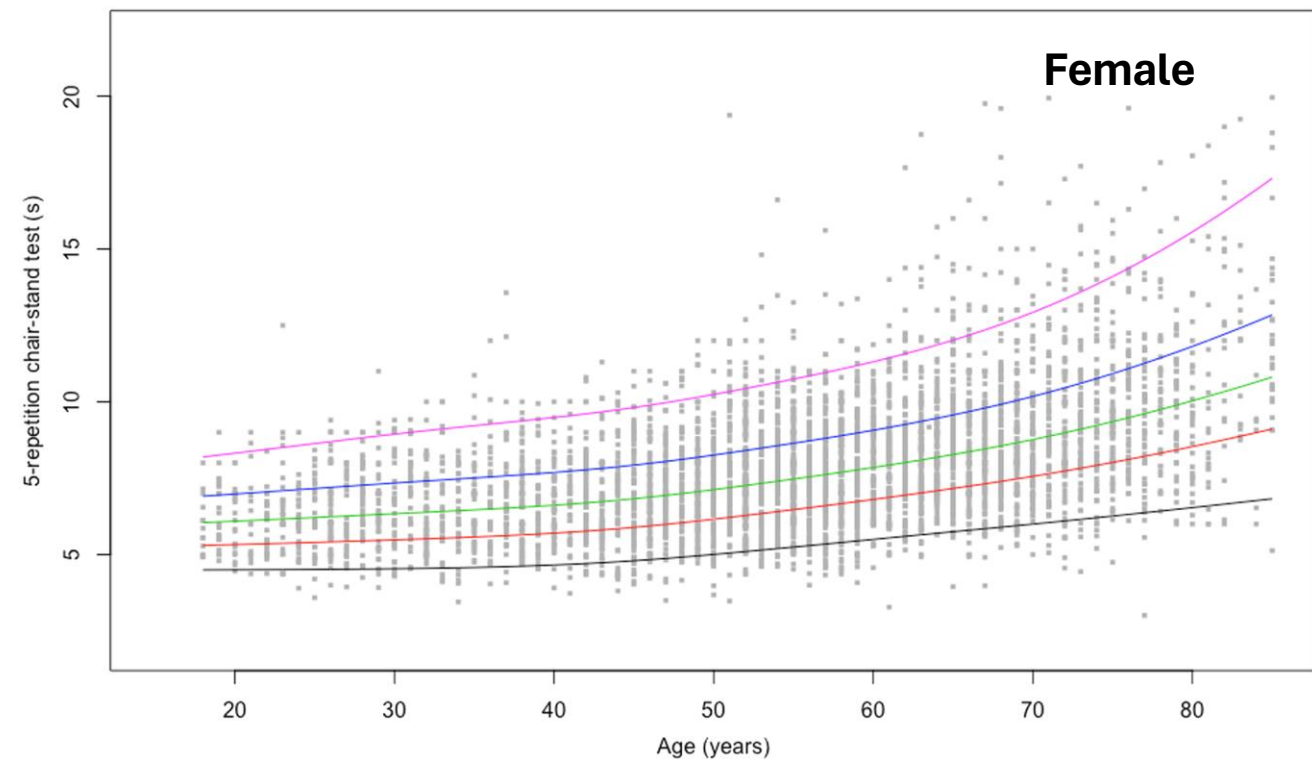
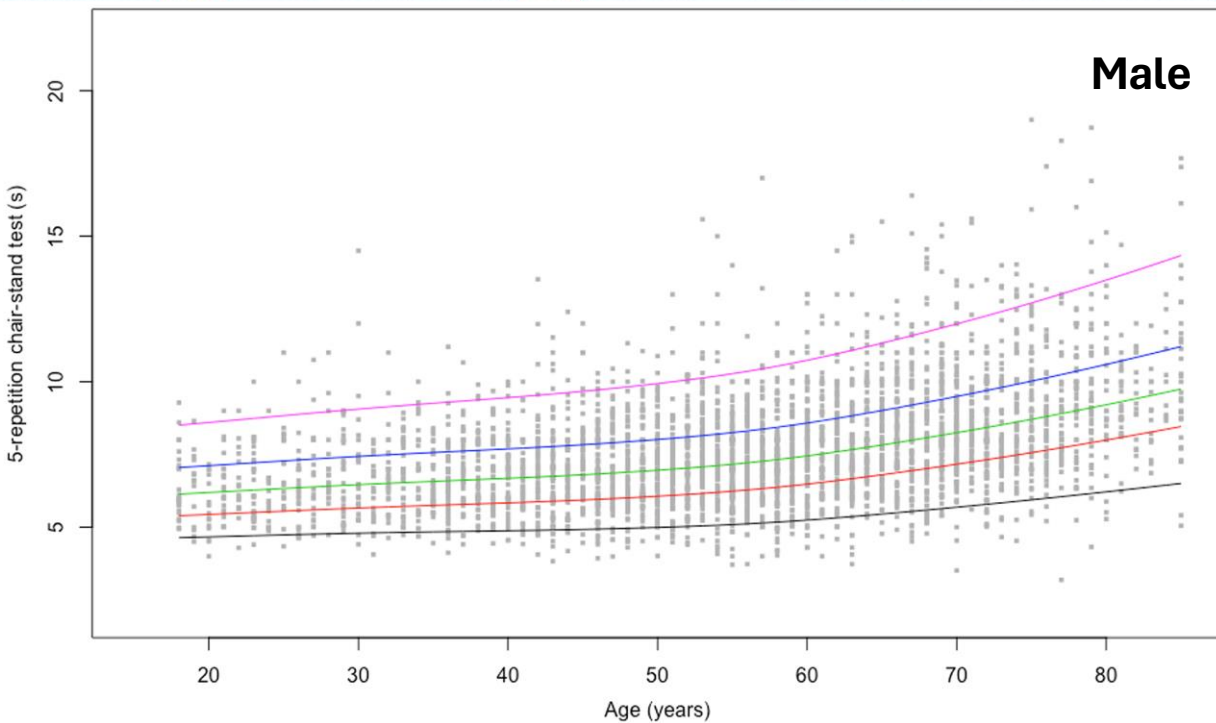


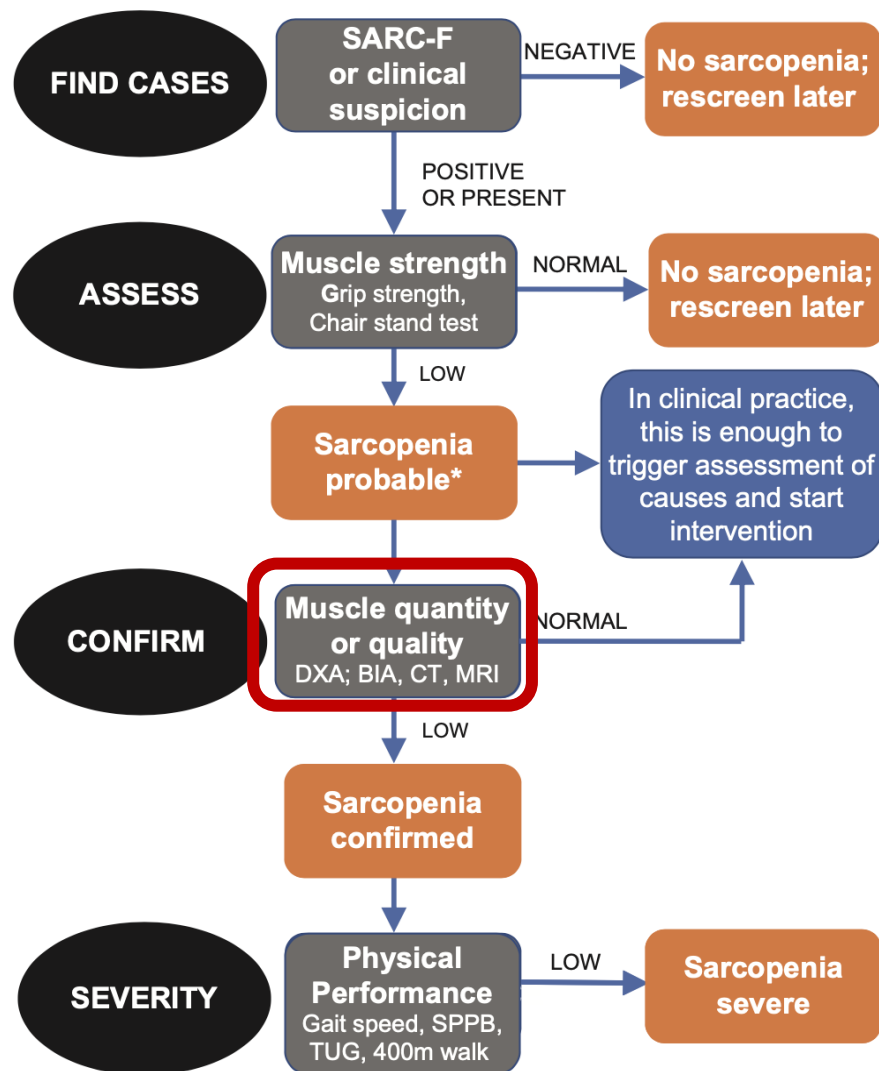


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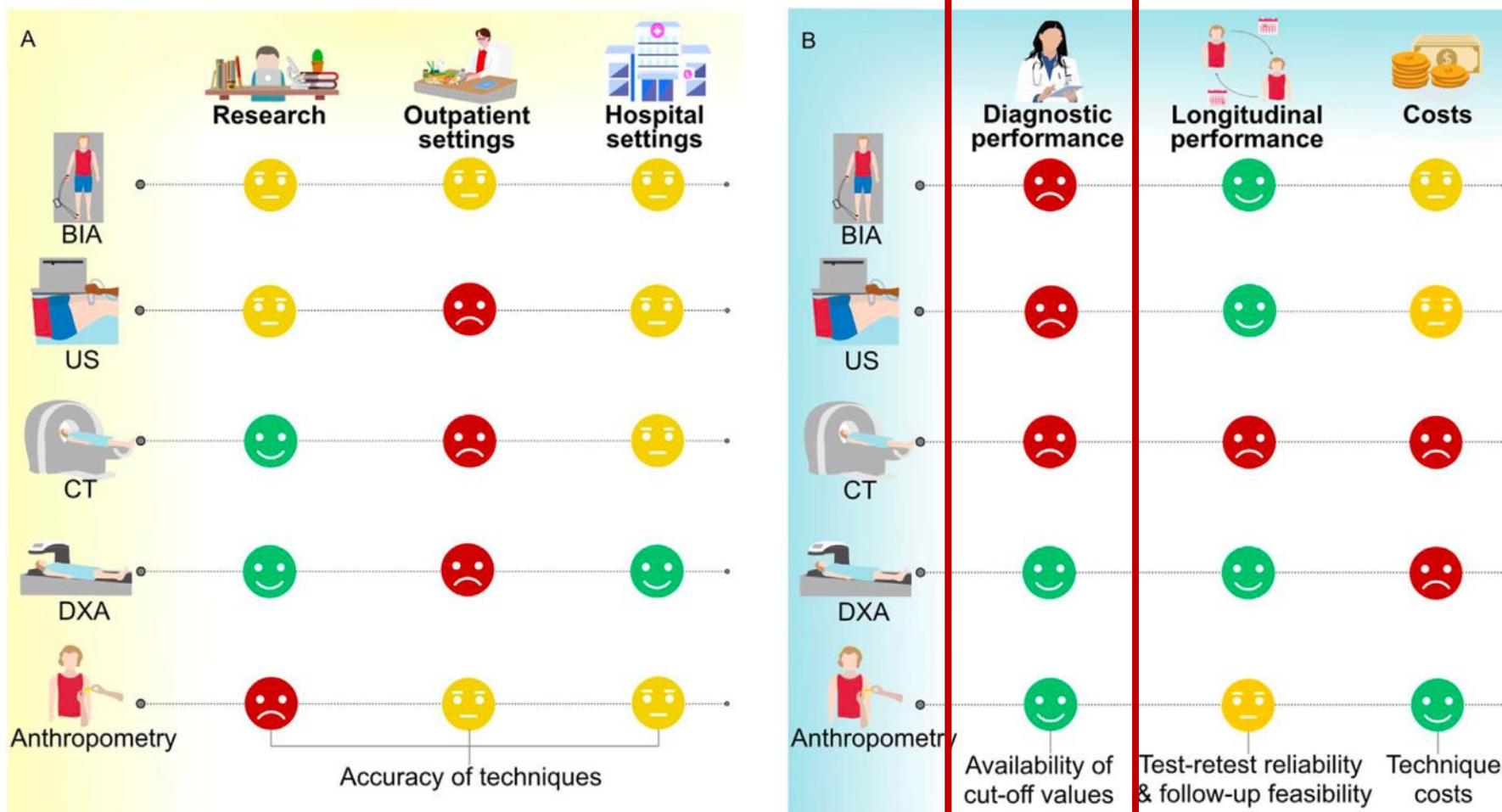
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Available methods for muscle mass assessment



US- Ultrasound



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SURROGATE APPROACHES for **MUSCLE MASS ASSESSMENT**

ANTHROPOMETRY

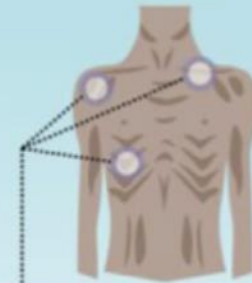


Calf circumference



Mid-upper arm circumference

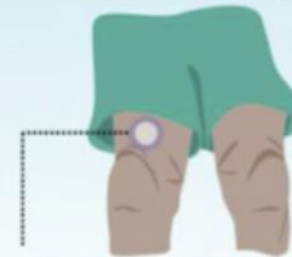
PHYSICAL EXAMINATION



Protruding clavicles, shoulders, ribs



Temple



Quadriceps depression



Interosseous muscle depression



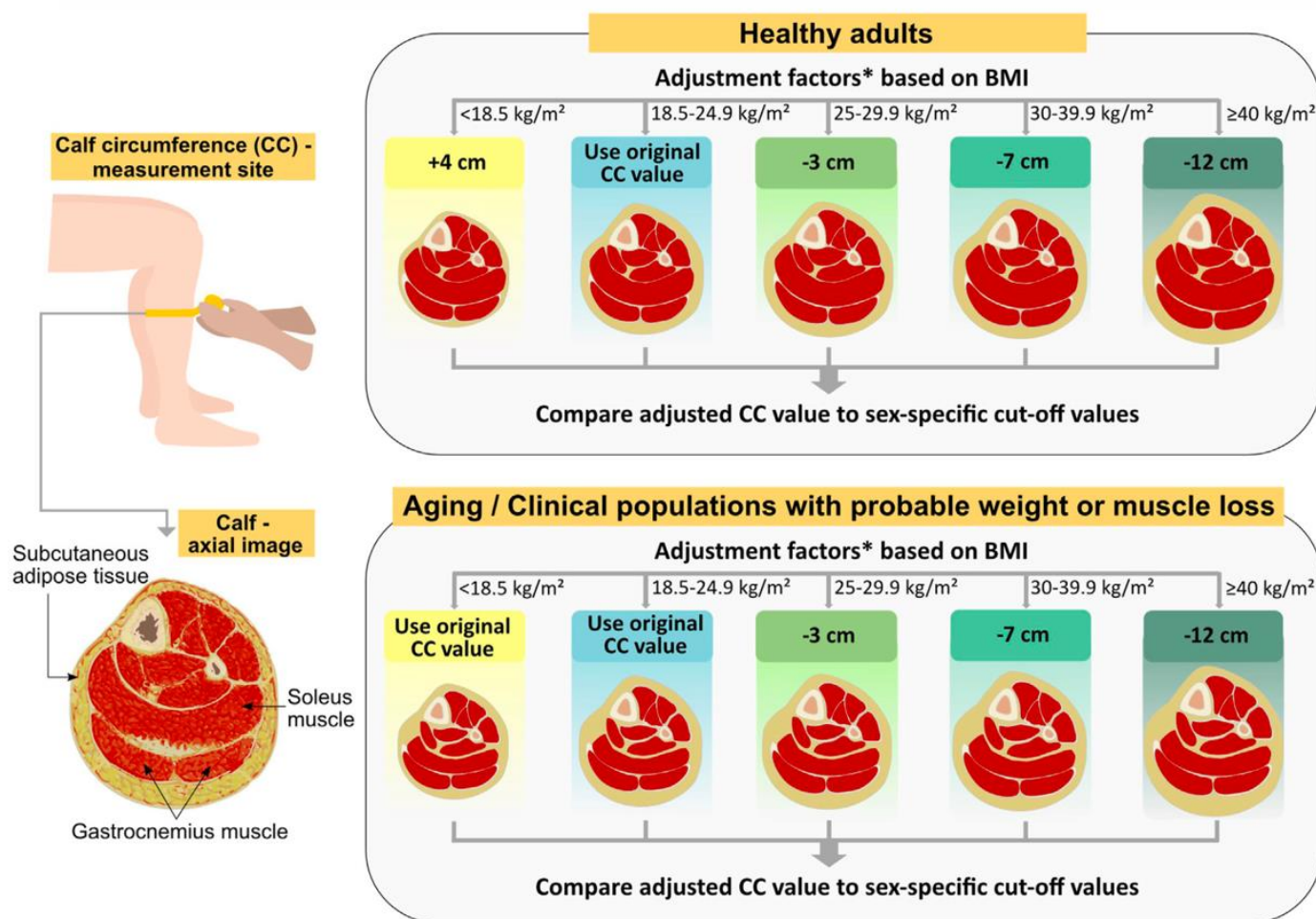


Prediction equations to estimate appendicular skeletal muscle mass using calf circumference: results from NHANES 1999- 2006

- DXA and anthropometric data from 15,293 adults surveyed in the 1999– 2006 NHANES
- Equation → $ASM \text{ (kg)} = -10.427 + (\text{calf circumference} \times 0.768) - (\text{age} \times 0.029) + (\text{sex} \times 7.523) + (\text{white} \times 0 \text{ or black} \times 2.203 \text{ or Mexican American} \times -0.540 \text{ or other} \times -0.402)$
- Able to explain almost 90% of the DXA-measured ASM variability

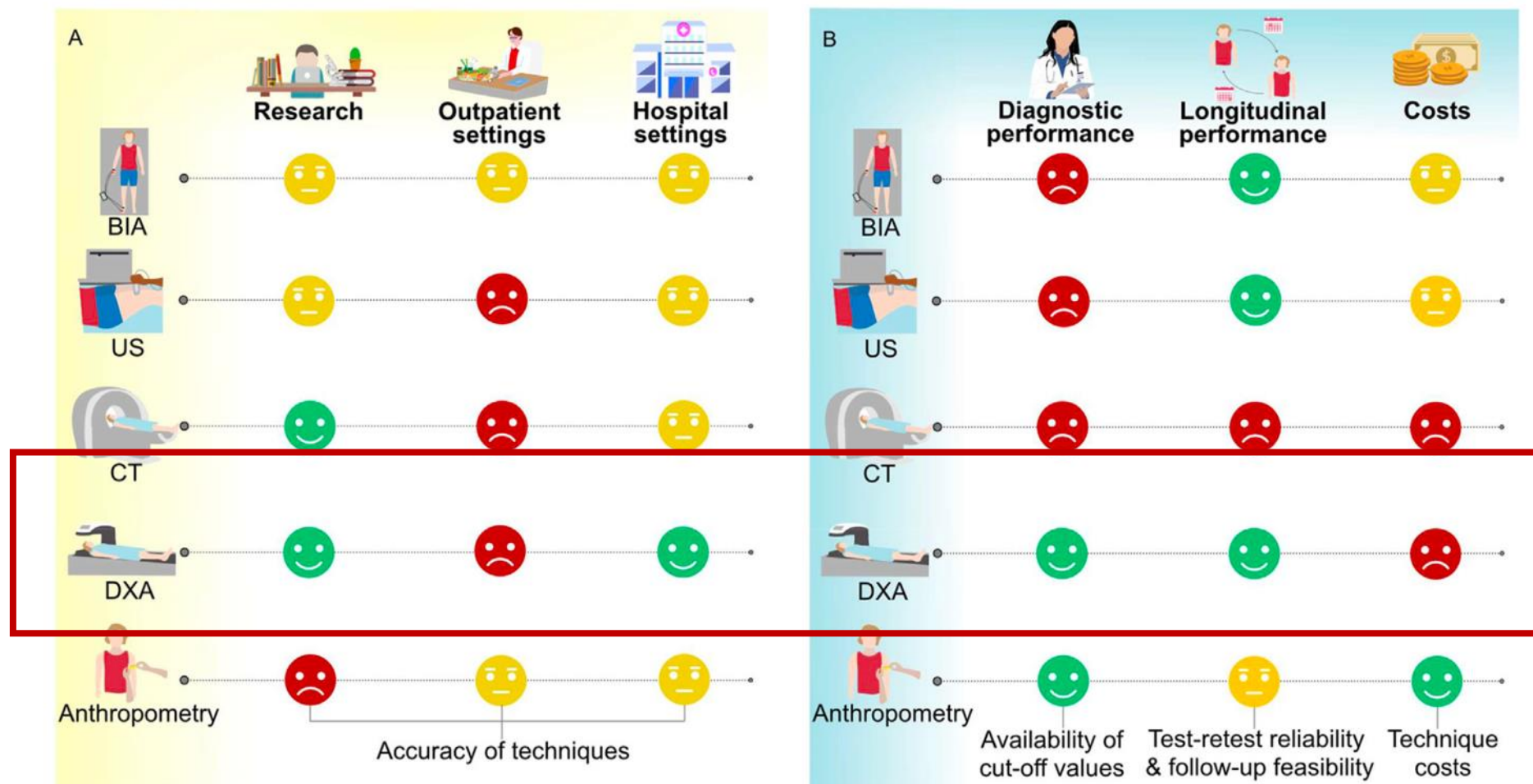


Adjustment factors for measurements of calf circumference according to BMI categories



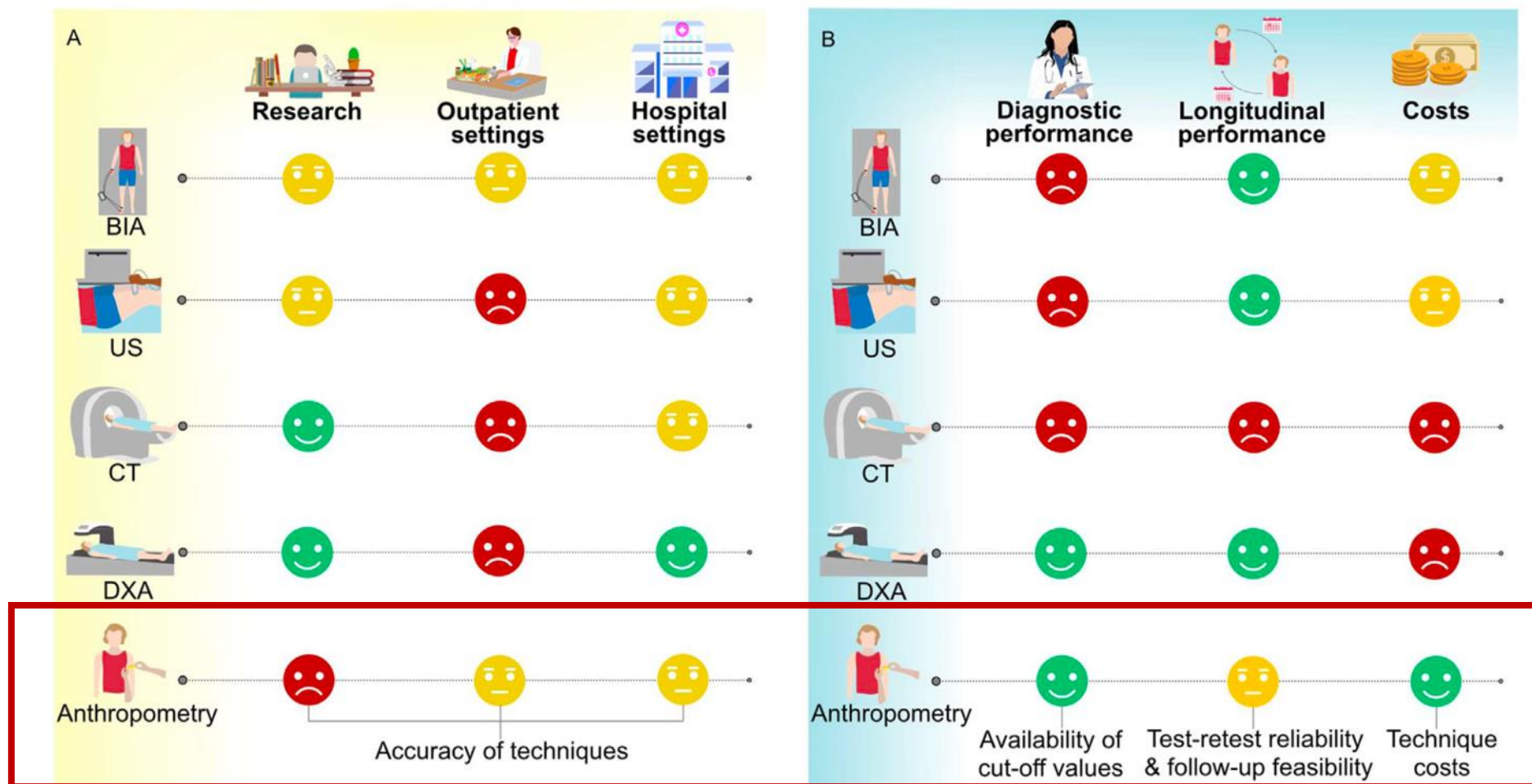


Available methods for muscle mass assessment





Available methods for muscle mass assessment





GLIM criteria for the diagnosis of malnutrition

Table 4 Thresholds for severity grading of malnutrition into Stage 1 (Moderate) and Stage 2 (Severe) malnutrition.

	Phenotypic Criteria ^a		
	Weight loss (%)	Low body mass index (kg/m ²) ^b	Reduced muscle mass ^c
Stage 1/Moderate Malnutrition (Requires 1 phenotypic criterion that meets this grade)	5–10% within the past 6 mo, or 10–20% beyond 6 mo	<20 if < 70 yr, <22 if ≥ 70 yr	Mild to moderate deficit (per validated assessment methods – see below)
Stage 2/Severe Malnutrition (Requires 1 phenotypic criterion that meets this grade)	>10% within the past 6 mo, or >20% beyond 6 mo	<18.5 if < 70 yr, <20 if ≥ 70 yr	Severe deficit (per validated assessment methods – see below)

a Severity grading is based upon the noted phenotypic criteria while the etiologic criteria described in the text and Fig. 1 are used to provide the context to guide intervention and anticipated outcomes.

b Further research is needed to secure consensus reference BMI data for Asian populations in clinical settings.

c For example appendicular lean mass index (ALMI, kg/m²) by dual-energy absorptiometry or corresponding standards using other body composition methods like bioelectrical impedance analysis (BIA), CT or MRI. When not available or by regional preference, physical examination or standard anthropometric measures like mid-arm muscle or calf circumferences may be used. Functional assessments like hand-grip strength may be used as a supportive measure [15].



GLIM criteria for the diagnosis of malnutrition

Table 4 Thresholds for severity grading of malnutrition into Stage 1 (Moderate) and Stage 2 (Severe) malnutrition.

	Phenotypic Criteria ^a		
Stage 1/Moderate Malnutrition (Requires 1 phenotypic criterion that meets this grade)	Weight loss >5% beyond 6 mo	Low body mass index (BMI) <20 if ≥ 70 yr	Mild to moderate deficit (per validated assessment methods – see below)
Stage 2/Severe Malnutrition (Requires 1 phenotypic criterion that meets this grade)	>10% within the past 6 mo, or >20% beyond 6 mo	<18.5 if < 70 yr, <20 if ≥ 70 yr	Severe deficit (per validated assessment methods – see below)

When not available or by regional preference, physical examination or standard anthropometric measure like mid-arm muscle or **calf circumferences** may be used

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Estimated appendicular skeletal muscle mass using calf circumference and mortality: Results from the aging and longevity study in the Sirente geographic area (*ilSIRENTE* study)

Francesco Landi^{*}, Riccardo Calvani, Hélio José Coelho-Junior, Francesca Ciciarello, Vincenzo Galluzzo, Beatrice Zazzara, Anna Maria Martone, Anna Picca, Emanuele Marzetti, Matteo Tosato

Fondazione Policlinico Universitario "Agostino Gemelli" IRCCS, 00168 Rome, Italy



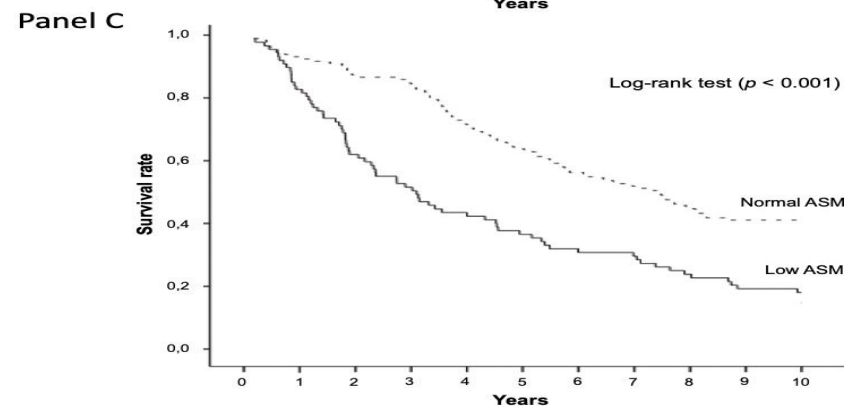
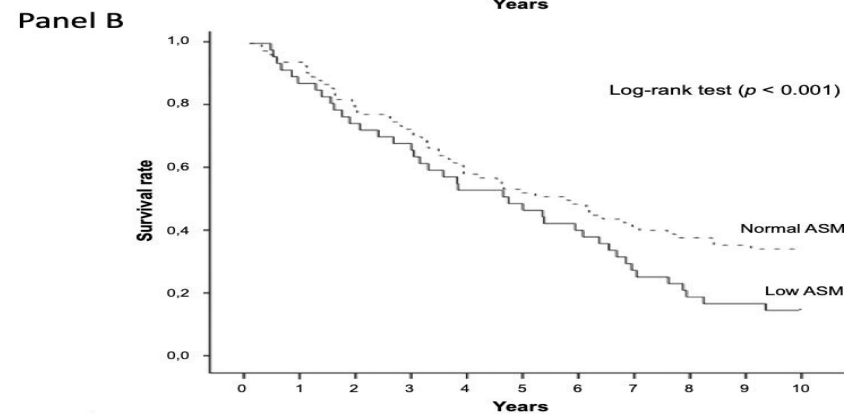
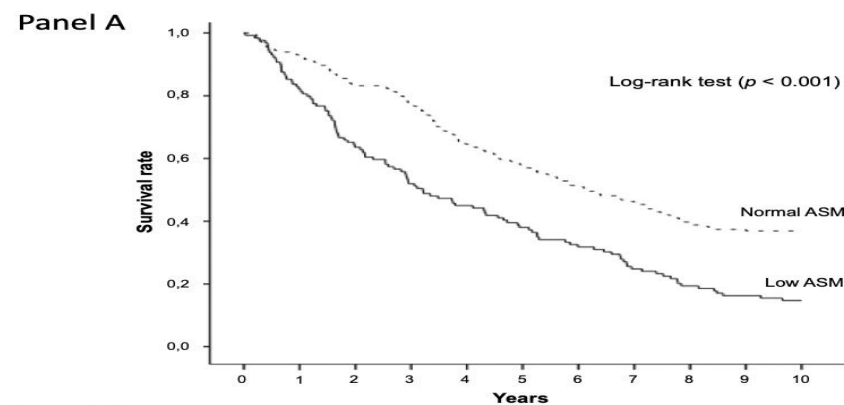


Table 2

Crude and adjusted hazard ratio of death and 95 % confidence intervals in the study population.

	Unadjusted	Model 1	Model 2	Model 3
	Hazard ratio (95 % confidence interval)			
Low ASM	3.38 (1.93–5.93)	2.93 (1.62–5.29)	1.98 (1.02–3.91)	1.84 (1.03–3.28)
Age		1.19 (1.11–1.28)	1.14 (1.06–1.23)	1.13 (1.06–1.21)
Gender (female)		0.43 (0.24–0.76)	0.42 (0.23–0.78)	0.49 (0.29–0.85)
ADL impairment			1.30 (1.03–1.65)	1.25 (1.03–1.53)
Cognitive impairment			1.42 (1.04–1.96)	1.45 (1.11–1.90)
BMI			0.95 (0.89–1.02)	0.94 (0.89–1.00)
CRP				1.00 (0.92–1.10)
IL-6				1.32 (1.13–1.54)

ASM: appendicular skeletal muscle mass.

Model 1: adjusted for age and gender.

Model 2: adjusted for age, gender, ADL (activities of daily living) impairment, cognitive impairment, and BMI (body mass index).

Model 3: adjusted for age, gender, ADL (activities of daily living) impairment, cognitive impairment, BMI (body mass index), CRP (C-reactive protein), and IL-6 (interleukin 6).



Journal of Cachexia, Sarcopenia and Muscle (2023)

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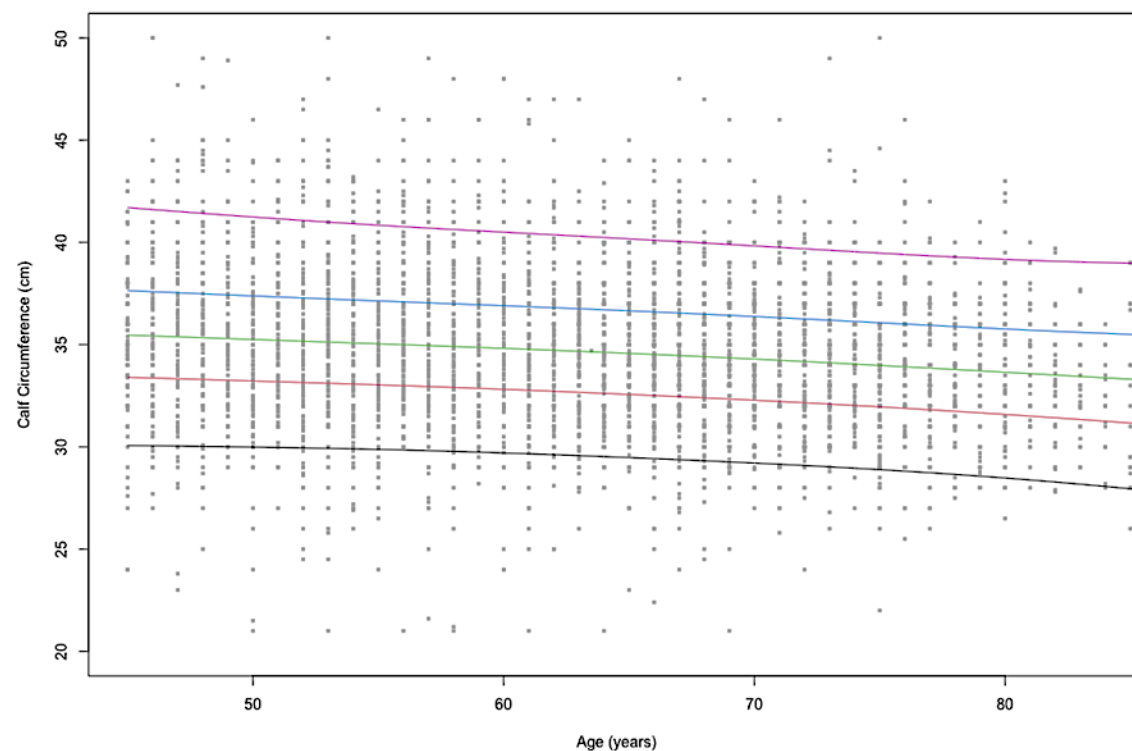
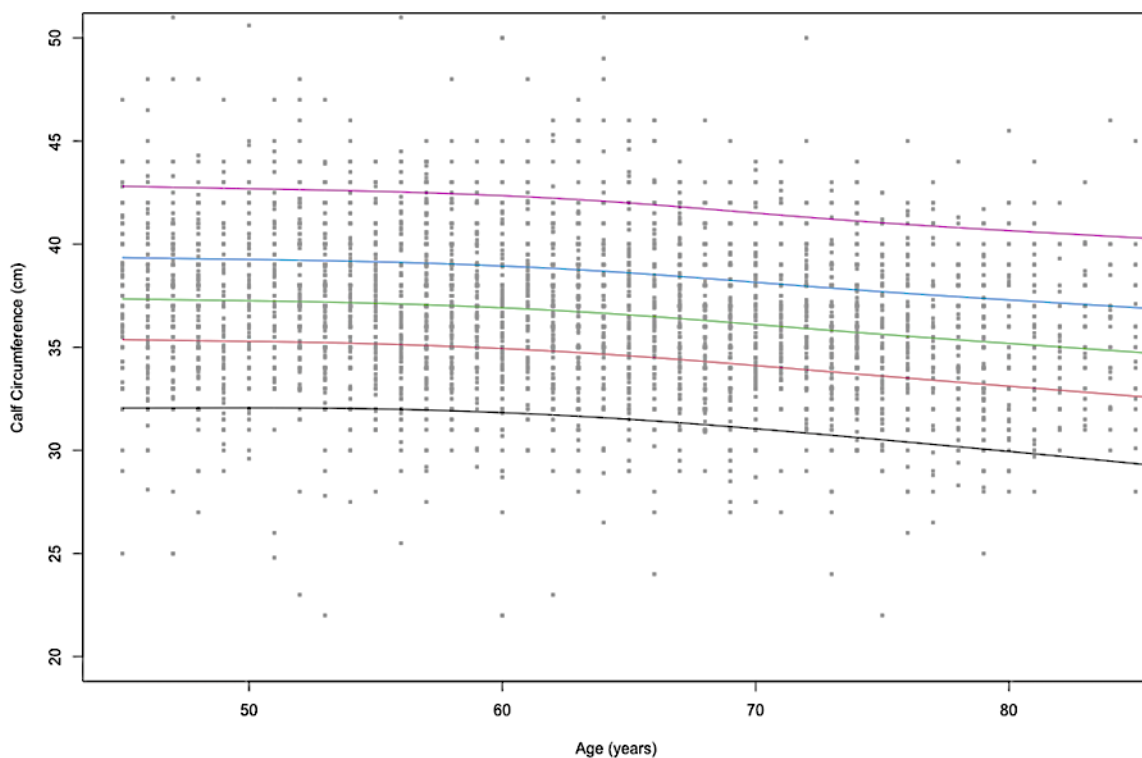
A simple medical device development according to normative values of calf circumference across ages: results from the Italian Longevity Check-up 7+ (Lookup 7+) project

Anna Maria Martone^{1,2}, Francesca Ciciarello¹, Vincenzo Galluzzo¹, Riccardo Calvani^{1,2}, Maria Beatrice Zazzara¹, Matteo Tosato¹, Hélio José Coelho-Junior², Emanuele Marzetti^{1,2} & Francesco Landi^{1,2*} 

¹Fondazione Policlinico Universitario 'Agostino Gemelli' IRCCS, Rome, Italy; ²Department of Geriatrics, Orthopedics and Rheumatology, Università Cattolica del Sacro Cuore, Rome, Italy



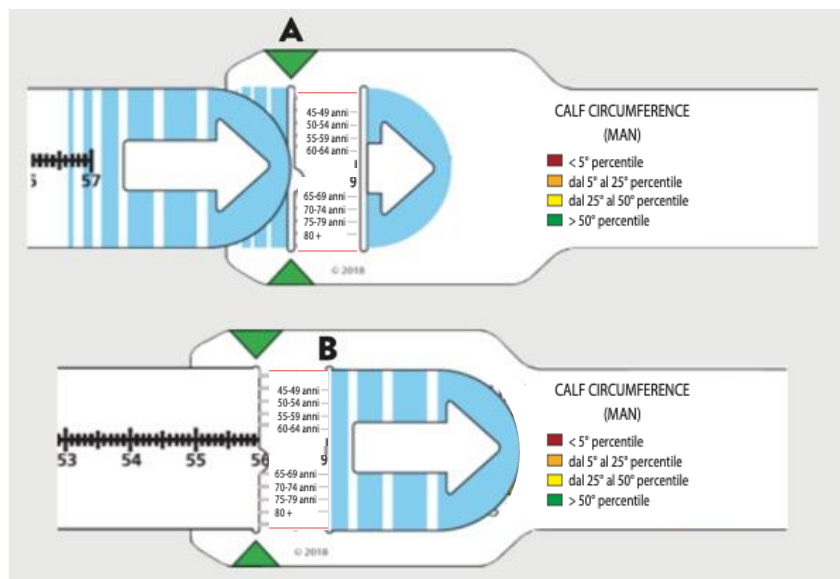
Normative values for calf circumference in Caucasian adults



Calf circumference reference percentiles for men (left) and women (right) aged 18 to 80+ years. The 5th, 25th, 50th, 75th, and 95th percentiles are shown in black, red, green, blue, and purple, respectively.



The CALF-C TAPE to estimate muscle mass in daily practice




- >50th percentile
- 25th < CC >50th percentile
- 5th < CC >25th percentile
- <5th percentile




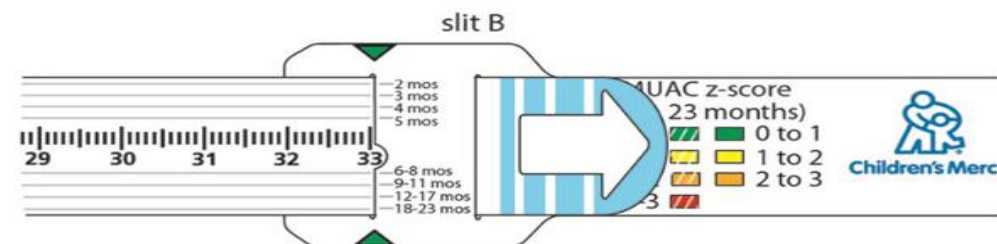
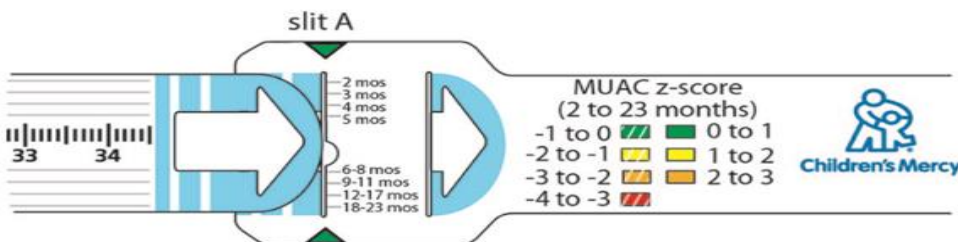
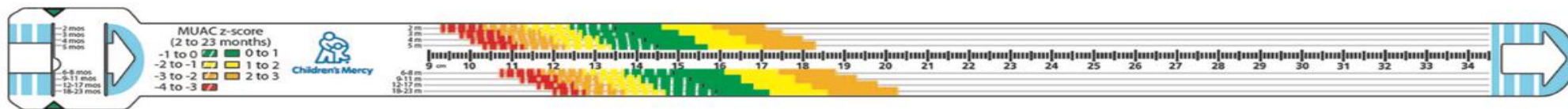
Calf circumference in daily practice: CALF-C tape

Original Article

User-Informed Medical Device Development: A Case Study for Pediatric Malnutrition Assessment

Kristi Thaete, MS¹, Kasey Rowzer, MS¹, Karen Stephens, MS¹,
and Susan M. Abdel-Rahman, PharmD^{1,2} 

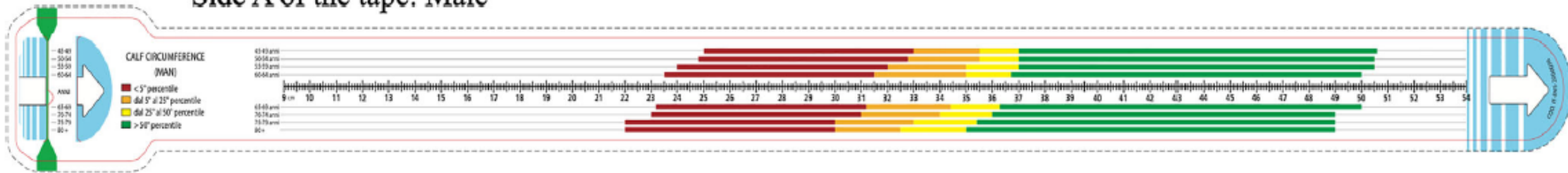
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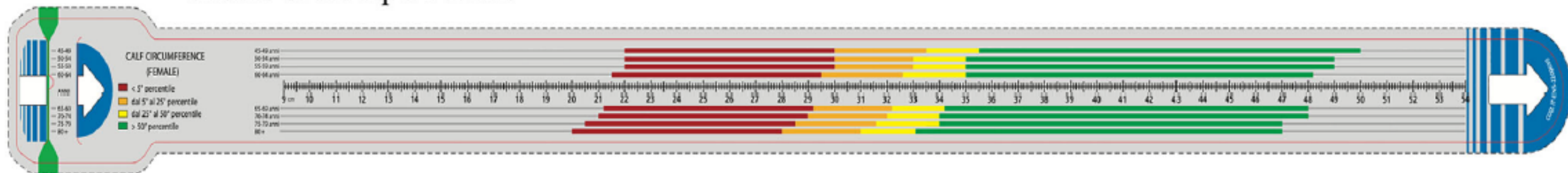


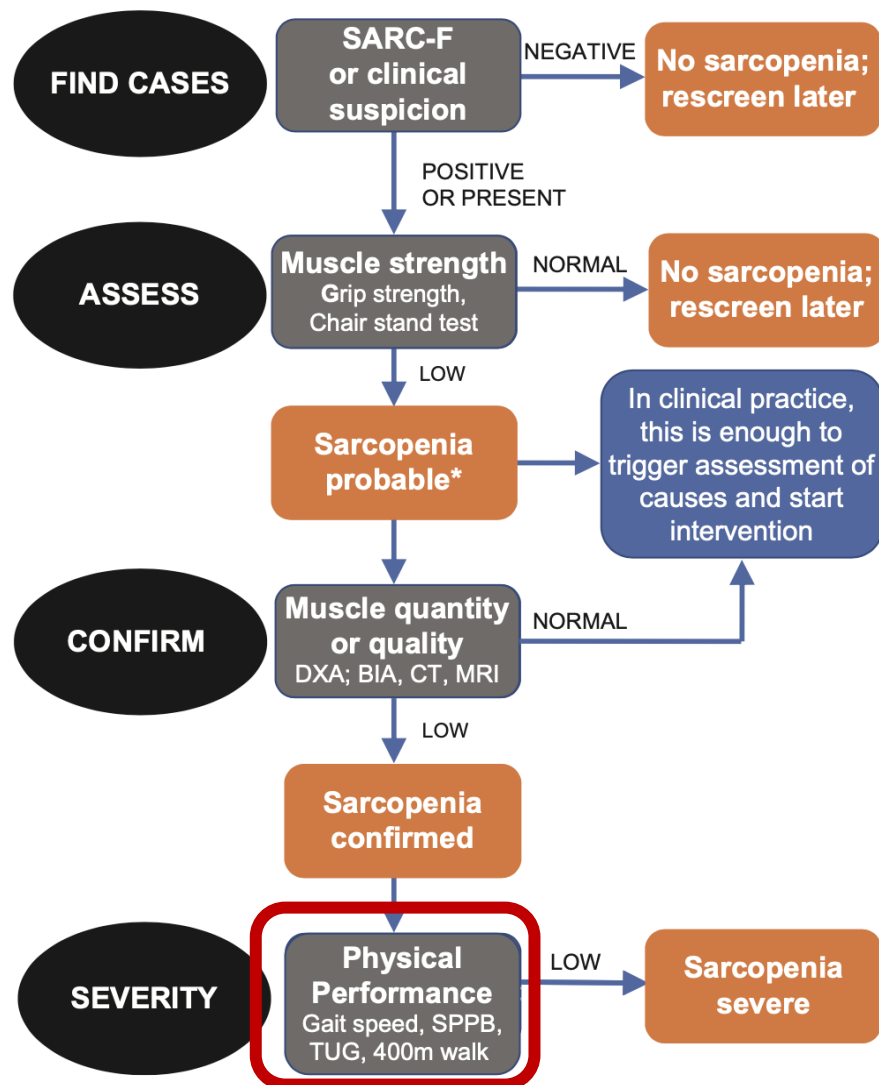
The CALF-C TAPE to estimate muscle mass in daily practice

Side A of the tape: Male



Side B of the tape: Female





A simple algorithm to diagnose sarcopenia in clinical practice

Age and Ageing 2018; **0**: 1–16
doi: 10.1093/ageing/afy169

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GUIDELINES

Sarcopenia: revised European consensus on definition and diagnosis

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Physical performance

Physical performance	Gait speed	Gait speed	NIH Toolbox 4 Meter Walk Gait Speed Test https://www.nia.nih.gov/research/labs/leps/short-physical-performance-battery-sppb https://www.youtube.com/watch?v=xLScK_NXUN0
	Short physical performance battery (SPPB)	SPPB	Short Physical Performance Battery Protocol https://research.ndorms.ox.ac.uk/prove/documents/assessors/outcomeMeasures/SPPB_Protocol.pdf
	Timed-up-and-go test (TUG) 400-meter walk or long-distance corridor walk (400-m walk)	TUG 400-m walk	NIH Toolbox https://www.nia.nih.gov/research/labs/leps/short-physical-performance-battery-sppb Mathias (1986) [40] Newman (2006) [41]



Tools to assess sarcopenia in daily practice

Table 1

Tools used to assess muscle mass, muscle strength and physical performance in clinical practice.

Outcomes	Tools	Proportion of users (%)
Muscle mass (n=136)	Calf circumference	57.5
	Dual-energy X-ray absorptiometry (DXA)	45.9
	Skinfold thickness	30.8
	Bioelectrical impedance analysis (BIA)	22.6
	Ultrasonography	18.5
	Magnetic resonance imaging (MRI)	16.4
	CT-scan	14.4
	Other	8.9
	Muscle strength (n=139)	Handheld dynamometer
Leg press		24.2
Chest press		9.39
Isokinetic dynamometer		7.38
Vigorimeter		2.01
Other		11.4
Physical performance (n=182)		Gait speed
	Timed up and go	58.6
	Self-reported physical function	58.1
	Sit to stand 5 times	53.9
	Standing balance	52.9
	Short physical performance battery test (SPPB)	28.8
	Stair climb	25.1
	3-D accelerometer	3.66
	Other	5.76

➤ **Survey completed by 255 clinicians from 55 countries across 5 continents**

➤ **53.3% assessed muscle mass in daily practice**



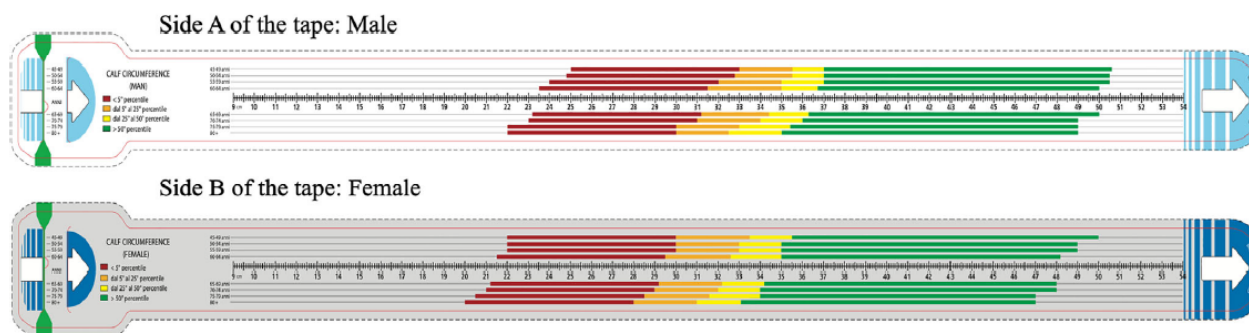
Tools to assess sarcopenia in daily practice

Physical performance
(n = 182)

Gait speed	63.3
Timed up and go	58.6
Self-reported physical function	58.1
Sit to stand 5 times	53.9
Standing balance	52.9
Short physical performance battery test (SPPB)	28.8
Stair climb	25.1
3-D accelerometer	3.66
Other	5.76



No Excuses!



CALF-C TAPE