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Original Study

Validating the SARC-F: A Suitable Community Screening Tool for Sarcopenia?

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A B S T R A C T

Objectives: Using data from the Hong Kong Mr and Ms Os study, we validated the SARC-F against 3 consensus definitions of sarcopenia from Europe, Asia, and an international group, and compared the ability of all 4 measures to predict 4-year physical limitation, walking speed, and repeated chair stands.
Design: Prospective cohort study.
Setting: Hong Kong community.
Participants: Four thousand men and women living in the community.
Measurements: A questionnaire regarding ability to carry a heavy load, walking, rising from a chair, climbing stairs, and falls frequency was administered. These questions were used to calculate the SARC-F score. Measurements, including appendicular muscle mass, were taken using dual-energy X-ray, grip strength using a dynamometer, 6-m gait speed, and time taken for repeated chair stand. Classification using the SARC-F score was compared using consensus panel criteria from international, European, and Asian sarcopenia working groups. The performance of all 4 methods was compared by examining the predictive ability for 4-year outcomes using ROC curve.
Results: The SARC-F has excellent specificity but poor sensitivity for sarcopenia classification; however, all 4 methods have comparable but modest predictive power for 4-year physical limitation.
Conclusion: The SARC-F may be considered a suitable tool for community screening for sarcopenia.

Since the term “sarcopenia” was first created by Rosenberg and Roubenoff in 1995[1] to describe loss of muscle with aging, much research has been devoted to this area. This research has been mainly of an epidemiological nature, relating to definitions, prevalence, and consequences. The definition has evolved from the original one of muscle mass measurement only (2 SD below young adult mean), to the current definitions that include muscle mass, strength, and function, for all population groups.[2–5] These criteria for European, American, and Asian Consensus Groups include cutoff points for the measurements of muscle mass, strength, and function. Differences in cutoff points are observed, likely due to differences in body size and shape, lifestyle, and perhaps influence of obesity. Thus, the prevalence of sarcopenia among a Taiwan Chinese population varies depending on whether European Working Group on Sarcopenia on Older People (EWGSOP) or International Working Group on Sarcopenia (IWGS) criteria were used, the variations being largely accounted for by the use of differing muscle indices.[6] Although these newer definitions have been validated in the United States and Europe,[7–9] variation in mean values for the parameters used in defining sarcopenia vary even among Asian countries, even though the differences are not as marked as for white populations.[10] Thus a universal diagnosis for sarcopenia, which is desirable for studies of biomarkers to the development of drug treatment, is yet to be attained.

Recent emphasis has been placed on the diagnosis of clinically important sarcopenia, as opposed to the definition of sarcopenia based on expert evidence. A US consortium has been using existing data sets to develop evidence-based criteria for the definition of clinically significance weakness and low muscle mass. Nevertheless, the model still uses threshold cut points for mobility performance, followed by strength, and then muscle mass, although there was overall strong support for using mobility and strength as the primary outcome.[11]

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Recently it has been shown that the Fracture Risk Assessment Tool (FRAX) questions (www.shef.ac.uk/FRAX/), without measurement of bone mineral density, may be sufficient to screen for osteoporosis.[12,13]

Because use of cut points rely on measurements using different instruments that may not be widely available, particularly in low-income countries, it was proposed that a simple questionnaire could be used to screen for sarcopenia.[14] A previous version with 1 question that is different (using frequency of walking up to a quarter mile instead of difficulty in lifting 10 pounds) showed in a small study that a score higher than 4 is associated with physical performance measures in US and Chinese populations.[15]

Using data from the Hong Kong Mr and Ms Os study, we compared the diagnosis of sarcopenia using the SARC-F against the 3-consensus definition of sarcopenia from Europe, the United States, and Asia, examining 4-year physical limitation, walking speed, and chair stand as outcome measures.

Participants and Methods

Participants

A total of 4000 community-living Chinese men and women aged 65 and older were recruited for a cohort study on osteoporosis and general health (Mr Os) in Hong Kong between August 2001 and February 2003 by placing recruitment notices in community centers for older adults and housing estates. The aim was to recruit a stratified sample so that approximately 33% would each be aged 65 to 69, 70 to 74, and 75 and older. Those who were unable to walk independently, had bilateral hip replacement, or were not competent to give informed consent were excluded. A team of trained research assistants administered the study questionnaire and physical measurements for each participant on the same day. The cohort was invited to re-attend for repeat questionnaire interviews and physical measurements after 2 and 4 years. Details of the survey population have been reported elsewhere.[16] All participants gave written consent and the study was approved by the Clinical Research Ethics Committee of the Chinese University of Hong Kong.

Questionnaire

Information from the Questionnaire was Extracted to Construct the SARC-F Score (Table 1): Strength, how much difficulty do you have in lifting and carrying 10 lb (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 falls = 2). Participants with a total score higher than 4 were classified as having sarcopenia.[12]

Table 1
SARC-F Score

Component	Question	Scoring
Strength	How much difficulty do you have in lifting and carrying 10 lb?	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 falls = 2

Information on daily functioning was obtained regarding impairment in walking 2 to 3 blocks outside on level ground, climbing up 10 steps without resting, preparing own meals, doing heavy housework such as scrubbing floors or washing windows, and doing own shopping for groceries or clothes. Physical limitation was assessed using the following 2 questions: do you have any difficulty in climbing stairs (possible answers: no, a little, a lot); do you have any difficulty in carrying out the following household activities, such as moving chairs or tables (possible answers: no, a little, a lot). Participants were categorized as having physical limitation if the answer to either question was "a little" or "a lot," whereas those who answered "no" to both questions were categorized as having no physical limitation.

Increasing physical limitation was defined as progression from those without limitation at baseline to having limitation at follow-up.

Physical Measurements

Body composition was measured by dual energy X-ray absorptiometry (DXA) by using a Hologic Delphi W4500 densitometer (Hologic Delphi, auto whole body version 12.4; Hologic Inc, Bedford, MA). Total appendicular skeletal muscle mass (ASM) was calculated as the sum of appendicular lean mass minus bone mineral content of both arms and legs. Grip strength was measured using a dynamometer (JAMAR Hand Dynamometer 5030JO; Sammons Preston Inc, Bolingbrook, IL). Two readings were taken from each side, and the average value between right and left was used for analysis. Gait speed was measured using the best time in seconds to complete a walk along a straight line 6 meters long. A warm-up period of less than 5 minutes was followed by 2 walks, and the best time recorded. Chair stand was measured by asking the participant to rise from a chair (seat height 54 cm) with arms folded across the chest, 5 times as quickly as possible. The time taken is recorded on a stop watch.

Diagnosis of Sarcopenia According to Different Consensus Panels

According to the EWGSOP algorithm,[3] a person who has low muscle mass, low muscle strength, and/or low physical performance is categorized as having sarcopenia. The lowest quintile values of the distribution of the current study population were used as cutoff points: thus, low muscle mass was defined as appendicular skeletal mass index (ASMI) <6.52 kg for men and <5.44 kg for women; low muscle strength was defined as grip strength ≤28 kg for men and ≤18 kg for women; and low physical performance as gait speed less than 0.8 m/s for both men and women.

For the IWGS criteria[2], cutoff values for ASM/ht^2 were ≤7.23 kg/m^2 for men and ≤5.67 kg/m^2 for women; and the cutoff value for gait speed was <1 m/s.

For the Asian Working Group for Sarcopenia (AWGS) criteria,[3] the cutoff values for grip strength were <26 kg for men and <18 kg for women; for walking speed was <0.8 m/s; for ASM/ht^2 < 7.0 kg/m^2 in men and <5.4 kg/m^2 in women.

Statistical Analysis

Statistical analyses were performed using the statistical package SAS, version 9.1.3 (SAS Institute, Inc, Cary, NC). Male and female

Table 2
Baseline Characteristics

	Male			Female		
	SARC-F, freq (%)/Mean (SD)		*P* Value*	SARC-F, freq (%)/Mean (SD)		*P* Value*
	No Sarcopenia (n = 1968)	Sarcopenia (n = 31)		No Sarcopenia (n = 1879)	Sarcopenia (n = 119)	
Characteristics						
Age	72.34 (4.97)	75.52 (6.04)	.001	72.40 (5.30)	75.40 (5.37)	<.0001
Low education (primary or below)	1184 (60.2%)	23 (74.2%)	.113	1547 (82.3%)	107 (89.9%)	.034
Living alone	89 (4.5%)	3 (9.7%)	.174	316 (16.8%)	25 (21.0%)	.239
Chronic obstructive pulmonary disease	224 (11.4%)	8 (25.8%)	.013	97 (5.2%)	4 (3.4%)	.385
Diabetes mellitus	284 (14.4%)	9 (29.0%)	.023	262 (13.9%)	23 (19.3%)	.103
Hypertension	817 (41.5%)	19 (61.3%)	.027	821 (43.7%)	49 (41.2%)	.591
Heart disease	354 (18.0%)	12 (38.7%)	.003	304 (16.2%)	25 (21.0%)	.168
Stroke	105 (5.3%)	4 (12.9%)	.066	60 (3.2%)	6 (5.0%)	.274
Current smoker	230 (11.7%)	8 (25.8%)	.016	35 (1.9%)	2 (1.7%)	.886
Current drinker	466 (23.7%)	5 (16.1%)	.326	50 (2.7%)	1 (0.8%)	.222
MMSE	27.00 (2.77)	24.74 (3.47)	.001	24.38 (3.88)	22.63 (4.63)	<.0001
Depression (GDS ≥8)	158 (8.0%)	11 (35.5%)	<.0001	168 (9.0%)	35 (29.4%)	<.0001
Weight loss from age 25 ≥ 5 kg	180 (9.6%)	5 (17.2%)	.167	120 (8.6%)	10 (13.2%)	.169
SARC-F						
Strength − difficulty lifting and carrying 10 lb			<.0001			<.0001
None (0)	1836 (93.3%)	3 (9.7%)		1483 (78.9%)	11 (9.2%)	
Some (1)	100 (5.1%)	7 (22.6%)		205 (10.9%)	12 (10.1%)	
A lot or unable (2)	32 (1.6%)	21 (67.7%)		191 (10.2%)	96 (80.7%)	
Assistance in walking − difficulty walking across a room			<.0001			<.0001
None (0)	1921 (97.6%)	8 (25.8%)		1829 (97.3%)	43 (36.1%)	
Some (1)	41 (2.1%)	12 (38.7%)		43 (2.3%)	40 (33.6%)	
A lot, use aids, or unable (2)	6 (0.3%)	11 (35.5%)		7 (0.4%)	36 (30.3%)	
Rise from a chair − difficulty transferring from a chair or bed			<.0001			<.0001
None (0)	1965 (99.9%)	27 (87.1%)		1876 (99.8%)	103 (86.6%)	
Some (1)	0 (0%)	0 (0%)		1 (0.1%)	6 (5.0%)	
A lot or unable without help (2)	3 (0.2%)	4 (12.9%)		2 (0.1%)	10 (8.4%)	
Climb stairs − difficulty climbing a flight of 10 stairs			<.0001			<.0001
None (0)	1892 (96.1%)	6 (19.4%)		1731 (92.1%)	19 (16.0%)	
Some (1)	62 (3.2%)	9 (29.0%)		118 (6.3%)	41 (34.5%)	
A lot or unable (2)	14 (0.7%)	16 (51.6%)		30 (1.6%)	59 (49.6%)	
Falls − times fallen in the past year			<.0001			<.0001
None (0)	1673 (85.0%)	19 (61.3%)		1460 (77.7%)	56 (47.1%)	
1–3 falls (1)	289 (14.7%)	8 (25.8%)		408 (21.7%)	49 (41.2%)	
≥4 falls (2)	6 (0.3%)	4 (12.9%)		11 (0.6%)	14 (11.8%)	

GDS, Geriatric Depression Scale; MMSE, Mini-Mental State Examination.
*P value of t test for continuous or χ^2 for categorical variables.

results were analyzed separately. Classification using SARC-F was compared with EWGSOP, IWSOP, and AWGS criteria using χ^2 tests. Physical function outcome measures after 4 years were examined for each of the 4 sarcopenia classifications using logistic regression. These include physical limitation, increase in physical limitation, walking speed <0.8 m/s, and repeated chair stand test that is below what is considered the average value according to age.[17] The area under the curve (AUC) was used to measure the concordance of predictive values with actual outcomes, adjusting for the following confounders: age, education, chronic obstructive pulmonary disease, diabetes mellitus, hypertension, heart disease, smoking habit, Mini-Mental Status Examination, and depression. AUCs were compared using Wilcoxon tests. All statistical tests were 2-sided. A P value less than .05 was considered statistically significant.

Table 3
SARC-F and Different Sarcopenia Definitions

	Male			Female		
	SARC-F, freq (%)		*P* Value of χ^2	SARC-F, freq (%)		*P* Value of χ^2
	No Sarcopenia (n = 1968)	Sarcopenia (n = 31)		No Sarcopenia (n = 1879)	Sarcopenia (n = 119)	
EWGSOP			.002			.021
No sarcopenia	1786 (90.8)	23 (74.2)		1725 (91.8)	102 (85.7)	
Sarcopenia	182 (9.3)	8 (25.8)		154 (8.2)	17 (14.3)	
IWGS			<.0001			.042
No sarcopenia	1543 (78.4)	14 (45.2)		1545 (82.2)	89 (74.8)	
Sarcopenia	425 (21.6)	17 (54.8)		334 (17.8)	30 (25.2)	
AWGS			.0001			.120
No sarcopenia	1790 (91.0)	22 (71.0)		1783 (94.9)	109 (91.6)	
Sarcopenia	178 (9.0)	9 (29.0)		96 (5.1)	10 (8.4)	

AWGS, The Asian Working Group for Sarcopenia; EWGSOP, The European Working Group on Sarcopenia in Older People; IWGS, The International Working Group on Sarcopenia.

Table 4
SARC-F Validated Against Different Sarcopenia Definitions

	Sensitivity		Specificity		Positive Predictive Value		Negative Predictive Value		Accuracy	
	Men, %	Women, %	Men, %	Women, %	Men, %	Women, %	Men, %	Women, %	Men, %	Women, %
EWGSOP	4.2	9.9	98.7	94.4	25.8	14.3	90.8	91.8	89.7	87.2
IWGS	3.8	8.2	99.1	94.6	54.8	25.2	78.4	82.2	78.0	78.8
AWGS	4.8	9.4	98.8	94.2	29.0	8.4	91.0	94.9	90.0	89.7

AWGS, The Asian Working Group for Sarcopenia; EWGSOP, The European Working Group on Sarcopenia in Older People; IWGS, The International Working Group on Sarcopenia.

Results

The baseline characteristics of the cohort are listed in Table 2. The classification of sarcopenia using SARC-F in men and women is tabulated according to the 3 consensus panel criteria (Table 3). Each of these 3 criteria are then used as the "gold standard" against which SARC-F is compared, and the sensitivity, specificity, positive and negative predictive values, and accuracy are shown in Table 4. SARC-F has excellent specificity (94%–99%) and negative predictive value but poor sensitivity. Participants were classified into those with and without sarcopenia at baseline, using SARC-F and each of the other 3 criteria, and risk of physical limitation, increase in physical limitation, and physical performance measures (walking speed and chair stand) after 4 years was examined (Table 5). Sarcopenia classified using the SARC-F, EWGSOP, IWGS, and AWGS all increased the risk of physical limitation, and poor performance measures at follow-up in men and women. For men, EWGSOP, IWGS, and AWGS also predicted the increase in physical limitation and follow-up, whereas for women, only sarcopenia diagnosed using the EWGSOP predicted increase in physical limitation at follow-up. The magnitude of the relative risk was similar for all criteria involving measurements (ranging from 1.6 to 3.1); however, those for the SARC-F were much higher (ranging from 3.8–25.1), although the 95% confidence intervals were wide, due to the small numbers. Using receiver operating curve and AUC values to compare the strength of predictive ability of the 4 tools, there was little difference among the 4 instruments, the AUC values being all between 0.63 and 0.76.

Discussion

This study shows that using a simple questionnaire consisting of 5 questions to screen for sarcopenia, without the need for using any measurements, has comparable specificity and predictive power for adverse physical outcomes when validated against criteria requiring measurements developed by consensus panels representing Europe, the United States, and Asia. Previously, the screening instrument was validated in 3 populations in the United States (the African American population in St Louis, MO, National Health and Nutrition Examination Survey, and the Baltimore Longitudinal Aging Study [Malmstrom, TK. Screening questionnaires for malnutrition and sarcopenia. Presented at Seventh International Cachexia Conference. Society on Sarcopenia, Cachexia, and Wasting Disorders. Kobe/Osaka, Japan; December 11, 2013.]), as well as a Chinese population in West China.[15] The choice of the composite question is based on clinical experience, and may seem somewhat arbitrary. It does not include questions relating to muscle mass, because this is not easily measurable in a community screening setting. Weight loss, and perhaps falls frequency, also may be questions that may be reasonable to include. However, when we tested the predictive statistics of these 2 variables separately, the odds ratios were either not statistically significant, or yielded odds ratios and AUC values similar to the SARC-F questionnaire.

Although the sensitivity is low, the high specificity makes the SARC-F suitable for screening out older people with sarcopenia. In the community and hospital settings, this is an important first step in carrying out quick, simple screening. Furthermore, the SARC-F is able to predict future adverse outcomes with comparable power to the EWGSOP, IWGS, and AWGS. The advantages of the SARC-F are that it is very quick and can be incorporated into routine clinical assessments, and that it is not dependent on cutoff values that may depend on body size and different lifestyles. However, for research purposes and evaluation of intervention, measurements used in the Consensus Panel tools would be necessary, as changes need to be documented objectively. Quick screening can be followed by further evaluation using DXA and detailed functional measures according to criteria proposed by various consensus panels. The adoption of this approach would minimize cost, and thereby facilitate uptake of screening. However, this could be at the expense of missing people who are sarcopenic but have been classified as not sarcopenic according to the SARC-F. However, the percentage misclassification for screening out people with sarcopenia is not high, and in the same order of magnitude as other screening tools in clinical practice.

Sarcopenia represents a major factor responsible for falls, fractures, and functional decline in older persons.[18–22] Early detection of sarcopenia is important, as intervention with resistance exercise has been shown to improve muscle function and to improve outcomes after hip fracture.[23,24] There is also evidence that protein supplementation may improve outcomes in persons with sarcopenia.[25–28] In addition, a number of drugs, such as selective androgen receptor molecules, myostatin antibodies, ghrelin agonists, and activin II receptor antagonists are under development to treat sarcopenia.[29–31] For these reasons, a simple screening tool, such as the SARC-F, could be extremely useful for use by general practitioners.

There are limitations in this study. The number of participants classified as having sarcopenia represent only a small proportion of the total population studied, and may be biased toward those without sarcopenia, as participation is voluntary and participants have to be able to attend the study center. Further validation of the SARC-F should ideally include those in hospitals or nursing homes.

In the field of sarcopenia research, there is need for a universal simple screening tool that does not require measurements involving cutoff values, and is validated against existing criteria as well as future adverse outcomes, to facilitate early intervention. This study represents a validation of the first such screening tool.

Conclusion

The SARC-F tool may be used as a first step in community screening for sarcopenia, as its specificity is high for sarcopenia classification based on other international consensus criteria. Classification using SARC-F is comparable to classification using international consensus panel criteria, all having poor sensitivity but high specificity.

Table 5
SARC-F, EWGSOP, IWGS, AWGS, and Different Outcomes at 4-Year Follow-Up

	Physical Limitation at 4-Year Follow-Up				Increase in Physical Limitation After 4 Years				Slow Walking Speed (<0.8 m/s) at 4-Year Follow-Up				Repeated Chair Stand Test Below Average at 4-Year Follow-Up*			
	No, n (%)	Yes, n (%)	Adj. OR (95% CI)†	AUC	No, n (%)	Yes, n (%)	Adj. OR (95% CI)†	AUC	No, n (%)	Yes, n (%)	Adj. OR (95% CI)†	AUC	No, n (%)	Yes, n (%)	Adj. OR (95% CI)†	AUC
Male	n = 1076	n = 490			n = 1185	n = 381			n = 1168	n = 392			n = 1175	n = 391		
Sarcopenia																
SARC-F (a)	4 (0.4)	10 (2.0)	3.76 (1.08–13.03)	0.680	12 (1.0)	2 (0.5)	0.28 (0.06–1.36)	0.649	3 (0.2)	11 (5.5)	22.14 (5.89–83.20)	0.674	2 (0.2)	11 (3.6)	25.08 (5.01–125.47)	0.752
EWGSOP (b)	52 (4.8)	63 (12.9)	1.94 (1.28–2.93)	0.683	73 (6.2)	42 (11.0)	1.29 (0.84–1.97)	0.649	78 (6.1)	32 (16.1)	2.22 (1.38–3.58)	0.668	66 (5.3)	48 (15.8)	2.02 (1.30–3.15)	0.744
IWGS (c)	156 (14.5)	142 (29.0)	1.79 (1.35–2.36)	0.686	201 (17.0)	97 (25.5)	1.23 (0.92–1.66)	0.649	204 (15.9)	75 (37.7)	2.61 (1.85–3.69)	0.694§	183 (14.6)	113 (37.2)	2.40 (1.77–3.27)	0.755
AWSG (d)	45 (4.2)	55 (11.2)	2.04 (1.32–3.17)	0.680	60 (5.1)	40 (10.5)	1.56 (0.999–2.43)	0.648	65 (5.1)	29 (14.6)	2.42 (1.47–3.98)	0.671	49 (3.9)	50 (16.5)	3.13 (1.98–4.96)	0.751
Female	n = 715	n = 870			n = 957	n = 630			n = 1185	n = 392			n = 1190	n = 397		
Sarcopenia																
SARC-F (a)	5 (0.7)	74 (8.5)	10.82 (4.30–27.18)	0.653	43 (4.5)	36 (5.7)	1.01 (0.63–1.62)	0.597	28 (2.5)	45 (11.2)	3.82 (2.30–6.33)	0.640	19 (1.8)	55 (10.3)	4.30 (2.44–7.58)	0.730
EWGSOP (b)	38 (5.3)	73 (8.4)	1.48 (0.97–2.25)	0.634‡	55 (5.8)	56 (8.9)	1.48 (0.995–2.20)	0.599	67 (6.0)	37 (9.2)	1.56 (1.01–2.41)	0.632	57 (5.5)	51 (9.5)	1.41 (0.91–2.17)	0.720‡
IWGS (c)	95 (13.3)	152 (17.5)	1.28 (0.96–1.71)	0.632‡	148 (15.5)	99 (15.7)	0.95 (0.72–1.27)	0.597	162 (14.6)	74 (18.5)	1.26 (0.92–1.72)	0.628	128 (12.3)	117 (21.8)	1.78 (1.32–2.40)	0.723
AWSG (d)	20 (2.8)	45 (5.2)	1.75 (1.002–3.04)	0.633‡	33 (3.5)	32 (5.1)	1.38 (0.83–2.30)	0.597	45 (4.1)	17 (4.2)	1.002 (0.56–1.81)	0.623‡	32 (3.1)	31 (5.8)	1.48 (0.85–2.60)	0.720‡

Adj, adjusted; AUC, area under the curve; AWGS, The Asian Working Group for Sarcopenia; CI, confidence interval; EWGSOP, The European Working Group on Sarcopenia in Older People; IWGS, The International Working Group on Sarcopenia; OR, odds ratio.

*Repeated chair stand test below average: >11.4 s for 60–69, >12.6 s for 70–79, and >14.8 s for ≥80 years old.

†OR adjusted for age, education, chronic obstructive pulmonary disease, diabetes mellitus, hypertension, heart disease, current smoker, Mini-Mental State Examination, and depression; no sarcopenia is used as reference.

‡$P < .05$, AUC comparing EWGSOP (b), IWGS (c), or AWSG (d) with SARC-F (a).

§$P < .05$, AUC comparing IWGS (c) or AWSG (d) with EWGSOP (b).

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