



*Pilot Enhancement Program on
Speech Therapy Referral for Tongue Pressure
Assessment & Training for Patients with Sarcopenia
in Geriatric Day Hospital of
Ruttonjee and Tang Shiu Kin Hospitals*

LUI BKP¹, CHAN TS¹, WONG KP², CHING KM³, LAM CY¹, PANG HSI¹, WAN MC¹

(1) Division of Geriatrics, Department of Medicine and Geriatrics, Ruttonjee and Tang Shiu Kin Hospitals

(2) Speech Therapy Department, Ruttonjee and Tang Shiu Kin Hospitals

(3) Dietetic Department, Ruttonjee and Tang Shiu Kin Hospitals

Hospital Authority Convention 2026

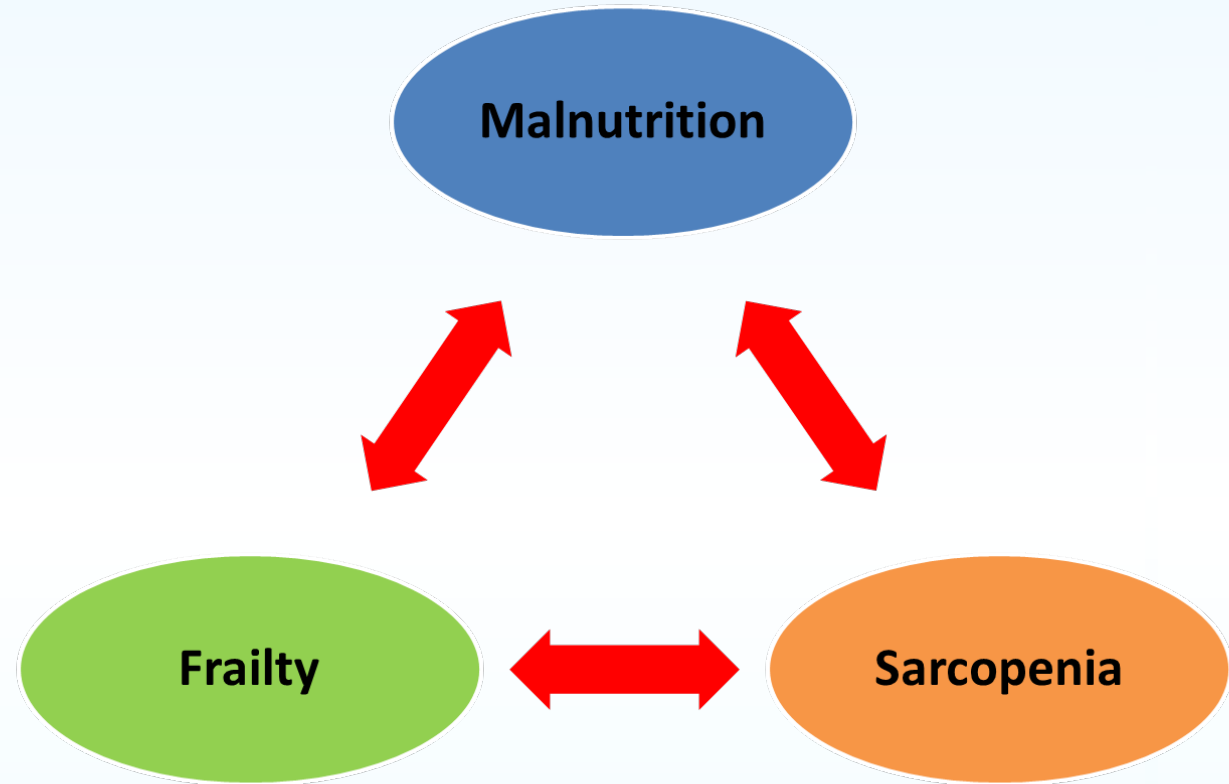
Oral Presentation-F4.1

Dr CY LAM (Associate Consultant)

Background: Oral Frailty to Sarcopenia

Oral Frailty (OF) is a measurable decline in oral function:

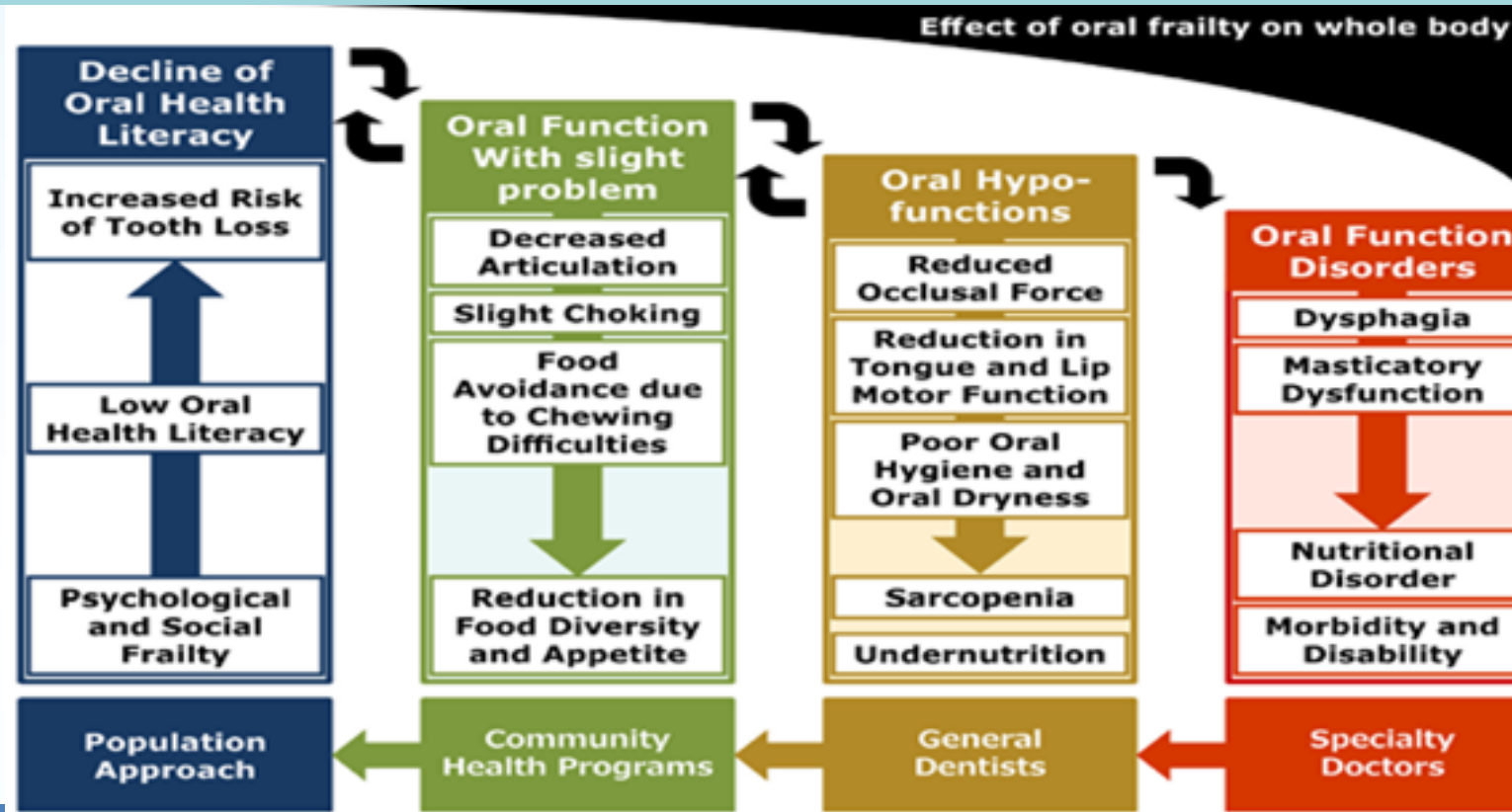
1. Chewing ability
2. Articulatory oral motor skill
3. Tongue pressure
4. Number of teeth
5. Salivation
6. Subjective difficulties in eating and swallowing



Longitudinal study has shown that OF predicts new onset sarcopenia, needs for long-term care and mortality.

(Tanaka et al., 2018)

Background: Oral Frailty to Sarcopenia



Sarcopenia: Age-related loss of skeletal muscle mass, strength, and physical performance

Oral problems can exacerbate sarcopenia; sarcopenia can also weaken oropharyngeal muscles

Oral Frailty is increasingly recognized as a new geriatric syndrome (Iwasaki & Hirano, 2022)

Prevalence of Oral Frailty: how big the problem is?

- Prevalence of OF among community-dwelling older adults ranged from **11% to 69%** in different countries
- Pooled Prevalence of OF among community-dwelling older adults: **32% (95% CI: 25%–38%)**



25.8% had severe gum diseases



27 % reduced oral motor skills, especially 11 % had chewing difficulties



Table 8 Oral health status of non-institutionalised elderly aged 65-74 between 1991 to 2021

	1991 ⁵⁴	2001 ⁵⁵	2011 ⁵⁶	2021 ⁵⁷
Number of teeth	15.0	17.0	19.3	22.8
Percentage with complete tooth loss	12.0%	8.6%	5.6%	0.9%
Tooth decay				
Mean number of untreated decayed teeth	1.4	1.3	1.3	1.2
Percentage with untreated tooth decay	#	52.9%	47.8%	47.1%
Gum diseases				
Percentage with severe gum diseases (with deep periodontal pockets)	15.0%	11.0%	20.4%	25.8%

Data not included in original report

(Department of Health, 2021; Chan et al., 2021)



frontiers | Frontiers in Public Health

1789 Systematic Review
published: 03 May 2025
doi: 10.3389/fpubh.2025.1423387

OPEN ACCESS
EDITED BY
Martina J. Summanan,
University of Washington, United States
REVIEWED BY
Wenbo Oubao,
VU Amsterdam, Netherlands
Mica Slegers,
University of Glasgow, United Kingdom
M. Ali Sghier,
Indragiri Polytechnic, Indonesia
*CORRESPONDENCE
Jun-kai Dou
✉ 77982101@qq.com
RECEIVED 23 April 2024
ACCEPTED 02 April 2025
PUBLISHED 03 May 2025
CITATION
Dou J-K, Liu H, Mei Y, Wang S, Zhang Y,
Zhao S-N and Shi K-J (2025) Prevalence of
oral frailty in community-dwelling older
adults: a systematic review and meta-analysis.
Front. Public Health 13:1423387.
doi: 10.3389/fpubh.2025.1423387
COPYRIGHT
© 2025 Dou, Liu, Mei, Wang, Zhang, Zhao and
Shi. This is an open-access article distributed
under the terms of the [Creative Commons
Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use,
distribution or reproduction in other forums is
permitted, provided the original author(s) and
the copyright owner(s) are credited and that
the original publication in this journal is cited,
in accordance with accepted academic
practice. No use, distribution or reproduction
is permitted which does not comply with
these terms.

Prevalence of oral frailty in community-dwelling older adults: a systematic review and meta-analysis

Jun-kai Dou^{1*}, Huan Liu², Yan Mei³, Song Wang⁴, Ying Zhang⁵, Shao-hua Zhao⁶ and Xue-zhi Shi⁷

¹Department of Rehabilitation Medicine, Lu'an People's Hospital, Lu'an, Anhui, China, ²Department of Geriatrics, The First Affiliated Hospital of Wannan Medical College (Traditional Medicine of Wannan Medical College), Wannan, Anhui, China, ³Department of Geriatrics, Lu'an People's Hospital, Lu'an, Anhui, China, ⁴Department of Internal Care Unit, Lu'an People's Hospital, Lu'an, Anhui, China, ⁵Department of Geriatrics, Lu'an People's Hospital, Lu'an, Anhui, China, ⁶Department of Geriatrics, Lu'an People's Hospital, Lu'an, Anhui, China, ⁷Department of Nursing, Lu'an People's Hospital, Lu'an, Anhui, China

Background: Older adults are vulnerable to oral frailty due to factors such as age, education level, physical condition, and limited access to medical resources. Given that oral frailty can lead to adverse outcomes and is often overlooked by policymakers and health professionals, it is important to understand the current state of oral frailty among community-dwelling older adults.

Design: Systematic review and meta-analysis.

Methods: Two researchers independently conducted searches in seven databases, extracted data, and assessed the quality of eligible studies. Data from cross-sectional studies or cohort studies with a clear definition of oral frailty. Stata 14.0 was utilized to evaluate the overall prevalence of oral frailty, while Cochran's I^2 statistics were employed to assess statistical heterogeneity.

Results: A total of 15 studies were ultimately included in this analysis. The pooled prevalence of oral frailty among community-dwelling older adults was 32% (95% CI: 24%–40%, $I^2 = 98.9%$, $P < 0.001$). By country, the prevalence was 53% (95% CI: 42%–65%) in China and 22% (95% CI: 19%–39%) in Japan. The incidence of oral frailty was 29% (95% CI: 18%–39%) among those aged 74 and over and 26%

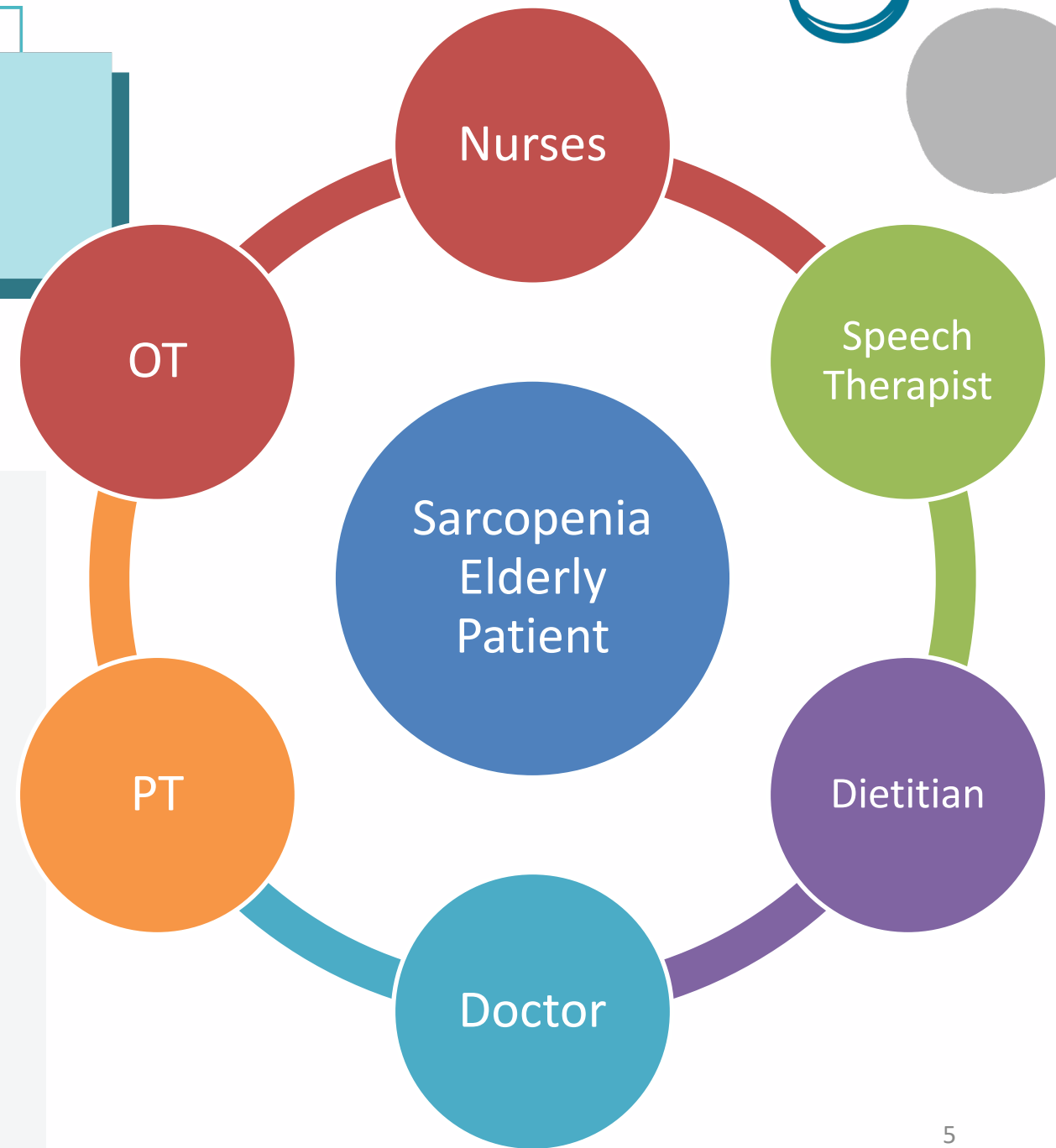
(Dou et al., 2025)

Our Team in GDH

Multidisciplinary Team approach

Service Enhancements

1. Early identification and intervention of sarcopenia and OF among community-dwelling elderly
2. Role of ST in management of OF
3. Enhance the care and service quality of sarcopenia patients



Pilot study for our new service model: Methods

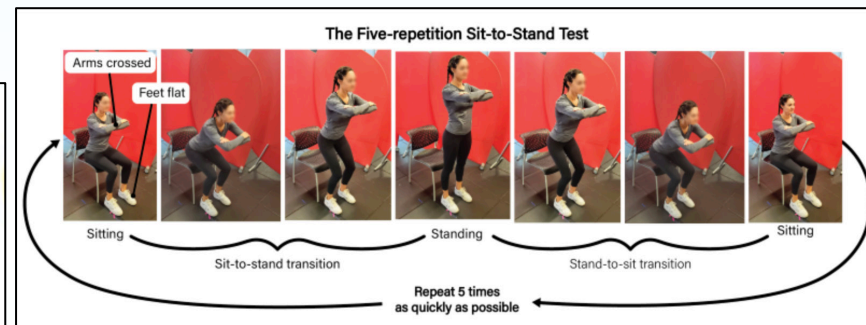
Patient Pool:

- Inclusion criteria
 - All GDH cases in RTSKH
- Exclusion criteria
 - Patients referred for stroke rehabilitation
 - Those living in the RCHE

Period: Oct- Nov 2024

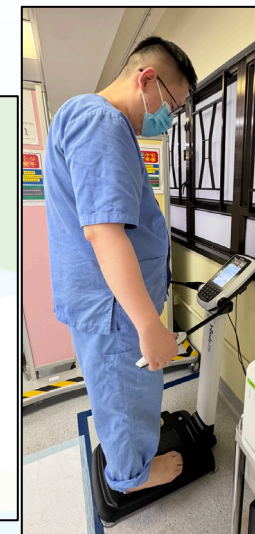
- All the recruited patients were assessed for sarcopenia, based on the Asian Working Group for Sarcopenia 2019.

Three criteria of diagnosis for Sarcopenia



肌肉數量測試

- 透過生物電阻測量分析器 (Bioelectrical Impedance Analysis, BIA) 評估身體肌肉量



Methods

(AWGS, 2019)

Severe sarcopenia



Muscle Mass

AND



Muscle strength

AND



Physical Performance

Sarcopenia



Muscle Mass

AND



Muscle strength

OR



Physical Performance

Possible sarcopenia: SARC-F ≥ 4



Acute to chronic health care or clinical research settings

Case Finding

Presence of any of the following clinical conditions:

- > Functional decline or limitation; unintentional weight loss; depressive mood; cognitive impairment; repeated falls; malnutrition
- > Chronic conditions (heart failure, chronic obstructive pulmonary disease, diabetes mellitus, chronic kidney disease, etc)

If no clinical conditions above are present:

- > Calf circumference (M: <34 cm, F: <33 cm)
- or > SARC-F ≥ 4
- or > SARC-CalF ≥ 11

Diagnosis

Muscle strength

- > Handgrip strength (M: <28 kg, F: <18 kg)

Physical performance

- > 6-metre walk: <1.0 m/s
- or > 5-time chair stand test: ≥ 12 s
- or > Short Physical Performance Battery: ≤ 9

Appendicular skeletal muscle mass (ASM)

- > Dual-energy X-ray absorptiometry (M: <7.0 kg/m², F: <5.4 kg/m²)
- or > Bioelectrical impedance analysis (M: <7.0 kg/m², F: <5.7 kg/m²)

Sarcopenia

Low ASM + low muscle strength
OR Low physical performance

Severe sarcopenia

Low ASM + low muscle strength
AND Low physical performance



Methods

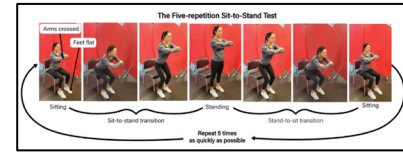
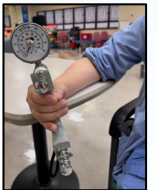
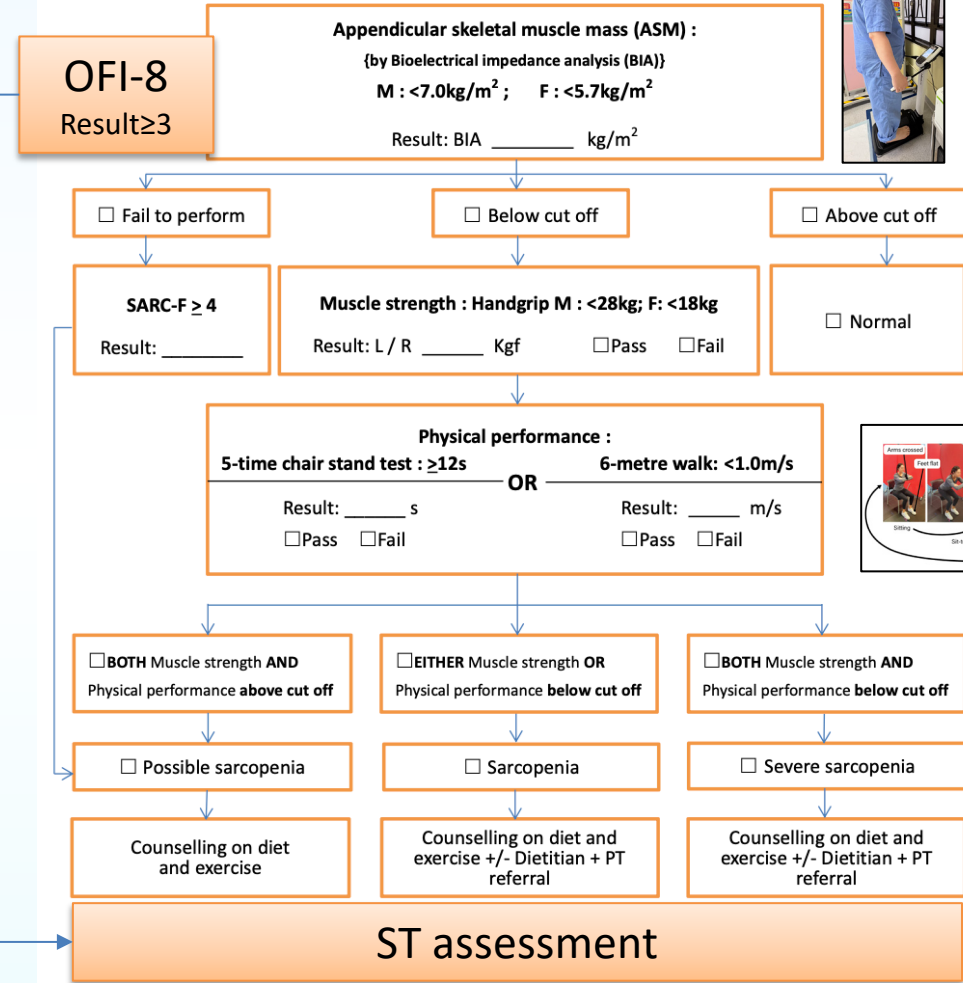
Assessments:

- Sarcopenia Assessment (nurse)
- Malnutrition Screening Test (nurse)
- Morse Fall Scale (nurse)
- Oral Frailty Index-8 (OFI-8) (nurse)
- Oral motor exam (ST)
- Iowa Oral Performance Instrument (IOPI) (ST)
 - maximum anterior tongue pressure
 - tongue strength endurance
 - dry swallow tongue pressure



Ruttonjee Hospital Department of Medicine & Geriatrics Geriatric Day Hospital Fall and Bone Health Record	Tang Shiu Kin Hospital	Please affix gum label or use block letters HN: _____ MRN: _____ Name: _____ (中文) _____ ID No.: _____ Sex/Age: _____ Dept: _____ Ward/Bed: _____
--	-------------------------------	--

Sarcopenia Assessment & Management



Reference : Chen LK,Woo J, Assantachai P, Auyeung TW, Chou MY, Iijima K, et al. Asian Working Group for Sarcopenia: 2019 consensus update on sarcopenia diagnosis and treatment. J Am Med Dir Assoc. 2020;21:300-7.e2.

Methods

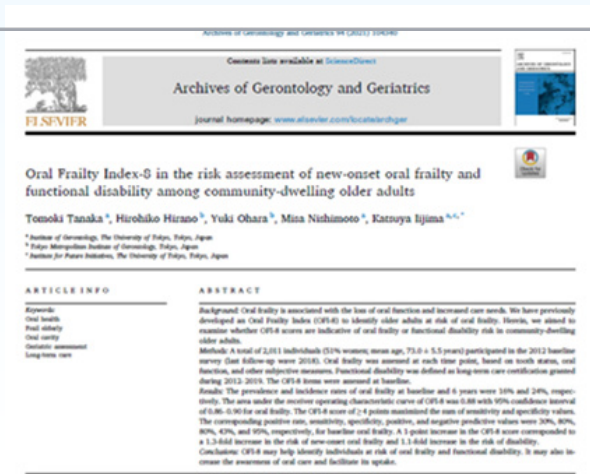


Table S1. 口腔衰弱指數 (Oral frailty index).

	是	否
(1)與6個月前相比，你在吃堅硬的食物有困難嗎？	<input type="checkbox"/> ²	<input type="checkbox"/> ⁰
(2)你最近有被茶或湯噎到嗎？	<input type="checkbox"/> ²	<input type="checkbox"/> ⁰
(3)你有用假牙嗎？*	<input type="checkbox"/> ²	<input type="checkbox"/> ⁰
(4)你經常口乾舌燥嗎？	<input type="checkbox"/> ¹	<input type="checkbox"/> ⁰
(5)你出門的頻率比去年少嗎？	<input type="checkbox"/> ¹	<input type="checkbox"/> ⁰
(6)你能吃魷魚乾或醃蘿蔔之類堅硬的食物嗎？	<input type="checkbox"/> ⁰	<input type="checkbox"/> ¹
(7)你一天刷幾次牙？(每天2次或更多次)	<input type="checkbox"/> ⁰	<input type="checkbox"/> ¹
(8)您是否至少每年看一次牙科？	<input type="checkbox"/> ⁰	<input type="checkbox"/> ¹

*如果您失去一顆牙齒，使用假牙治療是重要的，這樣您就可以吃堅硬的食物。

Table S1. Chinese version of OFI-8 questionnaire

OFI-8:

- Validated assessment tools
- Baseline OF
- Sensitivity: 91%
- Specificity: 63%
- AUC 0.88; 95%CI, 0.86-0.90 (p<0.001)

(Tanaka et al., 2021)

Methods

IOPI:

- ST measures anterior tongue pressure in terms of kPa using IOPI
 - a. During tongue pushing up against the bulb and roof of mouth,
 - b. During dry swallow,
 - c. Measure endurance in terms of second [50% of maximum kPa, or below 50% of maximum kPa if patient can hold for 1 sec or less than 1 sec]

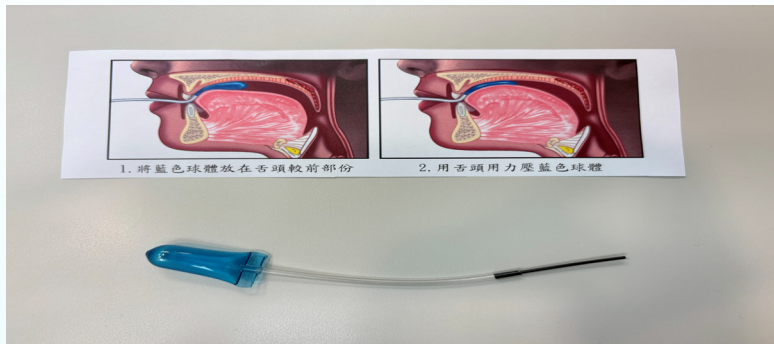
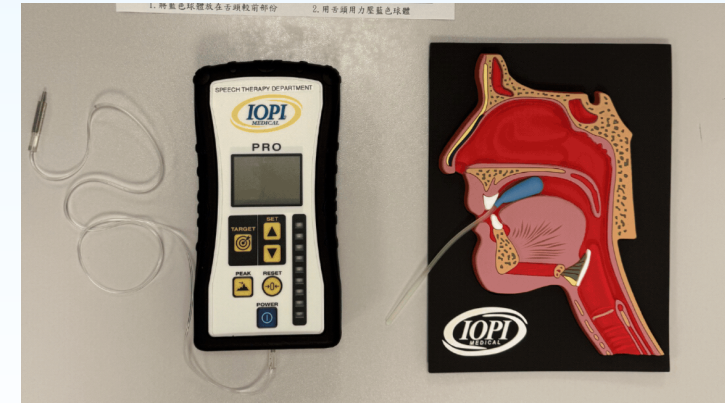


Figure F2. IOPI tongue bulb and tongue bulb placement picture for home exercise



Methods

Interventions:

- One-stop GDH-based interventions by Allied Health Team (PT, OT, ST, dietitian)
- Home-based oromotor exercise
- Nutrition support and diet education

Nurse Intervention			
Date		1 st visit	6-month FU
Diet advice	Advice on dietary intake Recommend- Protein: 1.2g X BW(kg)/day Calcium: 1200mg/day	Recommended _____g of protein intake/day	Recommended _____g of protein intake/day
Refer Dietitian	Patient's GFR < 60ml/min/1.73m ² by MDRD, Not for high protein diet	GFR= _____ ml/min/1.73m ² Refer Dietitian <input type="checkbox"/> Yes <input type="checkbox"/> No	GFR= _____ ml/min/1.73m ² Refer Dietitian <input type="checkbox"/> Yes <input type="checkbox"/> No
	Patient is presented with other chronic disease which required dietary modification		
Exercise	According to patient's physical ability and cognitive function and refer to Sarcopenia health booklet		
Fall prevention	Advice on Fall Prevention, drug use, exercise & life style modification according to protocols		
Postural hypotension intervention	<input type="checkbox"/> Lifestyle and home remedies <input type="checkbox"/> Fall prevention advice <input type="checkbox"/> Blood pressure monitoring <input type="checkbox"/> Consult doctor to review medications		
Additional intervention			
Completed by	Name & Rank	Signature	

Reference:

Allocation of protein in different meal:

Protein/day	Breakfast	Lunch	Dinner	Calcium rich food/ drink
50g	1 HBV	1.5	1.5	2
60g	1	2	2	2
70g	2	2	2	2
80g	2	3	3	2

Calculation of daily protein requirement:

If **underweight** to normal body weight:

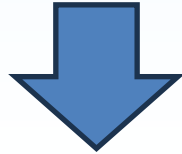
Use actual body weight x 1.2g Protein per KG BW

If **overweight**:

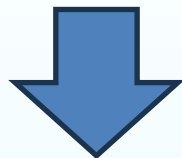
Use Ht x Ht x 25 x 1.2g Protein per KG BW

Results

65 Patients were assessed for sarcopenia



46 Patients with Possible Sarcopenia/ Sarcopenia Prevalence: 70.8%

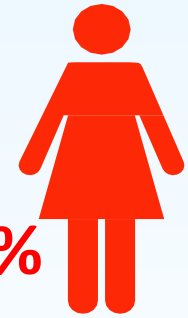


25 patients (38.5%) with Severe Sarcopenia



Gender

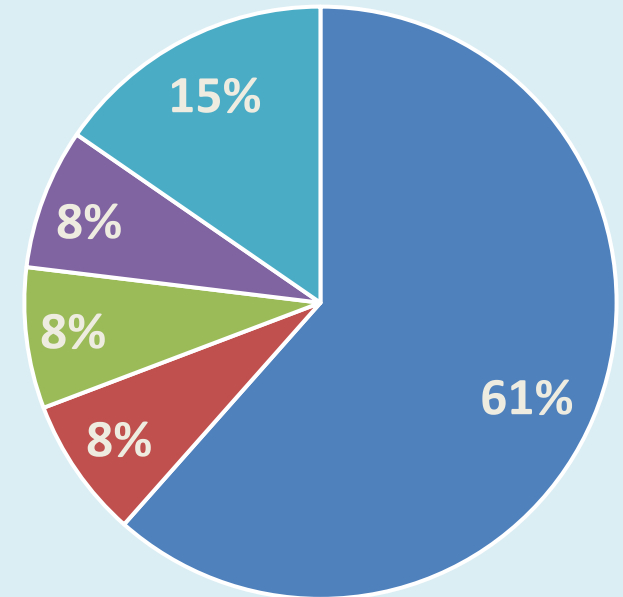
43% vs 57%



Mean age: 84.5years

Reason for referral to GDH

- Deconditioned / declined mobility
- Post-fracture hip rehab
- OA knee or LBP
- Parkinsonism
- Dementia / MCI



Results

Findings (N=65):

≥1 fall(s) in the past 6 mths	29/65 (44.6%)
Mean Charlson's comorbidity index	5.03
Prevalence of Sarcopenia:	46/65 (70.8%)
Prevalence of Severe Sarcopenia:	25/65 (38.5%)
Prevalence of baseline OF (OFI-8 scored ≥3)	42/65 (64.7%)
Prevalence of OF in sarcopenic patients	42/46 (91.3%)
ST assessment (n = 42 OF patients)	26 patients (12 defaulted, 4 not referred)
Correlation study: <ul style="list-style-type: none">• Negative correlation between OFI-8 score and Bioelectrical Impedance Analysis (BIA) (measure for skeletal muscle mass)($r=-0.466$, $n=25$, $p=0.019$)• Negative correlation between OFI-8 score and Body Weight ($r=-0.501$, $n=29$, $p=0.006$)	

OF: Oral frailty

Results

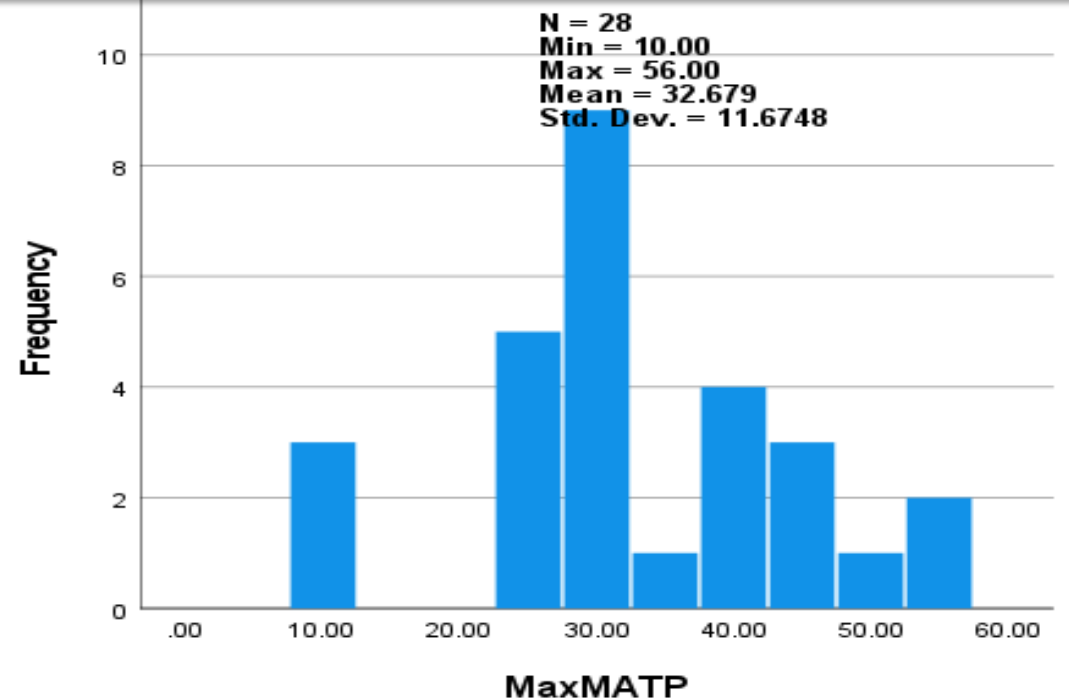
ST assessment for 26 OF(+) patients

- Mean maximum anterior tongue pressure of those patients: **32.7** +/- 11.7 kPa
- Mean 50% endurance of those patient was **3.5** +/- 2.35 (range: 1 - 8sec)

■ Situation in our patients

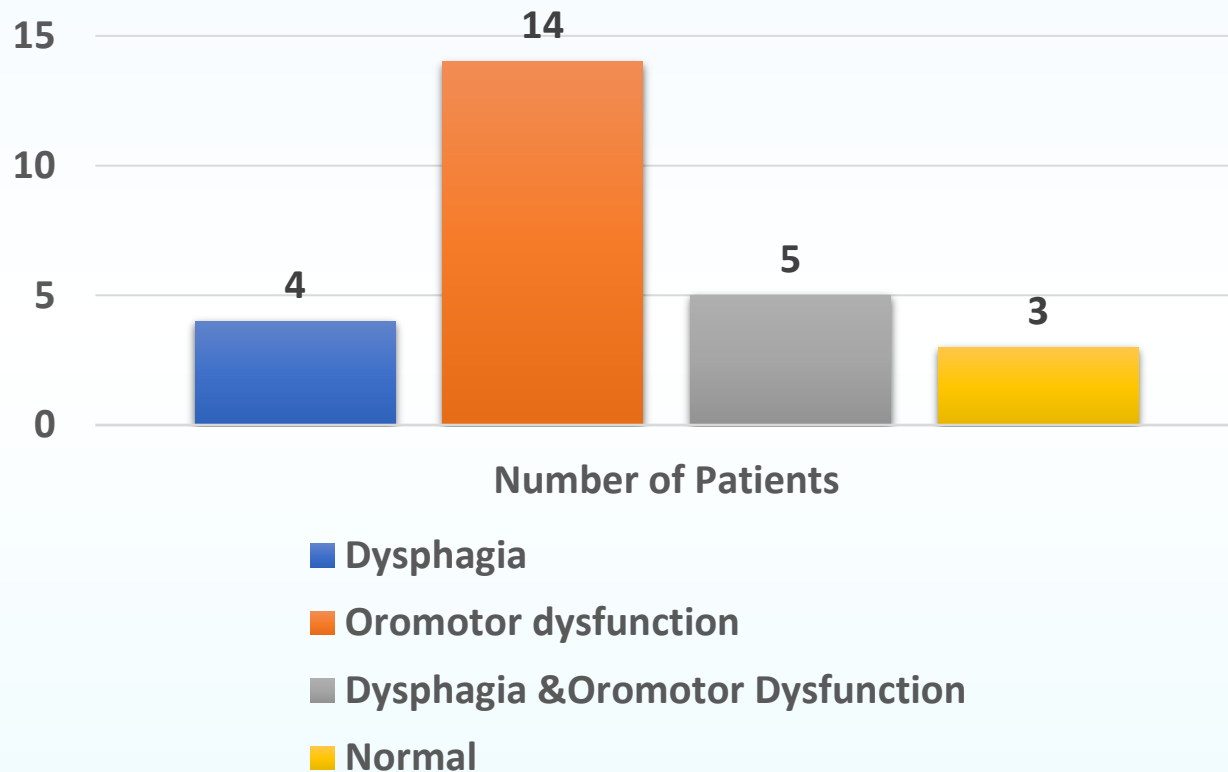
17 patients (51.5%) maximum anterior tongue pressure were below cut-off value 33kPa (with mean age 36.1 +/- 14.9 years) with benchmarking study from Taiwan (Wu et al., 2020)


**Mean Max. anterior tongue pressure
32.7kPa**



Results

Diagnosis by ST



- 
- ST assessment for 26 OF (+)patients
- 14 patients (53.8%) with oromotor dysfunction
 - 5 patients (19.2%) with dysphagia and oromotor dysfunction
 - 4 patients (15.4%) with dysphagia
 - 3 patients were found normal
 - OFI-8 (≥ 3 , SN: 88.5%, FP: 11.5%)

Discussions

■ Major findings of our pilot study

- We found a high prevalence of sarcopenia (70.8%) among community-dwelling elderly attending our GDH, and a much higher proportion of OF (+) among those with sarcopenia (91.3%), as compared to those without sarcopenia (64.7%).
- For patients screened positive for OF and attended ST assessment (n=26), the mean anterior tongue pressure was lowish (32.7kPa, below cutoff 33kPa), about half of them (53.8%) had oromotor dysfunction (before development of clinical dysphagia).
- OFI-8 scoring was negatively correlated with muscle bulk (BIA) and BW, and OFI-8 ≥ 3 had a reasonably good SN (88.5%) for baseline OF.

■ Limitations

- Small, single centre study
- May be selection bias for those who chose to attend ST assessment.
- Did not address dental problem which is a part of definition of oral frailty.

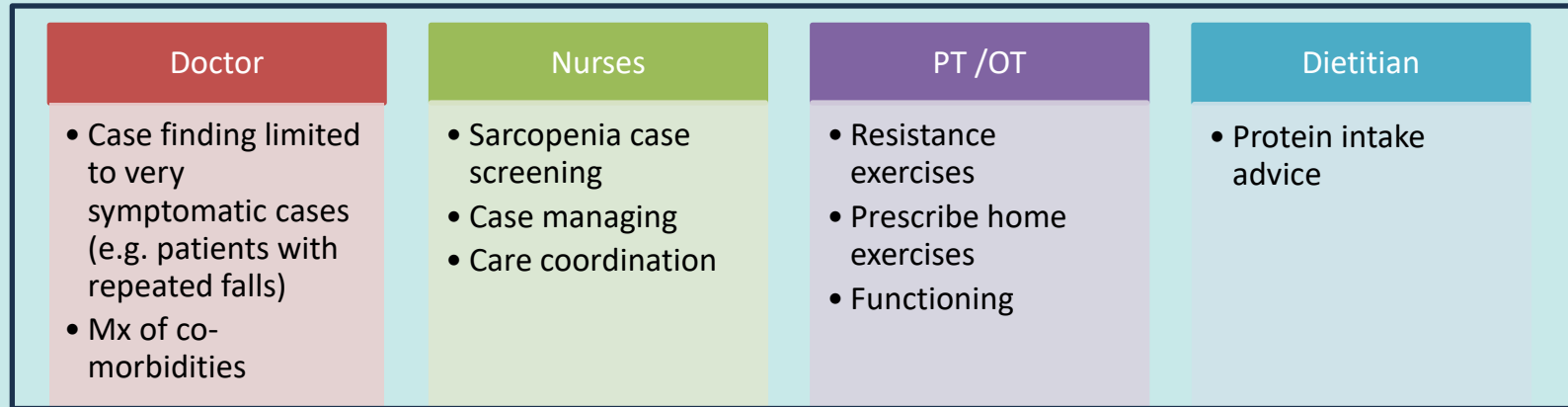


Conclusion

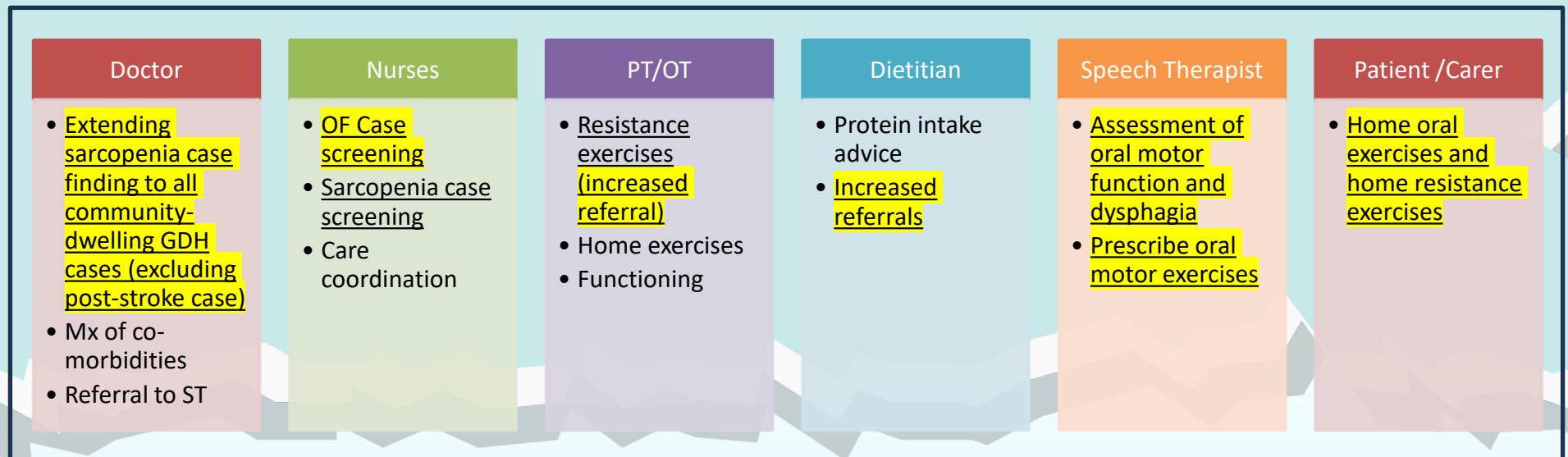
- As OF is a common and long-neglected issue among patients with sarcopenia, we suggest enhancing current sarcopenia assessment in GDH, with OF screening and early integration of ST service for OF management.
- Our pilot enhancement programme has led to new insights in management of geriatric patients with sarcopenia and OF.
 - Our preliminary result showed high prevalence of sarcopenia (70.8%) and high proportion of OF among sarcopenic community-dwelling patients.
 - We recommend the use of OFI-8 locally as it is easy to use and has good SN.
- Future local study will be needed for validation of OFI-8, tongue pressure cutoff and true prevalence of OF.

Enhanced model of care of sarcopenia in GDH

Old model



Suggested new care model



Acknowledgements



Dr. Wan M C, RTSKH Cons (M&G)/ HOD (Rheumatology)/ HOD (Geriatrics)

Dr. Wong C W, RTSKH Cons (M&G)

Dr. Yu S P, RTSKH Resident (M&G)

Ida Pang, RTSKH DOM (M&G, TSKDRC)

Chan T S, HKEC NC (Gerontology)

Peggy Lui, RTSKH WM (M&G)/ GDH

Lam S S, RTSKH RN (M&G)

Chan L Y, RTSKH RN (M&G)

Lee K N, RTSKH EN (M&G)

Chan L W, RTSKH EN (M&G)

Tong P Y, RTSKH EN (M&G)

Gwen Wong, RTSKH ST I/C

Mok S M, RTSKH ST(ST)

IP S F, RTSKH ST(ST)

Ng Y T, RTSKH ST(ST)

Ching K M, RTSKH Dietitian I/C





“Heart on Safety, Mind on People,
Building well-being Together!”

Reference

- Chan, A. K. Y., Tamrakar, M., Leung, K. C. M., Jiang, C. M., Lo, E. C. M., & Chu, C. H. (2021). Oral Health Care of Older Adults in Hong Kong. *Geriatrics (Basel, Switzerland)*, 6(4), 97. <https://doi.org/10.3390/geriatrics6040097>
- Dou, J. K., Liu, H., Mei, Y., Wang, S., Zhang, Y., Zhao, S. H., & Shi, X. Z. (2025). Prevalence of oral frailty in community-dwelling older adults: a systematic review and meta-analysis. *Frontiers in public health*, 13, 1423387. <https://doi.org/10.3389/fpubh.2025.1423387>
- Iwasaki, M., & Hirano, H. (2022). Decline in Oral Function and Its Management. *International dental journal*, 72(4S), S12–S20. <https://doi.org/10.1016/j.identj.2022.06.010>
- Kawamura, J., Tanaka, T., Kanno, S., Osawa, K., Okabayashi, K., Hirano, H., Shirobe, M., Nagatani, M., Son, B. K., Lyu, W., & Iijima, K. (2024). Relationship between a gum-chewing routine and oral, physical, and cognitive functions of community-dwelling older adults: A Kashiwa cohort study. *Geriatrics & Gerontology International*, 24(1), 68-74. <https://doi.org/10.1111/ggi.14757>
- Tanaka, T., Hirano, H., Ohara, Y., Nishimoto, M., & Iijima, K. (2021). Oral Frailty Index-8 in the risk assessment of new-onset oral frailty and functional disability among community-dwelling older adults. *Archives of gerontology and geriatrics*, 94, 104340. <https://doi.org/10.1016/j.archger.2021.104340>
- Wu, S. J., Wang, C. C., Lin, F. Y., Tseng, K. Y., & Hwu, Y. J. (2020). Analysis of labial and lingual strength among healthy Chinese adults in Taiwan. *International Journal of Environmental Research and Public Health*, 17(21), 7904. <https://doi.org/10.3390/ijerph17217904>