Professor Renuka Visvanathan
Aged & Extended Care Services, The Queen Elizabeth Hospital
And Adelaide Geriatrics Training and Research with Aged Care (GTRAC) Centre

Sarcopenia and Frailty in Older People
DISCLAIMER

- I am not a dietician or nutritionist and therefore will not be able to provide specific details about food types, nutrient source, caloric count etc.
Conflicts of Interest

• Member of the Malnutrition In The Elderly Group, Nestle Australia

• Have participated in international initiatives that have been funded through educational grants from Nestle Inc.

• One of the research studies presented in this talk received research sponsorship from Organon Pty Ltd.

• In the past, during training years, I received small travel grants from Pfizer Australia and Servier to attend conferences
OUTLINE OF THIS LECTURE

• Define Sarcopenia and Frailty and Discuss Impact

• Discuss how Sarcopenia and Frailty are associated

• Screening for Sarcopenia and Frailty

• Weight and Muscle

• Interventions- Good Nutrition and Physical Activity
Define Sarcopenia and Frailty
Discuss Impact Of Both Conditions
Older People Just Wanna Have Fun!
PHYSIOLOGICAL AGEING

Mr Kowalski Age 104 Years

Frail 100 year old man with some disability

Anne Perry
The Anorexia Of Aging= Appetite Loss

- Decreased Appetite
- Feeling Full Earlier

Reduced Nutritional Intake

- Decreased Energy Input
- Nitric Oxide
- Fundal Compliance
- Antral Filling
- Antral Stretch

Inflammation

- Leptin (in males)
- Ghrelin
- Cholecystokinin
- Testosterone (in males)

Smell
Taste

University of Adelaide
Energy intake and age

Average decrease in oral intake between 20 and 80
- 1321 kcal/d in men
- 629 kcal/d in women

Protein intake and age: g/kg body weight
NHANES 2003–2004

Fulgoni VL, Am J Clin Nutr 2008;87(suppl):1554S–7S
Sarcopenia

Decreased Appetite

Feeling Full Earlier

Reduced Nutritional Intake

Weight Loss

Loss of Muscle Mass

Sarcopenia
Sarcopenia

- Loss of Gait Speed

- Loss of Grip Strength

- Loss of Muscle Mass

\[ \text{ASM} = 10.047427 + 0.353307(\text{weight}) - 0.621112(\text{BMI}) - 0.022741(\text{age}) + 5.096201(\text{if male}) \]

  - Men: \(<8.28 \text{ kg/m}^2\)
  - Women: \(<5.97 \text{ kg/m}^2\)

Yu et. al 2014 Diagnostic accuracy of locally determined anthropometric-based appendicular skeletal muscle prediction equation in predicting low muscle mass. JAMDA 2015
# Prevalence Of Sarcopenia In Australia

<table>
<thead>
<tr>
<th>Investigator Team</th>
<th>Setting and Age</th>
<th>Cut-offs</th>
<th>Prevalence</th>
</tr>
</thead>
</table>
  **Men**: <7.09 kg/m²  
  **Women**: <5.91 kg/m²  
  Grip Strength (handgrip strength); Cut-offs:  
  **Men**: <28.8 kg  
  **Women**: <18.2 kg | 5% |
|                    |                 |                                                                         |            |
| Yu et. al. 2014    | Community Age 65+ | Muscle Mass (DXA) Cut-offs: lowest 20% of predictive population  
  **Men**: <7.36 kg/m²  
  **Women**: <5.81 kg/m²  
  Grip Strength (handgrip strength); Cut-offs:  
  **Men**: <28.8 kg  
  **Women**: <18.2 kg | **Men**: 6.5%  
  **Women**: 9.3% |

• Sarcopenia in older people is associated with disabilities and falls

• The healthcare cost of sarcopenia in the United State of America (US) in 2000 was reported to be $18.5 billion

• It was proposed that a 10% reduction in sarcopenia will result in a saving of $1.1 billion per year in US

The Cascade Of Decline To Frailty

- Decreased Appetite
- Feeling Full Earlier
- Reduced Nutritional Intake
- Weight Loss
- Loss of Muscle Mass
- Sarcopenia
- Frailty
FRAILTY IS ALSO A SIGNIFICANT PUBLIC HEALTH ISSUE

It is possible that in 2011, more than 270,000 community dwelling Australians aged 70 years and over were frail or at-risk of frailty.

By 2050, four million Australians aged 70 years and older will either be frail or at-risk of frailty.

Courtesy of Dr Helen Feist, Demography Researcher, UoA
Frailty Is Associated With Poor Health Outcomes

- Nursing Home Placement
- Falls and Fracture
- Hospitalisation
- Adverse Drug Reactions
- Increased Dependence on Aged Care Services
- Mortality
Phenotypic Model- Fried’s Criteria

• Exhaustion
• Unintentional weight loss...
• Weakness.....
• Slow walking speed....
• Low physical activity....

1-2 At-Risk
3+ Frail

Fried et al. J Geront 2001;56:M146-M156
FRAILTY- DEFINITION MODEL

• ‘the collected culmination of a lifetime of assaults on the body by medical problems or lifestyle’ .....‘it is marked by reduced resilience’


• ‘the frail individual is weak, slow and vulnerable to stressor events, such as illness, falls or any circumstance that compromises their physical and/or mental equilibrium’

Increasing Frailty

0

Low socio-economic status

Lack of Physical Activity
High Fat and Salt Diet
Low Fibre Diet

Diabetes
Hypertension
Constipation
Obesity

Diverticulitis
Angina
Obstructive Sleep Apnoea

Colon Cancer
Stroke
Glaucoma

Hip Fracture

80

60 years old
69 years old
72 years old
Screening For Frailty and Sarcopenia
The clinical Frailty Scale

Clinical Frailty Scale*

1. **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2. **Well** – People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g. seasonally.

3. **Managing Well** – People whose medical problems are well controlled, but are not regularly active beyond routine walking.

4. **Vulnerable** – While not dependent on others for daily help, often symptoms limit activities. A common complaint is being “slowed up,” and/or being tired during the day.

5. **Mildly Frail** – These people often have more evident slowing, and need help in high order IADLs (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6. **Moderately Frail** – People need help with all outside activities and with keeping house. Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.

7. **Severely Frail** – Completely dependent for personal care, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8. **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** – Approaching the end of life. This category applies to people with a life expectancy <6 months, who are not otherwise evidently frail.

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common symptoms in mild dementia include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In moderate dementia, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In severe dementia, they cannot do personal care without help.

Phenotypic Model - Fried’s Criteria

FRAIL SCREEN

• Exhaustion---- Are you fatigued?
• Unintentional weight loss...Have you lost more than 5% of your weight in the past 6 months?
• Weakness......Do you have difficulty walking up one flight of steps?
• Slow walking speed....Do you have more than five illnesses?
• Low physical activity.... Are you unable to walk at least one block (160 metres or 6.5 houses with 24 metre frontage)?

• FRAIL Screen \( \geq 3 = \text{risk} \)

Fried et al. J Geront 2001;56:M146-M156

Morley et. al. JNHA 2012; 16(7): 601-608
Screening for Sarcopenia

• A Practical Clinical Practice Strategy

A performance measure such as walk speed of <0.8 m/s also allows easy monitoring for improvement

\[
ASM = 10.047427 + 0.353307(\text{weight}) - 0.621112(\text{BMI}) - 0.022741(\text{age}) + 5.096201(\text{if male})
\]

- **Men:** <8.28 kg/m²
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We need to build an app but an excel sheet would do for now
Ideal Body Weight
The Body Mass Index

• Weight in Kg / [Height in m]$^2$

• WHO Healthy BMI range is 18.5-25kg/m$^2$
  Overweight BMI range is 25-<30 kg/m$^2$
  Obese BMI range is 30+ kg/m$^2$

This is different in older people
Note increased risk at approximately 22kg/m²

Note no increased risk in the WHO overweight category

23.5kg/m² was used as the reference BMI

FIGURE 2. HRs (95% CIs) of all-cause mortality according to BMI for men and women aged ≥65 y. BMI was modeled with restricted cubic splines in a random-effects dose-response model. A BMI (in kg/m²) of 23.5 (most common midpoint for the reference BMI category) was used as the reference to estimate all HRs. The vertical axis is on a log scale.

BMI and all-cause mortality in older adults: a meta-analysis

Jane E Winter, Robert J MacInnis, Naiyana Wattanapenpaiboom, and Caryl A Nowson

AJCN 2014
Young Arnold Schwarzenegger at Recess by Eric Perlin

Let us all pretend we are famous composers!
- You will be Beethoven.
- You will be Tchaikovsky.
- You will be Mozart.

As for myself,...

...I’ll be Bach!
Body Composition Rather Than Weight

- WATER
- BLOOD
- MARROW
- BONE
- FAT
- MUSCLE
Muscle Is Important In Older Age

- **WATER**, **BLOOD**, **Marrow**
- **Bone**
  - Reduced
- **Fat**
  - Increased
- **Muscle**
  - Reduced
- **Sarcopenia**
- **Osteoporosis**
- **Fractures**
  - Diabetes
  - Myocardial Infarction
  - Stroke
  - Obstructive Sleep Apnoea
  - Hypertension
- **Obesity**
- **Loss of Independence**
- **Falls and Fracture Frailty**
Comprehensive Assessment
## Contributing Factors To Nutritional Risk And Sarcopenia

"Meals on Wheels"

<table>
<thead>
<tr>
<th>M</th>
<th>Medication effects</th>
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<tbody>
<tr>
<td>E</td>
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Interventions or Treatment
ADDRESS REVERSIBLES

"Meals on Wheels"

M  Medication effects
E  Emotional problems, especially depression
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L  Low-salt, low cholesterol diets especially in institutions
S  Social problems (e.g. isolation, inability to obtained preferred foods)

A multifactorial interdisciplinary intervention reduces frailty in older people: randomized trial

Ian D Cameron¹, Nicola Fairhall¹,², Colleen Langron³, Keri Lockwood¹, Noeline Monaghan¹, Christina Aggar⁴, Catherine Sherrington⁵, Stephen R Lord⁵ and Susan E Kurrle³

241 subjects
70 years+
3 or more Fried’s criteria
Community dwelling
MMSE score 19 or +
Life expectancy 12months+

121 subjects (12 month study)
Comprehensive geriatric assessment followed by targeted intervention including up to 10 PT visits

120 subjects
Usual services available to people

• There was reduced risk of frailty in the intervention group compared to the control group
• Short Physical Performance Battery scores declined in control group but was stable in the intervention group
• There was improvement in gait speed in the intervention group compared to the control group
Reduce Sedentary Behaviour

The doctor said he needed more activity. So I hide his T.V. remote three times a week.
What To Do To Improve Health

1. Exercise
2. Exercise
3. Exercise
4. Exercise
5. Exercise
6. Exercise
7. Exercise
8. etc.

Yes, yes, yes—now, seriously what can we do to improve our health?
Exercise- Its Never Too Late

Ideal- daily exercise for at least 20 minutes (anything is better than nothing)

Progressive Resistance Exercise  
-can be chair based for the frail  
-using exercise bands  
-lifting dumbbells  
Aim progressively 8 to 10 exercises with 10-15 repetitions and 2 minutes rest in between

Aerobic Exercise  
-e.g. walking  
-e.g. swimming
From: Effect of Structured Physical Activity on Prevention of Major Mobility Disability in Older Adults: The LIFE Study Randomized Clinical Trial

Eligibility Criteria

• 70-89 years old
• Sedentary <20min/week of regular physical activity in the last month and <125min/week of moderate physical activity
• High risk of mobility disability with Short Physical Performance Battery score 9 or lower
• Could walk 400metres in <15 minutes
• No cognitive impairment
• Could Safely Participate In Intervention
Intervention

Intervention Group
• Walking with a goal of 150min/week - 30 min walking daily
• Strength, flexibility and balance training
• Centre based two times per week
• Home based 3-4 times per week
• Gradually increase

Health Education Group
• Weekly workshops of health education for first 26 weeks and then monthly thereafter (bimonthly attendance optional)
• Workshops did not include physical activity but there was 5-10 min stretching exercise
Mean age 79
Women 67%
Walk speed Approx 0.8m/s
From: *Effect of Structured Physical Activity on Prevention of Major Mobility Disability in Older Adults: The LIFE Study Randomized Clinical Trial*

A structured, moderate-intensity physical activity program compared with a health education program reduced major mobility disability over 2.6 years among older adults at risk for disability.
Protein Intake For Older People
Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group

Jürgen Bauer MD a,*, Gianni Biolo MD, PhD b, Tommy Cederholm MD, PhD c, Matteo Cesari MD, PhD d, Alfonso J. Cruz-Jentoft MD e, John E. Morley MB, BCh f, Stuart Phillips PhD g, Cornel Sieber MD, PhD h, Peter Stehle MD, PhD i, Daniel Teta MD, PhD i, Renuka Visvanathan MBBS, PhD k, Elena Volpi MD, PhD l, Yves Boirie MD, PhD m
Key Recommendations From The Group

• To maintain muscle, older people need more dietary protein than younger people:
  1.0 to 1.2g/ kg body weight/day

• It is also recommended that 25 to 30g of protein (2.5 to 2.8g of leucine) is consumed with each of the three main meals

• In older people with acute or chronic disease, then the protein requirements increase to between 1.2 to 1.5g/kg body weight/day

• Ingesting protein after exercise is likely to benefit in terms of building muscle
## Kidney function und kidney disease

<table>
<thead>
<tr>
<th>PROTAG-AGE recommendations for older people with kidney disease</th>
<th>Non-dialysis CKD</th>
<th>Hemodialysis</th>
<th>Peritoneal dialysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Severe CKD - GFR &lt; 30: 0.8 g/kg BW/day</td>
<td></td>
<td>1.5 g/kg BW/day</td>
<td>1.5 g/kg BW/day</td>
</tr>
<tr>
<td>• Moderate CKD - 30 &lt; GFR &lt; 60: more protein, but GFR should be monitored 2x/year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Mild CKD - GFR &gt; 60: no problem to increase protein intake</td>
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<td></td>
</tr>
</tbody>
</table>

An example of a meal plan
-sedentary male aged 70 years, weighs 75Kg, no CVD
[8300 kJ/day and 90 g protein]

Breakfast (27.5 g protein)
2 weet-bix with ½ banana sliced on top and ½ cup full cream milk
1 piece of wholemeal toast, Thin spread margarine, 1 slice cheese (thick)
½ cup yoghurt 1 cup black tea + 1 tsp sugar

Morning Tea
1 piece fresh fruit 1 cup black tea + 1 tsp sugar

Lunch (32.3 g protein)
2 slices wholemeal bread for sandwich, thin spread avocado, 1 slice cheese (thick)
40g sandwich meat 1 cup salad vegetables (lettuce, tomato, cucumber) 1 cup milo and milk

Afternoon Tea
1 apple 1 cup black tea + 1 tsp sugar

Dinner (25g protein)
120g lean beef cooked with thickened gravy
1 cup cooked vegetables Mashed potato (1 potato)

Supper (5g protein)
2 piece fruit toast, thin spread margarine

6-8 glasses of water per day

Courtesy of Ms Erin Healy, Graduate Dietitian, Flinders Uni
Vitamin D

- Natural source is the sun
- Vitamin D deficiency is very common
- Blood test and can be easily supplemented either via tablets or liquid booster doses periodically
- Important for bone health and muscle health (i.e. strength)

Professor Chris Nordin
Renowned advocate for calcium and Vitamin D to prevent fractures
Encourage Socialisation
Current Journey For The Frail

- The Frail Elderly (The Label)
- Presentation Late and In Crisis (Delirium, Falls)
- Hospital based-disrupted and disjointed
The Frail Elderly (The Label)

Presentation Late and In Crisis (Delirium, Falls)

Hospital based-disrupted and disjointed

An Older Person Living With Frailty or At-Risk (Long Term Condition)

Timely identification, preventative & proactive care, self management and personalized care planning

Community based person centred and coordinated (Health + Social+ Mental Health + Voluntary)

Professor John Young, Bradford Hospital Trust
The Frail Elderly (The Label)

Presentation Late and In Crisis (Delirium, Falls)

Hospital based-disrupted and disjointed

STEP 1: EARLY DETECTION THROUGH SCREENING

STEP 2: COMPREHENSIVE ASSESSMENT AND MANAGEMENT

An Older Person Living With Frailty or At-Risk (Long Term Condition)

Timely identification, preventative & proactive care, self management and personalized care planning

Community based person centred and coordinated (Health + Social+ Mental Health + Voluntary)

Professor John Young, Bradford Hospital Trust
THANK YOU FOR LISTENING

Questions?