Nutrition for Frail Elderly

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People age at different rates, defining frailty & fitness
Protein, Fat & Calorie Intake

- Nutrition intakes decrease with aging
- Energy and Protein intakes of the elderly are 30% less than younger adults

(Hallfrisch et al. J Gerontol. 1990;45:M186-191)
Factors Affecting Nutrition Intake with Aging

- Altered taste and smell
- Oral health problems (poor teeth, chewing problem)
- Decreased physical activity and mobility
- Illnesses / chronic diseases
- Psychosocial Issues (depression, isolation)
- Financial Issues

Diet restrictions due to my high blood pressure, heart disease and diabetes make eating less interesting

It is difficult to walk, thus hard to shop for food

I often feel sad and lose my appetite

Not eating enough due to chewing and teeth problems
Physiological Changes with age

- Loss of lean body mass – 0.3kg/year
- Loss of skeletal muscle – sarcopenia
- 30% decline in muscle mass from the third to eighth decade
- Increased adipose tissues
- Can also occur due to diseases, inability
- Decreased Energy requirement
Sarcopenia

The involuntary loss of muscle mass, strength and function

Body Composition Changes

- Loss of muscle mass
- Increase in body fat

Sarcopenia

- Progresses over decades
- Becomes a significant contributor to disability & loss of functional capacity

Body composition in man as a function of age. ■, Muscle; □, other tissues; ▴, fat. (Adapted from Cohn et al. 1980.)
Causes of Sarcopenia

Age-related

Physical inactivity & Immobility

Endocrine (corticosteroids, GH, thyroid, insulin resistance)

Cachexia

Starvation, Malabsorption

Neurodegenerative diseases
Outcome of Sarcopenia

• Decrease in muscle mass, muscle strength and endurance
• Loss of independence
• Decreased insulin sensitivity
• Disability and functional decline
• Increased risk of falls, subsequent fracture
• Hospital admission
• Long term care placement
• Increased mortality
What is Frailty?

A geriatric syndrome

decreased physiological reserve and resilience,
progressive functional decline,
vulnerability to stressors
elevated risk of adverse outcomes including death.
Frailty

- Based on Phenotype - Rule based definition
- 5 criteria
  1. Weakness
  2. Slowness
  3. Low activity
  4. Exhaustion
  5. Shrinkage (loss of weight or height)

Frail - positive in 3 or more out of five
Pre frail - 1 or 2 out of five

## Frailty - Phenotype

<table>
<thead>
<tr>
<th>FP criteria</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakness</td>
<td>Grip strength: lowest 20% (by sex, body mass index)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Slowness</td>
<td>Walking time/15 feet: slowest 20% (by sex, height)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Low level of physical activity</td>
<td>Kcal/week: lowest 20%</td>
</tr>
<tr>
<td></td>
<td>Males: 383 Kcal/week</td>
</tr>
<tr>
<td></td>
<td>Females: 270 Kcal/week</td>
</tr>
<tr>
<td>Exhaustion; poor endurance</td>
<td>“Exhaustion” (self-report)</td>
</tr>
<tr>
<td>Weight loss</td>
<td>&gt;10 lb lost unintentionally in prior year</td>
</tr>
</tbody>
</table>
Deficit – Based

• The frailty index

• Frailty Index = \text{Number of deficits in an individual} \over \text{Total number of deficits measured}

• e.g. in a dataset with 50 health deficit measures, a person with 10 things wrong (10 deficits) has a frailty index of 10/50 = 0.20.
Shared Risk Factors
- Old age
- Baseline cognitive impairment
- Baseline functional impairment
- Decreased mobility

Geriatric Syndromes
- Incontinence
- Falls
- Pressure ulcers
- Delirium
- Functional decline

Frailty

Poor outcomes
- Disability
- Dependence
- Nursing home
- Death
Frailty

- "Normal aging"
- "Accelerated aging"
- Frailty
- Disability

Performance vs. Time (age)
Fit vs Frail

- Minor illness in FIT OLDER PERSON
- Minor illness in FRAIL OLDER PERSON

Functional abilities

INDEPENDENCE

DEPENDENCE
Studies in Sri Lanka
Frailty Assessment Instrument

• 34 item instrument named frailty assessment instrument (FAI) was developed to assess frailty in elderly.

• These items belong to
  • physical,
  • Psychological
  • social domains.

• Sinhala version of FAI was validated to use in Sri Lankan settings.
Studies on prevalence of frailty

- Prevalence of frailty in Colombo district - 14.9% (95% CI: 13.17% - 16.63%).
- Males - 17.7% (95% CI: 14.99% - 20.41%)
- Females - 12.4% (95% CI: 10.19% - 14.61%).
- Frailty below the age of 75 years (young elders) in both sexes - 11.3% (95% CI: 9.39% - 13.21%)
- Elders 75 years or above (old elders) in both sexes - 21.6% (95% CI: 18.21% - 24.99%).
Data from Local studies

• Elders with unsatisfactory level of nutrition were having 1.6 times higher odds of being frail compared to the elders with satisfactory nutrition.

• Consumption of alcohol showed 1.5 time higher odds of being frail compared to the elders who do not consume alcohol.

• Elders who follow Buddhism bear 2.75 times higher odds of being frail compared to the other religion groups. ??tend to become vegetarians and more inactive life style towards the latter part of the life

• Unsatisfactory level of exercise 3.4 times higher odds of being frail compared to the satisfactory level of exercise
Protein and Frailty

- Studies have shown an association between inadequate protein intake and frailty.
- A 20% increase in uncalibrated protein intake (%kcal) was associated with a 12% (95% CI 8–16%) lower risk of frailty.
- A 20% increase in calibrated protein intake was associated with a 32% (95% CI 23–50%) lower risk of frailty.
- The Health, Aging, and Body Composition Study reported that over a 3-year period, those in the highest quintile of protein intake lost approximately 40% less total lean mass compared to those in the lowest quintile.

Whey protein

- An effective and efficient fuel for muscle in older age
- A natural, high quality protein source rich in essential amino acids and leucine
- A ‘fast’ protein, metabolized quickly and swiftly integrated into muscle
Whey is considered as ‘Fast Protein’

Whey: soluble protein
Facilitates gastric emptying time
More accessible & faster to digest
Easily to absorb

Casein: clots into stomach
Delays gastric emptying time
Slower to digest & absorb
Slower release of amino acid
Whey protein promotes a greater rise in MPS than casein at rest and with resistance exercise in old men.

(Br J Nutr 2012;108:958-962)
Standard of intake:

Older people require at least 1.0 – 1.2g/kg BW/day of dietary protein to maintain physical function & support muscle.

Most older adults who have an acute or chronic disease need more dietary protein (ie, 1.2 to 1.5 g/kg BW/d)
PROT-AGE Recommendations For Dietary Protein Intake in
Healthy Older Adults

• Older people should consume an average daily intake in the range of **1.0 to 1.2 g/kg BW/d**.
  (VS. the recommended dietary intake of protein of adults is 0.8g/kg/d)

<table>
<thead>
<tr>
<th>Elderly man with 60 kg</th>
<th>Elderly woman with 45 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needs 60-80 g protein per day</td>
<td>Needs 45 -54 g protein per day</td>
</tr>
</tbody>
</table>
Most older adults who have an acute or chronic disease need more dietary protein (i.e., 1.2 to 1.5 g/kg BW/d);
- People with severe illness or injury or with marked malnutrition may need as much as 2.0 g/kg BW/d.
### Sources of Protein

*(general requirement: 5-8 servings /day)*

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving size</th>
<th>Protein (g)</th>
<th>Energy (kcal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pork/ Beef (medium fat)</td>
<td>1 oz cooked (30g)</td>
<td>7</td>
<td>84</td>
</tr>
<tr>
<td>Fish</td>
<td>1 oz cooked (30g)</td>
<td>7</td>
<td>33</td>
</tr>
<tr>
<td>Cheddar Cheese</td>
<td>1 slice (30g)</td>
<td>7</td>
<td>114</td>
</tr>
<tr>
<td>Egg</td>
<td>1 whole</td>
<td>6</td>
<td>72</td>
</tr>
<tr>
<td>Tofu</td>
<td>1 square (84g)</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>Skim Milk</td>
<td>1 glass</td>
<td>8</td>
<td>83</td>
</tr>
<tr>
<td>Complete Oral Nutrition Supplement</td>
<td>1 glass</td>
<td>10</td>
<td>230-250</td>
</tr>
<tr>
<td>White rice</td>
<td>1 medium bowl</td>
<td>4</td>
<td>220</td>
</tr>
</tbody>
</table>
Vitamin D and Frailty

- Low 25-hydroxyvitamin D [25(OH)D] levels are common in institutionalized frail older adults
- Vitamin D supplementation has been shown to improve physical function

Low 25-hydroxyvitamin D [25(OH)D] levels have been linked to:
- Falls
- Fractures
- Pain
- Sarcopenia
- Poor physical function
- Disability
- And frailty
Vitamin D

Study report extremely low vitamin D levels in older adults. Depleted vitamin D levels are associated with low muscle strength. Supplementation of vitamin D increases muscle strength. (J Am Med Dir Assoc. 2010;11(6):391-396)

Sunlight: As the ultraviolet light in sunlight can enhance the manufacturing of active Vitamin D, an exposure to sunlight of around 15 minutes per day is recommended.

Elderly tend to stay indoors, often after suffering are not getting enough vitamin D.
Dietary source of Vitamin D

- Complete Oral Nutrition Supplement
- Egg yolks
- Saltwater fish
- Cereal
- Liver

Dietary Reference Intakes (DRIs):
Adult <70 y.o.: 15µg/day ; Adult >70 y.o.: 20µg/day
Vitamin D and calcium supplementation and falls

- Falls are a hallmark of the frail elderly.
- The results of the study indicate that vitamin D and calcium supplementation reduced the number of falls per person by 49%,
- improved musculoskeletal function,
- increased vitamin D status (both 25-hydroxyvitamin D and 1,25-dihydroxyvitamin D),
- decreased parathyroid hormone secretion
- bone resorption

Effects of Vitamin D and Calcium Supplementation on Falls: A Randomized Controlled Trial JOURNAL OF BONE AND MINERAL RESEARCH Volume 18, Number 2, 2003 © 2003 American Society for Bone and Mineral Research
Age- and sex-adjusted levels of vitamin E according to frailty status.

Prevalence of specific vitamin deficiencies by frailty status. *p < .05 by Mantel–Haenszel chi-square.

Number of vitamin deficiencies by frailty status. *p < .05 by Mantel–Haenszel chi-square.


The Gerontological Society of America
Malnutrition: a vicious cycle

- Reduced mobility
- Malnutrition
- Apathy, depression, reduced attention
- Loss of muscle mass
- Reduced appetite
- Reduced capacity to feed oneself
Malnutrition in the Elderly

Hospital
- Malnourished: 39%
- At risk of malnutrition: 47%
- Well nourished: 14%
- Total: 86%

Nursing home
- Malnourished: 14%
- At risk of malnutrition: 53%
- Well nourished: 33%
- Total: 67%

Community
- Malnourished: 6%
- At risk of malnutrition: 32%
- Well nourished: 62%
- Total: 38%

Rehabilitation
- Malnourished: 50%
- At risk of malnutrition: 41%
- Well nourished: 9%
- Total: 91%

n=1,384 patients
n=1,586 patients
n=964 patients
n=340 patients
Malnutrition: Increased risk of infection

Malnourished patients have:

Up to 3 times higher risk of infection\textsuperscript{20}

![Bar chart showing the risk of nosocomial infections in different nutritional states.]

- Well nourished: 4.4%
- Moderately malnourished: 7.6%
- Severely malnourished: 14.6%
Nutrition and Acute illness

• Poor intake
• Increased demand
• Increase in 1C temperature – Energy requirements increase by 10%
• Escalate weight loss

Result in
• Immunodeficiency
• Impaired wound healing
Strategies to improve the dietary intake of older people in hospitals

• Age appropriate food – culturally acceptable, personal choice
• Protected meal times – ward rounds, tests, investigations – minimized
• Ensure adequate hydration, (6-8 drinks a day), prevent constipation
• Give drinks after meals and avoid unfortified soups as a starter - prevents patients eating a more nutritious meal
• Energy dense snacks rather than fruits - milk based drinks rather than water
• Constipation – treated early as this reduces appetite or intake
• Colour coded trays to indicate need assistance, needing more time
Nutrition Interventions

• Adding a single type of multivitamins,
• Adding a single type of nutritional supplement formula,
• Adding an extra meal,
• Meals on wheels (MOW)
• Mixed with exercise,
• Individualized dietary counseling

Outcomes of Nutritional Interventions

- The results and outcomes varied due to the type and duration of nutrition intervention and nutritional status before the intervention.
- The studies that used energy supplements in the intervention showed significant improvements in one or more of the frailty indicators or nutritional status.
- Nutritional advice and counseling showed no significant improvement.
- Adding an extra meal to the habitual diet showed significant improvements on dietary intake.
- In the mixed intervention of nutrition and exercise, the exercise groups showed more improvement.

http://www.jfrailtyaging.com/
Conclusions from Nutritional Interventional studies

• In general, nutrition intervention showed significant effects on frailty indicators in most of the studies.
• Nutritional status before the intervention had an impact on the results,
• intervention appearing to be effective in older adults with malnutrition.
• Improvement in nutritional status might possibly have led to improvement in frailty status. Mixed intervention nutrition and exercise might have been more effective than nutrition only.

Prevention of Sarcopenia

Take action to improve muscle health!

Regular Exercise + Well Balanced diet
Prevention of Sarcopenia

Regular Exercise:

- Perform progressive muscle strengthening and resistance exercises for at least 30 minutes/time and 3 times/week

- Increase muscle size, muscles strength, endurance, balance and stability, to prevent falls and to restore independency.
Prevention of Sarcopenia

Well Balanced diet

- Standard of intake: Older people require at least **1.0 – 1.2g/kg BW/day of dietary protein** to maintain physical function & support muscle

- Source of protein: **whey is a natural, leucine – rich, high quality protein source**, offers benefits as a fuel for muscle in older age

- **Sufficient intake of Vitamin D**: Vitamin D is essential for maintaining muscle mass in aging people.
Nutritional status and frailty

Poor intake of energy foods
Low intake of protein
Vitamin D, E, C, folate

Vitamin D and calcium supplementation has reduced falls incidence in frail

Nutritional supplementation alone in frail elderly has shown little impact

**Multidomain approach** with supplementation (high energy and protein) and physical training, cognitive exercise, social services can modify frailty risk
Acknowledgements

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• Dr Madhu Siriwardane , Business Manager, Nestle Health Science
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12. Efficacy of Whey Protein Supplementation on Resistance Exercise–Induced Changes in Lean Mass, Muscle Strength, and Physical Function in Mobility-Limited Older Adults Journals of Gerontology: MEDICAL SCIENCES