Nutrition Support for the Elderly

Ian Chapman

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Under-nutrition is at least as common as obesity in older people

Over 65 years

- Obesity 10-25%
- Under-nutrition 10-40% (depending on definition)

Changes in energy (food) intake with aging
\approx 30\% between 20 and 80 years


Energy (KJ)

Age (yr)
Ageing and Eating: a summary

Compared to young adults, the elderly

• are less hungry
• are more full
• eat less food (consume less energy) overall
• eat less often and less often between meals
• are less responsive to hunger signals
• are less thirsty
• ? eat different foods

This has been called the "anorexia of aging"
Qualitative changes in food intake with age

- Intake of all macro- and micronutrients ↓ but ? disproportionate ↓ intake of carbohydrates and fibre, with comparative sparing of fat and protein
- Deficient micronutrient intakes become more common (due largely to reduced energy intake), particularly
  - Vitamin D
  - Folate
  - Calcium
  - Vitamin E

Energy intake and body mass indices (BMI) of US males (- -) and females (-)
(NHANES III 1988-91)
So, what’s the problem? (after all, isn’t obesity the worry?)

- Much of the weight lost with ageing is muscle and bone, not fat, and this is bad
- Weight loss and low body weight are harmful in older people
- When excessive muscle loss leads to sarcopaenia
- Under-nutrition, sarcopaenia and related frailty are common in older people
Body Composition

Deceased muscle and bone with increased age

- YOUNG MEN
  - 16% Fat
  - 84% Lean

- OLD MEN
  - 26% Fat
  - 74% Lean

- GH-Def
  - YOUNG MEN
    - 32% Fat
    - 68% Lean
  - OLD WOMEN
    - 39% Fat
    - 61% Lean

- YOUNG WOMEN
  - 26% Fat
  - 74% Lean

% Body Fat:
- Yellow = Fat
- Orange = Lean
Sarcopaenia

Muscle strength ↓ 1-2%/yr age 40→90yr
Skeletal muscle mass ↓ from about age 45 yr (≈ 3kg/decade)
Skeletal muscle mass more than 2SD below young adult mean
15% < 70 yr  →  50% > 80 yrs

Aetiology multifactorial (↓ exercise, ↓ anabolic hormones, ↑ cytokines, ↓ food intake and weight loss)

Sarcopenia predicts disability in older people:
3.3 x ↑ (women) and 4.7 x ↑ (men) in NHANES 111
Ageing and body fat

- Average 80 year old woman is 50% fat

- Body fat increases with age, even if weight does not

<table>
<thead>
<tr>
<th></th>
<th>men 20 yrs</th>
<th>men 75 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight</td>
<td>80 kg</td>
<td>80 kg</td>
</tr>
<tr>
<td>Mean % body fat</td>
<td>15%</td>
<td>29%</td>
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Sarcopaenic Obesity

High body fat **and** low muscle mass
Prevalence ↑ dramatically with age
2% <70 yr → 10% > 80 yr
(body fat > 40% AND skeletal muscle mass > 2SD below young adult mean)


Sarcopenia and obesity are additive risk factors for disability in the elderly

eg of 451 elderly followed for 8 years, those with sarcopaenic obesity at baseline

• ↑ rate of impaired activities of daily living (IADL) during followup cf non-sarcopenic, non-obese
• 2-3 x ↑ rate IADL cf either lean sarcopenic or non-sarcopenic obese.

Relative risk of death associated with obesity diminishes with age

from: Guidelines for healthy weight Willett et al NEJM 1999341:427
In older people

- Being “overweight” (BMI 25-30kg/m²) confers the greatest survival advantage
- There is little or no increase in mortality until BMI > 35 kg/m² (not at all in those > 75 years)
- The association of obesity with mortality may be weakening over time? due to improved medical care
- The health ill-effects of overweight/obesity are modest and mainly relevant on a population basis
Being under-nourished (low body weight and/or losing weight) is bad for older people

In people > 60 years BMI < 22 associated with

- ↑ biochemical markers of malnutrition
- ↓ Activities of daily living
- ↓ Functional status
- ↑ mortality if > 60 yrs


If over 60 years, ideal BMI ≈ 27-28 kg/m²

Weight loss >5% a bad prognostic marker in the elderly, particularly if involuntary
Weight loss is a risk factor in older people

Demonstrated in numerous studies

**Cardiovascular Health Study (Newman et al. JAGS 2001:1309)**
- Prospective US 7 year study of 4,714 subjects > 65 years

17% lost > 5% body weight in 3 years after enrolment

- Mortality 4 yr later: \(2.09 \times (1.67-2.62)\) in weight loss group

↑ in mortality with weight loss occurred irrespective of
- starting weight
- whether ↓ weight intentional or non-intentional in weight loss group
Under-nutrition is common in older people

Up to 15% of community- and 80% of nursing home-dwelling elderly

No gold standard for diagnosis but weight loss (> 5%) and low body weight are good markers

eg 2x ↑ discharge from sub-acute care facility to accommodation requiring support if BMI < 22 kg/m2 and/or weight loss > 7.5%

Visvanathan et al. Age Ageing 2004 33:260
Non-physiological causes of anorexia in older people

Social
- Poverty
  - social isolation
  - inability to shop/prepare meals

Psychological
- alcoholism
- bereavement
- depression
- dementia

Medications
- multiple

Medical
- cancer
- cardiac failure
- obstructive airways disease
- dysphagia
- Parkinson’s disease
- malabsorption
- poor dentition/dentures
Physiological causes of the anorexia of ageing

Multifactorial

- Impaired homeostasis
- Impaired senses of smell and taste
- Hormonal Changes
  - ↓ Androgens
  - ↓ GH and ghrelin
  - ↑ Cholecystokinin (CCK)
- Inflammation (↑ cytokines)
- Gastrointestinal Changes
Impaired regulation of energy intake with ageing:
Feeding response to underfeeding for previous 21 days

(Overleaf)

(figure)

(Roberts et al, 1994)
Less Varied Diet

Sensory-specific satiety:
The decline in subjective palatability of a food as more of it is eaten.
Tends to lead to ↑ in variety of food eaten
Declines with age → ↓ in dietary variation which can lead to nutritional deficiencies

Dietary Variety in Older People

- Positively associated with food intake and body weight ($r = 0.57$)
- No apparent association with protein intake
- Predicts micronutrient intake
- Probably declines with increasing age
- 64% of older people with BMI < 22 and low dietary variety consumed RDA protein vs 98% if BMI > 22 and good dietary variety

Prevention and management of under-nutrition in older people
Nutritional Frailty in Older People has many causes

Nutritional therapy alone is not likely to be enough
Management of Nutritional Frailty in older people

Recognition/Diagnosis – often deficient
Needs awareness of problem – THINK OF IT
specific screening measures in place

Non-nutritional therapies
Identify and treat cause if possible
↑ Exercise – particularly resistance
Remove harmful medications
Medications/drugs to ↑ appetite and food intake

Nutritional therapies
Food
Strategies to optimise intake
Supplements
Diagnosis of Under-nutrition in older People

- No gold standard, which adds to confusion
- Various diagnostic instruments have been developed which rely on differing combinations of
  - anthropometric measures
  - questions regarding weight loss, food intake and medications
  - measurement of blood parameters
    - eg serum albumin, hematocrit, lymphocyte count and serum folate (all ↓ in under-nutrition)

Widely used screening tools include

- Mini Nutritional Assessment (MNA)
- Functional Assessment of Anorexia Cachexia Therapy [FAACT]
- Seniors in the Community Risk Evaluation for Eating and Nutrition tool [SCREEN]
- Simplified Nutritional Appetite Questionnaire (SNAQ)
Even simple screening methods can provide useful information

SNAQ comprising four questions on appetite, timing of eating, frequency of meals and taste, has a high sensitivity and specificity (both > 75%) in predicting future 5% weight loss in older people


Weight loss of > 5%, particularly if involuntary
BMI < 22 kg/m²

Both associated with poor outcomes in older people
Exercise for Older People

Beneficial effects of similar magnitude to those in younger adults

- ↑Muscle size
- ↓Muscle strength
- ↑Physical activity
- Improves sleep and balance
- ↓depression
- ↑glucose tolerance
- ↓falls
- Functional improvements (stair climbing, 6 min walk, disability etc)

Fiatarone M et al. NEJM 1994 330:1819
Baker MK et al. Age and Ageing 2007 36:375
Singh N et al Sleep 1997 20:95
Muscle preserving effect of exercise during a weight loss diet: the effect on type of tissue lost during an 8 week weight loss program, in 72 mildly obese men, randomly assigned to exercise or no exercise.

Medications

• Limited established role for orexigenic drugs due to side effects and limited efficacy
  eg Megestrol acetate – progestational agent
  Dronabinol – cannabis derivative

• Ghrelin or ghrelin-like drugs

• CK antagonists

• Testosterone/anabolic steroids
Ways to increase intake of usual foods

Dietary advice of limited use. Need specific strategies

- Reduce social isolation: eat in company
  (meal size can double if eaten with several other people)
  Wansink B Annu Rev Nutr 2004 24:455
- Provide encouragement to eat
- Don’t overload with food – small frequent meals + snacks
- Provide opportunities to eat and access to food between meals
- Reduce difficulties in accessing food: packaging, utensils etc
  important

Nutritional Therapies:
Ways to ↑ energy intake as food

• ↑ Variety and palatability of foods offered

>2/3 institutionalised people > 65 years had changed their diets, restricted food choices and reduced food intake cf when younger

• Offer foods with richer tastes and relatively strong but appetising smells.

• Addition of sauces and meal fortification

• ? Modify macronutrient composition of foods offered
No good evidence that satiating effects of different macronutrients change with age
Prevention/management of micronutrient deficiencies

Maximise variety of foods eaten

Strongly consider

- Multivitamin supplements
- Calcium and vitamin D supplements
  eg 1000 iu D3 per day, 1200 mg elemental calcium
Nutritional Therapies: Nutritional Supplements

• Best given in liquid (drink) form

If given as liquids rather than solids associated with ↑ postprandial hunger, greater energy intake and greater weight gain


Satiating effect of protein may be reduced when given in liquid form

Mattes RD Appetite 2006 33:119
Nutritional Therapies: Nutritional Supplements

• Best given between meals (at least 1-hour pre-meal)

• Advise to maintain at least normal food intake at other times
Daily energy intake (mean ± SDM) in elderly, undernourished people in response to 500 kcal/day nutritional supplement

Unsupplemented group

Supplemented group

- baseline
- six months
Summary of results of trials of oral nutritional supplements

Shown to improve energy and nutrient intake
Increase body weight
Limited functional benefits
Some evidence for reduced length of hospital stay
Some evidence for reduced mortality in the very frail

BUT

Anabolic and metabolic responses to nutrient supplements seem to be reduced in older people

Boirie Y. J Nutr Health Aging 2009 13:717
Nutritional supplementation probably reduces mortality in older people

1. Stratton et al. 7630 participants, 166 trials

2. Cochrane meta-analysis. 3017 participants, 32 trials
   Relative risk of death 0.74 (0.59-0.92)

3. Potter JM et al, 18 trials
   Relative risk of death 0.61 (0.45-0.82)
   Curr Opin Clin Nutr Metab Care 2001 4:21
Benefits of Nutritional Supplements are greater in certain groups

- subjects > 75 years
- in under-nourished subjects (eg BMI < 20)
- supplement > 400 kcal/day
- supplement continued > 35 days
- subjects in hospital or nursing home

Benefits of administering to older people living in the community less clear than to those in hospital or institutions
Future Directions

• Role of anabolic hormones
• Testosterone
• Growth Hormone
• Others eg DHEA
• Role of combination therapies
• Functional Foods
  eg high leucine foods (with exercise)
• Translation of research to public health measures
Significant reduction in hospital admissions over 1 year with combination nutritional supplement and testosterone in undernourished, community-dwelling older people Chapman et al AJCN 2009 89:880

- Combined treatment
- No treatment