Frailty in the UK

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Frailty v sarcopenia phenotype

Frailty is multisystem impairment associated with increased vulnerability to stressors operationalised as below

Fried et al J Gerontol A Biol Sci 2001

C  R  u  z-Jentoft et al EWGSOP Consensus Guidelines Age Ageing 2010

Sarcopenia is the loss of muscle mass and strength or physical performance associated with increasing age
Is either diagnosis likely?

Frailty burden in the UK data: Hertfordshire Cohort Study

UK Prevalence of frailty in community dwelling older people

- Syddall et al Age Ageing 2009 Prevalence of frailty - Fried criteria
  4.1% men 8.5% women aged 65 –74 years

UK Prevalence of sarcopenia in community dwelling older people

- Patel et al Age Ageing 2013 Prevalence of sarcopenia - EWGSOP criteria
  4.6% men 7.9% women mean age 67 years

UK Annual healthcare costs unknown

- But Janssen et al JAGS 2004 US National Surveys estimate sarcopenia alone costs $18 billion
## Component items of Fried Frailty in the Hertfordshire Cohort Study

<table>
<thead>
<tr>
<th>N (%)</th>
<th>Men (N=320)</th>
<th>Women (N=318)</th>
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<tbody>
<tr>
<td>Unintentional weight loss (&gt;10lb over the past year)</td>
<td>17 (5.3)</td>
<td>11 (3.5)</td>
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<tr>
<td>Weakness*</td>
<td>22 (6.9)</td>
<td>68 (21.5)</td>
</tr>
<tr>
<td>Self-reported exhaustion**</td>
<td>18 (5.6)</td>
<td>32 (10.1)</td>
</tr>
<tr>
<td>Slow walking speed***</td>
<td>63 (19.8)</td>
<td>63 (19.9)</td>
</tr>
<tr>
<td>Low physical activity†</td>
<td>85 (26.6)</td>
<td>69 (21.7)</td>
</tr>
<tr>
<td>Frail on the Fried score (presence of three or more of the above</td>
<td>13 (4.1)</td>
<td>27 (8.5)</td>
</tr>
<tr>
<td>criteria)</td>
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*Grip strength ≤30kg men and ≤20kg for women

**The participant felt that everything they did was an effort for moderate amounts to most of the time in the past week

***Timed up and go 3 metre walk ≥3.82 seconds for men and ≥3.98 secons for women or test completed with use of a walking aid

†SF-36 physical functioning score in the bottom fifth of the sex-specific distribution (≤75 for men and ≤60 for women)

Mortality v markers of muscle function: a systematic review and meta-analysis

Cooper R et al BMJ 2010;341:c4467
Morbidity v markers of muscle function: a systematic review

<table>
<thead>
<tr>
<th>Measure of physical activity</th>
<th>Outcome</th>
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<tbody>
<tr>
<td></td>
<td>Fracture</td>
</tr>
<tr>
<td>Grip strength</td>
<td>++++eee--</td>
</tr>
<tr>
<td>Walking speed</td>
<td>++++-</td>
</tr>
<tr>
<td>Chair rises</td>
<td>+++-</td>
</tr>
<tr>
<td>Standing balance</td>
<td>+++e-</td>
</tr>
</tbody>
</table>

Each indicator represents one study population. 
plus = there was evidence that poorer performance on the specific test was associated with increased risk of specified outcome, e = equivocal association, minus = no evidence of association.

Cooper et al Age and Ageing 2011
Morbidity v markers of muscle function: association between diabetic status and grip strength

Sayer et al Diabetes Care 2005
HRQoL v markers of muscle function: association between SF-36 scores and grip strength

Physical Functioning

Role Physical

Bodily Pain

General Health

Percentage in lowest fifth

Quintiles of Grip

Men

Women

Quintiles of Grip

Sayer et al Age Ageing 2006
Receipt of healthcare v markers of muscle function: relationship between length of stay in hospitalised older patients and admission grip strength

Kerr et al Age Ageing 2006
What are risk factors/interventions?
Major influences on skeletal muscle function

- Age, gender, adult size & body composition
- Physical activity particularly resistance exercise
- Diet
- Drugs
- Immune-endocrine axis
- Genes
- Lifecourse approach
Identifying risk factors to develop effective interventions:
Hertfordshire Birth Cohort Studies

• Hertfordshire Ageing Study: 717 men & women born 1920 – 1930
• Hertfordshire Cohort Study: 3000 men & women born 1931-39
• Historical records weight at birth & one year
• Follow up for detailed characterisation of age-related disease and ageing phenotypes including frailty and sarcopenia
• Detailed characterisation of exposures including physical activity and diet

Syddall HE et al Int J Epidemiol 2010  
Syddall HE et al Int J Epidemiol 2005
Unhealthy lifestyle in later life is related to worse physical performance: findings from the Hertfordshire Cohort Study

Robinson et al. JAGS 2013 In press
Aerobic exercise can improve physical performance in older people: a Hertfordshire Cohort Study randomised controlled trial

p=0.04 for difference in response between control and exercise intervention groups
p values above bars are from paired t-tests for change in TUG time within person, among controls and among the exercise group

Denison et al JAGS 2013
Oily fish consumption is associated with muscle strength: findings from the Hertfordshire Cohort Study

Robinson et al JAGS 2007
Immune-endocrine biomarkers predict frailty: findings from the Hertfordshire Ageing Study

Baylis et al. AGE 2012
Is a life course approach helpful?
Associations between birth weight and grip strength

Sayer AA et al J Gerontol 2004
Sayer AA et al JNHA 2008
Dodds R et al JNHA 2012
A lifecourse approach to skeletal muscle function

**Early life**
Growth and development to maximise peak

**Adult life**
Maintaining peak

**Older life**
Minimising loss

Range of mass and strength between individuals

Sayer AA et al Age Ageing 2013
Relevance of the lifecourse approach to intervention

• Prediction: identifying individuals at risk
• Prevention: interventions across the lifecourse
• Treatment: novel agents

Sayer AA BMJ 2010