Understanding the impact of Sarcopenia in Frailty
Going from strength to strength

Dr Sanjay Suman MD FRCP
Consultant Geriatrician and Clinical Co-Director
Elderly Care and Stroke
Medway NHS Foundation Trust
Kent

This presentation has been sponsored by Abbott. Opinions that have been expressed are those of the speaker, and not necessarily those of Abbott.
Declaration of interests

*Honoraria, Advisory Board, Educational Grant*

Bayer, Pfizer, MSD, Astellas, Lilly, Internis, Flynn, Boehringer-Ingleheim, Ferring, Kyowa Kirin, Astellas, Vifor, BMS, Abbott
Session Focus

Sarcopenia
• New operational definition (EWGSOP 2018)
• Highly prevalent, overlap with frailty

Sarcopenia and Osteoporosis
• Often occur together
• Impact on falls, fractures, hospital admissions

Management
• Nutrition
• Exercise
# Sarcopenia and frailty overlap

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Weight Loss</td>
<td>&gt;10 lb (4.5kg) unintentionally in previous year</td>
</tr>
<tr>
<td>2. Muscle Weakness</td>
<td>Grip strength in lowest 20% of the population</td>
</tr>
<tr>
<td>3. Slowness</td>
<td>Gait speed in slowest 20% of the population</td>
</tr>
<tr>
<td>4. Exhaustion</td>
<td>Self reported Exhaustion</td>
</tr>
<tr>
<td>5. Low Activity</td>
<td>kcal/week in lowest 20% of the population</td>
</tr>
</tbody>
</table>

≥ 3 Frail
1- 2 Pre-frail

Prevalence of sarcopenia in a population of nursing home residents according to their frailty status: results of the SENIOR cohort (Belgium)

N= 662, 73% Women, Mean Age 83.2 ±8.99 years

<table>
<thead>
<tr>
<th>Frailty Status</th>
<th>Sarcopenia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robust</td>
<td>16.3 %</td>
</tr>
<tr>
<td>Pre-fragile</td>
<td>39.9 %</td>
</tr>
<tr>
<td>Fragile</td>
<td>47 %</td>
</tr>
</tbody>
</table>

Over 1/3rd of all nursing home residents are sarcopenic

Almost 1/2 of frail nursing home subjects are sarcopenic

Weakness was the main component of frailty, highest prevalence of sarcopenia in this group
Prevalence of sarcopenia in community-dwelling older people in the UK using the European Working Group on Sarcopenia in Older People (EWGSOP) definition: findings from the Hertfordshire Cohort Study (HCS)

1. Hertfordshire Sarcopenia Study (HSS)
   N = 103 (Men), Mean Age = 73 years
   Sarcopenia diagnosis using:
   Anthropometry
   grip strength
   physical performance measures
   + DXA
   Sarcopenia prevalence
   Men = 6.8%

2. HCS N= 765 (Men), 1022 (Women)
   Mean age = 67 years
   Sarcopenia diagnosis using:
   Anthropometry
   grip strength
   physical performance measures
   No DXA
   Sarcopenia prevalence
   Men = 4.6%, Women= 7.9%,
Sarcopenia and frailty share common aetiology

- Genetics
- Hormonal changes
  - Testosterone
  - IGF
  - GH
- Comorbidities
- Inflammation
  Common determinant for chronic diseases sarcopenia and frailty

1. BGS Spring Meeting 2019

https://doi.org/10.1016/j.mam.2016.06.001
Multi-factorial and Complex

Sarcopenia
Disease related malnutrition
Hospitalisation

Negative Health Outcomes
- Metabolic disorders
- Impaired function
- Disability
- Mortality
- Increased Hospital stay

Muscle Mass & Function loss

Anabolic resistance
Reduced blood Flow
Impaired regenerative capacity
Mitochondrial dysfunction
Insulin resistance

Sarcopenia is regarded as a risk predictor for falls in older adults

Clinical picture
- Poor muscle strength
- Slow Gait speed
- Poor balance
- Delayed reaction time

Possible explanations
- Loss of fast twitch muscle fibres
- Vitamin D deficiency

OR 1.52 (CI 1.32 – 1.77)
Sarcopenia, frailty and falls

Sarcopenia as a risk factor for falls in elderly individuals (IlSIRENTE study)
Sarcopenic participants were over X 3 more likely to fall

↓ Physical Activity

↑ Risk of Falls & Fractures

↓ Autonomy

Dependency
Hospital Admissions
Institutionalization
Death

Muscle mass and strength loss after 50 years
• Loss of leg muscle mass 1-2% / year
• Loss of Strength 1.5-5% / year

Sarcopenia
Healthy

Health Care Costs Associated With Muscle Weakness: A UK Population-Based Estimate

Received 17 July 2018 / Accepted 18 September 2018
© The Author(s) 2018

£ 2.46 billion / Annum

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK population</td>
<td>65,648,100</td>
</tr>
<tr>
<td>UK population aged 70 years and older</td>
<td>8,177,500</td>
</tr>
<tr>
<td>UK population aged 70 years and older with muscle weakness*</td>
<td>8,177,500 x 11.1% = 907,703</td>
</tr>
<tr>
<td>Excess economic burden for health care in the UK</td>
<td>907,703 x £1429 = £1.30 billion</td>
</tr>
<tr>
<td>Excess economic burden for health and social care in the UK</td>
<td>907,703 x £2707 = £2.46 billion</td>
</tr>
</tbody>
</table>

*11.1% of the Hertfordshire Cohort Study participants had muscle weakness using the FNIH criteria (<26 kg for men and <16 kg for women). It is assumed that this prevalence is similar in the UK

Population estimates according to the Office for National Statistics

Muscle weakness was defined using low grip strength (<26 kg for men, <16 kg for women)
Revised operational definition of Sarcopenia

2018

Sarcopenia = muscle disease

Low Muscle strength is the primary parameter

Categories of Sarcopenia

• Primary / Secondary (Disease, Inactivity, Malnutrition)
• Acute (<6 months) or Chronic (>6 months)
• Frailty overlap

Sarcopenia has been overlooked & undertreated in mainstream practice

• What variables to measure?
• How to measure them?
• What cut-off points best guide diagnosis and treatment?
• How to best evaluate effects of therapeutic interventions
Revised operational definition of Sarcopenia

Low Muscle Strength

Strength
- Grip: Men < 27 Kg, Women < 16 Kg
- Chair Stand: Men > 15 Seconds for five rises, Women > 15 Seconds for five rises

Low Muscle Quantity / Quality

Quantity
- ASM: Men < 20 Kg, Women < 15 Kg
- ASM / height$^2$: Men < 7.0 Kg / m$^2$, Women < 6.0 Kg / m$^2$

Low Physical Performance

Performance
- Gait Speed: Men + Women ≤ 0.8 m/s
- SPPB: ≤ 8 point score
- TUG: ≥ 20 S
- 400 m Walk Test: ≥ 6 min, for completion

Probable Sarcopenia

Confirmed Sarcopenia

Severe Sarcopenia

ASM = Appendicular Skeletal Mass
SPPB = Short Physical Performance Battery
TUG = Timed Up and Go

**Probable Sarcopenia**

**Confirmed Sarcopenia**

**Severe Sarcopenia**

**Revised operational definition of Sarcopenia 2018**

**ASM** = Appendicular Skeletal Mass
**SPPB** = Short Physical Performance Battery
**TUG** = Timed Up and Go

Sarcopenia

EWGSOP2 algorithm for case-finding

Find-Assess-Confirm-Severity (F-A-C-S)

**FIND CASES**
- SARC-F or clinical suspicion
  - **NEGATIVE** → No sarcopenia; rescreen later
  - **POSITIVE OR PRESENT**

**ASSESS**
- Muscle strength
  - Grip strength, Chair stand test
  - **NORMAL** → No sarcopenia; rescreen later
  - **LOW** → Sarcopenia probable

**CONFIRM**
- Muscle quantity or quality
  - DXA; BIA, CT, MRI
  - **NORMAL**
  - **LOW** → Sarcopenia confirmed

**SEVERITY**
- Physical Performance
  - Gait speed, SPPB, TUG, 400m walk
  - **LOW** → Sarcopenia severe

*In clinical practice, this is enough to trigger assessment of causes and start intervention.*
Sarcopenia and Osteoporosis may coexist

Muscle strength decline with age
- Early life: Maximize peak
- Adult life: Maintain peak
- Older life: Minimize loss

Range of strength in individuals
Threshold of low physical performance
Threshold of disability

Bone mass decline with age
DECREASING BONE MASS WITH AGE IN MEN & WOMEN

Bone growth
MALE PEAK BONE MASS
FEMALE PEAK BONE MASS
Bone loss due to menopause

Normal
Osteoporosis

Sarcopenia and Osteoporosis go hand in hand

In one study 37% of patients with hip fracture had Sarcopenia¹

Development of both osteoporosis and sarcopenia in later life are a common problem encountered as part of musculoskeletal aging²
• Accounts for 1.5 M hospital bed days / year.
• At any one time, patients recovering from hip fracture still occupy over 3,600 hospital beds.
• Average length of stay 20.0 days

Most common cause of serious injury and death following an accident in older people
Most of the deaths reflect high prevalence of comorbidities
Most common reason for older people to need emergency anaesthesia and surgery
509 acute HF patients were included.
Mean age 85.6±6.9 years, 79.2% women

- 20.1% patients had a BMI <22 kg/m².
- 81.2% had protein malnutrition.
- 17.1% patients had both energy and protein malnutrition.
- Serum vitamin D was <30 ng/ml in 93% patients.
- The prevalence of sarcopenia was 17.1%.

Vitamin D deficiency was present in 57.5% (n = 237)
Prevalence of vitamin D insufficiency was 34.5%, with only 8% of patients having normal vitamin D levels.¹⁶
Malnutrition in Older Person

- Weight Loss
  - Low BMI

- Sarcopenia
- Frailty

- Undernutrition
- Malnutrition

- Loss of body part (Amputation)
- Cachexia (inflammation ±Anorexia)

Anorexia (Ageing, medication side effects)
Problems with feeding (Dysphagia, chewing, Dementia)
Problems with meal preparation
Inappropriate calorie restriction
Malabsorption (reduced nutrient bioavailability)
Effect of Vitamin D on muscle strength

25 (OH) D (nmol/L)

- Deficient
  - Inadequate in some people
  - Treatment recommended
    - Treatment advised in certain patients
    - High fracture risk
    - Those at risk of deficiency
  - Reassurance and advice
- Sufficient for most of the population

Adult at risk groups

- People over 65 years of age
  - Thinning of the skin reduces the efficiency of vitamin D synthesis
- People not exposed to a great deal of sunlight
  - Those who cover their skin
  - Housebound or confined indoors for long periods
- People with darker skin
  - People of African, African-Caribbean or South Asian origin
    - (Darker skin pigments interfere with UV light getting to appropriate skin layer)

Oral vitamin D3 is the treatment of choice in vitamin D deficiency.
Comprehensive Geriatric Assessment (CGA) is considered gold standard for frailty assessment and management

1. MEDICAL ASSESSMENT
   1a. Physical Examination
   1b. Medication Review
   1c. Nutrition Assessment
   1d. Bone Health Assessment
   1e. Pain Assessment
2. ASSESSMENT of FUNCTIONING
3. PSYCHOLOGICAL ASSESSMENT
   3a. Cognitive Decline
   3b. Delirium
   3c. Dementia
   3d. Depression
4. SOCIAL ASSESSMENT
5. ENVIRONMENTAL ASSESSMENT
6. ADVANCE CARE PLANNING
7. SPIRITUAL WELLBEING ASSESSMENT
8. SEXUALITY and INTIMACY ASSESSMENT

Muscle Function and Nutritional Status integral part for assessing older people at risk of frailty and sarcopenia
Malnutrition Universal Screening Tool (MUST)  
“MUST do better”

Endorsed by NICE  
Quality standard [QS24]

Challenges in effective use in hospital setting
- Training and Education
- Leadership (and ownership)
- Competing priorities
- High Patient Turnover
- High Staff Turnover

A poorly completed MUST example
A recently admitted man with empyema, prolonged inpatient stay and fall to hip fracture on ward:

Endorsed by NICE  
Quality standard [QS24]
High protein ONS are especially suitable for individuals with wounds, post-operative patients, some types of cancer and the elderly.

**PROTEIN ORAL NUTRITIONAL SUPPLEMENTATION FOR THE ELDERLY AND MALNOURISHED HOSPITAL PATIENT**

White Z (PhD), Kotze V (RD), Erasmus A (RD)
Department Human Nutrition, University of Pretoria

Medical Chronicle October 2016

[Medical Chronicle logo]

www.medicalchronicle.co.za
Established 1965
Effect Of CaHMB, Protein And Vitamin D Supplementation On Post-operative Immobilization In Malnourished Older Adult Patients With Hip Fracture
A Randomized Controlled Study

Intervention Group
Standard Post-Op Nutrition + Specialised ONS* (n=32)

Control Group
Standard Post-Op Nutrition Alone (n=30)

Measurements at Post-Operative Days 15 & 30
- Anthropometric
- Wound-healing
- Immobilization period
- Muscle strength

* 2 x 220 ml servings / day Ensure Plus Advance

Specialized ONS Improved Wound Healing and Mobility in Patients Undergoing Surgery For Hip Fracture


- Increase in # Mobile Patients (15 And 30 Days)
- Increase in Muscle Strength (30 Days)
- Decrease in Wound Healing (30 Days)

<table>
<thead>
<tr>
<th>Mobile patients</th>
<th>Std post-operative nutr</th>
<th>HP-ONS+ Std post-operative nutr</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>10</td>
<td>6.4</td>
<td>16.5</td>
</tr>
<tr>
<td>12</td>
<td>8.6</td>
<td>15.9</td>
</tr>
<tr>
<td>14</td>
<td>14.6</td>
<td></td>
</tr>
</tbody>
</table>

- Increase in Mobile Patients: 3X
- Increase in Muscle Strength: 34.4%
- Decrease in Wound Healing: 8.2%
Effectiveness of Nutritional Supplementation on Sarcopenia and Recovery in Hip Fracture Patients

Elderly patients with hip fracture admitted to rehabilitation therapy

Intervention Group
Standard Diet + 2/day Specialised ONS (n=49)

Control Group
Standard Diet (n=43)


Improved Muscle Mass & Reduced Onset of Sarcopenia in Hip Fracture Patients on Specialised ONS
Nutritional Effect: Increased 90 day survival in hospitalized patients
NOURISH Study (multi-centre, prospective, randomised, placebo controlled, parallel group, double blind)

Intervention Group received nutrient-dense drink (HP-HMB) twice daily, containing:
350 Cal, 20 g protein
11 g fat, 44 g carbohydrate
1.5 g Ca HMB, 160 IU Vitamin D

Higher odds of achieving
1. Better SGA Nutritional Class after 90 days (p=0.009)
2. Day 30 body weight (p=0.035)
3. Serum 25 (OH) D concentration at days 30 and 60 (p=0.035 and p=0.008)
HMB supplementation for 8 weeks + mild training significantly improved muscle strength and performance parameters.

Changes in secondary outcomes (as percentages) from baseline to follow-up by group.

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0141757
Conclusions

Diagnosing Sarcopenia
• Regard as Muscle Disease
• Muscle Strength is key
• New Operational Definition
• Diagnostic Algorithm

Management
• Enhancing Nutrition (especially protein)
• Resistance Exercise
Thank you for listening

Questions

Comments