Helping Older Adults to Stay Independent for Longer

The role of nutrition & exercise in maintaining muscle mass, strength & function pre & post falls & fractures

With an ageing population, strategies that help older adults to maintain their independence for longer are increasingly important. Low muscle mass adversely affects health outcomes and is strongly linked to mobility problems, falls and hip fracture. Good nutrition, particularly adequate protein intake, and regular exercise programmes can help to maintain muscle strength and function to reduce the risk of falls and fractures.

Why muscle mass matters in older people

Skeletal muscle plays a crucial role within the body, helping to maintain physical movement and posture and influencing energy and protein metabolism.[1] The ageing process is associated with a progressive decline in skeletal muscle mass that begins at around 40 years of age. Muscle mass decreases by 8% per decade between 40-70 years of age, increasing to 15% per decade after the age of 70 years.[2, 3] By the age of 60-70 years, between 5-13% of people can be described as having sarcopenia (advanced loss of muscle mass, strength and function), rising to 11-50% in those aged over 80 years.[4, 5]

The causes of loss of muscle mass in older people are complex but anabolic resistance (reduced stimulation of muscle protein synthesis to a given dose of protein/amino acids), illness, malnutrition, reduced levels of physical activity and hospitalisation all play a part.[4] Low muscle mass has been shown to adversely affect health outcomes in chronic obstructive pulmonary disease, cancer and cardiovascular disease, and is associated with an increased rate of falls and fractures.[1, 4] The latter is the focus of this consensus group as falls and fragility fractures are a leading cause of disability and mortality in older adults. They also place a huge burden on the NHS; in England there are 255,000 falls-related emergency hospital admissions every year in those aged 65+ years, with the annual UK cost of fragility fractures estimated at £4.4 billion (with £2 billion attributable to hip fractures).[6]

Maintaining muscle mass, strength and function – best practice consensus

The role of nutrition and exercise in helping to maintain muscle mass, strength and function is now well established and recognised by professional groups, including the European Society for Clinical Nutrition and Metabolism (ESPEN) and the European Geriatric Medicine Society.[4, 7] However, research has shown that these interventions, particularly nutrition, are often overlooked in falls/hip fracture pathways, resulting in patients who are too weak to exercise due to low energy and poor nutritional status. A multi-disciplinary group including specialist dietitians, physicians, nurses and physiotherapists came together to discuss key issues and develop a best practice consensus on this area. This resource (**Figure 1**) has been designed to integrate with existing pathways (e.g. frailty and post fall/fracture pathways) and to provide practical guidance on screening, functional assessment, management strategies involving nutrition and exercise, monitoring and education.

The consensus group was chaired by **Ian Taylor**, Head of Nutrition and Dietetics, University College London Hospitals NHS Trust (UCLH). The other members of the consensus group were: **Deborah Howland**, Specialist Dietitian and Acute Team Leader, Torbay Hospital; **Beverley Marwood**, Senior Physiotherapist, Community Integrated Assessment Team, North Tees and Hartlepool NHS Foundation Trust; **Dr Anuj Patel**, GP, Wentworth Medical Practice, London; **Lesley Roberts**, Integrated Service Manager for End of Life and Admission Avoidance Services, Midlands Partnership NHS Foundation Trust; **Dr Adrian Slee**, Senior Teaching Fellow in Nutrition, University College London; **Dr Sanjay Suman**, Clinical Director Therapies and Older Persons Programme, Medway NHS Foundation Trust, Kent; **Dr Julie Whitney**, Physiotherapist and Academic, Academic Department of Physiotherapy, King's College London.

Figure 1: Best Practice Consensus

1. SCREENING & ASSESSMENT TO IDENTIFY THOSE AT RISK OF FALLS & FRACTURES

We all lose muscle as we age; on average 8% of muscle mass is lost per decade between the ages of 40 & 70, with 15% loss per decade after the age of 70.[2,3] Sarcopenia is the advanced loss of muscle mass & function, compounded by malnutrition, disease & hospitalisation.[8]

Loss of muscle mass is associated with increased rates of falls & fractures.[9] Good nutrition, particularly adequate protein & energy intake, can help manage declines in muscle mass, strength & function.[7] Regular exercise, especially programmes that build strength & challenge balance, can help to prevent falls.[10] The combination of nutrition & exercise is considered optimal for maintaining muscle strength & function to reduce the risk of falls & fractures.[7]

WHO TO SCREEN[11]

- Adults aged over 65 years (one third of people over 65 fall at least once a year, increasing to 50% over the age of 80).[6]
- All patients who have already had a fall. Conduct multi-factorial fall risk assessment on 65+ years with falls/gait/balance impairment. More complex presentations should be referred to falls clinic for evaluation.
- Anyone identified as being at high risk of falling.
- Patients attending the Emergency Department (ED) as a result of a fall.

SCREENING & ASSESSMENT TOOLS

Use screening tools to identify those at risk

- Utilise clinical judgement & simple questions about daily activities, appetite & weight loss as a first step.
- Conduct nutritional screening on a regular basis using the Malnutrition Universal Screening Tool ('MUST') or other locally validated tools.[12]
- Identify frailty in patients aged 65+ years using the electronic Frailty Index if available. Verify the frailty diagnosis using the Clinical Frailty Scale (CFS) or similar validated tool.[13]
- Ask all 65+ years patients whether they have fallen in the last 12 months or experienced any problems associated with balance & walking.[14]
- Consider using the SARC-F to screen for sarcopenia. Self-reported 5 item questionnaire considering Strength, Assistance with walking, Rise from a chair, Climb stairs & Falls.[5]

Assess muscle strength & function at every opportunity in order to identify sarcopenia & monitor any deterioration. Use validated tools & an individualised approach (no single test is appropriate for all patients):

- Timed up & go test (TUG) – time taken to rise from a chair, walk 3m, turn, walk back to the chair & sit down. Demonstrates gait speed, muscle weakness & balance. Time of 12-15 seconds indicates high risk of falls in older people.[11] Time of ≥20 seconds indicates low performance.[5]
- Gait speed test – timed walk over 4m. Validated for falls & sarcopenia. ≤0.8 m/s indicates low performance.[5]
- Sit-to-stand test – 30 second sit-to stand or 5 times sit-to stand. Assesses lower limb function & strength. Time of >15 seconds for 5 rises indicates low strength.[5]
- Hand grip strength. Measure using a dynamometer. Grip strength values of <27 kg in men & <16 kg in women indicate low strength.[5]
- Comprehensive Geriatric Assessment (CGA). Includes physical & mental condition, functions such as mobility & balance, social circumstances & environment.

Useful resources

- https://cks.nice.org.uk/falls-risk-assessment#!scenario
- https://www.england.nhs.uk/wp-content/uploads/2017/03/toolkit-general-practice-frailty-1.pdf

2. MANAGEMENT STRATEGIES TO MAINTAIN MUSCLE MASS & FUNCTION - NUTRITION

PROTEIN & ENERGY

- Patients should have an 'adequate energy intake' as evidenced by weight maintenance (or increase if appropriate).
- Older adults have higher protein requirements due to anabolic resistance & a greater need for protein to help maintain muscle mass & recover from illness including inflammation & infection.[7]
- UK adult Reference Nutrient Intake (RNI) for protein is 0.75 g/kg body weight/day:
  - International groups including ESPEN & PROT-AGE recommend 1.0-1.5 g/kg/day for 65+ years, with up to 2.0 g/kg/day in cases of severe illness, injury or malnutrition.[7,15,16]
  - The BDA Parenteral & Enteral Nutrition Specialist Group (PENG) recommend 1.2-1.5 g/kg/day for 65+ years with acute or chronic illness or complicating medical conditions, with up to 2.0 g/kg/day in severe illness, injury or malnutrition.[17]
- Assess patient's diet to quantify their protein intake:
  - Ask detailed questions to understand what the patient is eating
  - Provide guidance on how to improve protein intake throughout the day
  - Use visual aids to demonstrate good sources of protein plus guidance on portion sizes

VITAMIN D

- Vitamin D has an important role in muscle strength & function as well as bone strength. Vitamin D deficiency is defined as serum 25-hydroxyvitamin D (25[OH]D) levels less than 25 nmol/L.[18]
- Those 'at risk' of vitamin D deficiency include people 65+ years, those who have low or no exposure to the sun (e.g. those who are housebound or in care homes) & people with darker skin.[18]
- All adults, including those at increased risk of vitamin D deficiency, should take a daily supplement of 400 IU of vitamin D.[18]
- If patients have suffered a fracture, check vitamin D status. If symptoms of vitamin D deficiency are reported such as bone or muscle pain, impaired wound healing or difficulty climbing stairs, check vitamin D status.[18]
- A total loading dose of 300,000 IU, administered daily or weekly over 6-10 weeks, should be given to correct vitamin D deficiency, followed by a daily maintenance dose of 800 IU.[18]

HMB

- ß-hydroxy-ß-methylbutyrate (HMB) is a metabolite of the amino acid leucine. It is a potent stimulator of protein synthesis & an inhibitor of protein breakdown.[1]
- HMB has an evidence-based role in the management of sarcopenia & frailty.[1]
- When an oral nutritional supplement (ONS) is indicated, consider those containing HMB to help preserve muscle mass.
- Avoid the use of over the counter HMB tablets as these may vary in terms of dose & quality.

CALCIUM

- Adequate calcium is important for strong bones & muscle function.
- The UK adult RNI for calcium is 700 mg/day. Consider suitable ONS or calcium supplements in older adults as poor dietary intake & reduced absorption may lead to deficiencies.[18]

OTHER NUTRITIONAL APPROACHES

- Ensure older adults have a good variety of foods in their diet. Consider A-Z multivitamin if any concerns.
- Ensure patients are adequately hydrated.
- Omega-3 fats may be considered, although more evidence is required about their role in older people. Good sources of omega-3 include oily fish & some seeds & nuts (e.g. flaxseed & walnuts). Consider potential pollutants & sustainability when making recommendations.

Useful resources

- https://www.bda.uk.com/foodfacts/portionsizesfoodfactsheet.pdf
- https://theros.org.uk/media/2073/vitamin-d-and-bone-health-adults.pdf
- https://cks.nice.org.uk/vitamin-d-deficiency-in-adults-treatment-and-prevention#!scenarioRecommendation:1
- https://www.bda.uk.com/foodfacts/Calcium.pdf
- https://www.bda.uk.com/foodfacts/omega3.pdf

3. MANAGEMENT STRATEGIES TO MAINTAIN MUSCLE MASS & FUNCTION - EXERCISE

- There is strong evidence to show that exercise helps to prevent falls in older people. At least 50 hours of exercise is required for optimal effect on falls prevention or 3 hours exercise per week on an ongoing basis. Programmes should challenge balance & build strength.[10,19]
- An exercise prescription is helpful for older people. Exercise should be tailored to the individual taking into account expectations, preferences, previous exercise experience & locus of control. Fitter older people can follow an exercise plan. Those who are more frail can follow chair-based exercises which may be beneficial in improving muscle strength (although there is no evidence that they prevent falls).
- Using goals to promote participation is recommended. Goals should be person centred, relevant & practical.
- Exercise is not a short term intervention & adherence is essential, with regular ongoing monitoring to assess progress.
- Provide patients with tools & information to allow them to continue to exercise independently.
- A synergistic effect is seen with protein intake & exercise as exercise makes muscle cells more receptive to amino acid-mediated anabolism.[16]

Useful resources
- www.laterlifetraining.co.uk
- https://theros.org.uk/forms/documents/strong-steady-and-straight/
- https://www.nhsinform.scot/healthy-living/preventing-falls

4. ONGOING CLINICAL/FUNCTIONAL MONITORING

- Record patients' weight, strength & function & review regularly to monitor any changes.
- Ongoing monitoring through repeat screening & assessment of muscle function is essential. Triggers for reassessment include:
  - ED attendance
  - Change in medication
  - Change in care (e.g. increase in care needs or move to care home)
  - Referral to social services for care or aids/adaptations
- An individualised approach is needed to ensure best outcomes for patients. This should be completed by a specialist service, but can be commenced on a generic level by other competent healthcare professionals if they identify the need – i.e. chair based exercises or basic functional activity advice, guidance about nutritional needs.
- Adherence is key – check regularly that patients are following evidence-based interventions.
- Encourage self-awareness & self-monitoring amongst patients.
- Follow relevant guidelines where available.[19]

Useful resources
- https://www.nice.org.uk/guidance/CG161
- https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820673/Strength_and_balance_quality_markers_supporting_improvement_through_audit.pdf

5. EDUCATION

PATIENTS & CARERS

- Provide information to patients/carers about sarcopenia & loss of muscle mass & what that means in terms of impact on health outcomes & independence.
- Focus on simple changes & SMART goals that are easy to implement.
- Make patients/carers aware of individual protein requirements & why a high protein diet is important in older adults.
- Educate older adults about good sources of protein & ways to increase protein intake (e.g. lean meat, eggs, dairy products, nuts & nut butters, beans & legumes).
- Communicate the synergistic role of nutrition & exercise.
- Self-awareness & self-management are important factors.
- Flag & utilise existing local/national resources.

MULTIDISCIPLINARY TEAM (MDT)

- Educate all members of the MDT (e.g. from ward hostesses to physicians, social care, allied professionals) about nutrition & exercise & the difference they can make to older adults.
- Develop a directory of local services to ensure all stakeholders are aware of & know how to access available resources.

Useful resources
- https://www.ageing-better.org.uk/sites/default/files/2019-02/Raising-the-bar-on-strength-and-balance_0.pdf
- https://www.iofbonehealth.org/living-sarcopenia
- https://www.rcplondon.ac.uk/projects/falls-and-fragility-fracture-audit-programme-fffap

Summary and conclusions

It is estimated that more than 20% of the UK population will be aged 65 years or over by 2027, and with an ageing population and a finite healthcare budget, the focus on maintaining independence and quality of life for as long as possible has never been greater.[20]

Loss of muscle mass, strength and function are strongly associated with poor health outcomes, including increased falls and fractures. Management strategies that help to maintain muscle mass can really make a difference to patients and should be encouraged from an early stage. Good nutrition, especially adequate intake of protein, energy, calcium and vitamin D, can help to maintain and restore muscle mass and function, even in frail elderly patients. Oral nutritional supplements, particularly those containing ß-hydroxy-ß-methylbutyrate (HMB), a metabolite of the amino acid leucine, have been shown to be beneficial in maintaining muscle mass in malnourished older people.[1] Regular exercise that challenges and improves balance and builds strength can help to prevent falls and the combination of exercise plus appropriate nutrition is considered the gold standard for maintaining muscle strength and function.[7, 10]

Although the impact of sarcopenia is now more widely understood, education is needed for all members of the healthcare team about the role that nutrition and exercise can play in the prevention and management of falls and fractures, and regular screening of patients and recommendation of appropriate interventions should take place at every opportunity. Information should also be provided to older patients and their carers to empower them to make changes that will make a difference to their muscle strength and function and help them to continue to maintain mobility and quality of life for as long as possible.

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