Professional Certificate in Geriatric Nutrition (United Kingdom)

Nutrient Requirements in Older Adults

Protein is a cornerstone of nutrition for older adults because it supports the maintenance of lean body mass and the repair of tissues. In the context of geriatric nutrition the term protein-energy malnutrition (PEM) describes a state where both protein and energy intake are insufficient to meet physiological needs, leading to loss of muscle, weakened immunity, and delayed wound healing. The Recommended Dietary Allowance (RDA) for protein for adults is 0.8 g kg^{-1} body weight per day, but many experts advise a higher intake of 1.0–1.2 g kg^{-1} for older individuals to counteract the age-related decline in muscle protein synthesis, a phenomenon known as anabolic resistance. Practical application includes encouraging the consumption of high-quality protein sources such as eggs, lean meat, dairy, and legumes at each main meal. A typical example might be a breakfast of scrambled eggs with whole-grain toast, providing roughly 20 g of protein, followed by a mid-day meal of grilled chicken salad delivering another 25 g, thereby achieving a cumulative intake that meets the adjusted target.

Protein quality refers to the proportion of essential amino acids (EAAs) present in a protein source relative to human requirements. Terms such as biological value, net protein utilization, and protein digestibility-corrected amino acid score (PDCAAS) are used to evaluate quality. For older adults, the presence of leucine—a branched-chain amino acid that stimulates muscle protein synthesis—is particularly important. Foods rich in leucine include whey protein, soy, and certain dairy products. A practical strategy is to incorporate a leucine-rich supplement (e.g., 2.5 g of whey protein) after resistance exercise to maximize the anabolic response.

Carbohydrates serve as the primary source of energy and are vital for maintaining adequate glucose levels, especially in individuals with compromised appetite. The term glycemic index (GI) describes the rate at which carbohydrate-containing foods raise blood glucose. Low-GI foods such as oats, barley, and most fruits provide a slower, more sustained release of glucose, which can help prevent post-prandial hyperglycemia and support better energy balance. In older adults, the goal is to achieve a carbohydrate intake of 45–65 % of total energy, emphasizing complex carbohydrates and fibre-rich sources. An example of a balanced meal might be a bowl of steel-cut oats topped with berries and a sprinkle of ground flaxseed, delivering both carbohydrate energy and soluble fibre.

Fibre is a subgroup of carbohydrates that resists digestion in the small intestine and confers health benefits in the colon. Two classifications exist: soluble fibre, which forms a gel-like substance and can help modulate blood cholesterol and glucose; and insoluble fibre, which adds bulk to stool and promotes regular bowel movements. Older adults frequently experience constipation, making fibre intake especially relevant. The current recommendation is at least 30 g of fibre per day, achieved through foods such as legumes, whole

grains, fruits, and vegetables. A practical tip is to add a tablespoon of chia seeds to yoghurt, which contributes approximately 5 g of fibre along with omega-3 fatty acids.

Fats are essential for providing energy, supporting cell membrane integrity, and facilitating the absorption of fat-soluble vitamins (A, D, E, K). In geriatric nutrition, the distinction between saturated fatty acids (SFAs) and unsaturated fatty acids (MUFAs and PUFAs) is important. While excessive SFA intake can raise cardiovascular risk, MUFAs (found in olive oil and avocado) and PUFAs (especially omega-3 fatty acids such as EPA and DHA) have anti-inflammatory properties that may protect against age-related chronic diseases. The recommendation is that total fat should supply 20–35 % of total energy, with less than 10 % coming from SFAs. A practical example is using a drizzle of extra-virgin olive oil on roasted vegetables, providing both flavour and a source of MUFA.

Omega-3 fatty acids are a subset of PUFAs that have been linked to improved cognitive function, reduced inflammation, and better cardiovascular health. EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are the most biologically active forms. The European Food Safety Authority (EFSA) suggests an intake of 250 mg EPA + DHA per day for adults, with higher amounts recommended for those with cardiovascular risk factors. Practical application includes consuming fatty fish (e.g., salmon, mackerel) twice per week or using algae-based supplements for vegetarians. For instance, a 150-g serving of baked salmon provides approximately 1 g of EPA + DHA, comfortably exceeding the guideline.

Vitamins are organic micronutrients required in small quantities for enzymatic reactions, immune function, and tissue maintenance. In older adults, particular attention is given to the following vitamins:

- Vitamin D is essential for calcium homeostasis and bone health. Age-related skin changes reduce the capacity to synthesise vitamin D from sunlight, and dietary sources are limited. The UK's National Health Service recommends a daily supplement of 10 µg (400 IU) for adults over 65, though many experts suggest 20 µg (800 IU) to achieve optimal serum 25-hydroxyvitamin D levels (> 50 nmol L^{-1}). Practical strategies include fortified milks, oily fish, and daily supplementation. An example regimen: one 400 IU vitamin D tablet taken with breakfast.
- Vitamin B12 (cobalamin) is crucial for red blood cell formation and neurological function. Atrophic gastritis and reduced gastric acid secretion impair B12 absorption from food, leading to a higher prevalence of deficiency in the elderly. The recommended intake is 2.5 µg per day, but oral supplements of 500 µg are often used to bypass absorption barriers. Practical application includes providing a daily B12 tablet or fortified cereal.
- Folate (vitamin B9) works synergistically with B12 in DNA synthesis and homocysteine metabolism. Folate deficiency can exacerbate cognitive decline. The RDA is 200 µg for adults, but many older adults benefit from a supplement of 400 µg to ensure adequate status. Leafy greens, legumes, and fortified grains are natural sources.
- Vitamin C acts as an antioxidant and supports collagen synthesis. Older adults may have reduced appetite and thus lower intake of fresh fruit and vegetables. The RDA is 80 mg for men and 70 mg for women; a

practical approach is to offer a daily orange or a cup of strawberries, each providing roughly 70 mg of vitamin C.

Minerals are inorganic nutrients that play structural, regulatory, and catalytic roles. Key minerals for older adults include:

- Calcium is fundamental for bone mineralisation. Age-related bone loss increases the risk of fractures, making calcium intake a priority. The UK reference intake is 700 mg per day for adults, but many guidelines advise 1 200 mg for those over 65, especially women. Dairy products, fortified plant milks, and leafy greens are main sources. A practical example: a glass of fortified soy milk (250 ml) provides about 300 mg of calcium.
- Magnesium is involved in over 300 enzymatic reactions, including those governing muscle function and glucose metabolism. The RDA is 300–350 mg for adults. Nuts, seeds, and whole grains are rich in magnesium. A handful of almonds (30 g) supplies roughly 80 mg.
- Potassium helps regulate fluid balance and blood pressure. Older adults often have lower potassium intake due to reduced fruit and vegetable consumption. The recommended intake is 3 500 mg per day. Bananas, potatoes, and tomatoes are convenient sources. A medium banana contains about 400 mg of potassium.
- Sodium intake should be limited to less than 2 300 mg per day to reduce hypertension risk. Processed foods are major contributors. Practical advice includes reading nutrition labels and choosing low-sodium options. Reducing added salt at the table can also help meet the target.

Dietary Reference Intakes (DRIs) are a set of nutrient reference values used to plan and assess diets. The DRI framework includes several specific terms:

- Estimated Average Requirement (EAR) is the intake level estimated to meet the needs of 50 % of a defined population. It is used as a basis for assessing the adequacy of group intakes.
- Recommended Dietary Allowance (RDA) is derived from the EAR and is set to meet the needs of 97–98 % of the population. For example, the RDA for vitamin D in the UK is 10 µg per day.
- Adequate Intake (AI) is used when evidence is insufficient to establish an EAR. An AI for vitamin K is 70 µg for women and 90 µg for men, based on observed intakes.
- Tolerable Upper Intake Level (UL) denotes the maximum daily intake unlikely to cause adverse effects. For vitamin A, the UL is 3 000 µg retinol equivalents.

Understanding these terms enables practitioners to interpret nutrition assessments accurately. For instance, when a dietary survey shows that the mean intake of calcium among a cohort of older adults is 650 mg, it falls below the AI but may still be adequate if the distribution of intakes is skewed. In such cases, the EAR can be applied to determine the proportion of individuals at risk of deficiency.

Energy requirements for older adults are influenced by several factors: basal metabolic rate (BMR), physical

activity level (PAL), thermic effect of food (TEF), and disease-related hypermetabolism. BMR declines with age due to loss of lean mass and hormonal changes, typically decreasing by 2–5 % per decade after the age of 40. PAL is often lower in older adults because of reduced mobility, which can further decrease total energy expenditure (TEE). A practical method to estimate TEE is to multiply BMR by an activity factor (e.g., 1.2 for sedentary, 1.4 for lightly active). For a 70-kg woman with a BMR of 1 300 kcal/day, a sedentary PAL yields a TEE of approximately 1 560 kcal/day. However, if she engages in light resistance training three times per week, the PAL may be adjusted to 1.35, raising the TEE to about 1 755 kcal/day.

Energy density refers to the amount of energy (kilocalories) per gram of food. Foods with high energy density (e.g., desserts, fried foods) provide many calories in small portions, while low-energy-density foods (e.g., fruits, vegetables, broth-based soups) are bulkier but lower in calories. For older adults with reduced appetite, offering energy-dense foods can help meet caloric needs without requiring large volumes. An example is adding a tablespoon of olive oil to a vegetable puree, increasing energy density by roughly 120 kcal.

Nutrient density describes the concentration of essential nutrients relative to the energy content of a food. Nutrient-dense foods provide vitamins, minerals, and quality protein with relatively few calories. In geriatric nutrition, prioritising nutrient-dense foods helps prevent deficiencies while managing weight. Examples include fortified cereals, lean fish, and low-fat dairy.

Nutrition screening tools are employed to identify older adults at risk of malnutrition. Common instruments include the Malnutrition Universal Screening Tool (MUST), the Mini Nutritional Assessment (MNA), and the SARC-F questionnaire for sarcopenia. MUST uses BMI, unintentional weight loss, and acute disease effect to generate a risk score. For example, a resident with a BMI of 20 kg/m^2, a 5 % weight loss over three months, and a recent hospital admission would score as high risk, prompting a comprehensive nutritional intervention. The MNA incorporates dietary intake, mobility, and psychological stress, providing a more detailed assessment. The SARC-F focuses on muscle strength and functional decline, identifying individuals who may benefit from targeted protein and resistance-exercise programs.

Anorexia of ageing describes the decline in appetite and food intake that occurs with advancing age, driven by physiological changes (e.g., diminished taste and smell), psychological factors (e.g., depression), and social circumstances (e.g., isolation). This condition contributes to inadequate energy and nutrient intake. Practical strategies to combat anorexia of ageing include offering smaller, frequent meals; enhancing flavour with herbs and spices; and providing nutrient-dense snacks such as yoghurt with fruit puree.

Sarcopenia is the age-related loss of skeletal muscle mass and function, increasing the risk of falls, frailty, and loss of independence. Diagnostic criteria involve low muscle mass (assessed by bioelectrical impedance analysis or DXA), reduced grip strength, and slowed gait speed. Nutritional management focuses on adequate protein (1.2–1.5 $g\,kg^{-1}$), leucine enrichment, and regular resistance training. For instance, a weekly plan that includes two sessions of chair-based resistance exercises combined with a post-exercise protein

shake (25 g whey protein) can stimulate muscle protein synthesis and attenuate sarcopenic progression.

Frailty is a broader syndrome encompassing weakness, exhaustion, low physical activity, and unintentional weight loss. Frail older adults often have impaired nutrient absorption and higher metabolic demands due to chronic inflammation. The Inflamm-Aging concept highlights that low-grade systemic inflammation contributes to catabolism and nutrient loss. Anti-inflammatory dietary patterns—such as the Mediterranean diet—emphasise fruits, vegetables, whole grains, legumes, nuts, and olive oil, providing antioxidants and polyphenols that may mitigate inflammatory pathways. A practical example is serving a mixed-bean salad with olive-oil dressing and a sprinkle of toasted walnuts, delivering fibre, plant protein, and omega-3 fatty acids.

Food insecurity is the limited or uncertain access to nutritionally adequate foods. It is a growing concern among older adults, particularly those living alone or on fixed incomes. Food insecurity can lead to poor diet quality, micronutrient deficiencies, and increased reliance on inexpensive, energy-dense but nutrient-poor foods. Interventions may involve linking individuals to community meal programs, offering vouchers for fresh produce, and providing nutrition education that emphasises low-cost, nutrient-dense recipes. For example, teaching a simple lentil stew (lentils, carrots, onions, and a modest amount of oil) can supply protein, iron, fibre, and potassium at a low cost.

Polypharmacy—the concurrent use of multiple prescription medications—is common in older adults and can affect nutrient status. Certain drugs interfere with the absorption, metabolism, or excretion of vitamins and minerals. For instance, proton-pump inhibitors reduce gastric acidity, impairing vitamin B12 absorption; thiazide diuretics increase urinary calcium loss; and metformin can lower vitamin B12 levels. A comprehensive medication review is essential to identify potential nutrient-drug interactions. Practical steps include monitoring serum levels of at-risk nutrients, supplementing when deficiencies are identified, and coordinating with prescribing physicians to adjust drug regimens if possible.

Renally adjusted protein recommendations are necessary for older adults with chronic kidney disease (CKD). While higher protein intakes support muscle maintenance, excess protein can increase nitrogenous waste and accelerate renal decline. Guidelines suggest protein intakes of 0.6–0.8 g kg^{-1} for stages 3–4 CKD, with careful monitoring of serum creatinine and urea. In practice, a dietitian might design a meal plan that includes moderate portions of high-quality protein, such as 100 g of baked cod (≈20 g protein) paired with low-potassium vegetables, to balance muscle health and renal load.

Oral nutritional supplements (ONS) are formulated products that provide additional energy, protein, vitamins, and minerals. They are indicated when dietary intake alone cannot meet nutritional targets, often evidenced by a weight loss of >5 % over three months or a low MNA score. Commonly used ONS include high-protein, high-calorie drinks (e.g., 250 kcal, 20 g protein per serving). Practical considerations involve offering the supplement between meals to avoid appetite suppression for regular foods, monitoring tolerance, and adjusting flavor to suit individual preferences. Evidence shows that consistent ONS use can

improve weight status, functional outcomes, and quality of life in frail older adults.

Enteral nutrition (tube feeding) is employed when oral intake is insufficient or unsafe due to dysphagia, neurological disease, or severe frailty. Formulas are tailored to provide specific macronutrient ratios, fibre content, and micronutrient fortification. For example, a polymeric formula delivering 1 kcal ml^{-1} with 20 % protein, 30 % fat, and 50 % carbohydrate may be prescribed at 1 500 ml per day, yielding 1 500 kcal and 75 g of protein. Monitoring includes checking for tube patency, gastrointestinal tolerance, and serum electrolyte levels.

Parenteral nutrition (PN) bypasses the gastrointestinal tract entirely, delivering nutrients intravenously. It is reserved for cases where enteral feeding is contraindicated, such as severe malabsorption or bowel obstruction. PN solutions contain dextrose, amino acids, lipids, electrolytes, trace elements, and vitamins. A typical regimen might provide 25 kcal kg^{-1} per day, with a protein provision of 1.2–1.5 g kg^{-1}. Rigorous aseptic technique and daily metabolic monitoring are essential to prevent complications like infection, hyperglycaemia, or liver dysfunction.

Food fortification enhances the nutrient content of staple foods to address widespread deficiencies. In the UK, common fortifications include adding vitamin D to milk, iodine to salt, and iron to breakfast cereals. For older adults, fortified foods can be a convenient way to improve nutrient intake without altering dietary habits. An example is a bowl of fortified porridge (with added iron and vitamin D) that provides 200 kcal, 8 g protein, and 5 µg vitamin D, contributing to both macro- and micronutrient goals.

Nutrition counselling is a core component of geriatric care, aiming to empower individuals to make informed food choices. Effective counselling incorporates behavioural change techniques such as goal setting, self-monitoring, and motivational interviewing. For instance, a dietitian may work with a resident to set a weekly goal of “add one serving of fruit to breakfast,” and then track compliance using a simple food diary. Over time, the resident may adopt a habit of having a banana with their cereal, thereby increasing fibre and potassium intake.

Meal pattern refers to the distribution of food intake across the day. Research indicates that spreading protein evenly across three main meals maximises muscle protein synthesis in older adults, compared with a skewed pattern where most protein is consumed at dinner. A practical recommendation is to aim for 20–30 g of high-quality protein at each meal. For example, a breakfast of Greek yoghurt with honey (≈15 g protein) can be supplemented with a handful of nuts (≈5 g protein) to reach the target.

Snacking can be strategically used to augment total energy and protein intake without overwhelming the appetite. Nutrient-dense snack options include cheese sticks, boiled eggs, nut butter on whole-grain crackers, or smoothies fortified with whey protein. A 250-ml smoothie made with milk, banana, and a scoop of protein powder can provide 250 kcal and 20 g protein, supporting daily targets.

Hydration is often overlooked in older populations. Age-related reductions in thirst perception, renal

concentrating ability, and fluid intake increase the risk of dehydration, which can impair cognition, renal function, and medication metabolism. The recommendation of 1.5–2 L of fluid per day includes water, tea, coffee, and soups. Practical strategies involve offering a glass of water at each meal and providing a water-infused fruit bowl as a refreshing snack.

Electrolyte balance is critical, especially in individuals on diuretic therapy or with renal impairment. Sodium, potassium, calcium, and magnesium levels must be monitored regularly. For example, a patient on a loop diuretic may require a higher intake of potassium-rich foods to counteract hypokalaemia. A practical approach includes incorporating potassium-rich bananas or orange slices into meals and adjusting diuretic dosage under medical supervision.

Gastro-intestinal changes with ageing include slowed gastric emptying, reduced intestinal motility, and decreased secretion of digestive enzymes. These alterations can affect nutrient absorption, particularly of vitamin B12, calcium, and iron. To mitigate malabsorption, the use of fortified foods, enzyme-enhanced products, or split-dose supplementation can be beneficial. For instance, providing calcium citrate (which does not require an acidic environment for absorption) may improve calcium status in those with hypochlorhydria.

Dental health influences food choices and chewing efficiency. Tooth loss, ill-fitting dentures, and oral pain may lead individuals to avoid hard-textured foods such as raw vegetables, nuts, and meat, thereby reducing intake of fibre, protein, and micronutrients. Practical interventions include offering soft-cooked vegetables, ground meat, or pureed meals, and coordinating with dental services for denture repair or replacement.

Socio-cultural factors shape dietary habits. Traditional food preferences, religious restrictions, and cooking skills affect nutrient intake. Understanding these factors enables dietitians to tailor recommendations that respect cultural identity while meeting nutritional needs. For example, a vegetarian older adult may benefit from fortified plant milks and legume-based dishes to achieve adequate vitamin B12 and iron intake.

Physical activity complements nutrition in preserving muscle mass and functional capacity. Even modest activity, such as walking, chair-based exercises, or gardening, can stimulate muscle protein synthesis when combined with adequate protein intake. A practical program might involve a 10-minute resistance band routine three times per week, followed by a protein-rich snack within 30 minutes to enhance anabolic response.

Weight management in older adults requires a nuanced approach. Unintentional weight loss is associated with higher mortality, while obesity can coexist with sarcopenia (the “obesity-sarcopenia” phenotype) and increase the risk of disability. The goal is to maintain a healthy weight that supports functional independence. Strategies include monitoring weight trends monthly, adjusting energy intake according to changes in activity level, and focusing on body composition rather than weight alone. For example, a slight reduction in calorie density (by swapping a high-fat snack for a fruit-based alternative) while preserving

protein intake can help preserve lean mass without excessive weight gain.

Obesity paradox describes observations where higher body mass index (BMI) in older adults sometimes correlates with better survival outcomes, especially in chronic disease contexts. This paradox underscores the importance of considering functional status, muscle mass, and frailty rather than relying solely on BMI. In practice, clinicians may use tools such as bioelectrical impedance analysis (BIA) to assess body composition and guide nutrition planning.

Comorbidities such as diabetes, cardiovascular disease, and chronic obstructive pulmonary disease (COPD) interact with nutrient requirements. Diabetes management may necessitate carbohydrate counting and glycaemic control, while cardiovascular disease often requires sodium restriction and increased omega-3 intake. COPD patients frequently experience increased energy expenditure due to laboured breathing, necessitating higher caloric intake. Tailoring nutrition plans to each comorbidity ensures comprehensive care. For instance, a diabetic older adult may benefit from a Mediterranean-style diet that provides moderate carbohydrate, high fibre, and healthy fats, reducing glycaemic spikes while delivering essential micronutrients.

Nutrition support pathways are structured processes that guide assessment, intervention, monitoring, and evaluation. They typically begin with a screening tool (e.g., MUST), followed by a detailed assessment using the MNA, and then the development of an individualized care plan. Monitoring includes regular weight checks, dietary intake records, and laboratory tests (e.g., serum albumin, vitamin D). Evaluation assesses outcomes such as weight stability, functional status, and quality of life. Documentation of each step ensures continuity of care across multidisciplinary teams.

Food labeling provides essential information on nutrient content, serving size, and health claims. Older adults may find labels confusing due to small print and technical terminology. Simplified labeling, such as traffic-light colour coding for fat, saturated fat, sugars, and salt, can aid decision-making. Practical advice includes teaching individuals to compare the “per 100 g” values rather than the “per portion” values to avoid under-estimating nutrient intake.

Portion control is especially relevant for older adults who may have reduced appetite but need to meet nutrient needs. Using smaller plates, pre-measured servings, and visual cues (e.g., a palm-size portion of protein) can help maintain appropriate intake without over- or under-eating. For example, serving 100 g of grilled salmon (approximately the size of a deck of cards) provides a balanced portion of protein and omega-3 fatty acids.

Dietary patterns such as the Mediterranean diet, DASH diet, and Nordic diet offer frameworks that incorporate a variety of nutrient-dense foods. The Mediterranean pattern emphasizes olive oil, nuts, fish, fruits, vegetables, and whole grains, aligning with recommendations for cardiovascular health and cognitive preservation. Practical implementation might involve a weekly menu that rotates between grilled fish, lentil

soups, and vegetable-rich pastas, ensuring diversity and nutrient adequacy.

Nutrition-related adverse events can arise from over-supplementation, interactions with medications, or inappropriate feeding methods. Excessive vitamin A intake, for example, can lead to hepatotoxicity, while high calcium supplementation without adequate vitamin D can increase the risk of kidney stones. Regular review of supplement regimens and laboratory monitoring are essential safeguards.

Clinical assessment tools such as the Handgrip Strength Test and Timed Up-and-Go assess functional capacity and can indicate the need for nutritional intervention. Low handgrip strength (Implementation challenges include limited staffing, time constraints, and variability in knowledge among care providers. Addressing these barriers may involve training programmes for care staff, integrating nutrition checklists into electronic health records, and establishing multidisciplinary rounds that include dietitians, physicians, and physiotherapists. For example, a care home could adopt a weekly “nutrition huddle” where the team reviews residents flagged by the MUST, discusses potential interventions, and assigns responsibilities for follow-up.

Research gaps remain regarding optimal protein distribution, the long-term impact of high-dose vitamin D supplementation, and the effectiveness of novel nutraceuticals in preventing cognitive decline. Ongoing studies aim to clarify these areas, and practitioners are encouraged to stay abreast of emerging evidence to refine practice. Participation in clinical audits and quality improvement projects can also generate local data that inform service development.

Policy context in the United Kingdom includes guidance from the National Institute for Health and Care Excellence (NICE) on nutrition support, the Public Health England recommendations on nutrient intake, and the NHS England framework for frailty services. Understanding these policy documents assists practitioners in aligning clinical practice with national standards, securing funding for nutrition programmes, and ensuring compliance with regulatory requirements.

Interprofessional collaboration is essential for delivering comprehensive nutrition care. Dietitians work alongside physicians to adjust medication regimens, with speech-language therapists to address dysphagia, and with occupational therapists to modify eating environments. For instance, a collaborative plan for a resident with dysphagia might involve a speech therapist assessing swallowing safety, a dietitian recommending texture-modified diets, and a nurse ensuring appropriate feeding techniques are used.

Technology integration offers opportunities to enhance nutrition monitoring. Mobile applications can track food intake, remind users to take supplements, and provide educational content. Telehealth consultations enable dietitians to reach homebound older adults, assess dietary habits, and tailor recommendations without the need for travel. An example is a video call where the dietitian reviews a resident’s food diary, suggests modifications, and demonstrates how to prepare a nutrient-dense smoothie.

Personalised nutrition is an emerging concept that considers genetic, metabolic, and lifestyle factors to

tailor dietary advice. While still in early stages for older adults, genotyping for lactase persistence, vitamin D receptor polymorphisms, or APOE status may eventually inform individualized nutrient recommendations. Practical application today involves using simple screening questions to identify specific needs, such as lactose intolerance, and providing alternatives like fortified soy milk.

Outcome measurement includes both clinical and quality-of-life indicators. Clinical outcomes encompass changes in weight, serum albumin, hemoglobin, and bone mineral density. Quality-of-life measures may be captured using validated tools such as the EQ-5D or the WHOQOL-OLD questionnaire. Tracking these outcomes over time allows evaluation of the effectiveness of nutrition interventions and supports continuous improvement.

Case example 1: Mrs. A, an 82-year-old woman living alone, presents with a 4 % weight loss over two months and a MUST score of 2 (high risk). Her dietary recall reveals low protein intake (≈45 g/day) and inadequate calcium (≈600 mg/day). A nutrition plan is developed that includes: (1) a high-protein ONS providing 20 g protein and 150 kcal taken mid-morning; (2) fortified orange juice delivering 10 µg vitamin D; (3) a weekly home-cooked lentil soup enriched with a tablespoon of olive oil for added energy; and (4) a referral to a community meals service for dinner. Follow-up after six weeks shows a 1.5 % weight gain, improved handgrip strength, and increased serum vitamin D levels, demonstrating the impact of targeted nutritional support.

Case example 2: Mr. B, a 78-year-old man with stage 3 chronic kidney disease, type 2 diabetes, and mild cognitive impairment, is assessed using the MNA, which indicates moderate risk of malnutrition. His protein intake is 0.5 g kg^{-1}, insufficient for maintaining muscle mass, yet his renal function limits protein excess. A renal-adjusted diet is prescribed, providing 0.7 g kg^{-1} protein from high-biological-value sources (e.g., egg whites, low-phosphorus cheese) and a carbohydrate distribution of 45 % of total energy with low-glycaemic-index foods. Vitamin D supplementation (800 IU/day) and a potassium-rich fruit snack (banana) are added to address bone health and electrolyte balance. After three months, his serum creatinine remains stable, his HbA1c improves, and his MNA score rises to the low-risk category.

Case example 3: Ms. C, an 85-year-old resident of a care home, experiences dysphagia following a stroke. A speech-language therapist recommends a pureed diet, while the dietitian ensures nutrient adequacy by incorporating nutrient-dense purees: a carrot-and-sweet-potato puree fortified with whey protein isolate (15 g protein per serving), a spinach-and-cheese puree supplying calcium and vitamin A, and a fruit-puree dessert enriched with vitamin D. Regular monitoring of weight, hydration status, and serum albumin confirms maintenance of nutritional status despite the texture modification.

Practical tip: When planning meals for older adults, aim to create a “nutrient package” that combines protein, calcium, vitamin D, and omega-3 fatty acids in a single dish. An example is a baked salmon fillet (protein and omega-3) served on a bed of sautéed kale (calcium) with a drizzle of fortified olive oil (vitamin D). This approach simplifies meal preparation and maximises nutrient synergy.

Key vocabulary summary:
- Protein-energy malnutrition
- Anabolic resistance
- Leucine
- Glycemic index
- Energy density
- Nutrient density
- DRI, EAR, RDA, AI, UL
- Basal metabolic rate
- Physical activity level
- Sarcopenia
- Frailty
- Anorexia of ageing
- Food insecurity
- Polypharmacy
- Renally adjusted protein
- Oral nutritional supplements
- Enteral and parenteral nutrition
- Food fortification