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Managing malnutrition and multimorbidity in primary care: dietary approaches to reduce treatment burden

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There are many health and nutrition implications of suffering from multimorbidity, which is a huge challenge facing health and social services. This review focuses on malnutrition, one of the nutritional consequences of multimorbidity. Malnutrition can result from the impact of chronic conditions and their management (polypharmacy) on appetite and nutritional intake, leading to an inability to meet nutritional requirements from food. Malnutrition (under-nutrition) is prevalent in primary care and costly, the main cause being disease, accentuated by multiple morbidities. Most of the costs arise from the deleterious effects of malnutrition on individual’s function, clinical outcome and recovery leading to a substantially greater burden on treatment and health care resources, costing at least £19.6 billion in England. Routine identification of malnutrition with screening should be part of the management of multimorbidity together with practical, effective ways of treating malnutrition that overcome anorexia where relevant. Nutritional interventions that improve nutritional intake have been shown to significantly reduce mortality in individuals with multimorbidities. In addition to food-based interventions, a more ‘medicalised’ dietary approach using liquid oral nutritional supplements (ONS) can be effective. ONS typically have little impact on appetite, effectively improve energy, protein and micronutrient intakes and may significantly improve functional measures. Reduced treatment burden can result from effective nutritional intervention with improved clinical outcomes (fewer infections, wounds), reducing health care use and costs. With the right investment in nutrition and dietetic resources, appropriate nutritional management plans can be put in place to optimally support the multimorbid patient benefitting the individual and the wider society.

Keywords: Malnutrition: Nutritional support: Multimorbidity

The challenge of multimorbidity

Multimorbidity, the coexistence of two or more long-term medical conditions or diseases⁽¹⁾, is becoming increasingly common in the UK with an estimated prevalence of 27 % of those in primary care, a higher prevalence in women than men (30 % v. 24 %), in those with lower

socioeconomic status and increasing with age (3.8 % in 18–24 y olds to 83 % in those aged 85 y and above)⁽²⁾. There are many health and nutrition implications of suffering from multimorbidity which is often, but not always, observed in older persons. As life expectancy increases and individuals acquire a variety of chronic illnesses, multimorbidity is a huge challenge facing

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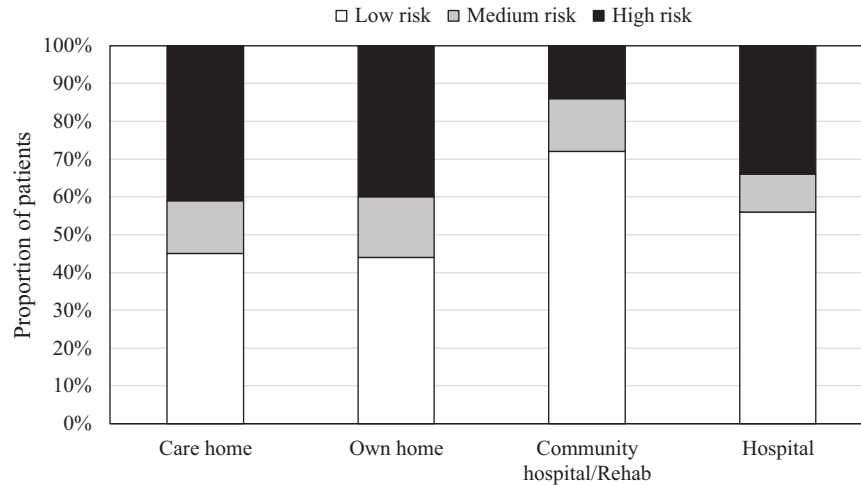


Fig. 1. Malnutrition risk according to setting in the UK

healthcare and social services. This is confirmed in the recent report by the Chief Medical Officer for England⁽³⁾ who highlighted the challenge we face from the ‘inexorable rise of multimorbidity’ and the need for the right resources and skills to manage the complexity of multiple long-term conditions. One of these complexities is the nutritional consequences of multimorbidity which can result in malnutrition and the need for the right skills and resources to deliver effective and appropriate dietary and nutritional care to improve outcomes. As part of the National Institute for Health and Care Excellence (NICE) guidelines (NG56, 2016)⁽⁴⁾ and standard (QS153)⁽⁵⁾ for managing multimorbidity they recommend reviewing non-pharmacological treatments, such as diets (and exercise) to assess likely benefits, harms and outcomes for the individual patient. Furthermore, the WHO Integrated Care of Older People report, which considers the challenges associated with ageing, with multiple conditions and the associated frailty, also refers to malnutrition and the need to consider dietary advice and nutritional interventions when managing the decline in intrinsic capacity in older people⁽⁶⁾. The purpose of this review is to focus on the inter-relationship of malnutrition and multi-morbidity, exploring both the identification and management of malnutrition and the potential for reductions in treatment burden with appropriate nutritional management in primary care.

Inter-relationship of malnutrition and multi-morbidity

Malnutrition can result from the effects of chronic diseases and conditions, the associated symptoms (e.g. breathlessness, gastrointestinal symptoms, pain etc) and management (including the effects of pharmacotherapy and polypharmacy) on appetite and nutritional intake, sometimes resulting in an inability to meet nutritional requirements from food alone^(7,8). In addition to anorexia, individuals may have problems eating (due to dentition, difficulty swallowing etc), weakness and disability limiting shopping, cooking, preparing or eating food and drink, or

psycho-social challenges that impair intake. The ongoing gap between nutritional intake and nutritional requirements for energy, protein and other nutrients, including micronutrients, leads to malnutrition^(7,8). Although in practice the indicators that are used initially to screen for malnutrition can include thinness (low BMI) and unintentional weight loss (that result from inadequate nutritional intake), these indicate risk of malnutrition, as malnutrition per se can encompass physical loss of body tissue, loss of fat mass and loss of muscle mass (sarcopenia), the resulting loss of function (e.g effects on immune system, loss of muscle strength, reduced activity or quality of life etc.) and the poorer outcomes that result from these nutritional deficits⁽⁸⁻¹⁰⁾. In many older individuals with multi-morbidity, frailty is present, a multi-component geriatric syndrome⁽¹¹⁾. Malnutrition, which includes the loss of muscle mass & strength because of nutritional deficits (as opposed to age-related and other causes of sarcopenia), can be one of many contributors to this condition^(11,12).

Unfortunately, malnutrition (undernutrition) remains prevalent in our society despite all the advances and innovations in medical care⁽¹³⁾. A recent survey undertaken by the Malnutrition Action Group of BAPEN using ‘MUST’ showed that malnutrition was common in primary care including in individuals in their own homes (56% at risk) and in care homes (55% at risk) as well as in those in hospital settings (44%) (Fig. 1)⁽¹⁴⁾. The main cause of malnutrition remains disease, accentuated by multiple co-morbidities and in the survey, malnutrition prevalence was highest in individuals with cancer (62%), gastrointestinal conditions (50%), respiratory conditions (48%), frailty (45%) and neurological diseases (43%).

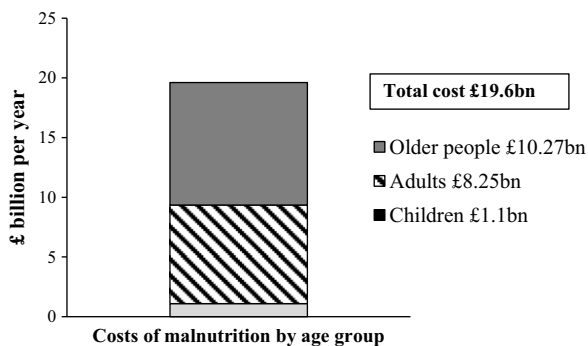
Other research using a secondary analysis of data from the National Diet and Nutrition Survey (NDNS)⁽¹⁵⁾ has indicated the greater prevalence of malnutrition with increasing age⁽¹³⁾, 10.7% aged 65–74y; 14.7% 75–84y; 17.7% > 85 y; overall 13.9% of older people (aged 65 y and over) are at risk of malnutrition in England⁽¹³⁾ within which the higher prevalence of multimorbidities will be a factor. In addition, the same analysis showed geographical inequality with a north-south divide showing a higher

Table 1. Poorer vitamin status with risk of malnutrition in community living elderly individuals (secondary analysis of NDNS⁽¹⁸⁾)

Vitamin	Malnutrition risk						ANOVA <i>P</i> value
	Low (<i>n</i> 856–932*)		Medium (<i>n</i> 66–74*)		High (<i>n</i> 61–68*)		
	Mean	SE	Mean	SE	Mean	SE	
Vitamin A (μmol/l)	2.20	0.22	2.01	0.07	2.07	0.09	0.025
Vitamin C (μmol/l)	41.1	0.81	31.3	3.02	28.4	3.16	0.000
Vitamin D (nmol/l)	52.1	0.86	44.9	2.90	43.1	2.72	0.003
Vitamin E							
α-tocopherol (μmol/l)	36.7	0.38	33.0	1.16	32.8	1.49	0.002
γ-tocopherol (μmol/l)	2.35	0.04	1.98	0.08	2.17	0.15	0.022

Results presented as mean ± SE.

*Number of subjects varies according to vitamin measured.


Fig. 2. Estimated costs of malnutrition in England according to age group

prevalence of malnutrition in older people in the North v. the South of England⁽¹³⁾⁽¹⁶⁾. Similarly, there is a higher prevalence of both multimorbidity and disease-related malnutrition in areas of greater socioeconomic deprivation (using the Index of Multiple Deprivation)^(2,3,16,17). Alongside protein-energy malnutrition in older individuals with multimorbidities, research also indicates low intakes and/or poor status of some key micronutrients (e.g. Table 1)^(7,13,16,18).

With the ongoing high rates of malnutrition, this condition is extremely costly for our society. In England, it is estimated to cost at least ~£19.6 billion (published in 2015) (~£23.5 billion for the UK)⁽¹⁹⁾ (Fig. 2), about 15% of the total expenditure on health and social care. Most of the costs of malnutrition are in health care (£15.27bn), mostly secondary care, with £4.36bn from social care. The health and social care costs are estimated to be 3x greater for a malnourished patient (£7408) than a non-malnourished patient (£2155). Costs of malnutrition are likely to rise in the future as the population ages and multimorbidity grows. Older adults (aged 65 years and over) already account for 52% of the total costs of malnutrition, with the remainder from younger adults (< 65 years) and children (see Fig. 2)^(19,20).

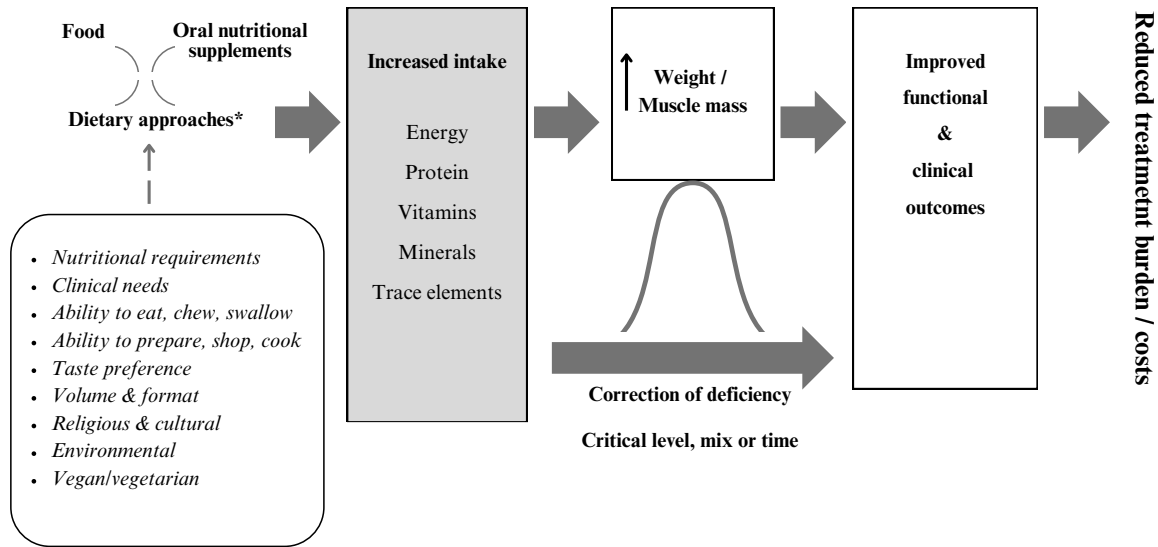
Most of the costs arise due to the deleterious effects of malnutrition on individual's function, clinical outcome and recovery leading to a substantially greater burden on treatment and health care resources. The consequences of untreated malnutrition include physical decline (loss of

muscle mass, impaired growth in infants and children), impaired psychosocial function, functional decline with reduced muscle strength, fatigue and inactivity, reduced quality of life, poorer clinical outcomes (e.g. increased infections, poor wound healing, mortality), and greater health care use (more hospital (re)admissions, longer hospital stays, more general practitioner (GP) and health care professional (HCP) visits, increased prescription costs) (see⁽⁷⁾ for more details). The high costs are not because of expenditure on strategies to manage malnutrition, estimated to be a very small proportion of the overall costs of malnutrition (<2.5%)⁽²⁰⁾. Indeed, some reports still indicate that not only is malnutrition under-identified, but that a significant proportion do not get nutritional support^(14,20–22).

The consequences and costs of malnutrition could be significantly curtailed if malnutrition was prevented or identified and treated earlier and/or more effectively⁽¹⁹⁾. For effective prevention strategies, a far greater awareness is needed in the population about malnutrition, with appropriate public health and government policies and resources in place to tackle the causes early⁽²³⁾. However, the scope of this review is the identification and management of malnutrition in those with multimorbidity rather than prevention.

Identification of risk of malnutrition in multi-morbidity

Effective ways of identifying malnutrition in those with multimorbidity in primary care are needed that are simple, practical and easy to implement and that are linked to an appropriate treatment and action plan. The first step to tackling malnutrition in those with multimorbidity is to undertake routine screening, as NICE CG32⁽²⁴⁾ and QS24⁽²⁵⁾ recommend, incorporating use of a simple, validated nutritional screening tool into pathways of care for multimorbidity where feasible and ethical in individual patients. The Malnutrition Universal Screening Tool 'MUST'^(8,26) can be used by health and social care professionals to screen for malnutrition in all settings in adults (see resources for HCPs to freely use on the BAPEN website and an online 'MUST' calculator (www.bapen.org.uk/screening-and-must/must-calculator)). Other screening



* A variety of dietary approaches from help with cooking, meals on wheels, snacks, diet sheets, counselling, oral nutritional supplements and artificial nutrition support can be complemented with other strategies (exercise, physiotherapy, feeding support, music, social and environmental changes, pharmacotherapy etc.)

Fig. 3. Pathway by which nutritional interventions improve nutritional intake to improve outcomes

tools are available for HCPs to use to screen infants, children and adults (see⁽¹⁰⁾ for more information). The objective measures in 'MUST' were carefully chosen and validated to predict those adults who will benefit from nutritional intervention, whilst keeping the tool simple and fast to complete. Some other screening tools, and assessments that have compared different screening tools, have focussed primarily on a tool's ability to predict outcomes^(10,27). This serves a different purpose, which may or may not relate to an individual's response to nutritional treatment (see⁽¹⁰⁾ for a more detailed review of screening tools and a very recent publication addressing this topic⁽²⁸⁾).

Screening is likely to be needed regularly as an individual with multiple clinical conditions (who also often requires many different medications) means nutritional problems and requirements may frequently change. Re-screening is also important when an individual moves between different health and social care settings and as such using the same tool (like 'MUST') facilitates continuity. Embedding the results of malnutrition screening into GP systems is vitally important, especially in those with multimorbidity, with the aim to ultimately have fully integrated systems to monitor individuals across all health and social care settings.

The results of screening must be linked to an action plan that meets the complex needs of the individual with comorbidities. In some cases, a more detailed nutritional assessment will be needed, especially where multiple conditions mean individualised assessments and treatments are required, with consideration for the requirements of the full spectrum of macro- and micro-nutrients. Dietitians are specifically trained and expert in this area and can also advise many of those with multiple complex conditions identified with malnutrition who will require some form of nutritional support.

There is also a role for empowering both patients with multimorbidity and their carers to take more ownership of their nutrition. A self-screening version of 'MUST' has been developed for patients and carers to use to screen themselves (www.malnutritionselfscreening.org), and this and other resources (e.g. www.malnutritionpathway.co.uk⁽²⁹⁾) provide simple information for patients.

Nutritional management of malnutrition in multi-morbidity

Once identified with screening and assessment as relevant, malnutrition should be managed in a timely, tailored and evidence-based way with an optimal diet, and provision of nutritional support, such as prescription of oral nutritional supplements for those who can be managed orally, and with the use of enteral tube feeding and/or parenteral nutrition where indicated⁽²⁴⁾.

By improving the nutritional intake and status of those with malnutrition associated with multimorbidity, relevant outcomes can be improved and the burden on society reduced (Fig. 3). If nutritional and dietary interventions do not improve nutritional intake, they are unlikely to be effective.

Maximising food intake

In patients at risk of malnutrition, dietary intake should be maximised as much as is feasible in those with multimorbidity and polypharmacy^(30,31). Food-based interventions (snacks, dietetic-led dietary advice) and other ways to encourage food intake (music, physical therapy, socialising etc.) exist that may support those with malnutrition in primary care, subject to the right resources. Both the British

Table 2. Liquid oral nutritional supplements (ONS) effectively improve total energy and protein intakes in older people in primary care

Setting	Energy (kcal/day)		Protein (g/day)	
	Dietary Advice	ONS	Dietary Advice	ONS
Care homes ⁽³⁹⁾	1253	1655 Food 1322 ONS 333	50	62 Food 49 ONS 13
Free living ⁽³⁸⁾	1848	2300 Food 1820 ONS 480	71	89 Food 68 ONS 21

Dietetic Association⁽³²⁾ and the malnutrition pathway⁽²⁹⁾ have further tailored information on maximising dietary intake in those with disease-related malnutrition, although further individualisation is likely in those with multimorbidity. Whilst maximising oral intake from the diet is a crucial first and fundamental step, where its safe and not contra-indicated, the ability of these interventions alone to improve total nutritional intakes enough may be limited by disease or medication-related anorexia. Skilled dietetic resource and expertise is needed in the primary care setting to enable effective nutritional intervention and as highlighted in the recent Chief Medical officers report⁽³⁾, further investment in resources skilled in managing multimorbidity is needed in the future.

Role of oral nutritional support in malnourished, multimorbid individuals

Nutritional intake

A more 'medicalised' dietary approach using liquid oral nutritional supplements in conjunction with maximising the intake of food, can be a useful addition to the toolkit for managing the malnourished person with multiple chronic illnesses in primary care and beyond. A wealth of evidence has shown the value of using oral nutritional supplements, in addition to the diet, improving intake in individuals with a variety of illnesses and diseases^(7,33–37). In RCT, ONS typically have little impact on appetite sensations, adding to rather than replacing food intake, and so effectively improving energy, protein and micronutrient intakes⁽⁷⁾. In comparative trials in older patients, in both care homes and free-living individuals, ready-made liquid ONS improve nutrient intakes to a significantly greater degree than food alone over 12 weeks (e.g.^(38–40) see Table 2). Despite significantly greater energy and protein intakes with liquid ONS in very elderly individuals with multimorbidity in care homes, sensations of hunger were not suppressed (ONS group 38mm, dietary advice group 39mm) and fullness sensations were significantly lower (ONS group 46mm, dietary advice group 60mm), all measured using visual analogue scales^(41,42). New longitudinal research has also highlighted the value of ready-made plant-based medical nutrition to improve intakes of energy, and protein with no suppression of appetite sensations and no reduction in food intake⁽⁴³⁾. Similarly, the total intake of a range of vitamins and minerals was increased, more effectively

enabling individuals to meet dietary reference values (Reference Nutrient Intakes⁽⁴⁴⁾) for 14 micronutrients (v. 7 before intervention), including those often lacking in a plant-based diet⁽⁴³⁾. It may be that supplying energy and nutrient-dense formulations in a liquid may have less effect on appetite than using semi-solid and solid foods⁽⁴⁵⁾. It is important to note that the evidence for the effectiveness of ONS is for liquids in a ready-made (ready-to-drink) format as opposed to powders that have to be reconstituted with a liquid⁽⁴⁶⁾. The reasons for this are more likely to be due to poorer compliance and adherence, due to the larger volumes and the practicalities of reconstituting such formats for those who are sick, with multiple diseases and conditions, and/or the resource pressures of health care professionals in institutions unable to spare the time for preparation and serving. In terms of the value of separate micronutrient supplementation in addition to nutritional support, a recent review suggested there was currently insufficient evidence and further research required⁽⁴⁷⁾.

Functional outcomes

One of the benefits of improving the nutritional intake of malnourished individuals with multimorbidity is the improvements in functional measures that can result. These may depend on an individuals' morbidities, the acute or chronic nature of their conditions, and the type and duration of nutritional support provided. Functional changes can include improved muscle strength, such as skeletal muscle strength^(34,48) or respiratory muscle strength in patients with Chronic Obstructive Pulmonary Disease⁽⁴⁹⁾. Other patient groups may benefit from improvements in mobility, activities of daily living, fewer falls and functional limitations, and improved quality of life^(50–52). Even in very elderly (mean age 88 y) care home residents with multiple morbidities, significant improvements in quality of life have been observed with oral nutritional supplements in a cost-effective way (cost per quality-adjusted life years (QALY) £10 961, with an 83 % probability of a 'cost per QALY ≤ £20 000'^(39,40)).

Treatment burden and costs

Systematic reviews and meta-analyses have also indicated the value of oral nutritional interventions when used in community settings in those with morbidities, reducing

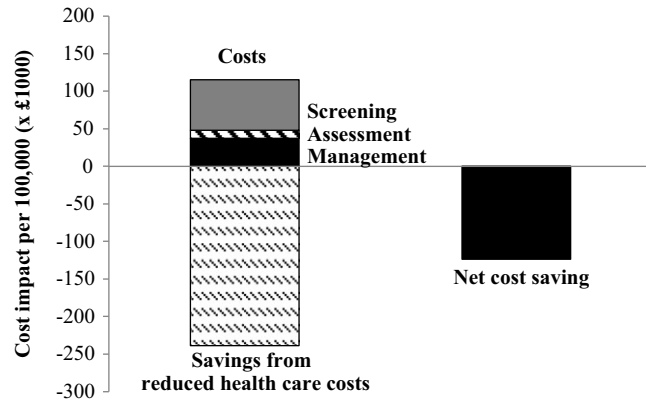


Fig. 4. Cost savings of implementing NICE guidelines for nutrition support in England

treatment burden by improving clinical outcomes (such as fewer infections and wounds) and reducing health care use (e.g. fewer admissions to hospital, fewer GP visits, shorter hospital stays) and costs^(50,51,53). Recently we published a systematic review and meta-analysis showing that improving nutritional intakes with liquid ONS (mean intake 588 kcal and 22 g protein daily) in individuals (mean age 67 (35–87) y) in the community with a variety of morbidities significantly reduced complications, including infections, pressure ulcers and poor wound and fracture healing⁽⁴⁶⁾. Meta-analysis of 39 RCT showed an OR of 0.68 (95% CI 0.59, 0.79), $P < 0.001$; I^2 0.0) and the calculated number needed to treat was 14⁽⁴⁶⁾. Reductions in complications were only seen in those trials in which adherence to ONS was high⁽⁴⁶⁾. Fewer complications, in addition to better functional recovery, can be reasons for the lower health care use associated with nutritional interventions including oral nutritional supplements^(50,51). In addition to fewer health care professional and general practitioner visits in free-living older people⁽³⁸⁾ and shorter hospital stays in acutely ill individuals^(51,54), there have been a variety of analyses showing significant reductions in hospital (re)admissions with the use of oral nutritional supplements^(50,53) and with nutritional support generally^(36,54). Consequently, the use of nutritional support to manage malnourished patients with a variety of morbidities can lead to lower health care costs and economic analyses also show the cost effectiveness of nutritional support^(19,55–57).

To complement RCT, the pragmatic implementation of screening and nutritional support in free-living malnourished individuals with a variety of morbidities has also shown improvements in outcomes and reductions in costs^(58–60). Furthermore, the reduction in treatment burden and health care costs has been nicely evaluated in a complex analysis and detailed publication by Elia *et al.*⁽¹⁹⁾ that assessed the costs and the cost savings of implementing the NICE nutritional guidelines in the population of England (CG32⁽²⁴⁾). As shown in Fig. 4, although there are costs associated with implementing screening and assessment and nutritional management, these are more than offset by the reduced costs associated with fewer hospital readmissions, shorter hospital stays etc. The calculated net cost saving was £123 530 per 100 000 population

leading to an estimated net saving of £65M in England alone (see⁽²⁰⁾ for a summary).

Mortality

Research has highlighted the benefits of interventions to improve nutritional intake showing lower mortality in individuals with a wide variety of morbidities (focussed on individuals in acute settings)^(36,52,54,61–63). Wong *et al.* 2023⁽⁶³⁾ recently published an umbrella review and meta-analysis showing that interventions to improve oral intake (including ONS, dietary intake, exercise etc) reduced mortality at 30 d (RR 0.72 (95% CI 0.55, 0.94), 15 RCT (n 4156)), and at 6 months (RR 0.81 (95% CI 0.71, 0.92)) and one year (RR 0.80 (95% CI 0.67, 0.95); 27 RCT (n 6387)) compared to placebo/standard care. In polymorbid patients, a systematic review and meta-analysis of 27 trials indicated significantly lower rates of mortality in patients receiving nutritional support whilst acutely ill in hospital (OR, 0.73; 95% CI 0.56, 0.97)⁽³⁶⁾, with a similar 30% reduction shown in a more recent larger review of a broader patient group⁽³⁷⁾. In the 2019 systematic review of patients with polymorbidity, the sensitivity analyses suggested a more pronounced reduction in risk of mortality in those patients with established malnutrition, in those with greater adherence and in more recent trials⁽³⁶⁾. This review paper indicated the importance of interventions continuing outside of the hospital when patients with polymorbidity have returned home and when benefits can still be evident. Indeed, in malnourished patients given post-discharge nutritional support as outpatients, significantly lower mortality was found from a meta-analysis of 14 RCTs⁽³⁷⁾.

Guidelines

With the rise in the prevalence of individuals with multi-morbidities, particularly in primary care, specific guidelines on nutrition to inform treatment protocols will be needed. There is very little mention of nutrition and diet in the NICE guidelines for multimorbidity⁽⁴⁾, although the NICE nutritional support guidelines (CG32) are a good reference document⁽²⁴⁾. An excellent set of nutritional guidelines has been developed for hospitalised patients with polymorbidity (multimorbidity) by ESPEN⁽⁶⁴⁾. There are 32 practical recommendations to guide clinicians in treating polymorbid inpatients that cover screening, assessment, calculation of nutritional requirements, monitoring and interventions. They highlight the importance of individualisation of nutritional therapy due to the complexities of managing multiple diseases and conditions, the critical need for community-based approaches for those at nutritional risk and more research in primary care to inform the creation of more tailored guidelines for community nutritional support for this growing group of patients. Undoubtedly, in addition, greater allocation of resources to facilitate appropriate and effective nutritional management of individuals with multi-morbidity will need to accompany the implementation in practice of the optimal guidelines for managing malnutrition now and in the future.

Summary

In summary, there are many nutritional challenges arising from the growing population of individuals with multimorbidity in our society. One of the key challenges is disease-related malnutrition, a prevalent and costly condition that is underdetected and undertreated. Greater awareness and prompt identification of malnutrition by health and social care professionals, or patients and carers themselves is important. Nutrition and dietetic expertise and resources plus the use of a variety of medical nutrition interventions in the treatment 'toolkit' need to be embedded into the care of individuals with multimorbidity in primary care as well as when admitted into hospitals. Making sure the right training, expertise and resources are allocated to managing multimorbidity, including the nutritional aspects in the community, will be key for the future ageing society. There is a wealth of evidence to support the use of nutritional intervention to manage malnutrition across many different patient groups, diseases and settings, with benefits nutritionally, functionally, clinically and economically with reduced treatment burden. However, there is a need to strengthen the data and guidelines specifically for managing multimorbidity, particularly in community settings and to further empower patients and care-givers, where appropriate, about nutrition. Subsequently, with the right investment in nutrition and dietetic services in primary care, an appropriate nutritional management plan can be put in place to optimally support the multimorbid patient in order to benefit the individual themselves, and the wider society.

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Competing interests

R J Stratton is also employed by Danone Specialised Nutrition.

References

- Wallace E, Salisbury C, Guthrie B *et al.* (2015) Managing patients with multimorbidity in primary care. *BMJ* **350**, h176.
- Cassell A, Edwards D, Harshfield A *et al.* (2018) The epidemiology of multimorbidity in primary care: a retrospective cohort study. *The British J Gen Pract* **68**, e245–e251.

- Whitty C (2023) *Chief Medical Officer's Annual Report 2023 Health in an Ageing Society*. London: Department of Health & Social Care.
- National Institute for Health and Care Excellence (NICE) (2016) *Multimorbidity: Clinical Assessment and Management. NICE Guideline [NG56]*. London: National Institute of Health and Care Excellence.
- National Institute for Health and Care Excellence (NICE) (2017) *Multimorbidity. QUALITY Standard [QS153]*. London: National Institute of Health and Care Excellence (NICE).
- World Health Organisation (2017) *Integrated Care for Older People. Guidelines on Community-Level Interventions to Manage Declines in Intrinsic Capacity*. Geneva: World Health Organisation.
- Stratton RJ, Green CJ & Elia M (2003) *Disease-Related Malnutrition: An Evidence Based Approach to Treatment*. Oxford: CABI Publishing.
- Elia M (2003) *Screening for Malnutrition: a Multidisciplinary Responsibility. Development and use of the Malnutrition Universal Screening Tool ('MUST') for adults. A report by the Malnutrition Advisory Group of the British Association for Parenteral and Enteral Nutrition*. Redditch, UK: BAPEN.
- Elia M (2000) *Guidelines for Detection and Management of Malnutrition*. Maidenhead: Malnutrition Advisory Group (MAG), Standing Committee of BAPEN.
- Elia M & Stratton RJ (2012) An analytic appraisal of nutrition screening tools supported by original data with particular reference to age. *Nutrition (Burbank, Los Angeles County, Calif)* **28**, 477–494.
- Fried LP, Tangen CM, Walston J *et al.* (2001) Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci* **56**, M146–156.
- British Geriatrics Society (2017) *Fit for Frailty. Consensus best Practice Guidance for the Care of Older People Living in Community and Outpatient Settings*. London: British Geriatrics Society
- Elia M & Stratton RJ (2005) Geographical inequalities in nutrient status and risk of malnutrition among English people aged 65 years and over. *Nutrition (Burbank, Los Angeles County, Calif)* **21**, 1100–1106.
- Stratton RJ, Cawood AL, Anderson L *et al.* (2023) *Malnutrition and Nutritional Care Survey in Adults. Malnutrition Action Group*. Letchworth: British Association for Parenteral and Enteral Nutrition.
- Finch S, Doyle W, Lowe C *et al.* (1998) *National Diet and Nutrition Survey: People Aged 65 Years and Over, 1: Report of the Diet and Nutrition Survey*. London: The Stationary Office.
- Stratton RJ (2007) Malnutrition: another health inequality? *Proc Nut Soc* **66**, 522–529.
- Stratton RJ & Elia M (2006) Deprivation linked to malnutrition risk and mortality in hospital. *Br J Nutrition* **96**, 870–876.
- Elia M & Stratton RJ (2005) Poorer vitamin status in the elderly at risk of malnutrition using the 'malnutrition universal screening tool'? *Proc Nut Soc* **64**, 15A.
- Elia M (2015) *The cost of Malnutrition in England and Potential Cost Savings from Nutritional Interventions. A Report from the Malnutrition Action Group of BAPEN and the National Institute for Health Research Southampton Biomedical Research Centre*. Redditch, UK.: BAPEN.
- Stratton RJ, Smith T, Gabe S (2018) *Managing Malnutrition to Improve Lives and Save Money*. Redditch, UK.: BAPEN.
- Stratton RJ (2022) *Survey of Malnutrition and Nutritional Care in Adults. UK Malnutrition Awareness Week, October*

2021. *Malnutrition Action Group Report*. Redditch: British Association for Parenteral and Enteral Nutrition.
22. Stratton RJ, Beggs E, Holmes E *et al.* (2021) *Survey of Malnutrition and Nutritional Care in Adults*. UK Malnutrition Awareness Week, October 2020. *Malnutrition Action Group Report*. Redditch: British Association for Parenteral and Enteral Nutrition.
 23. NHS England (2015) *Commissioning Excellent Nutrition and Hydration*. Leeds: NHS England.
 24. National Institute for Health and Clinical Excellence (NICE) (2006) *Nutrition Support in Adults: Oral Nutrition Support, Enteral Tube Feeding and Parenteral Nutrition (Clinical Guideline 32)*. London: National Institute for Health and Clinical Excellence (NICE).
 25. National Institute for Health and Clinical Excellence (NICE) (2012) *Quality Standard for Nutrition Support in Adults. NICE Quality Standard 24*. London: National Institute for Health and Clinical Excellence (NICE).
 26. Todorovic V, Russell C, Stratton R *et al.* (2003) *The 'MUST' Explanatory Booklet. A Guide to the 'Malnutrition Universal Screening Tool' (MUST) for adults. A Report by the Malnutrition Advisory Group (BAPEN)*. Redditch: BAPEN.
 27. Elia M & Stratton RJ (2011) Considerations for screening tool selection and role of predictive and concurrent validity. *Curr Opin Clin Nutr Metab Care* **14**, 425–433.
 28. Wunderle C, Siegenthaler J, Seres D *et al.* (2024) Adaptation of nutritional risk screening tools may better predict response to nutritional treatment. A secondary analysis of the randomized controlled trial EFFORT. *Am J Clin Nutr* **119**, 800–808.
 29. Managing Adult Malnutrition in the community (2021). <https://www.malnutritionpathway.co.uk/> (accessed 4 January 2024).
 30. Stratton RJ (2005) Should food or supplements be used in the community for the treatment of disease-related malnutrition? *Proc Nut Soc* **64**, 325–333.
 31. Cawood AL (2014) Oral nutritional support. In *Manual of Dietetic Practice* [J Gandy, editor]. Oxford: Wiley-Blackwell.
 32. British Dietetic Association (BDA) (2023) *Eating, Drinking and Ageing Well*. Birmingham: British Dietetic Association.
 33. Hubbard GP, Elia M, Holdaway A *et al.* (2012) A systematic review of compliance to oral nutritional supplements. *Clin Nutr* **31**, 293–312.
 34. Cawood AL, Elia M & Stratton RJ (2012) Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. *Ageing Res Rev* **11**, 278–296.
 35. Collins PF, Stratton RJ & Elia M (2012) Nutritional support in chronic obstructive pulmonary disease. *Am J Clin Nutr* **95**, 1385–1395.
 36. Gomes F, Baumgartner A, Bounoure L *et al.* (2019) Association of nutritional support with clinical outcomes among medical inpatients who are malnourished or at nutritional risk: an updated systematic review and meta-analysis. *JAMA Netw Open* **2**, e1915138.
 37. Kaegi-Braun N, Kilchoer F, Dragusha S *et al.* (2022) Nutritional support after hospital discharge improves long-term mortality in malnourished adult medical patients: systematic review and meta-analysis. *Clin Nutr* **41**, 2431–2441.
 38. Smith TR, Cawood AL, Walters ER *et al.* (2020) Ready-made oral nutritional supplements improve nutritional outcomes and reduce health care use—a randomised trial in older malnourished people in primary care. *Nutrients* **12**, 517.
 39. Parsons EL, Stratton RJ, Cawood AL *et al.* (2017) Oral nutritional supplements in a randomised trial are more effective than dietary advice at improving quality of life in malnourished care home residents. *Clin Nutr* **36**, 134–142.
 40. Elia M, Parsons EL, Cawood AL *et al.* (2018) Cost-effectiveness of oral nutritional supplements in older MALNOURISHED care home residents. *Clin Nutr* **37**, 651–658.
 41. Blundell JE (1979) Hunger, appetite and satiety—constructs in search of identities. In *Nutrition and Lifestyles* [M Turner, editor]. London: Applied Science Publishers.
 42. Stubbs RJ, Hughes DA, Johnstone AM *et al.* (2000) The use of visual analogue scales to assess motivation to eat in human subjects: a review of their reliability and validity with an evaluation of new hand-held computerized systems for temporal tracking of appetite ratings. *British J Nutr* **84**, 405–415.
 43. Delsoglio M, Griffen C, Syed R *et al.* (2023) A multi-center prospective study of plant-based nutritional support in adult community-based patients at risk of disease-related malnutrition. *Front Nutr* **10**, 1297624.
 44. Department of Health (1991) *Report on Health and Social Subjects 41. Dietary Reference Values for Food Energy and nutrients for the United Kingdom*. London: HMSO.
 45. Leidy HJ, Apolzan JW, Mattes RD *et al.* (2010) Food form and portion size affect postprandial appetite sensations and hormonal responses in healthy, nonobese, older adults. *Obesity (Silver Spring)* **18**, 293–299.
 46. Cawood AL, Burden ST, Smith T *et al.* (2023) A systematic review and meta-analysis of the effects of community use of oral nutritional supplements on clinical outcomes. *Ageing Res Rev* **88**, 101953.
 47. Kaegi-Braun N, Germann S, Faessli M *et al.* (2022) Effect of micronutrient supplementation in addition to nutritional therapy on clinical outcomes of medical inpatients: results of an updated systematic review and meta-analysis. *Eur J Clin Nutr* **76**, 964–972.
 48. Cereda E, Pisati R, Rondanelli M *et al.* (2022) Whey protein, leucine- and vitamin-D-enriched oral nutritional supplementation for the treatment of sarcopenia. *Nutrients* **14**, 1524.
 49. Collins PF, Elia M & Stratton RJ (2013) Nutritional support and functional capacity in chronic obstructive pulmonary disease: a systematic review and meta-analysis. *Respirology (Carlton, Vic)* **18**, 616–629.
 50. Elia M, Normand C, Laviano A *et al.* (2016) A systematic review of the cost and cost effectiveness of using standard oral nutritional supplements in community and care home settings. *Clin Nutr* **35**, 125–137.
 51. Elia M, Normand C, Norman K *et al.* (2016) A systematic review of the cost and cost effectiveness of using standard oral nutritional supplements in the hospital setting. *Clin Nutr* **35**, 370–380.
 52. Stratton RJ & Elia M (2010) Encouraging appropriate, evidence-based use of oral nutritional supplements. *Proc Nut Soc* **69**, 477–487.
 53. Stratton RJ, Hebuterne X & Elia M (2013) A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. *Ageing Res Rev* **12**, 884–897.
 54. Kaegi-Braun N, Faessli M, Kilchoer F *et al.* (2021) Nutritional trials using high protein strategies and long duration of support show strongest clinical effects on mortality: results of an updated systematic review and meta-analysis. *Clin Nutr ESPEN* **45**, 45–54.
 55. Schuetz P, Sulo S, Walzer S *et al.* (2022) Economic evaluation of individualized nutritional support for hospitalized patients with chronic heart failure. *Nutrients* **14**, 1703.



56. Elia M & Stratton RJ (2008) A cost-utility analysis in patients receiving enteral tube feeding at home and in nursing homes. *Clin Nutr* **27**, 416–423.
57. Elia M, Stratton RJ, Russell C *et al.* (2005) *The Cost of Disease-Related Malnutrition in the UK and Economic Considerations for the Use of Oral Nutritional Supplements (ONS) in Adults*. Redditch: BAPEN.
58. Brown F, Fry G, Cawood A *et al.* (2020) Economic impact of implementing malnutrition screening and nutritional management in older adults in general practice. *J Nutr, Health Aging* **24**, 305–311.
59. Cawood A, Kominek N, Janik L *et al.* (2017) Local implementation of a pathway to manage malnourished COPD patients in the community. *Eur Resp J* **50**, PA1609.
60. Cawood AL, Smith A, Pickles S *et al.* (2009) Effectiveness of implementing MUST into care homes within Peterborough Primary Care Trust England. *Clin Nutr* **4**, 81.
61. Stratton RJ & Elia M (2007) A review of reviews: a new look at the evidence for oral nutritional supplements in clinical practice. *Clin Nutr* **26**, 5–23.
62. Kaegi-Braun N, Schuetz P, Mueller B *et al.* (2020) Association of nutritional support with clinical outcomes in malnourished cancer patients: a population-based matched cohort study. *Front Nutr* **7**, 603370.
63. Wong A, Huang Y, Sowa PM *et al.* (2023) An umbrella review and meta-analysis of interventions, excluding enteral and parenteral nutrition, initiated in the hospital for adults with or at risk of malnutrition. *Am J Clin Nutr* **118**, 672–696.
64. Wunderle C, Gomes F, Schuetz P *et al.* (2024) ESPEN practical guideline: nutritional support for polymorbid medical inpatients. *Clin Nutr* **43**, 674–691.