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ESPEN Guideline

ESPEN guideline on clinical nutrition and hydration in geriatrics

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SUMMARY

Background: Malnutrition and dehydration are widespread in older people, and obesity is an increasing problem. In clinical practice, it is often unclear which strategies are suitable and effective in counteracting these key health threats.
Aim: To provide evidence-based recommendations for clinical nutrition and hydration in older persons in order to prevent and/or treat malnutrition and dehydration. Further, to address whether weight-reducing interventions are appropriate for overweight or obese older persons.
Methods: This guideline was developed according to the standard operating procedure for ESPEN guidelines and consensus papers. A systematic literature search for systematic reviews and primary studies was performed based on 33 clinical questions in PICO format. Existing evidence was graded according to the SIGN grading system. Recommendations were developed and agreed in a multistage consensus process.
Results: We provide eighty-two evidence-based recommendations for nutritional care in older persons, covering four main topics: Basic questions and general principles, recommendations for older persons with malnutrition or at risk of malnutrition, recommendations for older patients with specific diseases, and recommendations to prevent, identify and treat dehydration. Overall, we recommend that all older persons shall routinely be screened for malnutrition in order to identify an existing risk early. Oral nutrition can be supported by nursing interventions, education, nutritional counseling, food modification and oral nutritional supplements. Enteral nutrition should be initiated if oral, and parenteral if enteral nutrition is insufficient or impossible and the general prognosis is altogether favorable. Dietary restrictions should generally be avoided, and weight-reducing diets shall only be considered in obese older persons with weight-related health problems and combined with physical exercise. All older persons should be considered to be at risk of low-intake dehydration and encouraged to consume adequate

Abbreviations: ADL, activities of daily living; BM, biomedical endpoint; EN, enteral nutrition; GPP, good practice point; MoW, meals on wheels; ONS, oral nutritional supplements; PC, patient-centered endpoint; PICO, population of interest, interventions, comparisons, outcomes; PN, parenteral nutrition; RCT, randomized controlled trial; SLR, systematic literature review.

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amounts of drinks. Generally, interventions shall be individualized, comprehensive and part of a multimodal and multidisciplinary team approach.

Conclusion: A range of effective interventions is available to support adequate nutrition and hydration in older persons in order to maintain or improve nutritional status and improve clinical course and quality of life. These interventions should be implemented in clinical practice and routinely used.

1. Introduction

1.1. Particularities of older persons

An older person is usually defined as a person aged 65 years or older. A geriatric patient is not specifically age-defined but rather characterized by a high degree of frailty and multiple active diseases which becomes more common in the age group above 80 years [1]. As a consequence of acute and/or chronic disease in combination with age-related degenerative changes, limitations in physical, mental and/or social functions occur. The ability to perform the basic activities of daily living independently is jeopardized or lost. The person is in increased need of rehabilitative, physical, psychological and social care and requires a holistic approach to avoid partial or complete loss of independence [1].

It is the main aim of geriatric medicine to optimize functional status of the older person and, thus, to ensure greatest possible autonomy and best possible quality of life [1]. A reduced adaptive and regenerative capacity, however, and thus, reduced capacity for rehabilitation is characteristic of older patients, making it more difficult to return the patient to an unrestricted or to his/her previous condition.

One of the most meaningful geriatric syndromes is sarcopenia, characterized by a disproportionate loss of muscle mass and strength that is accompanied by a decline in physical activity, functionality and performance. An excessive loss of muscle mass and strength results in physical impairment, frailty, disability and dependence from others. Sarcopenia also impairs the metabolic adaptation to stress and disease [2]. Despite large overlap with sarcopenia, frailty represents a distinct clinical syndrome, characterized by an increased vulnerability to stress as a consequence of cumulative decline in many physiological systems during aging. Frailty is associated with an increased risk of adverse health outcomes and estimated to affect about 25% of persons aged 85 years or older [3,4].

1.2. Nutritional challenges in older persons

Nutrition is an important modulator of health and well-being in older persons. Inadequate nutrition contributes to the progression of many diseases, and is also regarded as one important contributing factor in the complex etiology of sarcopenia and frailty [2,3,5].

Due to many factors, nutritional intake is often compromised in older persons and the risk of ***malnutrition*** is increased. Anorexia of aging is crucial in this context. Particularly in case of acute and chronic illness nutritional problems are widespread, and a reduced dietary intake in combination with effects of catabolic disease rapidly leads to malnutrition [5,6]. A close relation between malnutrition and poor outcome, e.g. increased rates of infections and pressure ulcers, increased length of hospital stay, increased duration of convalescence after acute illness as well as increased mortality, is well documented also in older persons [6]. Regarding the definition of malnutrition we refer to the ESPEN consensus [7] and terminology [8]. Within this framework, for older persons the presence of either a striking unintended loss of body mass (>5% in six months or >10% beyond six months) or a markedly reduced body mass (i.e. BMI <20 kg/m^2) or muscle mass should be regarded as serious signs of malnutrition needing clarification of the underlying causes. For the diagnosis of malnutrition the recent global consensus approach (GLIM) advocates the combination of at least one phenotype criterion (i.e. non-volitional weight loss, low BMI or reduced muscle mass) and one etiology criterion (i.e. reduced food intake/malabsorption or severe disease with inflammation) [9]. Older persons are at risk of malnutrition if oral intake is markedly reduced (e.g. below 50% of requirements for more than three days) or if risk factors, which either may reduce dietary intake or increase requirements (e.g. acute disease, neuropsychological problems, immobility, chewing problems, swallowing problems), are present. The prevalence of malnutrition generally increases with deteriorating functional and health status. Reported prevalence rates greatly depend on the definition used, but are generally below 10% in independently living older persons and increase up to two thirds of older patients in acute care and rehabilitation hospitals [10,11].

Besides malnutrition, older persons are at increased risk of ***dehydration*** for various reasons with serious health consequences [12,13]. Prevalence rates are also low in community-dwelling older persons but increase to more than one third in more frail and vulnerable older adults and in those in need of care [14].

On the other hand, like in the general population, ***obesity*** with its well-known negative health consequences is an increasing problem also in older people, currently affecting between 18 and 30% of the worldwide population aged 65 years and older [15,16].

Thus, supporting adequate nutrition including adequate amounts of food and fluid to prevent and treat malnutrition and dehydration as well as obesity is an important public health concern.

1.3. Ethical aspects regarding nutritional interventions in older persons

Oral nutrition does not only provide nutrients, but has significant psychological and social functions, enables sensation of taste and flavor and is an important mediator of pleasure and well-being. Therefore, oral options of nutrition should always be the first choice, also in situations where nutritional interventions, i.e. assisted feeding, are difficult, time-consuming and demanding due to advanced morbidity and slow responses.

In all cases, respecting the patient's will and preferences is of utmost priority.

For further details regarding ethical aspects of nutritional interventions we refer to the ESPEN guideline on ethical aspects of artificial nutrition and hydration [17].

2. Aims

The present guideline aims to provide evidence-based recommendations for clinical nutrition and hydration in older persons in order to prevent and/or treat malnutrition and dehydration as far as possible. Furthermore, the question if weight-reducing

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interventions are appropriate for overweight or obese older persons is addressed.

The aim of clinical nutrition in older persons is first and foremost to provide adequate amounts of energy, protein, micronutrients and fluid in order to meet nutritional requirements and thus to maintain or improve nutritional status. Thereby, maintenance or improvement of function, activity, capacity for rehabilitation and quality of life, support of independence and a reduction of morbidity and mortality is intended. These therapeutic aims do not generally differ from those in younger patients except in emphasis. While reducing morbidity and mortality is a priority in younger patients, in geriatric patients maintenance or improvement of function and quality of life is often the most important aim.

This guideline is intended to be used by all health care providers involved in geriatric care, e.g. medical doctors, nursing staff, nutrition professionals and therapists but also welfare workers and informal caregivers. Geriatric care takes place in different health care settings, i.e. acute care, rehabilitation and long-term care institutions but also in ambulatory settings and private households. Unless otherwise stated, the recommendations of this guideline apply to all settings since no fundamental differences in nutritional therapy are known.

3. Methods

The present guideline was developed according to the standard operating procedure for ESPEN guidelines and consensus papers [18]. It is based on the German guideline "Clinical Nutrition in Geriatrics" [19] which was further developed and extended by a group of 13 experts (eight geriatricians and five nutrition scientists/dietitians) from nine European countries, who are all the authors of this guideline.

3.1. PICO questions

Based on the standard operating procedures for ESPEN guidelines and consensus papers, the first step of the guideline development was the formulation of so-called PICO questions which address specific **p**atient groups or **p**roblems, **i**nterventions, **c**ompare different therapies and are **o**utcome-related [18].

The development of PICO questions was guided by the question which interventions are effective to treat malnutrition in older persons and to prevent malnutrition in older persons at risk of malnutrition. In an initial two-day meeting of the guideline working group in April 2016, the PICO questions were created as described in Table 1. We further aimed to clarify if older persons with specific common geriatric health problems (i.e. hip fracture and orthopedic surgery, delirium, depression, pressure ulcers) benefit from specific nutritional interventions and if older persons with diabetes mellitus, overweight or obesity should be advised to follow a specific diet. Besides malnutrition the topic of dehydration turned out to be of significant interest. Moreover, three basic questions regarding energy and nutrient requirements and general principles of nutritional care were found to be important and were added without systematic literature search.

In total, 33 PICO questions were created, which were finally split into four main chapters – "Basic questions and general principles", "Recommendations for older persons with malnutrition or at risk of malnutrition", "Recommendations for older patients with specific diseases", and "Recommendations to prevent, identify and treat dehydration". Fourteen tandems of one responsible person and one supporting person were formed each working on one of 14 subchapters of these guideline topics and related PICO questions. These persons were responsible for identification of relevant papers (based on lists of potentially relevant articles derived from the literature search), evaluation, quality assessment and assignment of evidence level for relevant papers (using SIGN checklists) and generation of a first draft of recommendations. They also prepared the supporting text explaining and substantiating the recommendations.

In a second two-day meeting in April 2017, recommendations were discussed and agreement achieved within the working group. 83 recommendations were formulated.

Table 1
Definition of population, interventions, comparators and outcomes (PICO).

Population
- Mean age 65+ years
- With malnutrition or at risk of malnutrition
- In all health care and social care settings
  - Community, outpatient, home-care
  - Nursing home, care homes, long-term care
  - Acute-care hospital, rehabilitation incl. orthogeriatrics
- In all functional and health conditions with or without specific health problems

Interventions
- Supportive interventions (improvement of meal ambience, nursing interventions)
- Dietary counseling
- Dietary modifications: additional snacks, finger food, fortification, texture-modification
- Oral nutritional supplements (ONS, standard products, specific modified products)
- Enteral nutrition (EN)/tube feeding
- Parenteral Nutrition (PN) incl. (subcutaneous) fluid
- Combined interventions, e.g.
  - Dietetic and nursing actions
  - Nutritional intervention and exercise
- Individualized, comprehensive, multidisciplinary, multidimensional approaches

Comparison
- Standard care
- Placebo
- Other nutritional interventions (e.g. EN vs. ONS)

Outcomes
- Adverse events
- Energy and/or nutrient intake
- Nutritional status (anthropometric, biochemical parameters, body composition)
- Clinical course (complications, morbidity, length of hospital stay)
- Functional course
  - Physical (e.g. activities of daily living, mobility, physical performance, frailty)
  - Mental (e.g. cognition, memory, mood)
- Quality of life, well-being
- Nursing home admission, hospital admissions
- Caregiver burden
- Health care costs, cost-effectiveness
- Survival

3.2. Literature search

To answer the PICO questions, a comprehensive literature search was performed on 4th July 2016 as described in Table 2 to identify suitable systematic reviews and primary studies.

A detailed search strategy was developed combining keywords for older persons (e.g. aged, older persons, geriatric), health care settings (e.g. nursing home, long-term care, rehabilitation), (risk of) malnutrition/dehydration or overweight/obesity with a wide range of interventions (e.g. dietary counseling, nutrition education, meal ambience, food fortification, texture modification, dietary supplement, nutritional support, enteral nutrition, parenteral nutrition, fluid therapy, multicomponent intervention). The detailed search strategy is available from the authors on request.

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Table 2
Criteria for systematic search for literature – databases, filters and keywords.

Publication date	From 1st January 2000 to 3rd July 2016
Language	English
Databases	Medline/PubMed (NIH), EMBASE (Ovid), Cochrane library
Filters	1. Randomized controlled trial.pt. (421924) 2. Controlled clinical trial.pt. (91079) 3. Randomized.ab. (352126) 4. Placebo.ab. (171702) 5. Drug therapy.fs. (1876752) 6. Randomly.ab. (252510) 7. Trial.ab. (364041) 8. Groups.ab. (1573781) 9. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 10. Exp meta-analysis/(67756) 11. (systematic* adj2 review*).ti,ab. (89972) 12. (meta-anal* or metaanal*).ti,ab. 13. 10 or 11 or 12 14. 9 or 13 15. Exp animals/not humans.sh. 16. 14 not 15 (3351618) 17. Exp Aged/ 18. Adolescent/or middle aged/or young adult/or exp child/ or exp infant/ 19. 18 not 17 20. 16 not 19
Publication type	Systematic review or randomized controlled trial
Search format	(([aged] AND [malnutrition or dehydration]) OR [hip fracture or cognitive frailty]) AND [RCT or SR in older humans filters] AND [dietary or fluid or nutritional support]

After removal of duplicates, 6000 hits remained whose titles and abstracts were screened in duplicate by five group member tandems using the following predefined inclusion criteria:

- Paper is written in English
- Paper is a controlled trial (RCT) or a systematic review
- Paper exclusively or mainly about older adults aged at least 65 years
- Older adults have some form of malnutrition or dehydration, or are at specific risk of malnutrition or dehydration (including patients with typical geriatric conditions, e.g. femoral fracture, dementia, heart failure, delirium, depression, COPD, but excluding studies focusing on other medical disciplines, e.g. oncology, nephrology, neurology, major surgery, where separate guidelines exist) OR the paper reports effects of weight loss interventions in overweight/obese older persons.
- Effect of a nutritional or fluid intervention, effect of a change, of a specific intake or status, or the effect of an intervention or factor that may improve nutrition or hydration is studied.

Since the focus of the present guideline is on general (i.e. protein-energy) malnutrition, single or combined micronutrient interventions were excluded. Also pharmacological interventions were not considered. Relevant conference abstracts and study design papers were included, but only if no related full paper was in the list, to have the possibility to look for meanwhile published full papers.

Based on this screening process, lists of potential systematic literature reviews (SLRs), RCTs and other trials of interest were created by each reviewer, sorted by main topics (malnutrition, dehydration, specific patient groups). DV acted as a third reviewer in case of disagreement and combined all parts to three final lists of potentially relevant SLRs, RCTs and other trials.

Additional references from studies cited in guidelines, SLRs or (R)CTs were also included, if they did not appear in the original list. After 3rd July 2016, relevant new articles were considered.

3.3. Literature grading and grades of recommendation

For grading the literature, the grading system of the Scottish Intercollegiate Guidelines Network (SIGN) was used [20]. The allocation of studies to the different levels of evidence is shown in Table 3.

According to the levels of evidence assigned, the grades of recommendation were decided (Table 4). In some cases, a downgrading was necessary e. g. due to poor quality of primary studies included in a systematic review. These cases are described in the commentary accompanying the recommendations. The wording of the recommendations reflects the grade of recommendation, i.e. level A is indicated by “shall”, level B by “should” and level 0 by “can” or “may”. The good practice point (GPP) is based on experts' opinions due to the lack of studies; here, the wording can be chosen deliberately.

If applicable, the recommendations were assigned to the outcome models according to Koller et al., 2013 [21], see Table 5.

Supportive of the recommendations, the working group developed commentaries to the recommendations where the background and basis of the recommendations are explained.

3.4. Consensus process

Between 16th June 2017 and 23rd July 2017, an online voting on the recommendation was performed on the guideline-services.com platform. All ESPEN members were invited to agree or disagree with the recommendations and to comment on. A first draft of the guideline was also made available to the participants on that occasion. 65 recommendations reached an agreement >90%, 17

Table 3
Levels of evidence.

1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1–	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case control or cohort or studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2–	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

According to the Scottish Intercollegiate Guidelines Network (SIGN) grading system. Source: SIGN 50: A guideline developer's handbook. Quick reference guide October 2014 [20].

Table 4
Grades of recommendation [18].

A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population; or A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
0	Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2++ or 2+
GPP	Good practice points/expert consensus: Recommended best practice based on the clinical experience of the guideline development group

Table 5
Outcome models in clinical studies.

Endpoints with implications for evaluating trials in clinical nutrition	Examples
Biomedical endpoint (BM)	e.g. improvement of body weight, body composition, morbidity, mortality
Patient-centered/-reported endpoint (PC)	e.g. validated quality-of-life score
Health economic endpoint (HE)	e.g. QALYs or budget savings
Decision-making endpoint (DM)	e.g. clinical parameters or biomarkers that allow to make a clinically relevant decision such as transfer from ICU to a normal ward or nutritional support yes/no
Integration of classical and patient-reported endpoint (IE)	The combination of BM and PC, e.g. complex scores such as the Frailty Index

Adapted from Koller et al. [21].

Table 6
Classification of the strength of consensus.

Strong consensus	Agreement of >90% of the participants
Consensus	Agreement of >75–90% of the participants
Majority agreement	Agreement of >50–75% of the participants
No consensus	Agreement of <50% of the participants

According to the AWMF methodology [22].

recommendations reached an agreement of >75–90% and only one recommendation an agreement ≤75%. Those recommendations with an agreement higher than 90%, which means a strong consensus (Table 6) were directly passed, all others were revised according to the comments and voted on again during a consensus conference which took place during the ESPEN congress 2017 in The Hague on 11th September 2017. Apart from three recommendations, all recommendations received an agreement higher than 90%. During the consensus conference, it was agreed after discussion to omit three of the original recommendations and to split two recommendations into two separate ones respectively. Therefore, the guideline consists of 82 recommendations.

To support the recommendations and the assigned grades of recommendation, the ESPEN guideline office created evidence tables of relevant meta-analyses, systematic reviews and (R)CTs. These evidence tables are available online as supplemental material to this guideline.

3.5. Outline of the guidelines

I. Basic questions and general principles (without systematic literature search)
II. Recommendations for older persons with malnutrition or at risk of malnutrition
- Supportive interventions
- Nutritional counseling
- Food modification
- Oral nutritional supplements
- Enteral and parenteral nutrition
- Exercise

III. Recommendations for older patients with specific diseases
- Hip fracture and orthopedic surgery
- Delirium
- Depression
- Pressure ulcers
- Overweight and obesity
- Diabetes mellitus

IV. Recommendations to prevent, identify and treat dehydration in older persons
- Low-intake dehydration
- Volume depletion

4. Recommendations with commentaries

I. Basic questions and general principles (without systematic literature search)

I.1 How much energy and nutrients should be offered/delivered to older persons?

Recommendation 1

Guiding value for energy intake in older persons is 30 kcal per kg body weight and day; this value should be individually adjusted with regard to nutritional status, physical activity level, disease status and tolerance. (BM)

Grade of recommendation B – strong consensus (97% agreement)

Commentary

With increasing age, resting energy expenditure (REE) is generally decreasing, mainly due to decreasing fat-free body mass. In healthy and sick older persons measurements of REE resulted in about 20 kcal/kg body weight (BW) and day [23–25]. Based on usual physical activity levels (PAL) between 1.2 and 1.8, total energy expenditure (TEE) amounts to 24–36 kcal/kg. Due to their strong relation to fat-free mass, basal energy requirements are also influenced by gender and by nutritional status; in fact REE/kg BW is higher for men than for women and increases with decreasing body mass index (BMI). For older persons with underweight (BMI ≤21 kg/m^2) energy requirements between 32 and 38 kcal/kg are assumed [25]. In sick older people energy requirements may, on the one hand, be reduced due to reduced physical activity, and on the other hand be increased due to disease effects (e.g. inflammation, fever, drug effects). Minimal requirements of ill older persons are estimated to be between 27 and 30 kcal/kg [25].

Based on these figures, about 30 kcal/kg BW are suggested as a rough estimate and general orientation for energy requirements in older persons. This guiding value needs individual adjustment regarding all relevant factors, i.e. gender, nutritional status, physical activity and clinical condition. In addition, the aim of nutritional support (e.g. weight maintenance or increase), and acceptance and tolerance of the nutritional intervention need to be considered.

Because of great heterogeneity and large individual variation of energy requirements, even in healthy older persons [26,27], adequacy of energy intake needs to be controlled by close monitoring of body weight (taking water retention or losses into account), and intake adapted accordingly. It should be kept in mind that spontaneous oral energy intake of acutely hospitalized older patients is usually low and does not cover requirements.

Recommendation 2

Protein intake in older persons should be at least 1 g protein per kg body weight and day. The amount should be individually adjusted with regard to nutritional status, physical activity level, disease status and tolerance. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary

The traditional recommendation for protein intake 0.8 g/kg body weight and day for adults of all ages [28,29] is currently under discussion for older persons, based on growing evidence from experimental and epidemiological research that older people might need higher amounts of protein for optimal preservation of lean body mass, body functions and health. Daily amounts of 1.0–1.2 g/kg body weight have been suggested for healthy older persons by several expert groups [30–32]. In case of illness, protein requirements may even be further increased, e.g. due to inflammation (including inflamm-aging), infections and wounds, however, to which extent is difficult to assess. Very little is known about the protein needs of frail and ill older persons, and scientific evidence, e.g. from intervention trials, is presently insufficient to derive concrete figures. Daily amounts of 1.2–1.5 g/kg have been suggested for older persons with acute or chronic illness [30,31] and up to 2.0 g/kg body weight and day in case of severe illness, injury or malnutrition [30].

Until more evidence is available, an intake of at least 1.0 g/kg should be ensured in all older persons, particularly in those at risk of malnutrition, e.g. frail and multimorbid persons, whose intake is often far below this amount [33–35]. Increased requirements, e.g. for muscle growth with strength training, for tissue regeneration in malnutrition or wound healing or for increased metabolic demands in case of critical illness, should be met by appropriately increased intake.

It is important to bear in mind that an insufficient intake of energy increases protein requirement. Thus, regarding protein status it is important to ensure not only adequate intake of protein but also appropriate intake of energy.

Recommendation 3

For EN, fiber-containing products should be used. (BM)

Grade of recommendation B – strong consensus (91% agreement)

Commentary

Older patients often suffer from gastrointestinal problems including constipation and diarrhea. Since dietary fiber may contribute to the normalization of bowel functions, and intake is usually low in geriatric patients, the importance of an adequate intake of dietary fiber is emphasized. Daily amounts of 25 g are considered adequate for normal laxation in adults of ages [36] and can be regarded as guiding value also for older patients.

Also for EN, there is no reason to omit dietary fiber as long as bowel function is not compromised. Conversely, fiber-containing products for EN have been shown to contribute to normal bowel function [37–43] and are, thus, generally recommended. In addition, enterally nourished patients should not be deprived of the well-known beneficial metabolic effects of dietary fiber.

Recommendation 4

Provided that there is no specific deficiency, micronutrients should be delivered according to the recommendation for healthy older persons.

Grade of recommendation GPP – strong consensus (91% agreement)

Commentary

Dietary recommendations for micronutrients for older persons do not differ from those for younger adults, however, our knowledge about requirements in very old, frail or ill persons is poor. Due to an increasing prevalence of gastrointestinal diseases, which are accompanied by reduced nutrient bioavailability (e.g. atrophic gastritis and impaired vitamin B_{12}, calcium and iron absorption), older persons are at increased risk of micronutrient deficiencies, which should be corrected by supplementation. Provided that there is no specific deficiency, micronutrients should be delivered according to the recommendation of the European Food Safety Authority (EFSA) [44] or corresponding national nutrition societies for healthy older persons.

I.2 How should nutritional care be organized in older persons?

Recommendation 5

All older persons – independent of specific diagnosis and including also overweight and obese persons – shall routinely be screened for malnutrition with a validated tool in order to identify those with (risk of) malnutrition.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 6

A positive malnutrition screening shall be followed by systematic assessment, individualized intervention, monitoring and corresponding adjustment of interventions.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary to recommendations 5 and 6

The process of nutritional care for older persons consists of several steps which are based on systematic screening for malnutrition. If there are any indicators of nutritional risk, a detailed assessment should follow to substantiate the diagnosis of malnutrition and as a basis for the definition of individual treatment goals and the development of a comprehensive nutritional care plan. Interventions need to be implemented, checked for their effectiveness and adjusted if necessary until treatment goals are achieved (Fig. 1).

Screening: Independent of specific diagnosis and also in overweight and obese persons, malnutrition and its risk should be systematically and routinely screened at admission to a geriatric institution using a validated tool and thereafter in regular intervals, depending on the patient's condition (e.g. every three months in long-term care residents in stable condition, at least once a year in general practice) in order to identify affected individuals early. The most common screening tool developed and validated for older persons is the short-form of the Mini Nutritional Assessment (MNA) [45,46]. In addition to standard screening parameters (BMI, weight loss, reduced intake, disease) [47] it includes two important geriatric syndromes that regularly contribute to the development of malnutrition – immobility and neuropsychological problems – and thus, besides malnutrition also considers an existing risk of malnutrition. If BMI is not obtainable, calf circumference can be used instead. The MNA

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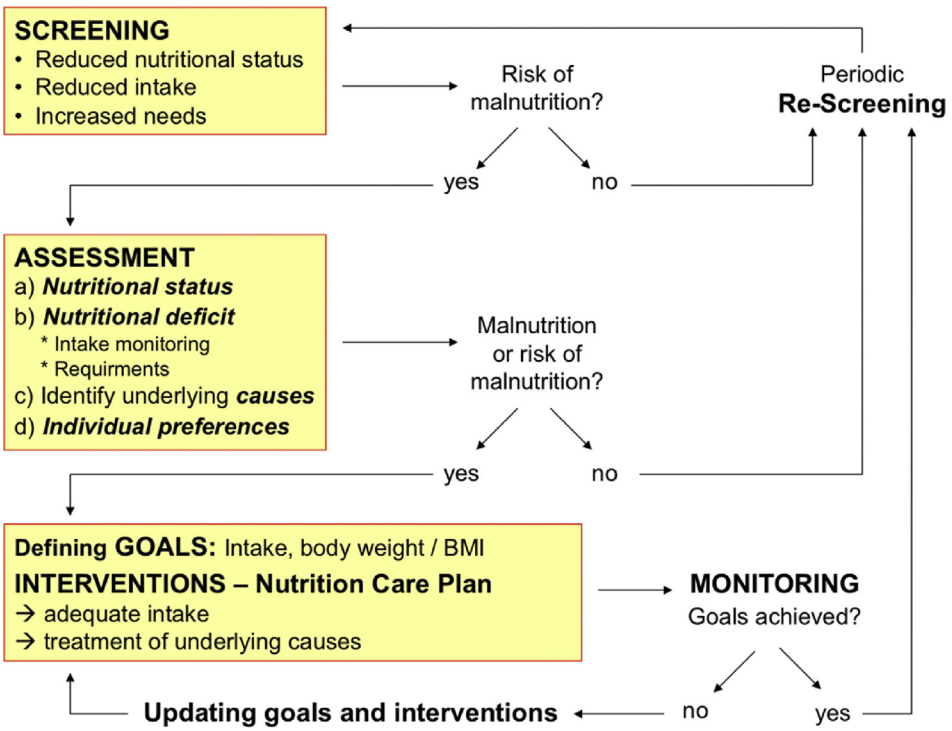

Fig. 1. Process of nutritional care for older persons.
Modified from Volkert et al. [19].

short-form can be completed in a few minutes and be applied in all geriatric settings [11].

Assessment: In individuals who are identified as malnourished or at risk of malnutrition by screening, a comprehensive nutritional assessment should follow, providing information on kind and severity of malnutrition and its underlying causes as well as on individual preferences (regarding food and beverages as well as enteral and PN) and resources (e.g. chewing and swallowing ability, eating dependence, gastrointestinal function, severity of disease, general prognosis) for nutritional therapy. Dietary intake monitoring (e.g. by plate diagrams) is recommended for several days in order to estimate the amount of food and fluid consumed [48] and relate dietary intake to individual requirements (see recommendation 1).

Nutritional intervention: Based on the screening and assessment results, individual goals regarding dietary intake and body weight/BMI should be defined, and an individual nutrition care plan developed and implemented in an interdisciplinary team approach. All aspects of the patient – physical and mental/psychic, social, clinical as well as ethical – should be considered, and all options used to ensure an adequate dietary intake. Dietetic, nursing and medical actions should be implemented in a coordinated manner (see recommendation 8).

Monitoring: The intervention process needs to be monitored, and reassessments should be performed in regular intervals, e.g. after several days, in order to check if goals are achieved. If this is not the case, goals and interventions have to be modified and adjusted according to experienced problems and the new situation. In case of EN or PN criteria for termination of the therapy have to be defined, e.g. if the goals are not achieved in a given time period or nutritional situation improved markedly (see recommendation 30). In the hospital setting, it is important to initiate adequate nutritional care after discharge at home and to ensure the continuation of the nutritional strategy started in hospital (see recommendation 25).

Since nutritional therapy may require various persons and professions (e.g. medical specialists, nurses, therapists), all interventions should be coordinated and agreed with all parties involved (see recommendation 9). As a matter of course, also intensive communication with the patient and his or her family should take place during the whole process, in order to learn and consider wishes and expectations of the person concerned. For implementation in daily routines, these general recommendations have to be concretized and adapted to the local conditions of each institution. Standard protocols for nutritional screening, assessment and therapy have to be developed and consistently put into practice (see recommendation 7). Several guidelines for nutritional management of older persons have been developed in recent years [49–53], mainly for the long-term care setting [50–52], which are overall in line with the present recommendations.

Recommendation 7

In institutional settings, standard operating procedures for nutritional and hydration care shall be established and responsibilities well regulated.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Based on the recommendations in this guideline, local policies and procedures for nutritional care – including standard operating procedures for regular screening for malnutrition – should be

established. In order to assure implementation in every day practice, nutritional strategies should be supported by the head of the institution, and responsibilities well-regulated. Desirably, each geriatric institution should constitute a multidisciplinary team, including a (registered) dietitian, a nurse specialized in nutrition, a medical doctor, housekeeping personnel and representative from all other professions involved in nutritional care in this institution, which develops, implements and supervises local procedures for nutritional care. In geriatric acute care settings, a dietitian should be part of the geriatric team and participate in regular team conferences, ensuring the integration of nutritional interventions in the overall therapeutic concept.

In geriatric acute care and rehabilitation hospital units, nutritional assessment and implementation of a nutritional care plan has been shown to improve energy and protein intake, serum proteins and health-related quality of life of the patients [54]. Implementation of a screening and treatment protocol at a geriatric hospital unit including regular team meetings improved body weight and hospital-acquired infections compared to standard care [55]. Multidisciplinary nutritional care concepts including regular team meetings increased dietary intake and improved quality of life in hip fracture patients [56], and improved nutritional status, wellbeing and quality of mealtimes in demented nursing home residents [57].

As malnutrition is highly prevalent in older persons, especially if institutionalized, geriatric institutions should provide a defined care plan and adequate resources to screen for malnutrition and identify persons with or at risk of malnutrition as well as to prevent and treat malnutrition. Special attention should be drawn to the interface management, as important information concerning the nutritional situation is frequently lost in the situation of patients' transition to another healthcare sector.

I.3 How should nutritional care be performed in older persons?

Recommendation 8

Nutritional and hydration care for older persons shall be individualized and comprehensive in order to ensure adequate nutritional intake, maintain or improve nutritional status and improve clinical course and quality of life. (BM, PC)

Grade of recommendation A – strong consensus (100% agreement)

Commentary

Nutritional problems are multifaceted and differ between individuals. Moreover, older persons are heterogeneous regarding health status, prognosis, physiological resources, nutritional needs, preferences, and individual goals. In this light it seems reasonable to adapt nutritional interventions individually. The systematic literature search identified five RCTs providing evidence for comprehensive individualized nutritional interventions in older persons with malnutrition or at risk of malnutrition [58–62]. All studies were performed in the hospital setting, studies from the nursing home setting are lacking.

Three RCTs of low to acceptable quality investigated the effects of comprehensive individualized nutritional interventions in older hospitalized patients at nutritional risk with various diagnoses [58,59] or after acute stroke [60]. The studies reported positive effects on energy and protein intake [58,59], body weight [59,60], complications, antibiotic use, readmissions [59] and functional measures [59,60]. Additionally, all three studies showed benefits with respect to quality of life in the group receiving individual nutritional care compared to the group with usual care [58–60]. No effect was found regarding length of hospital stay [59,60]. In a further RCT of acceptable quality [61], the effect of additional individual nutritional support by dietetic assistants was investigated in older hospitalized patients with hip fracture. The study reported increased energy intake and decreased mortality in the trauma unit and within four months after discharge in the intervention group compared to the group with standard care. The study did not show intervention effects on body weight, grip strength, complications and length of hospital stay. Feldblum et al. [62] extended an individualized nutritional intervention in older internal medical patients to six months after hospitalization and showed an improved MNA score and reduced mortality in the intervention compared to the control group. However, no intervention effects on energy or protein intake, body weight, and functional measures were observed.

Recommendation 9

Nutritional interventions for older persons should be part of a multimodal and multidisciplinary team intervention in order to support adequate dietary intake, maintain or increase body weight and improve functional and clinical outcome. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary

Nutritional care comprises different approaches including e.g. dietary counseling, meal enrichment, offering snacks, provision of oral nutritional supplements (ONS), EN or PN (see recommendations 18 to 36), which can complement each other with respect to their effects on dietary intake and nutritional status. Moreover, nutritional care goes beyond pure nutritional interventions, also covering mealtime assistance (see recommendation 12), the adaption of environmental factors (see recommendations 13, and 14) and the elimination of underlying causes (see recommendation 10), turning it into a multidisciplinary action requiring collaboration of dietitians, nurses, kitchen and housekeeping personnel, medical doctors, therapists, family members and of course the patient himself.

The systematic search identified four RCTs with several substudies of low to acceptable quality focusing on multimodal and multidisciplinary interventions (combining more than two intervention strategies) in older persons with malnutrition or at risk of malnutrition [63–72]. Neelemaat et al. [63] performed a RCT combining different components of nutritional care like energy- and protein-enrichment of diet, provision of ONS as well as calcium and vitamin D supplements, and telephone counseling in older patients from hospital admission up to three month after discharge and reported positive effects on energy and protein intake, vitamin D serum levels and the incidence of falls. In addition cost-effectiveness of the intervention was shown [64]. No effects were found regarding body weight, fat free mass, handgrip strength as well as 1- and 4-year mortality [63,65]. Beck et al. [66,67] conducted a multi-facet intervention in nursing home residents consisting of home-made nutritional supplements, oral care and group exercise resulting in improved protein intake, body weight, physical performance and social activity. The study showed no significant effect on energy intake. In an 11-week cluster RCT with older malnourished people receiving home care or living in nursing homes [68,69] a multidisciplinary intervention with nutritional

support, physio- and occupational therapy was implemented, showing positive effects on quality of life, ability to stand up from a chair and oral care. Moreover, the intervention was cost-effective [69]. The RCT, however, did not find differences in body weight, handgrip strength, falls, institutionalization rates and mortality between the intervention and the control group [68,69]. A RCT in older patients with hip fracture reported beneficial results of a comprehensive rehabilitation program including nutritional intervention on length of hospital stay, activities of daily living and mobility after twelve months [70] as well as on in-hospital falls and fall-related injuries [71]. A sub-study including only patients with complete MNA at baseline and 4-months follow-up showed significantly fewer days of delirium, less new pressure ulcers and reduced length of hospital stay in the intervention group than in the control group. BMI and MNA, however, remained unchanged [72] (see also recommendation 46).

These studies illustrate the complexity of the situation and underline the importance of a comprehensive treatment approach in older patients. Consequently, clinical nutrition interventions shall be part of a multimodal and multidisciplinary geriatric team intervention. Because of partly inconsistent results, the evidence grade was reduced from A to B.

Recommendation 10

Potential causes of malnutrition and dehydration shall be identified and eliminated as far as possible.

Grade of recommendation GPP – strong consensus (95% agreement)

Commentary

Potential causes of poor intake and/or poor nutritional status in older persons are manifold and should be explored systematically, e.g. by check-lists and subsequent assessment and diagnostic clarification. Swallowing evaluation, dental examination, oral and general health assessment and check-up of medications for potential side effects impeding adequate nutrition (e.g. by causing anorexia, xerostomia, dysgeusia, gastrointestinal disorders or somnolence), for example, may uncover eating obstacles and provide starting points for adequate interventions. In institutionalized older people, eating and feeding problems are widespread and should also be identified, e.g. by informal observation during meals, and eliminated as far as possible by appropriate remedial actions [73]. Potential causes of malnutrition in older persons and according interventions are shown in Table 7.

Table 7
Potential causes of malnutrition and reasonable interventions.

Potential cause	Potential interventions
Chewing problems	• Oral care • Dental treatment • Texture modified diet, if adequate
Swallowing problems (dysphagia)	• Professional swallowing evaluation • Swallowing training • Texture-modified diet, according to swallowing evaluation
Impaired upper extremity function	• Physiotherapy, occupational therapy • Adequate help with eating and drinking (e.g. cutting food, hand-feeding) • Provision of adequate eating and drinking aids • Finger foods • Shopping/cooking aid, meals on wheels
Restricted mobility, immobility	• Physiotherapy • Resistance training • Group exercise • Shopping/cooking aid, meals on wheels
Cognitive impairment	• Supervision of meals • Adequate meal assistance (e.g. verbal prompting, help with eating) • Shopping/cooking aid, meals on wheels • Family style meals in institutions
Depressive mood, depression	• Adequate medical treatment • Eating and drinking with others/shared meals • Pleasant meal ambience/eating environment • Group activities, occupational therapy
Loneliness, social isolation	• eating and drinking with others/shared meals • Group activities
Poverty	• Social programs
Acute disease, (chronic) pain	• Adequate medical treatment
Adverse effects of medications (e.g. xerostomia, apathy)	• Check medication for potential side effects • Reduce dose of medication • Replace or stop medications
Restricted diets	• Revision and liberalization of dietary restrictions

Recommendation 11

Dietary restrictions that may limit dietary intake are potentially harmful and should be avoided.

Grade of recommendation GPP – strong consensus (91% agreement)

Commentary

Dietary restrictions are one potential cause of malnutrition since they may limit food choice and eating pleasure and thus bear the risk of limiting dietary intake. As recently reviewed by Darmon et al. [74], restrictive diets furthermore seem to be less effective with increasing age, albeit data about their effects in older persons are rare. In one study, ambulatory patients older than 75 years following a low salt, low cholesterol or diabetic diet for 11 ± 6 years were found to be at increased risk of malnutrition compared to age- and gender-matched controls [75]. In a position statement, the American Dietetic Association concludes that liberalization of diet prescriptions for older adults in long-term care may enhance nutritional status and quality of life [76]. Due to the risk of malnutrition, future studies about the effects of restrictive diets in old age are unlikely, and it is good clinical practice to liberalize dietary restrictions in older persons in order to reduce the risk of malnutrition and related loss of fat-free mass and functional decline.

II. Recommendations for older persons with malnutrition or at risk of malnutrition

Supportive interventions

II.1 Should older persons with malnutrition or at risk of malnutrition be offered mealtime assistance?

Recommendation 12

Older persons with malnutrition or at risk of malnutrition and with eating dependency in institutions (A) as well as at home (GPP) shall be offered mealtime assistance in order to support adequate dietary intake. (BM)

Grade of recommendation A/GPP – strong consensus (100% agreement)

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Commentary

Many older persons are restricted in their ability to eat and drink independently due to functional and cognitive limitations. Support may be needed ranging from adequate positioning at a table and verbal prompting to direct physical assistance to bring foods and fluids into the mouth.

The literature search identified three SLRs which were considered relevant to the key question and all rated as high quality [77–79]. The SLR by Tassone et al. [79] examined the effects of mealtime assistance provided to hospitalized patients (≥65 years) by nurses, trained staff or volunteers. Outcomes assessed were nutritional status including anthropometric measures and energy and protein intake. A total of five studies were included. Two of the studies reported on the participants' nutritional status prior to the intervention, with a number of those in the intervention group being malnourished or at-risk of malnourishment. Four of the five (including one RCT) could be combined for meta-analysis. Assistance provided at mealtimes in these studies included setting up meal trays, positioning patients in a comfortable position, opening food and beverages, removing lids, feeding patients, encouraging intake and providing social support at the mealtime. Overall, mealtime assistance significantly improved daily energy and protein intake. The two SLRs by Abdelhamid et al. [78] and Abbott et al. [77] dealt with several interventions including eating and drinking assistance provided to old people in institutions. Outcomes in general were those related to nutrition or fluid intake. Nutritional status is not reported for any of the studies, but the overall aim was to improve, maintain or facilitate dietary intake, suggesting that participants were at risk of or already malnourished. Abbott et al. [77] included six feeding assistance studies. Two RCTs [80,81] and three pre-post comparisons [82–84] assessed the effects of positive reinforcement, correct positioning and feeding assistance, and all described positive effects on dietary intake. Marginal, non-significant improvements in food intake were also reported from a pre-post trial of reminiscence therapy during mealtimes in a very small study including seven residents with dementia [85]. Abdelhamid et al. [78] focused on institutionalized persons with dementia and described six studies, where feeding assistance was mainly part of complex interventions to support food and drink intake, which made it difficult to conclude which part of the intervention was responsible for the observed effects.

No intervention studies have been performed among old people in home-care where malnutrition and risk of malnutrition are also prevalent. Nevertheless, it is reasonable to assume that eating-dependent older persons living in private households may also benefit from mealtime assistance.

II.2 Should food intake in older persons with malnutrition or at risk of malnutrition be supported by a home-like, pleasant dining environment?

Recommendation 13

In institutional settings, food intake of older persons with malnutrition or at risk of malnutrition shall be supported by a home-like, pleasant dining environment in order to support adequate dietary intake and maintain quality of life. (BM, PC)

Grade of recommendation A – strong consensus (100% agreement)

Commentary

Environmental factors play an important role for the atmosphere during mealtimes, among them eating location, furniture and meal companions, ambient sounds, odors, temperature and lighting, food accessibility, portion size and presentation of the food [86,87]. These factors are known to be important determinants of food intake and can be modified in order to support adequate dietary intake in persons with eating difficulties.

Literature search identified two relevant SLRs to be included [77,88], both of high quality. The SLR by Abbott et al. [77] examined the effectiveness of mealtime interventions for older persons living in residential care. Outcomes assessed were either those directly related to food intake or those related to nutritional or functional status. Data on dietary satisfaction and quality of life, where measured, were also outcomes of interest. A total of 11 studies assessed the effect of dining environment alteration and three of these were RCTs. In these three studies participants were older than 65 years and living in residential homes and hence with malnutrition or at risk of malnutrition. All three assessed the effect of enhancing the ambience of the dining room environment along with the introduction of family style meals and greater staff assistance. Meta-analysis results were in favor of the intervention regarding body weight (all three RCTs) and energy intake (two RCTs) but not significant. One of the studies [89] reached individual significance. Findings from the non-randomized studies were also mixed, but the authors conclude that positive findings prevail. Two of the RCTs also assessed the effects on quality of life and both found maintenance of reported quality of life in contrast to a significant decrease in residents dining in their usual conditions. The SLR by Bunn et al. [88] focused on interventions to indirectly promote dietary intake in persons with dementia across all settings and levels of care including a wide range of different outcomes. Nutritional status is not reported for any of the studies but the overall aim was to improve, maintain or facilitate food/drink intake, suggesting that participants were at risk of or already malnourished. Seventeen studies (no RCTs) were found reporting effects of changes to aspects of the dining environment or food service, but interventions were very heterogeneous and partly included multiple components, and a high risk of bias was reported for all studies. The authors conclude that family style meals and soothing mealtime music are promising interventions, among others, to support eating and drinking in persons with dementia [88].

II.3 Should older persons with malnutrition or at risk of malnutrition be encouraged to share their mealtimes with others?

Recommendation 14

Older persons with malnutrition or at risk of malnutrition should be encouraged to share their mealtimes with others in order to stimulate dietary intake and improve quality of life.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Eating is a social act, and eating in company is known to stimulate dietary intake, also in older persons [86,90]. Older persons living alone and also nursing home residents however often miss company and conversation during mealtimes. In an observational study in 50 older home health service receivers a

significantly higher intake of energy in persons who had others present during meals was observed compared to those who ate alone [91]. Higher energy intakes were also observed in older hospitalized patients attending a dining room compared to those eating by their bedside [92]. The stimulating effect of eating company seems to be dependent on the number of persons present at a meal as well as on the relationship between these persons: The more people are present, and the better known these persons are the more food is eaten [86]. People in general are more relaxed and comfortable with familiar persons. As a consequence they stay longer at the table and continue to eat which may result in an increased dietary intake. Furthermore, a direct behavioral effect is assumed that people adapt their intake to the eating behavior of their companions [86]. This effect might especially be helpful in older persons with cognitive impairment who are digressing and forgetting to eat and may be stimulated by other persons serving as a model.

Literature search identified a systematic review of high quality about the effectiveness of interventions to support dietary intake in persons with dementia [78], including mealtime interventions with a strong focus on the social elements of eating and drinking. No RCTs but four non-randomized trials (all among people above 65 years of age) were identified, assessing the effect of e.g. shared mealtimes with staff or implementation of a breakfast club on various outcome parameters. Although these studies were small and of low quality, they provided consistent suggestion of improvements in aspects of quality of life. In one of these studies the effect on body weight is reported with a significant increase after three months compared to the control group [93]. It is however stressed that in case of specific problems and desires, individual approaches are needed, e.g. some older people may be agitated during meals causing disturbances in the dining room. Some older persons may find it disturbing to eat when they have to eat with other people with inferior hygiene and eating habits. On the other hand persons with severe eating problems may struggle to behave in accordance with their own standards, and it has been suggested that the lack of eating competences leads to small portions to decrease exposure to failures in the presence of others [94]. As for all other interventions, here also decisions shall always be individualized according to the persons needs and preferences.

II.4 Should home-dwelling older persons with malnutrition or at risk of malnutrition be offered specific meals on wheels?

Recommendation 15

Meals on wheels offered to home-dwelling older persons with malnutrition or at risk of malnutrition should be energy-dense and/or include additional meals to support adequate dietary intake. (BM)

Grade of recommendation B – strong consensus (97% agreement)

Commentary

Home-delivered meals, also called meals on wheels (MoW), are a valuable option for older persons living in private households who are unable to shop and prepare their meals by themselves. Purchase of this service may enable older persons to remain living in their own homes and contribute to adequate dietary intake of these persons. It might be especially helpful in situations of transition from institutional settings to the private household where patients are in a recovery phase and limited in their activities. Quality and effectiveness of home-delivered meals depend on many factors, and several studies suggest that nutritional intake of MoW consumers is below recommended levels [95]. A recent review about home-delivered meals admits that the effects of this service are difficult to evaluate [96], but it seems reasonable to assume that persons who are otherwise unable to obtain regular meals may benefit from this support. The question however arises if home-delivered meals should meet specific requirements for persons with malnutrition or at risk of malnutrition.

Literature search identified two SLRs considered relevant to the PICO question [97,98]. Baldwin et al. [97] examined supportive interventions for enhancing dietary intake in malnourished or nutritionally at-risk adults in a recent Cochrane review and included two RCTs about the effects of specifically modified home-delivered meals [99,100]. Campbell et al. [98] focused on home-delivered meal programs, but this SLR was rated to be of low quality. Among 80 studies included, the same two RCTs comparing specific modes of MoW were identified which are used here to answer the PICO question. The RCT from Silver et al. [100] found that enhancing the energy density of food items regularly served in a home-delivered meals program increased lunch and 24-hour energy and nutrient intakes in a 1-day intervention. Although mean BMI was approximately 24 kg/m^2, almost half of the participants had lost at least 5 lb. during the prior six months. In the study by Kretser et al. [99] participants received either the traditional MoW program of five hot meals per week (providing 33% of RDA), or the restorative, comprehensive new MoW program of three meals and two snacks per day, seven days a week for six months (providing 100% of RDA). Almost all participants were malnourished or at risk of malnutrition according to MNA. The new MoW group gained significantly more weight than the traditional MoW group [99].

Because of presently limited evidence regarding specific modes of home-delivered meals grade of recommendation was downgraded to B.

II.5 Should older persons with malnutrition or at risk of malnutrition be offered nutritional education as part of a comprehensive intervention concept?

Recommendation 16

Older persons with malnutrition or at risk of malnutrition should be offered nutritional information and education as part of a comprehensive intervention concept in order to improve awareness of and knowledge about nutritional problems and thus promote adequate dietary intake. (BM)

Grade of recommendation B – strong consensus (94% agreement)

Commentary

According to the Council of Europe [101] the majority of patients are not aware of the importance of a good nutritional status to secure a proper medical treatment. For example few patients are aware of the fact that a weight loss in relation to disease will increase their risk of complications. Therefore the Council of Europe recommends that the topic of patient information and education should receive high priority in educational themes at all levels [101]. However, the focus of this report was not specifically on older patients.

Literature search identified two SLRs on this topic to be included [88,102], one [88] was rated as high quality and the other [102] as acceptable. Young et al. [102] reviewed the evidence regarding

effectiveness of nutritional education or advice on physical function, emotional health, quality of life, nutritional indices, anthropometric indicators, mortality, service use and costs of care in people over 65 years of age living at home. The main focus of the education was on healthy life style, and the intervention was mainly provided by nurses and in some cases dieticians. Five studies (of 23) had nutritional education as the sole constituent of the program, whilst the rest included it as part of a more complex intervention. There was very limited information about the nutritional status of the participants but few were probably malnourished or at risk of malnutrition. Based on the results presented in the SLR it is not possible to make any specific conclusions about this group. The SLR by Bunn et al. [88] included interventions with an educational and/or awareness component for persons with dementia and/or their formal or informal care-givers. The overall effect on nutritional status in the three RCTs included was very limited.

Despite presently poor scientific evidence we recommend to improve nutritional awareness and knowledge of older persons with malnutrition or at risk of malnutrition by information and education as one of several strategies to support adequate dietary intake. If care-givers are involved in nutritional matters, e.g. in case of cognitive impairment, they should also be addressed (see recommendation 17). For quality assurance reasons, it is desirable that nutritional information and education is given by a nutritional expert, e.g. a dietician.

II.6 Should food intake in older persons with malnutrition or at risk of malnutrition be supported by education of their caregivers?

Recommendation 17

Health care professionals as well as informal caregivers should be offered nutritional education in order to ensure awareness of and basic knowledge on nutritional problems and thus promote adequate dietary intake of older persons with malnutrition or at risk of malnutrition. (BM)

Grade of recommendation B – strong consensus (95% agreement)

Commentary

One of the barriers to proper nutritional support in hospitals highlighted by the Council of Europe was lack of sufficient education with regard to nutrition among all staff groups, and it was concluded that a general improvement in the educational level of all staff groups is needed [101].

Literature search identified three relevant SLRs [77,88,103], two [77,88] of high and one [103] of average quality. In the SLR by Abbott et al. [77], six studies examined the effectiveness of staff training in residential care regarding either food intake or nutritional status. The only RCT found no effect on dietary intake of residents with dementia in spite of increased knowledge. Positive effects were reported in two controlled trials on body weight and in two pre-post studies on dietary intake. The SLR by Bunn et al. [88] addressed the effectiveness of a range of interventions including education or training for people with dementia and/or their formal or informal care-givers. Nutritional status was not reported in any of the studies but the overall aim to support dietary intake suggests that participants were at risk of malnutrition or already malnourished. The SLR found 15 studies including six RCTs, all with high or unclear risk of bias. Study designs and results were heterogeneous with overall no definitive evidence on effectiveness or lack of effectiveness. Altogether, education and support for formal and informal care-givers was rated as promising intervention. The SLR by Marshall et al. [103] examined if informal carers and community care workers are effective in managing malnutrition in older adults living in the community regarding a range of outcomes. Based on eleven studies (including six RCTs) using varying types of interventions the SLR concluded that interventions targeted at identifying, preventing and/or treating malnutrition were able to improve or prevent decline in nutritional and functional status without increasing informal carer burden.

Despite presently poor scientific evidence we recommend to improve nutritional awareness and knowledge of formal as well as informal caregivers by nutritional education as one of several strategies to support adequate dietary intake of older persons with malnutrition or at risk of malnutrition. For quality assurance reasons, it is desirable that nutritional information and education is given by a nutritional expert, e.g. a dietician.

Nutritional counseling

II.7 Should older persons with malnutrition or at risk of malnutrition be offered individualized nutritional counseling?

Recommendation 18

Older persons with malnutrition or at risk of malnutrition and/or their caregivers should be offered individualized nutritional counseling in order to support adequate dietary intake and improve or maintain nutritional status. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Recommendation 19

Individualized nutritional counseling should be offered by a qualified dietician to these persons and/or their caregivers, should consist of several (at least 2) individual sessions that may be combined with group sessions, telephone contacts and written advice and should be maintained over a longer period of time.

Grade of recommendation GPP – strong consensus (97% agreement)

Commentary to recommendations 18 and 19

Nutritional counseling by a health care professional is regarded as the first line of nutrition therapy. It is a supportive process consisting of repeated personal talks and discussions with the patient with the aim to develop a sound understanding of nutritional topics and support favorable health-promoting eating habits [104,105]. Individual counseling should be performed by trained nutrition professionals (registered/accredited dieticians or nutritionists) and may be combined with educative group sessions, written advice and/or telephone contacts and all other forms of nutritional therapy.

Literature search identified one guideline [53] and a SLR [106] which were considered relevant to the key question. The identified Danish guideline was developed by means of the GRADE approach and the quality was rated high. The SLR by Munk et al. [106] was conducted according to the methods of the Cochrane

Collaboration and the level of quality was assigned as being high. The Danish guideline (DHMA) [53] comprised two PICOs relevant for the present guideline. Assessed outcomes for both PICOs were intake of energy and protein, weight (end of treatment and longest follow-up), mobility, muscle strength, activities of daily living, quality of life, and gastro-intestinal disturbances. The first PICO question addressed was: Should geriatric patients with loss of weight and function be offered individualized dietary counseling or standard nutritional support (brief general dietary advice or standard ONS prescription)? Four studies, published in seven papers, were identified that could answer this question [107–113], all were judged to be of low quality. Only one of the studies used individual nutritional counseling as stand-alone intervention, and the four studies were very heterogeneous regarding participants/setting as well as modes of dietary counseling. The narrative summation and meta-analysis did not find any significant effects, but calculated pooled estimates showed a trend in favor of the individualized dietary counseling for most outcomes considered. Therefore, a weak recommendation for this approach is given in the Danish guideline ("Individual dietary counseling may be considered …") [53].

The second PICO question addressed in the Danish guideline was: Should geriatric patients with loss of weight and function be offered a short period (≤12 weeks), or a longer period (more than twelve weeks) of nutritional counseling? As no studies were found that could answer this question, DHMA made a good practice point in favor of the longer intervention period [53].

The SLR by Munk et al. [106] aimed to evaluate the evidence for an effect of individualized dietary counseling in nutritionally at risk older patients after discharge from an acute hospital. Outcomes assessed were energy and protein intake, nutritional status, physical function, quality of life, hospital readmissions and mortality. Four RCTs were included, which all were rated to be of high risk of bias, mainly because of lack of blinding and high drop-out rates [62–64,107,114,115]. In one of these studies, caregivers were involved as far as possible [114]. The intervention schemes varied, consisting of no or one counseling sessions during hospital stay and three to six sessions after discharge (conducted as home visits or by telephone) over 8–16 weeks. Two studies included additional standardized prescription of ONS and vitamins [63,64,107,115], in the other two studies ONS could be part of the individual care plan resulting from counseling [62,114]. The meta-analysis found positive effects on body weight, energy and protein intake but no effect on hand grip strength or mortality compared to brief dietary advice or nothing at all. Due to lack of data, conclusions with regard to quality of life and hospital admissions were not possible.

Due to the limited quality of the original studies, restriction to hospital discharge in some of the studies and only rare involvement of caregivers, the recommendation was downgraded to B. In order to be effective, the counseling should consist of several sessions over a longer period of time (at least eight weeks).

Food modification

II.8 Should older persons with malnutrition or at risk of malnutrition be offered food-based fortification?

Recommendation 20

Older persons with malnutrition or at risk of malnutrition should be offered fortified food in order to support adequate dietary intake. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary

Food fortification (or dietary enrichment) by using natural foods (e.g. oil, cream, butter, eggs) or specific nutrient preparations (e.g. maltodextrin, protein powder) can increase energy and protein density of meals and beverages and thus enable an increased intake by eating similar amounts of food.

Literature search identified two SLRs [116,117] which were both considered relevant and rated of acceptable quality. The SLR by Trabal & Farran-Codina [117] examined the effects of dietary enrichment with conventional foods on energy and protein intake, nutritional and functional status, and episodes of infection. Nine studies (including three RCTs and four cluster RCTs) were included, four performed in nursing homes, four in hospitals and one at home, with a mean age of participants between 67 and 91 years. Nutritional status was specified in only two studies where participants were described as malnourished or at risk of malnutrition. In all studies meals were enriched with energy, in five studies in combination with protein. Three studies included snacks in the intervention in addition to the enriched meals. In seven out of nine studies using energy enrichment a significant increase in energy intake was observed and in three out of five studies using protein enrichment a significant increase in protein intake was observed. Reporting on other outcomes was scarce and the quality of studies was described as heterogeneous, e.g. the amount of enrichment was often not clearly reported [117].

Morilla-Herrera et al. [116] also examined the effectiveness of food-based fortification by means of macronutrients in older people in a SLR. They included seven studies (all RCTs) with a mean age of participants above 65 years either using additional foods and snacks or increasing energy and nutrient density of the meals. Participants were frail community-dwelling or institutionalized and may thus be regarded as malnourished or at risk of malnutrition. Meta-analysis of four RCTs resulted in significant increases of energy and of protein intake. Due to heterogeneity of the studies, small numbers of participants and poor quality of some studies, the authors concluded that further high quality studies are required to provide reliable evidence [116].

Literature about food fortification with micronutrients was recently summarized in a scoping review for residential care [118] but evidence is presently insufficient to derive specific recommendations in this regard.

II.9 Should older persons with malnutrition or at risk of malnutrition be offered additional snacks, and/or finger food?

Recommendation 21

Older persons with malnutrition or at risk of malnutrition should be offered additional snacks, and/or finger food, in order to facilitate dietary intake.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Dietitians and other healthcare professionals traditionally use a number of dietary strategies to improve the energy and nutrient intake of older adults with malnutrition or at risk of malnutrition including the use of snacks between meals or finger foods, the latter in particular for persons who have difficulties using cutlery and remaining at the table for the entire duration of a meal.

Literature search identified four SLRs that included studies offering additional snacks and/or finger foods [78,88,116,117]. The

SLRs from Abdelhamid et al. [78] and from Bunn et al. [88], both focusing on people with dementia, were rated to be of high quality. Morilla-Herrera et al. [116] and Trabal & Farran-Codina [117] examined the effects of food fortification and included some studies which offered additional snacks along with food fortification strategies. The quality of both SLRs was rated as acceptable. Effects of snacks were however not analyzed separately and thus no specific conclusions were possible in this regard. In combination with food fortification positive effects on intake are described [116,117] (see recommendation 20). Abdelhamid et al. [78] describe two non-randomized trials examining the use of finger foods. One evaluated six months of a finger food menu for twelve cognitively impaired residents with poor dietary intake and limited use of cutlery, finding weight-loss stopped in ten out of twelve participants and eating independence improved (though no numbers or statistical analysis were provided) [119]. The other assessed effects of increased finger food provision on weight and food consumption of 43 care center residents with Alzheimer's disease [120]. The number of finger food offered could only be slightly increased. The proportion of food eaten also slightly increased but no effect on body weight was observed. Bunn et al. [88] also included the above mentioned study from Jean [119] about finger foods in their SLR. In addition one study offering finger food [121] and one study offering additional snacks [122] as part of comprehensive mealtime interventions are described where the effects of finger foods and snacks however cannot be separated from the other intervention components. One study using a glass-door refrigerator filled with snacks accessible at all times and additional time for meals reported an increased BMI after twelve weeks in 40 inpatients with dementia [123]. Based on this before-after study, constantly accessible snacks and additional time for meals are described as promising intervention needing high-quality reassessment [88]. In an additional relevant trial in older long-term-care residents at risk of malnutrition, the offering of three snacks between main meals and before bed resulted in an increase in energy intake by about 30% after three and after six weeks [124].

Due to little expense and no risk of harm we recommend additional snacks and/or finger food despite presently very limited scientific evidence.

II.10 Should older persons with malnutrition or at risk of malnutrition be offered texture-modified food?

Recommendation 22

Older persons with malnutrition or at risk of malnutrition and signs of oropharyngeal dysphagia and/or chewing problems shall be offered texture-modified, enriched foods as a compensatory strategy to support adequate dietary intake.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Chewing and swallowing problems limit the ability to eat food of normal texture and thus increase the risk of malnutrition. Both problems are widespread in older persons. Texture-modified foods intend to compensate for these functional limitations and hence support an adequate dietary intake. Texture-modification can also make the swallowing process slower and thereby safer [125,126]. Nevertheless, insufficient dietary intake is described in older persons with dysphagia receiving texture-modified diets [33–35,127].

Literature search identified one guideline giving evidence-based recommendations for the use of texture-modified diets for adults with oropharyngeal dysphagia [128], which was recently updated [129] and considered relevant to the key question. The guideline was developed as recommended by the Danish Centre for Clinical Guidelines. The quality of the update was assigned as high. In the underlying systematic search no literature assessing the effects of texture-modified food was found, and it was concluded that it is 'good clinical practice' to offer modified foods as a compensatory strategy to facilitate the intake of foods.

At present, also no studies about the effects of enrichment of texture-modified diets are available, but based on positive effects of enrichment of regular texture diets (see recommendation 20) it is assumed that enrichment can have similar effects in texture-modified diets for patients with chewing and/or swallowing problems. As texture-modified diets are usually accompanied by reduced food and fluid intake, nutritional intake should be closely monitored. For more detailed recommendations for patients with dysphagia we refer to the ESPEN Guideline Clinical Nutrition in Neurology [130].

Oral Nutritional Supplements

II.11 Should older persons with malnutrition or at risk of malnutrition be offered oral nutritional supplements?

ONS are energy and nutrient dense products designed to increase dietary intake when diet alone is insufficient to meet daily nutritional requirements. There are a wide range of ONS styles (milk, juice, yoghurt, savory), formats (liquid, powder, pudding, pre-thickened), volumes, types (high protein, fiber containing), energy densities (one to three kcal/ml) and flavors available to suit a wide range of needs and requirements. ONS are classified "high protein" when they provide >20% of energy from protein and "high energy" when they provide >1.5 kcal/ml or gram.

Recommendation 23

Older persons with malnutrition or at risk of malnutrition with chronic conditions shall be offered ONS when dietary counseling and food fortification are not sufficient to increase dietary intake and reach nutritional goals.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 24

Hospitalized older persons with malnutrition or at risk of malnutrition shall be offered ONS, in order to improve dietary intake and body weight, and to lower the risk of complications and readmission. (BM)

Grade of recommendation A – strong consensus (100% agreement)

Recommendation 25

After discharge from the hospital, older persons with malnutrition or at risk of malnutrition shall be offered ONS in order to improve dietary intake and body weight, and to lower the risk of functional decline. (BM)

Grade of recommendation A – strong consensus (100% agreement)

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Recommendation 26

Oral nutritional supplements offered to an older person with malnutrition or at risk of malnutrition, shall provide at least 400 kcal/day including 30 g or more of protein/day. (BM)

Grade of recommendation A – strong consensus (97% agreement)

Recommendation 27

When offered to an older person with malnutrition or at risk of malnutrition, ONS shall be continued for at least one month. Efficacy and expected benefit of ONS shall be assessed once a month.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 28

When offered to an older person with malnutrition or at risk of malnutrition, compliance in ONS consumption shall be regularly assessed. Type, flavor, texture and time of consumption shall be adapted to the patient's taste and eating capacities.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary to recommendations 23–28

Dietary counseling (see recommendations 18 and 19), food fortification (see recommendation 20), additional snacks (see recommendation 21) and ONS are options to increase daily dietary intake by the oral route. However, only a very small number of studies have compared the effectiveness of ONS to that of "normal food" support strategies in older persons. In older persons living at home, requiring community services and at elevated risk of malnutrition, weight gain was greater and the number of falls was lower in the "ONS provided by a dietician group" than in the "dietician visit only" group [131]. In older residents of long term care, energy intake was increased by 30% with snack foods and by 50% with ONS [124]. In older malnourished care home subjects, ONS resulted in a higher energy and protein intake and better quality of life than dietary counseling [132]. However, dietary counseling and food modifications may be better accepted for long duration, and are cheaper, so we suggest that in chronic clinical situations such as observed in the community or in nursing homes, they may be proposed first, and that ONS be proposed when dietary counseling and food fortification are not sufficient to reach nutritional goals. It is important to mention, however, that these different options to support adequate intake should not be seen as mutually exclusive, but as complementing each other.

Systematic literature search found six high quality SLRs including up to 62 randomized or quasi-randomized clinical trials which have assessed the efficacy of ONS versus usual care in older persons [97,133–139].

Milne and colleagues undertook systematic reviews restricted to older patients (mean age of population > 65 years) receiving protein and energy supplementation, usually in the form of sip feeds, versus usual care, first in 2002 (31 trials), with an update in 2005 (49 trials) and lastly in 2009 (62 trials) [135–137]. Although studies took place in a variety of settings, most participants were hospitalized in-patients with acute conditions. Studies showed a benefit of supplementation on nutritional intake and on percentage weight change. Meta-analysis in 2002 and 2005 showed a significantly reduced total mortality in supplemented compared with control groups; this was not observed in 2009. Subgroup analyses regarding mortality were consistently statistically significant when limited to trials with participants who were defined as malnourished and when 400 kcal or more was provided per day by ONS. Subgroup analyses limited to participants who were at least 75 years old, when supplementation was continued for 35 days or more, and when participants were unwell produced contradictory results regarding mortality risk. In all three reviews, the risk of complications by the end of follow-up in supplemented groups was not statistically significantly different from that in the control groups. No statistically significant effect of supplementation was reported for hand grip strength, and it was not possible to combine trials for meta-analyses of other functional outcome parameters.

The systematic review from Cawood et al. [139] involved 36 RCTs using high protein ONS (>20% energy from protein) of any consistency (ready-made liquid, powder, puddings) for any duration. Population study groups had a mean age of 74 years (83% of trials were performed in patients >65 years). Studies with participants in any nutritional status (well-nourished and malnourished) and from any setting were included. Compared to usual care, high protein ONS demonstrated a range of effects across settings and patient groups including reduced risk of complications, reduced risk of readmissions to hospital, improved grip strength, increased intake of protein and energy with little reduction in normal food intake and improvements in body weight. There was inadequate information to compare high protein ONS to standard ONS (<20% energy from protein). There was no overall significant effect on mortality and length of stay in the hospital. High protein ONS that provided >400 kcal/day (16 trials) contained in mean 29% of protein (20–40%). Thus, we recommend that ONS shall provide at least 400 kcal with 30% of the energy as protein, corresponding to 30 g of protein.

The meta-analysis from Stratton et al. [138] focused on the impact of ONS on hospital (re)admissions and showed significant reductions with ONS vs. routine care using data from six RCTs of which five were performed in older persons. In the five RCTs that recorded specifically readmissions after hospital discharge, the reduction of readmissions was also significant.

The SLR and meta-analysis from Baldwin et al. [97] included 41 trials addressing different interventions in adults to support dietary intake. In the ten trials that focused on supplementation of meals, nine used energy-protein ONS, one used a fat emulsion. Eight studies included exclusively older persons; one other study included malnourished hospitalized patients (70 ± 13 yrs.) and the last study included 4023 stroke patients (71 ± 12 yrs.) of which only 8% were malnourished. It is important to note that studies with individually adapted ONS were excluded. Overall results show no effect on mortality, length of hospital stay or readmissions. There was no subgroup analysis. It is possible that the large number of well-nourished stroke patients had a strong impact on the overall negative results.

The SLR and meta-analysis from Bally et al. [133] included 22 trials focusing on nutritional support in malnourished medical inpatients. Nutritional support was mostly ONS, but the authors also considered mixed interventions, oral glucose supplement with vitamins, unspecified clinical nutrition plans, or nutritional care from health care assistants and snacks. Fifteen trials were performed in older patients, eleven with ONS alone, two with ONS included in mixed interventions and two with other nutritional

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support plans. The authors underline the high heterogeneity of the trials. Results show a positive significant effect of nutritional support on energy and protein intake and body weight. Non-elective readmissions were significantly decreased by the intervention. There was no effect on mortality, hospital acquired infections, Barthel index or length of stay in the hospital. There was no subgroup analysis based on age or disease. This meta-analysis mostly reinforces previous results from Cawood et al. [139] and Stratton et al. [138], strongly suggesting that nutritional support decreases readmissions in hospitalized patients, including older patients, with malnutrition or risk of malnutrition.

Interesting data come from hospital post-discharge RCTs. A systematic review [134], including six trials with hospitalized older patients who were malnourished or at risk of malnutrition found evidence for increased dietary intake and body weight after discharge with oral nutritional supplements (ONS). In pooled analyses, no significant effects were found with respect to mortality or readmission risk. Two studies found a positive effect on functional outcomes (hand grip [140] and activities of daily living [141]). Two other RCTs (not included in this systematic review) studied the effects of a combined dietary counseling and ONS intervention after hospital discharge and reported prevention of weight loss and improved ADL functions [107] and decreased functional limitations [64,115]. Thus, individual RCTs suggest that nutritional interventions may support improvement of functional status post-discharge.

In a recent large multicenter RCT, which was not included in the previous SLRs, the effects of a high-protein ONS containing beta-hydroxy-beta-methylbutyrate were examined in 652 malnourished older hospitalized patients [142]. No significant between-group differences were observed for 90-day readmission rate, but 90-day mortality was significantly lower with the ONS relative to placebo, which is different to the results reported above and certainly needs further investigations.

Regarding length of time of the intervention, subgroup analysis in the meta-analyses from Milne et al. both 2002 and 2005 showed a consistently statistically significant impact of ONS on mortality when supplementation was continued for 35 days or more compared to less than 35 days [135,136]. This effect was no longer observed in the updated review in 2009 [137], and this issue was not addressed in other SLRs. However, it is important to note that in the 2009 update, the duration of the nutritional intervention was $\geq$35 days in 70% of the trials. Furthermore, older malnourished patients need a higher energy supply than younger adults to gain weight, and the increase in body weight and fat free mass in response to equal energy supply is slower in older patient [143]. Thus, nutritional interventions are likely to need time to be effective on nutritional status and other clinical outcomes. So, we recommend to consume ONS for at least one month.

The frequency of reported nutritional assessment in clinical trials is usually limited to the baseline and final assessments, and information on more often and continued monitoring of the nutritional situation is lacking. There was however consensus among the experts that nutritional status (body weight), appetite and clinical situation should be assessed at least once a month, when ONS are offered to older persons, to monitor the effects and expected benefits of the intervention as a basis to decide on continuation or cessation of the therapy.

To achieve beneficial effects, compliance is crucial. Compliance with ONS is usually reported to be good in clinical trials. In 46 clinical trials in mostly older participants across healthcare settings (mean age 74 years), overall compliance was 78%, better in the community (81%) than in the hospital (67%) [144]. Compliance was higher in older than in younger patients. A close correlation between the amount of energy from ONS prescribed and the amount consumed was reported. There was also a significant positive correlation between compliance and total energy intake (energy intake from food plus ONS energy intake), showing that ONS consumption has little effect on usual food intake.

In order to support compliance, offered products shall be adapted to the patient's wishes and needs. In particular, swallowing disorders may require texture adaptation of ONS. Because there is a risk that patients get tired in consuming the same ONS day after day, compliance shall be regularly assessed. A varied offer and options for change are proposed to enhance consumption of the products.

Enteral and parenteral nutrition

II.12 Should enteral tube feeding be offered to older persons with malnutrition or at risk of malnutrition?

Recommendation 29

Older persons with reasonable prognosis shall be offered EN if oral intake is expected to be impossible for more than three days or expected to be below half of energy requirements for more than one week, despite interventions to ensure adequate oral intake, in order to meet nutritional requirements and maintain or improve nutritional status.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

The effect of EN is generally not well studied. Rigorous prospective RCTs comparing EN with no feeding are not feasible for ethical reasons. All we know about EN therefore mainly comes from observational trials. EN is frequently commenced late, after substantial weight loss has already developed, which is in the stage of severe malnutrition [145,146] and which hampers an effective nutritional therapy [147]. In general, the survival after insertion of a percutaneous endoscopic gastrostomy (PEG) in geriatric patients is poor. A meta-analysis demonstrated a survival of 81% after one month, 56% after six month and of 38% after one year [148]. However, survival very much depends on the indication and selection of patients [149–154]. Several studies demonstrate some improvement of nutritional state after initiation of EN in older patients [146,147,155–160]. Nevertheless, the effect on functionality, mortality and quality of life remains unclear [161–172].

Recommendation 30

The expected benefits and potential risks of EN shall be evaluated individually and reassessed regularly and when the clinical condition changes.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Several studies have determined some risk factors for early mortality after PEG insertion, to help the decision-making process and to avoid futile PEG placements [149–153,166,173–176]. These risk factors comprise dementia, urinary tract infection, previous aspiration, diabetes, hypalbuminemia, acute illness, hospitalization, bedsores, higher age, nil-by-mouth, poor nutritional state, low BMI and the number of comorbidities. Nevertheless, these factors can hardly lead the decision-making in an individual case. One

would assume that geriatric patients in a very poor general state who undergo PEG placement would have a higher risk of early mortality after PEG placement, but a geriatric data base analysis revealed that none of the parameters of geriatric assessment emerged as a risk factor of hospital mortality after PEG insertion [154]. Thus, each patient must be evaluated individually with regards to the following questions:

1. Is EN likely to improve or maintain the quality of life of this patient?
2. Is EN likely to improve or maintain the functionality of this patient?
3. Is EN likely to prolong survival in this patient?
4. Is prolongation of life desirable from the patient's perspective?
5. Are the risks of feeding tube insertion and EN lower than the expected benefit?

In general, complication rates of EN are reported to be low [177], but under real-life conditions, the complication rate of both nasogastric tube feeding and PEG feeding may be substantial [153,178]. In this regard, it may be advisable to regularly assess mortality after PEG insertion in the individual hospital or department. If mortality is higher than above mentioned [148], patient selection and technical aspects should be questioned.

In general, the condition of patients on EN may change very quickly. That is why the indication and the expected benefits of EN should be reassessed on a regular basis. If the patient's ability for oral feeding improved substantially, or conversely an advantage of EN is no longer expected, EN should be discontinued. In situations where the effect of EN is difficult to anticipate, a treatment trial over a predefined period and with achievable and documented goals may be advisable [17]. Especially in patients with severe dementia, the risk-benefit ratio of EN is unfavorable and EN is generally not recommended. In this situation, we refer to the specific dementia guidelines of ESPEN [179].

Recommendation 31

Older persons with low nutritional intake in the terminal phase of illness shall be offered comfort feeding instead of EN.

Grade of recommendation GPP – consensus (88% agreement)

Commentary

EN is in principle a life-prolonging procedure. If the prolongation of life is no longer a desirable goal, the patients' quality of life should be considered exclusively. This is regularly the case in the palliative situation. In this situation, the patient should be offered whatever he or she likes to eat and drink orally, in the amount he or she likes to consume. This approach is mostly described by the term comfort feeding [180]. In this situation, covering a patient's nutritional requirements is entirely irrelevant [17].

Recommendation 32

If EN is indicated, it shall be started without delay.

Grade of recommendation GPP – strong consensus (96% agreement)

Commentary

Some studies show that a substantial weight loss has frequently occurred before the initiation of EN, i.e. on average 11.4 kg in the study by Loser et al. [145,153]. As weight loss and poor nutritional state are risk factors for mortality in general and particularly poor survival after PEG insertion [174], weight loss prior to initiation of EN should be avoided as far as possible. In addition, in the FOOD trial, which was performed in patients with dysphagic stroke, early EN was associated with an absolute reduction in risk of death of 5.8% ($p = 0.09$) [181]. Although this result was not statistically significant, this trend is an additional argument for early initiation of EN, in the absence of evidence from other randomized trials. Therefore, EN, if indicated, should start without relevant delay.

Recommendation 33

Older patients who require EN presumably for less than four weeks should receive a nasogastric tube.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

If there is an indication for EN, it must be decided which type of EN is adequate for the individual patient. From a practical point of view, it would be inadequate to undertake an invasive procedure like a PEG placement for a patient who will presumably need EN for only a few days. It is also assumed that EN sometimes may be continued longer as would be necessary once a PEG tube has been inserted. In a systematic review that compared nasogastric tube feeding with PEG feeding in older patients with non-stroke dysphagia, a pooled analysis of nine studies involving 847 patients demonstrated no significant differences in the risk of pneumonia and overall complications [182]. Within this review, meta-analysis was not possible for mortality and nutritional outcomes, but three studies suggested improved mortality outcomes with PEG feeding while two out of three studies reported PEG feeding to be better from a nutritional perspective. Within the FOOD trial, which prospectively compared early versus delayed EN as well as PEG feeding with nasogastric feeding in dysphagic stroke patients, PEG feeding was associated with an increased risk of death or poor outcome of 7.8% ($p = 0.05$) [181]. These data do not support a policy of early initiation of PEG feeding in dysphagic stroke patients. However, sufficient data in patients without dysphagia are not available. The recommended time frame of four weeks is thus somehow arbitrary and is meant as advice from the experts' perspective.

Recommendation 34

Older patients expected to require EN for more than four weeks or who do not want or tolerate a nasogastric tube should receive a percutaneous gastrostomy/PEG.

Grade of recommendation GPP – strong consensus (96% agreement)

Commentary

In addition to what has been recommended before, a gastrostomy should be undertaken in patients with reasonable prognosis who presumably require EN for a longer period. As mentioned in the commentary to recommendation 33, the time frame of four weeks is somehow arbitrary and mainly aims to prevent a too early gastrostomy. On the other hand, a nasogastric feeding-tube that is well tolerated, may be utilized for more than four weeks.

In geriatric patients, nasogastric tubes are frequently not well tolerated, but are also often not fixed adequately. In general,

frequent dislodgement of nasogastric tubes is associated with poor EN, which is a concern when using nasogastric tubes. However, this should never lead to any physical or chemical restraints in order to avoid manual or accidental dislodgement. If a nasogastric tube is dislodged despite adequate skin fixation, a nasal loop may be an alternative. Two studies about nasal loops in tube fed stroke patients demonstrated that nasal loops are safe, well tolerated and effective in delivering full EN [183–185]. A RCT observed an increase of 17% mean volume of fluid and tube feed given in the nasal loop group, without any differences in outcome after three months [185]. As a practical alternative to nasal loops, a PEG may be placed in those patients with frequent tube dislodgement who presumably require EN for more than a few days.

Recommendation 35

Tube fed older patients shall be encouraged to maintain oral intake as far as safely possible.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Most patients on EN are able to consume some amount of food and drinks orally. In case of dysphagia, the texture of food and drinks that can be swallowed safely has to be determined by a dysphagia specialist. Oral intake of the safe texture should be encouraged as far as safely possible, because oral intake is associated with sensory input and training of swallowing, increased quality of life and enhances the cleaning of the oropharynx. It has to be kept in mind that even patients with dysphagia and nil-by-mouth have to swallow more than 500 ml of saliva per day which alone is a risk factor for aspiration pneumonia. Aspiration pneumonia is suggested to be mainly caused by the bacterial content of aspirated saliva and not by the saliva itself, or a minimal oral intake [186,187]. However, the ability to have safe oral intake has to be decided individually, depending on the degree of dysphagia, the presence or absence of protective cough reflex and the cough force. For details please see ESPEN guideline on clinical nutrition in neurology [130].

II.13 Should older persons with malnutrition or at risk of malnutrition be offered parenteral nutrition?

Recommendation 36

Older persons with reasonable prognosis (expected benefit) shall be offered PN if oral and enteral intake are expected to be impossible for more than three days or expected to be below half of energy requirements for more than one week, in order to meet nutritional requirements and maintain or improve nutritional status.

Grade of recommendation GGP – strong consensus (100% agreement)

Commentary

PN is a safe and effective therapeutic procedure, which is used for delivery of all macronutrients and micronutrients into the organism via central or peripheral vein. It is always indicated and may allow adequate nutrition in patients who need nutrition support and who cannot meet their nutritional requirements via the enteral route (when EN is contraindicated or poorly tolerated). Age per se is not a reason to exclude patients from PN. Several studies have documented that PN is a feasible and successful method of nutritional support also in older people [147,188–190], not only in hospital but also at home [191]. It is however only rarely indicated as oral and enteral interventions are generally the first choice for nutritional support [190]. When indicated, PN should to be initiated immediately due to the risk of loss of independence in older patients and because even short-term starvation in the acutely ill older person leads to loss of lean body mass which can be critical especially in older patients. Indication criteria for PN are the same as in middle-aged subject: older patients facing a period of starvation of more than three days when oral nutrition or EN is impossible, and when oral or EN has been or is likely to be insufficient for more than 7–10 days.

II.14 How should enteral and parenteral nutrition be performed in older patients?

Recommendation 37

EN and PN and hydration shall be considered as medical treatments rather than as basic care, and therefore should only be used if there is a realistic chance of improvement or maintenance of the patient's condition and quality of life.

Grade of recommendation GPP – strong consensus (96% agreement)

Commentary

Any kind of medical treatment is contraindicated when it is obvious that it cannot be help for the patient. EN and PN are medical treatments because they require the insertion of a feeding tube or intravenous cannulation and a physician's prescription. The most important reason for commencement of EN or PN or hydration should be anticipated beneficial effects of such treatment for the individual person. If EN, PN or hydration are initiated, the effect of such treatment should be controlled. Clinical improvement as well as prevention of further clinical deterioration can both be relevant goals for an individual patient. Conversely, as for any other medical treatment, EN and PN should not be initiated or are contraindicated in situations when no benefits for the patient are expected. Especially in patients where death is imminent, e.g. within the next four weeks, or in patients with incurable disease, which cannot be improved by any treatment including nutritional support (e.g. advanced dementia, terminal phase of malignant cancer disease) the patient's comfort is the highest priority [17].

Prospective studies on the effect of EN or PN in patient patients with moderate or advanced dementia are lacking. Therefore, any use of EN, parenteral hydration or nutritional support should be in accord with other palliative treatments. Cessation of EN, PN and parenteral rehydration is possible when these treatments do not lead to anticipated goals. Cultural background, economical resources, social facilities as well as ethical and religious motivations may play a substantial role in determining the nutritional treatment and its outcome in very old, frail and chronically ill patients.

Recommendation 38

Older patients should *not* receive pharmacological sedation or physical restraints to make EN or PN or hydration possible.

Grade of recommendation GPP – strong consensus (100% agreement)

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Commentary

The goal of nutritional support is to improve or at least maintain nutritional status of the patient, which should be connected with increased or maintained lean body and especially muscle mass. It was shown and it is obvious that immobilization of the subject leads to loss of fat free mass and notably skeletal muscle mass, in particular in older persons [192]. The loss of physical activity is a logical consequence of pharmacological sedation or physical restraints; consequently, it usually leads to muscle mass loss. As maintenance or gain of body weight and muscle mass are the central goals of nutritional support, immobilization and sedation counteract planned goals of nutritional support. In addition, sedation and physical restraints may also lead to cognitive deterioration and should therefore be avoided. It has to be mentioned, however, that in rare exceptions, such as hyperactive delirium, it may be advantageous for the patient to use drugs with sedative effects or even physical restraints for a very limited period of time in order to prevent the patient from self-injury.

Recommendation 39

In older patients with malnutrition, EN and PN shall start early; it shall be gradually increased during the first three days in order to avoid the refeeding syndrome.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 40

During the first three days of EN and PN therapy in malnourished older persons, special attention shall be drawn to blood levels of phosphate, magnesium, potassium and thiamine which shall be supplemented even in case of mild deficiency.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary to recommendations 39 and 40

Refeeding syndrome (RFS) is a condition of potential risk in malnourished patients with electrolyte disturbances leading to clinical deterioration. Consequences include volume overload, redistribution of phosphate, potassium and magnesium, hypophosphatemia, muscle weakness, anemia and finally organ failure. Possible cardiac sudden death is described in up to 20%.

Criteria to identify RFS vary from reduced phosphate or any electrolyte serum concentration, the coexistence of electrolyte disturbances and clinical symptoms (e.g. peripheral edema, acute circulatory fluid overload, disturbance to organ function) [193]. A standardized definition is unfortunately lacking, and current knowledge about the syndrome is altogether limited. Only two observational studies were performed in older populations [194,195]. Kagansky et al. [194] reported significantly more weight loss, lower albumin levels, glucose-containing infusions and food supplements in older patients who developed at least one episode of hypophosphatemia (serum phosphate $\leq$ 0.77 mmol/L), which was detected on average on day 10.9 $\pm$ 21.5 of hospitalization. Hypophosphatemia was also associated with an increased length of hospital stay and mortality rate, which was however no longer significant in a multivariate analysis [194]. Lubart et al. [195] evaluated 40 frail older patients with prolonged feeding problems before the insertion of a nasogastric tube. A high mortality rate was observed which was mainly related to infectious complications, but in the light of a considerable number of patients with hypophosphatemia the authors suggested the RFS as a contributing factor to mortality [195].

Known risk factors for the RFS are a reduced BMI, significant unintended weight loss, no nutritional intake for several days, low plasma concentrations of magnesium, potassium or phosphate before feeding and a medical history of drug or alcohol abuse [196], and it has recently been observed that these risk factors are very common in older hospitalized patients [197]. A large overlap between the risk of malnutrition according to common screening tools and the risk of RFS was observed in the same patient group [198], suggesting that in older persons with malnutrition or at risk of malnutrition a risk of RFS should generally be taken into consideration.

Particular attention has to be paid within the first 72 h of nutritional support, which should generally be started early but increased slowly, accompanied by close monitoring of clinical signs and serum levels of phosphate, magnesium, potassium and thiamine. Further studies would be particularly useful in older patients, given also the high prevalence of kidney dysfunction in this specific population.

Exercise interventions

II.15 Should older persons with malnutrition or at risk of malnutrition in addition to nutritional interventions be offered exercise interventions?

Recommendation 41

In addition to nutritional interventions, older persons with malnutrition or at risk of malnutrition should be encouraged to be physically active and to exercise in order to maintain or improve muscle mass and function. (BM)

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

In older people weight loss occurs at the expense of muscle mass [199] and is associated with impaired physical function [200]. Muscle disuse and periods of bed rest can further exacerbate the degradation of muscle mass and strength [192].

The systematic search identified no RCT comparing a combined exercise and nutrition intervention with a singular nutritional intervention in older people with malnutrition or at risk of malnutrition using a two factorial design. Six RCTs of low to acceptable quality were found using a four factorial design with an exercise group and a control group in addition to the two aforementioned intervention groups in older persons with malnutrition or at risk of malnutrition [108,109,113,201–205]. Most of these RCTs showed neither a beneficial effect of the combined nor of the singular nutritional intervention on body composition, strength and functional outcomes. Only Rydwik et al. [108] reported improved muscle strength in the combined intervention group compared to the nutrition group, while other functional and nutritional measures did not differ. The type of nutritional intervention varied distinctly between studies limiting their comparability. Possible reasons for failing might be insufficient adjustment of interventions to individual nutritional needs and small sample sizes which were partially not based on a-priori power calculation.

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Despite poor evidence from RCTs, older persons with malnutrition or at risk of malnutrition should be encouraged to be physically active and to exercise in addition to nutritional treatment, as the older muscle is still able to react on anabolic stimuli of exercise training and consequently the decline in muscle function is at least partly reversible by adequate exercise interventions [206–208]. Before starting the exercise intervention, health status and physical performance level of the patient need to be evaluated to exclude contraindications for exercise training and to identify the appropriate training type, intensity and starting level [209].

Recommendation 42

During periods of exercise interventions, adequate amounts of energy and protein should be provided to older persons with malnutrition or at risk of malnutrition in order to maintain body weight and to maintain or improve muscle mass. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary

Exercise increases energy expenditure. In times of insufficient energy intake and energy stores, amino acids retained in the muscles, are used for energy production [210]. To avoid (further) weight loss and to maintain muscle mass in older people with malnutrition or at risk of malnutrition a positive or at least zero energy balance is of particular importance during periods of exercise interventions. As energy needs may vary considerably between individuals, they need to be estimated before the start of an intervention (see recommendation 1). Adequate amounts of protein are at least as important to avoid muscle atrophy and to stimulate muscle protein synthesis [210] (see recommendation 2).

The systematic search found five RCTs of low to high quality comparing combined exercise and nutrition interventions to singular exercise interventions in older people with malnutrition or at risk of malnutrition [109,204,211–213]. In older COPD patients, greater improvements in body weight were reported in those receiving an energy and protein containing supplement in combination with low intensity exercise training compared to the exercise alone group after twelve weeks of intervention [211]. In older rehabilitation patients with reduced muscle mass, adding a protein and vitamin D enriched supplement to a multicomponent exercise training showed more beneficial effects on body weight, MNA score and muscle mass than the training alone [212]. In another RCT from the same setting positive effects of a combined nutrition and exercise intervention were found regarding arm and calf circumferences as surrogates for muscle mass, but not for MNA score [213]. A RCT in older malnourished patients with lower limb fracture reported lower weight loss in the group receiving an oral nutritional supplement in combination with resistance training compared to the resistance training group [204]. One study in malnourished community-dwelling older adults failed to show any effect of individual nutritional advice and physical training [109]. However, in this study independent of the interventions, participants who needed to increase their energy intake by $\geq$ 20% to reach their energy requirements but failed this goal lost weight and fat free mass during the intervention period whereas no changes were observed in those reaching this goal [109].

Altogether, these studies support the need of adequate amounts of energy and protein during periods of exercise interventions.

III. Recommendations for older persons with specific diseases

III.1 Should older patients after hip fracture and orthopedic surgery be offered nutritional support?

Older persons suffering from a hip fracture and undergoing orthopedic surgery are generally at risk of malnutrition due to the acute trauma and surgery-associated anorexia and immobility. Voluntary oral intake in the postoperative phase is often markedly below requirements [61,214–217]. As a consequence, rapid deterioration of nutritional status and impairment of recovery and rehabilitation are common [56,214,218,219].

The literature search found two systematic reviews that were relevant to the PICO question and examined different types of nutritional support as sole intervention [220,221], one Cochrane review of high [220] and the other of acceptable quality [221]. Three additional RCTs were identified (published in eleven articles of acceptable quality) testing the effects of multicomponent interventions including nutrition for hip fracture patients [70–72,218,222–228].

Recommendation 43

Older patients with hip fracture shall be offered oral nutritional supplements postoperatively in order to improve dietary intake and reduce the risk of complications. (BM)

Grade of recommendation A – strong consensus (100% agreement)

Commentary

A recent high-quality Cochrane review and meta-analysis included 41 randomized trials on different types of nutritional therapy involving 3881 patients with a hip fracture (mean ages around 80 years) [220]. The methodological quality of all included trials was judged to be low to very low, leading to a low to very low overall grading of the quality of evidence across all intervention types and outcomes [220]. 18 trials (16 RCTs and two quasi-randomized trials) provided standard ONS to hip fracture patients, of which five specifically targeted patients that were malnourished. Four additional RCTs tested ONS with high protein content (>20% energy from protein). Sample sizes were mostly small (between 10 and 171 participants). All interventions were started preoperatively or within the first postoperative week and continued for at least one month up to six months. The use of ONS mostly leads to a significant increase in energy and nutrient intake. Adverse side effects were not increased (6 RCTs). Meta-analysis showed no effect of supplementation via standard (15 RCTs) or high-protein (4 RCTs) ONS on mortality risk. Combined analysis of eleven trials using standard ONS indicated a reduced risk of postoperative complications (RR 0.71; 95% CI 0.59–0.86), whereas for high-protein ONS (2 RCTs) no such effect was found [220]. The second meta-analysis [221] included a subset of ten of these RCTs (regardless whether they used standard or high-protein ONS) with a total of 986 patients and came to the same conclusions regarding mortality and complications. Regarding other outcomes (nutritional status, function, readmissions, length of hospital stay and quality of life), the great variety of variables and assessment methods used impeded any combined analysis.

Based on these results, we recommend to offer ONS to geriatric hip fracture patients, regardless of their nutritional state. To date,

there is not sufficient evidence that special ONS (e.g. high in protein) have additional beneficial effects for these patients. ONS shall always be offered in combination with other interventions to increase oral intake (e.g. fortified foods) as part of a multidisciplinary approach (see recommendation 46).

Recommendation 44

Supplementary overnight tube feeding shall NOT be offered to older patients with hip fracture unless there is an indication for EN for other reasons.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

The Cochrane analysis from Avenell et al. [220] found three RCTs and one quasi-randomized trial that tested the effects of supplementary overnight EN alone and one additional RCT that tested overnight tube feeding followed by ONS. Sample sizes were small (between 18 and 140 participants), the interventions were always started within five days from surgery and usually continued until discharge or until oral intake was sufficient. Supplementary overnight EN was overall poorly tolerated. Regarding mortality and complication risk, the meta-analysis of EN only studies as well as the RCT using tube feeding followed by ONS showed no evidence of an effect. Effects on nutritional status, length of hospital stay and functional status were inconsistent [220]. Due to high patient burden, poor tolerance and lack of clear beneficial effects, a negative recommendation is given.

Recommendation 45

In older patients with hip fracture, postoperative ONS may be combined with perioperative PN in order to improve nutritional intake and reduce the risk of complications. (BM)

Grade of recommendation 0 – consensus (83% agreement)

Commentary

Regarding the effects of PN, Avenell et al. [220] included one RCT of low quality that evaluated three days of perioperative peripheral PN followed by seven days of ONS compared with standard care in 80 patients with a fractured hip [216,229]. This short-time combined intervention increased total fluid and energy intake to near optimal levels during hospital stay. Risk of complications within four months was significantly reduced (RR 0.21 (99% CI 0.08–0.59), while mortality risk, length of hospital stay and the proportion of participants who were discharged to their own homes were unaffected [216].

Based on this positive result, and bearing the risk of complications associated with PN in mind, it may be considered to offer supplementary PN during the acute perioperative period, combined with ONS and early oral food intake postoperatively, in order to increase nutritional intake and reduce the risk of complications. As presently only one trial of low quality is available, the grade of evidence was reduced to “0”.

Recommendation 46

Nutritional interventions in geriatric patients after hip fracture and orthopedic surgery shall be part of an individually tailored, multidimensional and multidisciplinary team intervention in order to ensure adequate dietary intake, improve clinical outcomes and maintain quality of life. (BM, PC)

Grade of recommendation A - strong consensus (100% agreement)

Commentary

Multicomponent interventions including nutritional measures were examined in three RCTs in hip fracture patients in comparison to usual care. In one trial, performed in Sweden, the intervention included geriatric assessment and subsequent rehabilitation, staff education, teamwork, individual care planning and active prevention, detection and treatment of postoperative complications during hospitalization [70–72,222]. Nutritional interventions consisted of nutritional status and dietary intake registration, provision of protein-enriched meals and additional protein drinks. The authors reported reduced length of hospital stay, improved independence in activities of daily living (ADL) and mobility after twelve months [71] as well as reduced in-hospital falls and fall-related injuries [70]. The same intervention resulted in a subgroup of 157 patients with complete MNA at baseline and 4-months follow-up in significantly fewer days of delirium, fewer pressure ulcers and reduced length of hospital stay, despite no improvement in BMI and MNA [72]. In another study in Taiwan a comprehensive, interdisciplinary in-hospital care concept was followed by discharge planning and a home-based rehabilitation program with consultations for six months post-hospital [218,223–226,228]. Nutritional interventions consisted of periodic nutritional assessments and, in case of (risk of) malnutrition, further intervention by a dietitian, geriatric nurse and geriatrician [223,226]. Patients in the comprehensive care group had a three times higher likelihood of recovering to complete independence in basic activities of daily living (ADL) until six months follow up [223]. These effects faded until twelve months follow up [223], but improved self-care ability and decreased emergency department visits were reported up to two years after hip-fracture surgery [228]. Moreover, better health-related quality of life [224] and a lower risk of malnutrition [223] after six and twelve months were observed. Participants who were malnourished or at risk of malnutrition at discharge had a greater chance of recovering to a well-nourished state after six and twelve months [218,225]. In this subgroup, improvements in functional independence and balance occurred mainly in those who improved in nutritional status [225]. Finally, in the third trial, multifactorial, targeted geriatric treatments including nutritional interventions in combination with high-intensity resistance training for twelve months, resulted in reduced mortality, nursing home admissions and ADL dependency compared with usual care [227].

These studies illustrate the importance of a holistic view and comprehensive treatment approach in orthogeriatric patients. Nutritional interventions should be continued after hospitalization, as effects were seen as long as nutritional care was provided.

In the field of supportive interventions, the effects of additional support by dietetic assistants during hospitalization were

tested in one RCT of low quality, also considered in the Cochrane review of Avenell et al. [220], including 318 patients in an acute trauma unit, which were helped to get preferred foods and ONS and helped with eating [61]. This intervention improved energy intake (mostly from ONS) and reduced the risk of mortality (RR 0.57; 95% CI 0.34–0.95) compared to conventional care, but did not affect complication risk and length of hospital stay. Because of no perceived risk of harm, assistance with food provision and intake is recommended for geriatric patients after hip fracture and surgery in the same way as for geriatric patients in general (see recommendations 8 and 12).

III.2 Should older patients with delirium or at risk of delirium be offered nutritional support?

Recommendation 47

All older patients hospitalized to have urgent surgery shall receive a multi-component non-pharmacological intervention that includes hydration and nutrition management in order to prevent delirium. (BM)

Grade of recommendation A – strong consensus (100% agreement)

Recommendation 48

All older patients admitted to a medical ward and at moderate to high risk of delirium shall receive a multi-component non-pharmacological intervention that includes hydration and nutrition management in order to prevent delirium. (BM)

Grade of recommendation A – strong consensus (95% agreement)

Commentary to recommendations 47 and 48

Delirium is common in older people, especially when admitted to the hospital for acute medical or surgical care. Dehydration is a common precipitating factor and malnutrition a common contributing factor to delirium [230,231].

Several systematic reviews on non-pharmacological approaches to prevent and treat delirium in older patients have been published recently [230,232,233]. Abraha et al. [232] reviewed any non-pharmacological intervention aiming to prevent or treat delirium in older patients in any setting. They found that multicomponent non-pharmacological interventions significantly reduced the incidence of delirium in surgical wards (all except one study included participants in need of urgent surgery) and in medical wards (only in those at moderate or high risk of delirium). The evidence did not support the efficacy of any intervention in treating established delirium. Nutrition intervention was part of many non-pharmacological interventions, but no trials on nutrition as single-component intervention to prevent or treat delirium were identified. Other evidence-based recommendations support our recommendations on delirium [232]. A more recent Cochrane review focusing on hospitalized non-ICU patients reached similar conclusions: multi-component interventions reduced the incidence of delirium compared to usual care in medical and surgical settings [233]. Furthermore, this review calls attention to the subgroup of patients with pre-existing dementia, where the effect of multi-component interventions remains uncertain. An additional Cochrane review addressed the prevention of delirium in people living in nursing homes. A single, small, low quality trial showed no significant effect of hydration on the incidence of delirium. No trial that included any other nutrition intervention was identified [230].

In summary, nutrition and hydration interventions have only shown efficacy in the prevention of delirium when they are part of multidisciplinary interventions (10 of 19 trials on multidisciplinary interventions included at least one nutrition/hydration intervention). However, interventions used are heterogeneous (Table 8) and no evidence-based recommendations but common sense is needed to decide how to include nutrition and hydration in local programs.

Recommendation 49

Hospitalized older patients with present delirium shall be screened for dehydration and malnutrition as potential causes or consequences of delirium.

Grade of recommendation GPP – strong consensus (95% agreement)

Commentary

Delirium is common in older people, especially when admitted to the hospital for acute medical or surgical care. Dehydration is a common precipitating factor and malnutrition a common contributing factor to delirium [230,231]. Guidelines on delirium management recommend checking nutrition and hydration in delirious patients in order to correct existing problems (for example, see [234–236]).

III.3 Should older patients with depression be offered nutritional support?

Recommendation 50

Depressed older patients shall be screened for malnutrition.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 51

Older patients with depression may NOT routinely receive nutritional interventions unless they are malnourished or at risk of malnutrition (BM)

Grade of recommendation 0 – strong consensus (100% agreement)

Commentary to recommendations 50 and 51

Depression is a common cause of nutritional problems in old age. Having a significant weight loss or weight gain (>5%) or a change in appetite is one of the nine specific symptoms that define a major depressive disorder [237]. Thus, detection of nutritional problems is part of the assessment of depression. On the other hand, depression is included in the differential diagnosis of the etiology of malnutrition, especially in older patients, and is included in the comprehensive geriatric assessment. The association between depressed mood and malnutrition is well established [238,239].

However, data on the impact of nutrition interventions on the outcomes of depression in older subjects are lacking. Two trials

Table 8
Nutrition and hydration in multi-component interventions to prevent delirium.

Trial[a]	Population	Intervention
Bjorkelund (2010)	Hip fracture	Intravenous fluid supplementation in the ambulance or immediately after admittance Extra oral multi-nutrient drinks daily post-operatively
Caplan (2006)	Geriatric ward	Hydration assistance, encouraging patients to drink, providing water close by and personal help when needed Feeding assistance that involved meal set up and feeding
Chen (2011)	Common elective abdominal surgical procedures	Daily oral care involving tooth brushing Nutrition screening Diet education Feeding assistance if needed
Harari (2007)	Elective surgical patients (65+ years)	Patient education on good nutrition Nutrition review and intervention by geriatric team
Inouye (1999)	General-medicine service (70+ years)	Early recognition of dehydration and volume repletion
Lundstrom (2007)	Hip fracture	Staff education Recording of food and liquid intake Protein enriched meals (at least 4 days) Nutritional and protein drinks twice daily during hospital stay Consultation with dietician as needed
Marcantonio (2001)	Hip fracture	Treatment of fluid overload or dehydration Proper use of dentures Proper positioning for meals Assistance for meals as needed Supplements: 1–3 cans depending on oral intake NG tube if unable to take food orally
Pitkala (2006)	General-medicine service (70+ years)	Comprehensive geriatric assessment and treatment including nutrition as an item Nutritional supplements for those at risk of malnutrition or malnourished
Vidán (2009)	Geriatric acute care unit	In presence of dehydration (urea:creatinine ratio >40), four glasses of water a day (prescribed and scheduled like a drug) were given In presence of malnutrition, daily intake register and nutritional supplements were introduced
Wong (2005)	Hip fracture	Maintenance of fluid and electrolyte balance Use of dentures Positioning Dietician review and intervention

[a] For full reference of these articles please refer to Abraha et al. [232].

have considered the effect of nutrition intervention on depressive symptoms in older hospitalized patients. A first RCT studied the effect of a high energy (995 kcal/day) ONS used for six weeks in 225 hospitalized patients (roughly, one third had depressive symptoms assessed with the 15-item Geriatric Depression Scale (GDS), baseline nutritional status not described) [240]. GDS was significantly better in the intervention compared to the control group at six months, but not at six weeks. A second RCT explored an individualized nutritional intervention in 259 hospitalized older patients and found no changes in GDS scores at six months [62], the number of those with depression is not stated. All these trials used GDS (a validated depression screening instrument that measures depressive symptoms) as main outcome measure, but minimum clinically significant difference has not been defined for GDS. No trial has used the cure of depression as outcome measure for nutritional interventions in older persons. When depressed patients are malnourished or at risk, recommendations for these conditions made elsewhere in this guideline will apply.

III.4 Should older patients with or at risk of pressure ulcers be offered nutritional support?

Recommendation 52

Nutritional interventions should be offered to older patients at risk of pressure ulcers in order to prevent the development of pressure ulcers. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Recommendation 53

Nutritional interventions should be offered to malnourished older patients with pressure ulcers to improve healing. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary to recommendations 52 and 53

The incidence and prevalence of pressure ulcers (PUs) vary widely according to the definition and stage of ulcer, patient population, care setting, and preventive interventions used among others. It has been reported that PUs prevalence in European hospitals ranges from 8 to 23%, while in nursing homes about 11% of residents have a PU stage two or higher on admission, and among ulcer-free residents staying in the nursing home, 14–33% develop a new PU [241]. Possible important outcomes related to PUs treatment were defined by ONTOP Evidence Group which identified rates of complete wound healing as the most critical, and reduction of pain, time to complete wound healing, reduction of wound size, length of hospital stay, admission to nursing homes, lower incidence of infections or use of antibiotic therapy, nursing time spent in wound care, in-hospital mortality, costs of hospital admission, hospital readmissions in a given time after discharge as important outcomes [241].

Two SLRs [242,243] and two overviews of SLRs [241,244] were identified and considered relevant. Their quality was rated as moderate to high. The quality of studies included in these reviews was rated as low. One additional RCT published later was also considered [245]. The quality of this RCT was rated as moderate.

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The meta-analysis by Stratton et al. [242] of four RCTs showed that the supplementation with ONS (high protein) in patients with no PUs at baseline resulted in a significantly lower incidence of PUs when compared to standard care. Addition of a RCT on EN in the meta-analysis produced similar results. Evidence form RCTs comparing the effect of ONS or EN versus routine care on the healing of existing pressure ulcers was insufficient to be compared and to allow meta-analysis. More recently, Lozano-Montoya et al. [244] evaluated the effects of non-pharmacological interventions for PU prevention, including nutritional interventions. Based on the same four RCTs meta-analyzed by Stratton et al. [242] the authors concluded that "nutrition intervention during acute hospital admission may slightly reduce the incidence of PUs at 2–4 weeks in patients at risk of developing PUs". The quality of evidence was however rated as very low. Vélez-Díaz-Pallarés et al. [241] focused on treatment of existing PUs and identified eight studies (seven RCTs) evaluating the effects of nutritional interventions. All studies failed to show any effect, but again the overall quality of studies included was rated low to very low. Langer and Fink [243] identified eleven trials that compared the effects of mixed nutritional supplements with standard hospital diet, meta-analysis of eight of these trials found borderline significance for an effect on PU development (OR 0.96; 95% CI 0.73–1.00). Regarding healing, 14 trials were found which were very heterogeneous regarding type of nutritional supplements, participants, comparisons and outcomes, and meta-analysis was not appropriate. No clear evidence of an effect was found in any of the individual studies [243].

Benefits of nutritional interventions may depend on nutritional status and concomitant relevant health problems causing the (risk of) pressure ulcers. Unfortunately, the majority of trials considered did not distinguish between malnourished and non-malnourished patients. Cereda et al. [245] restricted their randomized, controlled and blinded study to 200 malnourished persons with PUs (stage II, III and IV) in long term and home care services and showed that supplementation with an oral nutritional formula enriched with arginine, zinc, and antioxidants improved PU healing compared to an isocaloric isonitrogenous formula (greater and more frequent reduction in PU area). Although the experimental formula was more expensive, it proved to be cost-effective [246].

In case of malnutrition, there is a clear need of nutritional interventions, and an early screening of malnutrition should be performed at hospital and nursing home admission independent of the presence of PUs, as described elsewhere in this guideline. Thus, also in malnourished older patients with pressure ulcer nutritional interventions are indicated; in these patients they may support healing of PUs. As only one RCT is presently documenting these benefits, the grade of recommendation is downgraded to B. The need of high quality studies in this specific topic is emphasized.

III.5 Should older persons with overweight or obesity be offered specific nutritional interventions or advised to follow a specific diet to reduce body weight?

Independent of age, the WHO defines overweight as BMI 25 to <30 kg/m^2 and obesity as BMI ≥30 kg/m^2 [247]. Due to changes in body composition during aging and a reduction of body height, the validity of the BMI as a measure of overweight and obesity is reduced in older people [248–250]. Moreover, there is increasing evidence that in terms of mortality, cardiovascular and metabolic risk and even in terms of function, the distribution of body fat may be more important than the amount per se [249,250]. To date no consensus on how to assess obesity-related health risk in older adults has been reached and the role of BMI, overweight and obesity remains highly controversial.

The systematic literature search resulted in no suitable SLRs to answer the PICO questions, but several guidelines [250–254] and position statements [255,256] on overweight and obesity treatment giving specific recommendations for older adults were identified. Twelve RCTs were found testing dietary interventions aimed at weight loss in overweight and obese older persons against a combination of the same dietary intervention with an exercise intervention [257–268].

Recommendation 54

In overweight older persons weight-reducing diets shall be avoided in order to prevent loss of muscle mass and accompanying functional decline.

Grade of recommendation GPP – strong consensus (95% agreement)

Commentary

Experts generally agree that there is usually no need for overweight older people to lose weight [250–252,255,256] as meta-analyses indicate that mortality risk of healthy older people is lowest in the overweight range [269–271]. Further, weight loss, whether intentional or not, enhances the age-related loss of muscle mass, and consequently increases the risk of sarcopenia, frailty, functional decline, fractures and malnutrition [252,272,273]. Moreover, the common weight regain after a weight-reducing diet is predominantly a regain in fat mass and not in lean mass [273]. Thus, repeated phases of weight loss and regain, called "weight cycling", might contribute to the development of sarcopenic obesity (the presence of reduced muscle mass together with excess fat mass) [273]. Therefore, and to avoid a progress to obesity, maintaining a stable body weight is considered desirable for overweight older adults [16]. A combination of a balanced, nutrient-rich diet providing adequate amounts of energy and protein, and physical activity, if possible even exercise, is a sound strategy to keep weight stable and to prevent obesity [274].

Recommendation 55

In obese older persons with weight-related health problems, weight-reducing diets shall only be considered after careful and individual weighing of benefits and risks.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Obesity, especially severe obesity (BMI ≥35 kg/m^2), increases metabolic and cardiovascular risk as well as the risk of mobility limitations and frailty in older persons [248,255,256], particularly when marked muscle loss has already occurred [273]. Current expert recommendations regarding weight reduction in older people primarily refer to cases of obesity that are associated with comorbidities and obesity-related adverse health effects [252,255,256,272]. In these cases, positive effects of intended weight loss on orthopedic problems, cardiovascular and metabolic risk, insulin sensitivity, chronic inflammation and functional limitations have been reported, partly in combination with physical

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exercise [16,248–250,252,255]. On the other hand, as weight loss in older persons may have harmful effects due to the loss of lean mass (see commentary to recommendation 54), the decision for or against weight reduction shall always be taken at the individual level. It should be based on a careful weighing of possible risks and benefits of the intervention considering functional resources, metabolic risk, comorbidities, patients' perspective and priorities, and estimated effects on his or her quality of life [249,250]. If decision is made against weight reduction, it is advisable to aim at weight stability and avoidance of further aggravation of obesity [16].

Recommendation 56

If weight reduction is considered in obese older persons, energy restriction shall be only moderate in order to achieve a slow weight reduction and preserve muscle mass.

Grade of recommendation GPP – strong consensus (95% agreement)

Commentary

If weight reduction is considered to be beneficial, it has to be approached with great care [250,251]. Interventions working in young adults cannot simply be extrapolated to older populations with low muscle mass and frailty [272]. To avoid loss of muscle mass and to achieve a slow weight reduction in older persons, the dietary intervention should consist of a balanced diet as generally recommended for older adults, with a maximally moderate caloric restriction (~500 kcal/d less than estimated needs and maintaining a minimum intake of 1000–1200 kcal/d) targeting a weight loss of 0.25–1 kg/week (~5–10% of initial body weight after six months or more) and assuring a protein intake of at least 1 g/kg BW/d and an appropriate intake of micronutrients [252,254,255]. Strict dietary regimens, like diets with very low energy intake (<1000 kcal/day), are strongly discouraged in the older population due to the risk of developing malnutrition and promoting functional decline [75,255,273].

Recommendation 57

If weight reduction is considered in obese older persons, dietary interventions shall be combined with physical exercise whenever possible in order to preserve muscle mass. (BM)

Grade of recommendation A – strong consensus (100% agreement)

Commentary

As it is of utmost importance for obese older persons to avoid loss of muscle mass while losing their excess fat mass, dietary interventions shall be combined with structured, supervised physical exercise whenever possible, in addition to an increase in everyday physical activity. Twelve RCTs are available that compared the effects of a dietary weight loss intervention alone to a combination of the same dietary intervention with an exercise intervention in older persons. Three of these studies were restricted to obese persons [258,260,261], the others included mixed samples of obese and overweight older persons. The studies were not always based on an a-priori power calculation, and six studies had less than 40 participants [259–261,264–266]. In ten of these twelve trials, a weight-reducing diet alone resulted in the desired weight loss, which consisted of fat mass but also of lean mass [259–261,263–268]. The combination of a weight-reducing diet with exercise training had comparable if not greater effects than the singular weight-reducing diets regarding the reduction of body weight and fat mass, while often preserving lean mass better than diet alone [258–260,264–266,268]. Moreover, for several strength and physical performance measures, greater improvements were observed in the combined groups than in the diet only groups [257–260,262–266,268]. In these studies, the weight-reducing diets consisted of a balanced diet with a daily energy deficit of 300–1000 kcal, aiming at a weight loss of 5–10% of initial body weight and/or 0.25–1 kg per week [257–268]. One study used partial meal replacement to achieve the weight loss goal [263], and most studies provided weekly or bi-monthly dietician-led educational sessions (individual and/or group) on nutrition and on achieving behavioral and lifestyle changes [257–259,261,262,266,268]. Exercise training was conducted 2–5 times per week and a single session lasted 45–90 min. Most studies used a combination of flexible, endurance and resistance training [257,258,260,261,263]. In two studies, participants performed solely aerobic endurance training [264,268], in one trial exercise consisted mainly of walking [267], in three trials of moderate to high intensity resistance training [259,265,266], and one study compared aerobic and resistance training, showing comparable results [262]. Before starting an exercise intervention, health status and physical performance level of the patient need to be evaluated to exclude contraindications for exercise training and to identify the optimal starting level and exercise type in order to ensure a safe and successful training [209,275].

It should also be considered that the participants of the above mentioned RCTs were mostly “young-old” (60–70 years) with marginal disease burden and few functional limitations, not representing a typical geriatric population. As very old and frail persons are more vulnerable to any kind of stress, decisions for or against weight loss require particular care in this population subgroup (see commentary to Recommendation 55). Also, interventions to reduce body weight in very old, functionally impaired and multimorbid persons need to be conducted with particular caution and close monitoring [16,251]. Presently, RCTs on possible benefits and harms of weight loss in more vulnerable groups of obese older individuals, e.g. in nursing homes or hospitals, are lacking and are required in future since an increasing number of obese older patients is found in these settings, and obesity contributes to their dependence, complicates care procedures and therefore impacts their quality of life [16,276].

III.6 Should older patients with diabetes mellitus be offered specific nutritional interventions or advised to follow a specific diet?

Recommendation 58

Older patients with diabetes mellitus shall routinely be screened for malnutrition with a validated tool in order to identify those with (risk of) malnutrition.

Grade of recommendation GPP – strong consensus (95% agreement)

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Recommendation 59

In older patients with diabetes mellitus restrictive diets shall be avoided in order to prevent malnutrition and accompanying functional decline.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 60

Malnutrition and risk of malnutrition in older patients with diabetes mellitus shall be managed according to the recommendations for malnourished older persons without diabetes mellitus.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary to recommendations 58 – 60

Our review of the literature disclosed no studies on the prevention or treatment of malnutrition specifically in older persons with diabetes. Based on the few studies on the prevalence of malnutrition in older diabetics it follows that the prevalence of (risk of) malnutrition in older diabetics is as high or even higher than in their non-diabetic counterparts [277–279]. This risk is most likely related to the functional dependence and multimorbidity in these older diabetics. In order to identify those diabetics with (risk of) malnutrition we recommend to screen routinely for malnutrition (see part on screening and assessment of this guideline).

To decrease the risk of malnutrition developing in older persons with diabetes we recommend to avoid restrictive diets. These diets have limited benefits and can lead to nutrient deficiencies [74,280]. A balanced diet of about 30 kcal/kg body weight/d providing 50–55% of the total energy contribution by carbohydrates, rich in fiber (25–30 g/d) and which favors mono- and polyunsaturated fatty-acids is proposed as recommended for the general older population. In case of obesity in older diabetic patients we refer to the respective recommendations provided elsewhere in this guideline (see recommendations 55–57).

In case of malnutrition in an older person with diabetes mellitus we recommend to follow the same guidelines as for non-diabetic older adults. The use of oral nutritional supplements or use of tube feeding can result in a rise of the glucose levels. However, prevention and treatment of malnutrition with its probable negative short-term outcomes are regarded more important than possible long-term complications of hyperglycemia.

IV. Recommendations to identify, treat and prevent dehydration in older persons

Dehydration relates to a shortage of water (fluid) in our bodies. This can be due to insufficient drinking (low-intake dehydration) or excess losses (through bleeding, vomiting, diarrhea etc., called volume depletion), or a combination of both types (combined dehydration) [281–284]. ***Low-intake dehydration*** is a shortage of pure water leading to loss of both intracellular and extracellular fluid and to raised osmolality in both compartments (intracellular and extracellular). ***Volume depletion*** is due to excess losses of fluid and salts (especially sodium and sometimes other components); extracellular fluid is lost primarily, not intracellular fluid, and serum osmolality will be normal or low. Literature search identified ten SLRs [78,88,285–292] and four RCTs [281,293–295] relevant to answer the PICO question.

Low-intake dehydration

IV.1 How much should older persons drink each day?

Recommendation 61

Older women should be offered at least 1.6 L of drinks each day, while older men should be offered at least 2.0 L of drinks each day unless there is a clinical condition that requires different approach. (BM)

Grade of recommendation B – strong consensus (96% agreement)

Commentary

Daily water intake is required to compensate daily losses by respiration, exudation, urine and feces. An individual's minimum fluid requirement is 'the amount of water that equals losses and prevents adverse effects of insufficient water' [295]. We take fluid from drinks and foods, but drinks or beverages account for 70–80% of fluid consumed [296].

Recommendations for adequate fluid intakes in older adults are often based on small studies in young adults and studies in other mammals [297] so actual volumes suggested tend to depend on the assumptions made. The European Food Safety Authority (EFSA) reviewed the literature and recommended an Adequate Intake (AI) of 2.0 L/day for women and 2.5 L/day for men of all ages (from a combination of drinking water, beverages and food) [286]. Assuming 80% of these fluid needs to come from drinks then women would require 1.6 L/d of drinks, and men 2.0 L/d. Minimal drinks recommendations in women vary from 1.0 L/d in the Nordic countries to 2.2 L/d in the USA, while in men the range is 1.0–3.0 L/d of drinks or beverages [298–302]. Other countries use vaguer units, such as "6–8 cups/glasses a day" [303]. Given this variation, use of the EFSA fluid recommendation of 2 L/d for women and 2.5 L/d for men from all sources, or 1.6 L/d and 2.0 L/d respectively from drinks alone would seem appropriately cautious in older adults. Individual fluid needs are related to energy consumption, water losses and kidney function, so larger people may require more fluid. The EFSA recommendations apply to "conditions of moderate environmental temperature and moderate physical activity levels" so needs may be higher in extreme temperatures (e.g. summer heat) or at times of greater physical activity. Excessive losses due to, fever, diarrhea, vomiting or severe hemorrhage must also be balanced by additional intake. On the other hand, specific clinical situations, namely heart and renal failure, may need a restriction of fluid intake.

IV.2 What should older persons drink each day?

Recommendation 62

A range of appropriate (i.e. hydrating) drinks should be offered to older people according to their preferences. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Commentary

Drinks providing fluid with a hydrating effect on our bodies include water, sparkling water, flavored water, hot or cold tea, coffee, milk and milky drinks, fruit juices, soups, sports or soft drinks and smoothies [294]. There is a common myth, which should be dispelled, that in order to be hydrated we need to drink plain water – this is not the case. Beer and lager are hydrating and may also be appropriate for some older adults (not needing to restrict alcohol for medical or social reasons). Drinks should be chosen according to the preferences of the older person, as well as the drinks' fluid and nutritional content – so that milky drinks, fruit juices and smoothies, high calorie drinks and fortified drinks all have particular benefits in specific circumstances. Despite worries about "dehydrating" effects of caffeine and alcohol there is good evidence that coffee does not cause dehydration [293,294], and nor do alcoholic drinks of up to 4% alcohol [294]. The effect of alcoholic drinks with greater than 4% alcoholic content on hydration status is not yet clear, and clinical studies are lacking (further research is needed). Research on which drinks are hydrating was carried out in younger adults [293,294]; similar research does not appear to have been carried out in older adults. However, there is little reason to believe that these findings would not apply to older adults.

In the UK coffee intake and alcoholic drinks each make up around 10% of drinks intake in free-living older adults, so are important fluid sources [304]. Twenty percent of UK care home residents reported that their favorite drink was coffee, and 50% drank coffee at some point each day [305,306]. If continence is a concern then decaffeinated drinks (such as coffee, tea and soft drinks) may be tried, but are not necessary unless found helpful [307,308].

There is good evidence from two RCTs that the hydration potential for most non-alcoholic drinks, such as hot or iced tea, coffee, fruit juice, sparkling water, carbonated beverages/soda, and also lager, are very similar to those of water [293,294]. Although this research was in younger adults it suggests that variety, offering a range of drinks, and the drinks preferred by older adults, will be both hydrating and more enjoyable than always drinking water.

IV.3 Which older persons are at risk of low-intake dehydration?

Recommendation 63

All older persons should be considered to be at risk of low-intake dehydration and encouraged to consume adequate amounts of drinks. (BM)

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

A non-systematic review of studies reporting serum osmolality in older adults suggests that low-intake dehydration is common in this group [309]. Levels of dehydration (signified by serum or plasma osmolality >300 mOsm/kg) were low (0–15%, mean 7%) in older adults living at home in Japan [310], the US [311,312] and Sweden [313]. Three US [314–316] and one UK [14] study of more frail and vulnerable older adults living in residential or long-term care suggested that up to 38% (mean 19%) were dehydrated. The risk of dehydration was higher again in older adults admitted to hospital (4–58%, mean 36%) in the UK [317–321], Sweden (reported in Hooper et al. [287]) and Austria [322]. Reduced fluid intake in more vulnerable older adults was confirmed in a study measuring daily water turnover rates (using deuterium oxide tracer) in older adults living in residential care (median 1.5 L/d, range 0.91–2.94), 27% less than in independently living older adults [323]. The causes of low-intake dehydration in older adults appear to be varied and inter-related, and have been examined in several non-systematic reviews [12,13,324].

A wide range of age-related physiological changes increase dehydration risk [12,324]. Aging appears to blunt two key physiological (and protective) responses to drinking too little, thirst and primary urine concentration by the kidney [14,325–328]. In addition our total body water is reduced as we get older so we have a smaller fluid reserve, and many older adults use medications such as diuretics and laxatives which increase fluid losses [122,329–332]. While in some populations age is a risk factor for dehydration, in frail and vulnerable older adults it appears that degree of frailty and vulnerability (as assessed by functional status and cognition) are more relevant indictors [13,14,315].

Besides physiological changes, a range of other risk factors increase vulnerability to dehydration with age. Memory problems may cause older adults to forget to drink and forget that they haven't drunk (not being prompted to drink by thirst) [12–14,315]. Many older adults choose to reduce their drinks intake voluntarily, and because they don't feel thirsty as a result, assume they are still drinking enough for their health. Reasons for reducing fluid intake often revolve around continence (and fear of incontinence) and issues about getting to the toilet [13,333,334]. Furthermore, drinking with others is an important part of social interaction, and social contact is a key trigger for drinking – but as social isolation becomes more common, drinking routines are lost and drinks intake is reduced [335]. Physical access to drinks can also be an issue [13,323,336], as can swallowing problems and dysphagia. Thus, older adults are at high risk of dehydration due to drinking insufficient amounts of fluids and should be encouraged to consume adequate amounts of drinks.

IV.4 Should older persons be screened for low-intake dehydration?

Recommendation 64

All older persons should be screened for low-intake dehydration when they contact the healthcare system, if clinical condition changes unexpectedly, and periodically when malnourished or at risk of malnutrition.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

As described above (recommendation 63), low intake dehydration is common in older adults. There is some evidence that older adults with low-intake dehydration have poorer outcomes than those who are well-hydrated [322]. High quality cohort studies which have adjusted for key confounding factors have consistently found that older adults with raised serum osmolality (>300 mOsm/kg or equivalent) have an increased risk of mortality [337–339] and one showed an associated doubling in risk of 4-year disability [338].

Two systematic reviews [285,340] have assessed RCTs and uncontrolled trials aiming to increase fluid intake in older adults. Unfortunately most trials assessed fluid intake hydration status and health outcomes poorly, so success in increasing fluid intake is

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unclear. Nevertheless, regarding the severe consequences of dehydration, we recommend to screen for low-intake dehydration to identify dehydration early allowing for timely interventions to normalize hydration status and prevent poor outcomes. This might be of particular importance in situations of increased risk of dehydration e.g. in case of acute deterioration of health or poor food intake.

IV.5 How should low-intake dehydration be identified in older persons?

Recommendation 65

Directly measured serum or plasma osmolality should be used to identify low-intake dehydration in older adults.

Grade of recommendation GPP – strong consensus (95% agreement)

Commentary

When we take in too little fluid (drink too little) the fluid within and around our cells becomes more concentrated, raising the osmolality of serum and plasma [281–284]. The raised osmolality is the key physiological trigger of protection mechanisms (such as thirst and increased concentration of urine by the kidney). In older adults renal function is often poor so that renal parameters no longer accurately signal low-intake dehydration [12,334,341]. Clinical judgement is also highly fallible in older adults [342]. For these reasons, the US Panel on Dietary Reference Intakes for Electrolytes and Water stated "The primary indicator of hydration status is plasma or serum osmolality" [300]. This statement sets the reference standard for dehydration in older adults. It is based on physiology and biochemistry and has been well agreed by hydration experts for many decades [282–284]. In contrast, extracellular water loss (volume depletion) due to diarrhea, vomiting or renal sodium loss is connected with normal or low plasma osmolality.

Recommendation 66

An action threshold of directly measured serum osmolality >300 mOsm/kg should be used to identify low-intake dehydration in older adults. (DM)

Grade of recommendation B – strong consensus (94% agreement)

Commentary

Threshold values of serum osmolality have been assessed in varied ways, but Cheuvront et al. [281] appear to have developed these most rigorously. They assessed the range of plasma osmolality in hydrated younger adults, then in the same persons who had been dehydrated, identifying the cut-off that best separated the two states. Their suggested threshold is that serum or plasma osmolality >300 mOsm/kg is classified as dehydrated. This cut-off value concurs with observations from cohort studies assessing effects of raised serum osmolality in older people [317,337–339].

Serum osmolality is the sum of concentrations of osmotically active components especially of sodium, chloride, bicarbonate, potassium glucose, and urea. Interpretation of raised serum osmolality (>300 mOsm/kg) as sign of dehydration depends on checking that serum glucose, and to some extent urea are within normal range; if not these should be normalized by adequate treatment. In low-intake dehydration it is common that despite raised serum osmolality none of the major components (sodium, potassium, urea or glucose) is raised out of the normal range – but general fluid concentration leads to small rises within the normal range in all these components (Hooper unpublished).

Recommendation 67

Where directly measured osmolality is not available then the osmolarity equation (osmolarity = 1.86 × (Na+ + K+) + 1.15 × glucose + urea + 14 (all measured in mmol/L) with an action threshold of >295 mmol/L) should be used to screen for low-intake dehydration in older persons. (DM)

Grade of recommendation B – strong consensus (94% agreement)

Commentary

Work with a set of European cohorts of older adults has suggested that most existing serum osmolarity equations are not diagnostically accurate to calculate serum osmolality in older adults [341,343]. However, one equation (osmolarity = 1.86 × (Na+ + K+) + 1.15 × glucose + urea + 14 (all measured in mmol/L)) usefully predicted serum osmolality in people aged ≥65 years with and without diabetes, poor renal function, dehydration, in men and women, in the community, in residential care and in hospital, with a range of ages, health, cognitive and functional status [341,343]. Given costs and prevalence of dehydration in older people, a cut point of 295 mOsm/L will identify most adults with low-intake dehydration (sensitivity 85%, specificity 59%) and should trigger advice and support with drinking and fluid intake. A directly measured serum osmolality test a few days later will identify older adults in need of more intensive support, intervention and/or follow up. This equation has also been found to be useful in younger adults [344].

Note on terms: osmol**a**lity is directly measured osmolality, measured using freezing point depression, while osmol**a**rity aims to approximate osmolality and is an estimate based on an equation of several components. The terms are often used incorrectly.

Recommendation 68

Simple signs and tests commonly used to assess low-intake dehydration such as skin turgor, mouth dryness, weight change, urine color or specific gravity, shall NOT be used to assess hydration status in older adults. (DM)

Grade of recommendation A – consensus (83% agreement)

Recommendation 69

Bioelectrical impedance shall NOT be used to assess hydration status in older adults as it has not been shown to be usefully diagnostic. (DM)

Grade of recommendation A – strong consensus (100% agreement)

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Commentary to recommendations 68 and 69

A Cochrane systematic review of diagnostic accuracy of simple signs and tests for dehydration in older adults (aged at least 65 years old) has pooled diagnostic data from studies assessing many single clinical signs and tests against serum osmolality, osmolarity or weight change [287]. It found that none was consistently useful in indicating hydration status in older adults [287]. The signs have either not been shown to be usefully diagnostic or have been shown not to be usefully diagnostic. These findings have been confirmed by more recent diagnostic accuracy studies in older adults [319,345–347]. The Cochrane review also found no evidence of the utility of bioelectrical impedance in assessment of hydration status in older adults in four included studies [287].

Recommendation 70

Older persons and their informal carers may use appropriate tools to assess fluid intake, but should also ask healthcare providers for assessment of serum osmolality periodically.

Grade of recommendation GPP – strong consensus (94% agreement)

Commentary

Unfortunately, assessment of fluid intake is often highly inaccurate in older adults. A recent study in residential care compared staff-completed drinks intake assessment with direct observation over 24 h for 22 older adults, finding a very low correlation ($r = 0.122$) [305]. The low correlation appeared to be due to many drinks being omitted from the staff assessments, as well as recording of drinks given rather than drinks consumed. On average staff assessments were 700 ml/d lower than direct observation would suggest. This poor ability to assess drinks intake in residential and nursing care facilities has been reported numerous times [348–351]. Measurement of serum osmolality is the method of choice (see recommendations 65 and 66).

There is little evidence of the accuracy of assessment of fluid intake by informal carers, but it may be better than for care staff as informal carers may be more aware of the full drinks intake of the older adult. We have evidence that when older adults record their own drinks intake it is more accurate than that assessed by care staff [352]. Older adults and their informal carers may like to use a tool like the Drinks Diary (which explicitly assesses amount consumed, rather than amount provided [352]) to record fluid intake, but we suggest that they also ask their health care providers to check serum or plasma osmolality. Within health and social care settings fluid intake or fluid balance should only be assessed in specialist medical units with specifically trained personnel.

IV.6 How should older persons be treated for low-intake dehydration?

Recommendation 71

Older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolarity >295 mmol/L) who appear well should be encouraged to increase their fluid intake in the form of drinks preferred by the older adult.

Grade of recommendation GPP – strong consensus (100% agreement)

Commentary

Treatment for low-intake dehydration involves administration of hypotonic fluids [282–284], which will help correct the fluid deficit while diluting down the raised osmolality. In mild dehydration older persons should be encouraged to drink more fluid, which can be in the form of drinks preferred by the older person, such as hot or iced tea, coffee, fruit juice, sparkling water, carbonated beverages/soda, lager or water [293,294]. Oral rehydration therapy (which aims to replace electrolytes lost in volume depletion by diarrhea or vomiting) and sports drinks are NOT indicated. Hydration status should be reassessed regularly until corrected, then monitored periodically alongside excellent support for drinking.

Recommendation 72

For older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolarity >295 mmol/L) who appear unwell, subcutaneous or intravenous fluids shall be offered in parallel with encouraging oral fluid intake. (BM)

Grade of recommendation A – strong consensus (95% agreement)

Recommendation 73

For older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolarity >295 mmol/L) and unable to drink, intravenous fluids shall be considered. (BM)

Grade of recommendation A – strong consensus (95% agreement)

Commentary to recommendations 72 and 73

Several systematic reviews of moderate quality have reviewed the evidence comparing subcutaneous and intravenous fluid administration in older adults [291,292] or more generally [289,290], and guidelines for older adults have been produced [329,353]. The earlier systematic review assessing evidence for hypodermoclysis in older people searched until 1996 and included 13 studies, mainly case reports, which reported on 668 patients receiving electrolyte-containing, electrolyte-free or hypertonic solutions [291], suggesting that 23 patients (3.4%) experienced adverse effects, but noted that electrolyte-containing solutions resulted in fewer and less severe side effects than electrolyte-free or hypertonic.

The later systematic review re-analyzed the earlier review and included two small later RCTs and a cohort study [292]. The first RCT randomized 96 patients with signs of mild to moderate dehydration in German geriatric wards to subcutaneous or intravenous infusion of half-normal saline-glucose 5% [354]. Thirteen (27%) allocated to subcutaneous changed to intravenous, eleven due to a need for intravenous drugs and two because of poor absorption, while 17 (35%) allocated to intravenous were switched to subcutaneous administration (eight due to intravenous puncture being difficult to achieve). There were no differences between groups in median duration of hospital stay, duration of infusion, patient discomfort or nurses' assessment of feasibility, but doctors rated subcutaneous infusions as significantly more feasible, and more fluid was delivered to patients receiving intravenous therapy. The second RCT randomized cognitively impaired patients admitted to a UK acute geriatric unit with mild dehydration or poor oral intake to subcutaneous or intravenous 0.9% saline, 0.45% saline

or 5% dextrose [355]. Re-siting of the infusion was required in four patients (13%) of the subcutaneous and seven (23%) of the intravenous group, and one of the intravenous group was switched to subcutaneous because of access difficulties. Groups were similar in terms of amount of fluid delivered, serum creatinine and urea. Agitation related to the fluid provision was noted for 80% of those on intravenous and 37% on subcutaneous fluids ($p = 0.0007$). The only complications noted were local edema in two receiving subcutaneous fluids. Overall, the review suggested that the evidence suggests that "appropriate volumes of subcutaneous dextrose infusions (in the form of half-normal saline-glucose 5%, 40 g/L dextrose and 30 mmol/L NaCl, or 5% dextrose solution and 4 g/L NaCl, or two-thirds 5% glucose and one-third normal saline) can be used effectively for the treatment of dehydration, with similar rates of adverse effects to intravenous infusion" [292].

A systematic data review suggests that financial costs of subcutaneous rehydration are probably lower than intravenous, but the systematic review is methodologically poor and the evidence base it collates is of low quality – better designed studies are needed [289].

When dehydration is severe and greater fluid volumes are needed or intravenous access is required for administration of medications or nutrition, then administration of intravenous fluid is the method of choice [356,357]. Parenteral hydration should however always be considered as a medical treatment rather than as basic care, and its benefits and risks should be carefully balanced (see recommendations for enteral and parenteral nutrition in Chapter II.)

IV.7 What interventions may help to support older persons to drink well and prevent low-intake dehydration?

Recommendation 74

To prevent dehydration in older persons living in residential care, institutions should implement multicomponent strategies across their institutions for all residents. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Recommendation 75

These strategies should include high availability of drinks, varied choice of drinks, frequent offering of drinks, staff awareness of the need for adequate fluid intake, staff support for drinking and staff support in taking older adults to the toilet quickly and when they need it. (BM)

Grade of recommendation B – strong consensus (100% agreement)

Recommendation 76

At a regulatory level, the strategy of mandatory monitoring and reporting by institutions of hydration risks in individual residents and patients should be considered. (BM)

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 77

Care plans for older adults in institutions should record individual preferences for drinks, how and when they are served, as well as continence support, to promote drinking. Assessment of individual barriers and promoters of drinking should lead to plans for supporting drinking specific to each older person.

Grade of recommendation GPP – strong consensus (100% agreement)

Recommendation 78

Older adults who show signs of dysphagia should be assessed, treated and followed up by an experienced speech and language therapist. Their nutrition and hydration status should be carefully monitored in consultation with the speech and language therapist and a dietician.

Grade of recommendation GPP – strong consensus (94% agreement)

Recommendation 79

Strategies to support adequate fluid intake should be developed including older persons themselves, staff, management and policymakers.

Grade of recommendation B – strong consensus (100% agreement)

Commentary to recommendations 74 – 79

No interventions to support adequate drinks intake have been clearly shown to prevent or treat low-intake dehydration in older adults. A recent systematic review assessed the effectiveness of interventions and environmental factors to increase drinking and/or reduce dehydration in older adults living in residential care, including randomized trials, non-randomized intervention studies and cohort studies [285]. The review identified 19 intervention and four observational studies from seven countries but suggested that overall the studies were at high risk of bias. The evidence suggests that multicomponent interventions (including increased staff awareness, assistance with drinking, support using the toilet and a greater variety of drinks on offer) may be effective [285]. It was also suggested that introduction of the US Resident Assessment Instrument (which requires mandatory monitoring and reporting of hydration risks) reduced dehydration in older adults [285,295]. A small single study implied that high contrast red cups were helpful in supporting drinking in nine men with dementia [285]. Large cohort studies in the US and Canada suggested different relationships between care home ownership and dehydration – in Canada for-profit ownership was associated with increased hospital admissions for dehydration while in the US dehydration prevalence did not differ between for-profit and not-for-profit homes [285]. No clear relationships were observed between staffing levels and dehydration prevalence [285,358,359]. The review suggested that multiple strategies including involvement and input from older adults, staff, management and policymakers will be needed to address problems with drinking in residential care.

A pair of systematic reviews assessed effectiveness of interventions to support food and drink intake in people with mild cognitive impairment or dementia, which included cohorts of older

adults not labeled as having dementia but where a cognitive assessment showed that on average cognitive impairment was present [88,340], as it is in most care home populations. Included studies were small and fluid intake and hydration status were poorly assessed. No further strategies for supporting fluid intake were identified within these reviews, but a key suggestion from assessments of nutrition more generally was that studies with a strong social element, where socializing around food and drink was supported, tended to improve quality of life, nutritional status and fluid intake [340].

Observational data have suggested that the number of drinks offered to older adults in residential care is strongly positively associated with fluid intake [13,305]. We found limited information on increasing fluid intake in hospital or community settings.

Patients with dysphagia are at specific high risk of dehydration and fluid intake has been reported to be low, especially when thickened fluids are used to make swallowing safer [360]. A partner ESPEN guideline recommends that stroke patients receiving thickened fluids should have their fluid balance monitored by trained professionals [130]. A high quality systematic review, though not specific to older adults, has suggested that use of chin down swallowing and thin fluids should be the first choice of therapy in chronic dysphagia [128]. A small short term RCT in older adults with severe cognitive impairment suggested that cervical spine manipulation may increase dysphagia limit for those with swallowing problems, but effects on hydration were not assessed [361].

A recent systematic review and guidelines reports RCTs showing that in people following stroke thickened fluids alongside access to free water (not other drinks) compared to thickened liquids alone was effective at protecting against aspiration and increasing fluid intake. Use of pre-thickened drinks rather than drinks thickened with powder at point of use were also better at supporting fluid intake post-stroke [130].

Volume depletion

IV.8 How should volume depletion be identified?

Recommendation 80

In older adults, volume depletion following excessive blood loss should be assessed using postural pulse change from lying to standing (≥30 beats per minute) or severe postural dizziness resulting in inability to stand. (DM)

Grade of recommendation B – strong consensus (100% agreement)

Recommendation 81

In older adults, volume depletion following fluid and salt loss with vomiting or diarrhea should be assessed by checking a set of signs. A person with at least four of the following seven signs is likely to have moderate to severe volume depletion: confusion, non-fluent speech, extremity weakness, dry mucous membranes, dry tongue, furrowed tongue, sunken eyes. (DM)

Grade of recommendation B – strong consensus (95% agreement)

Commentary to recommendations 80 and 81

Volume depletion (reduced volume of extracellular fluids only, due to loss of fluids and electrolytes, also called salt loss or extracellular dehydration) occurs without raised serum or plasma osmolality, and following medical conditions resulting in excessive losses of fluid and electrolytes, such as bleeding, vomiting and diarrhea [281–284].

The clearest signs following excessive blood loss are a large postural pulse change (≥30 beats per minute) or severe postural dizziness leading to lack of ability to stand [288], which are 97% sensitive and 98% specific when blood loss is at least 630 mL, but much less sensitive at lower levels of blood loss. However, these results were found in younger adults not taking beta-blockers, so sensitivity and specificity may vary in older persons. The authors report that postural hypotension has little additional predictive value.

Signs following fluid and salt loss with vomiting or diarrhea are less clear. A systematic review of signs associated with volume depletion after vomiting or diarrhea suggests that no signs are individually very useful, but that a person having at least four of the following seven signs is likely to have moderate to severe volume depletion: confusion, non-fluent speech, extremity weakness, dry mucous membranes, dry tongue, furrowed tongue, sunken eyes, However, the authors suggested that this form of diagnosis needs further assessment [288]. Decreased venous filling (empty veins) and low blood pressure may also be good signs of hypovolemia.

IV.9 How should volume depletion be treated?

Recommendation 82

Older adults with mild/moderate/severe volume depletion should receive isotonic fluids orally, nasogastrically, subcutaneously or intravenously. (BM)

Grade of recommendation B – strong consensus (95% agreement)

Commentary

Treatment for volume depletion aims to replace lost water and electrolytes and involves administration of isotonic fluids [284,356].

NICE conducted a set of systematic reviews to assess the best protocol for assessment and management of fluid and electrolyte status in hospitalized patients [356], including older adults. Their evidence base was updated in 2017. Their resultant guidance and flowchart suggests that where a patient is hypovolaemic and needs fluid resuscitation then this should occur immediately. Where fluid resuscitation is not needed then assessment of patients' likely fluid and electrolyte needs should be met orally or enterally where possible, but if not feasible then intravenous fluid should be considered. Where electrolyte levels are low this would suggest replacement with isotonic fluids (fluids with sodium, potassium and glucose concentrations similar to those within the body) such as oral rehydration therapy. Isotonic or slightly hypotonic fluids are ideal [284]. NICE provide a set of interrelated algorithms for assessment, fluid resuscitation, routine intravenous maintenance and replacement and redistribution of fluid and electrolytes.

Conflict of interest

The expert members of the working group were accredited by the ESPEN Guidelines Group, the ESPEN Education and Clinical Practice Committee, and the ESPEN executive. All expert members

have declared their individual conflicts of interest according to the rules of the International Committee of Medical Journal Editors (ICMJE). If potential conflicts were indicated, they were reviewed by the ESPEN guideline officers and, in cases of doubts, by the ESPEN executive. None of the expert panel had to be excluded from the working group or from co-authorship because of serious conflicts. The conflict of interest forms are stored at the ESPEN guideline office and can be reviewed by ESPEN members with legitimate interest upon request to the ESPEN executive.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.clnu.2018.05.024

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