Central Denmark Region

Undernutrition in older people

A narrative review

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Abstract (English)

Background

Undernutrition among older adults occurs in all health care settings. The ethology is multifaceted and characterized with poor appetite and food intake leading to weight loss. The consequences of undernutrition are multiple and severe, such as increased risk of infections, prolonged recovery, morbidity, dependency of help, loss of autonomy, hospitalization, poor quality of life and mortality.

Aim

This paper aims to summarize the existing evidence on undernutrition, identify barriers to achieve successful implementation of nutrition management and identify older adults' perspective to nutritional problems and management.

Methods

Literature search was performed 3 July 2019 in the electronic databases PubMed, Cinahl, Embase and Cochrane Library for full length article in the English language.

Results

Nutritional problems remain unrecognized because health professionals adopt an unsystematic approach to nutritional problems with missing screening, assessment, nutritional plans and monitoring.

The types of interventions vary, e.g. oral nutritional supplements (ONS), nutritional counselling, dinning environment, mealtime assistance, or active involvement of the older individual.

A recent hospital study showed that a systematic approach, to ensure patients 75% of their nutritional needs, significantly improved health outcomes.

In the municipalities, individualized and general strategies have shown positive effect on energy and protein intake, maintained functional status, reduced risk of complications, readmission to hospital and mortality.

Multiple barriers hinder effective implementation of nutritional interventions and thus remain unrecognized and untreated. Barriers may be related to organizations or individuals e.g. poor inter-disciplinary communication and collaboration; poor knowledge; poor education, poor involvement of the older adult and his/her family resulting in poor nutritional care.

Conclusion

Studies on undernourished older people have demonstrated improved outcomes, but multiple barriers hinder effective implementation and nutritional problems may remain unrecognized and untreated. The responsibility lies with the health care professionals, the management and the politicians, who need to take action and implement the necessary nutritional interventions in a systematic and persistent way. This will save costs for extra care due to the decreased physical functioning of older persons and to hospitalizations due to increased morbidity. More research is needed that includes older peoples' perspective on nutritional problems.

Abstract (dansk)

Baggrund

Underernæring blandt ældre ses i alle dele af sundhedsvæsnet. Årsagerne er mangeartede og kendetegnet ved nedsat appetit og kostindtag, som medfører vægttab. Konsekvenserne af underernæring er mange og alvorlige, så som forøget risiko for infektioner, forlænget tid til helbredelse, øget sygelighed, afhængighed af hjælp, tab af selvstændighed, hospitalsindlæggelse, nedsat livskvalitet og død.

Formål

Denne artikels mål er at opsummere den aktuelle evidens om underernæring, identificere barrierer for succesfuld ernæringsbehandling og identificere den ældres perspektiv på ernæringsproblemer og hvordan disse håndteres.

Metode

Litteratur søgning blev gennemført 3. juli 2019 i de elektroniske databaser PubMed, Cinahl, Embase and Cochrane Library. Der blev søgt efter fuld tekst artikler på engelsk.

Resultater

Ernæringsproblemer forbliver uløste fordi sundhedsprofessionelle anvender en usystematisk tilgang og ofte udelader screening, vurdering, ernæringsplan eller overvågning af ernæringindsatsen.

Interventionstyperne er forskellige fx ernæringssupplement, ernærings vejledning, spisemiljø, spise assistent eller aktiv involvering af den ældre.

Et hospitals baseret studie viser signifikante resultater på helbred ved at anvende en systematisk tilgang, som sikrer patienten 75 % af sit ernæringsbehov.

Indenfor det kommunale område har såvel individuelle og generelle strategier vist positiv effekt på energi og proteinindtag, bevaret funktionsstatus, reducerede komplikationer, genindlæggelse på hospital og død.

Adskillige barrierer forhindrer effektiv implementering af ernæringsinterventioner og derfor bliver problemerne ikke opdagede og forbliver ubehandlede. Barriererne kan være relateret til organisationer eller individer, fx tværfaglig kommunikation og samarbejde; ringe viden og dårlig uddannelse af de sundhedsprofessionelle, og ringe involvering af den ældre og dennes familie. Hvilket fører til dårlig ernæringspleje.

Konklusion

Underernæringsstudier har dokumenteret forbedrede resultater, men mange barrierer forhindrer effektiv implementering hvorfor ernæringsproblemerne ikke identificeres og ikke behandles. Sundhedsprofessionelle, ledere og politikere må handle og implementere de nødvendige ernæringsinterventioner på en systematisk og vedholdende måde. Herved vil der kunne spares økonomiske ressourcer til ekstra pleje pga. ældres nedsatte funktionsniveau og hospitalsindlæggelser som følge af øget sygelighed. Desuden er der behov for mere forskning som inkluderer den ældres perspektiv på ernæringsproblemer.

Introduction

Prevalence of undernutrition

Undernutrition among older adults occurs in all health care settings. In hospitals the prevalence of malnutrition and risk of malnutrition is estimated to be 30-83% (1-3), in the rehabilitation settings 53-92 % (4,5), in the community 5-35% (6-10), and in nursing homes 4-97% (4,11). In other health care settings, literature on the prevalence is rare. Smaller studies found unintentional weight loss in 26% of out clinic patients (12) and 17 % in general practice (13).

Causes of undernutrition

The cause of undernutrition is multifactorial. Aging per se affects appetite and food intake in several physiological ways such as reduced appetite, decline in smell and taste senses, dental and chewing problems. Additionally, psychological, social and environmental factors affect appetite and food intake, caused by factors like eating alone, fatigue, sadness and loneliness (14-20).

Consequences of undernutrition

The consequences of undernutrition are multiple and severe. Undernutrition, with breakdown of protein cells, leads to muscle loss, respiratory failure and compromised heart function as well as decrease in immunity. These consequences lead to decreased capacity of daily activities, physically dependency and loss of autonomy. A vicious cycle is established, resulting in social isolation and aggravation of the nutritional state with increased risk of infections, prolonged recovery, morbidity, hospitalization, diminished quality of life, risk of nursing home replacement, and increased mortality (5,6,11,21). On a society level undernutrition has major economic consequences due to increased utilization of health care resources (1,22,23).

Definitions

According to "The European Society for Clinical Nutrition and Metabolism" (ESPEN) undernutrition can be categorized as 1) disease-related malnutrition (DRM) with or without inflammation, or 2) undernutrition without disease (24). DRM with inflammation is caused by a concomitant disease leading to reduced food intake, tissue breakdown and weight loss. Unlike younger individuals, older people do not spontaneously regain appetite after diseases (25). DRM without inflammation is related to factors like dysphagia, neurological diseases, dementia and depression. Undernutrition without disease is among older adults in the developed countries

socioeconomic or psychologic-related malnutrition, which may be caused by poverty, social inequities, poor care, mourning, poor dentition, or self-neglect (24). Sarcopenia, which is age-related loss of muscle mass and function (26), in combination with disease-related inflammation leads to the onset of the syndrome of frailty (27). The frail individual will be at risk for poor outcomes in the presence of stressors (e.g. risk of falls, fractures and physical disability) (28).

Political focus on undernutrition

In 2009, the European Council adopted a number of recommendations to combat undernutrition among older Europeans in care homes and home care. The recommendations enable the establishment of a framework for health care workers, caregivers, organizations, management and policy makers for further implementation on a national and international level (29). Moreover, a health policy report from the World Health Organization brought focus on the need for respectful inclusion of patients' and families' preferences, values and goals and their involvement in health care decisions (30).

The question is, whether or not local politicians in regions and municipalities have adapted these recommendations to local conditions and involved citizens and health care staffs in the implementation.

Barriers to tackle undernutrition

Researchers have identified barriers to provide good nutritional care and prevent and treat undernutrition (31,32). Despite this, undernutrition remains a problem in all health care settings. One explanation may be lack of focus from health professionals, management and politicians. Another explanation could be that older, undernourished people and health care professionals have different views on the prioritization and severity of the nutrition problem (33). Older peoples' perceptions and experiences with nutritional care have not received sufficient attention and are lacking in the literature.

The purpose of this paper is to review and summarize the existing evidence on undernutrition among older adults, to identify barriers for successful implementation of nutritional management and to identify older adults' understanding of nutritional problems and how to manage them.

Methods

References for this narrative review were identified through searches of publications in the electronic databases Medline, Cinahl, Embase and the Cochrane Library. The literature search was performed 3 July 2019 and limited to full-length articles in English. The search terms included keywords for older adults (e.g. older people, aged 65+), health care setting (e.g. hospital, home care, nursing home), malnutrition/undernutrition with intervention (e.g. nutritional support), and outcomes (e.g. health-related outcomes, barriers, patient-centered, patient perspective). Retrospective searches were also conducted from relevant articles, evidence-based guidelines and other sources. Results from the search were examined, grouped into categories and subsequently discussed in this narrative review.

Results

The nutritional care process

National and international authorities, nutrition organizations and societies recommend a systematic approach to identify and treat undernutrition in hospitals as well as in community health care. The nutritional care process includes four steps: 1) screening 2) assessment/ diagnosis 3) nutritional care plan and 4) monitoring (24,34).

Systematic screening, assessment, nutrition care plan and monitoring

Early identification of nutritional status is essential (35). Therefore, nutritional screening should be performed in all subjects that come into contact with health care services, independent of diagnosis (34). Depending on the setting, screening should be performed within the first 24-48 hours after first contact and thereafter at regular intervals (24).

Older adults who are identified as malnourished or at risk of malnutrition should undergo a nutritional assessment to provide information on the severity and underlying causes for poor nutritional status and/or intake (e.g. swallowing difficulties, mouth and/or dental problems, side effect of medication, nausea). Based on screening and assessment, individual goals are defined, including goals for dietary intake and body weight (24). Finally, the nutrition care process needs to be monitored and reassessment performed in order to adjust to new situations and experiences (34).

Barriers to systematic nutritional care

Up to 40-50% of older people are not nutritionally screened during hospital stay. This results in underestimation of nutritional problems (3,36). Nutritional problems remain unrecognized, because health care professionals do not screen or assess for malnutrition, but solely base their assessment on clinical judgments. They may leave out e.g. overweight and obese persons from screening programs. Interventions in obese individuals aimed at weight loss should always be combined with physical exercise to prevent loss of muscle mass (37).

Barriers against good nutritional care are many; lack of time, knowledge, competences and priorities by health professionals, structure and organization as well of lack of focus by the management (3,10,31,38).

Older persons find the main barrier to be poor appetite. In hospitalized older persons poor appetite is related to pain, bad taste and side effects of medication (39). Older persons living in the community find that poor appetite is related to eating alone, poor health, changed food preferences, poor mouth and teeth status as well as chewing and swallowing difficulties (7,40,41).

The responsibility for providing nutritional care in all care settings lies with the health professionals (29). The care staffs in hospitals and municipalities are often left to themselves when looking for solutions of problems they encounter. Adjustment of guidelines and procedures to local conditions are often missing leading to poor implementation of systematic nutritional care, daily routines and documentation (38). The result is that even fewer older adults will have relevant interventions implemented and nutritional problems may remain unrecognized and untreated. All involved in nutritional care need to take their part of the responsibility, including management and politicians e.g. by defining local politics for home care, nursing homes and hospitals and follow up the politic to ensure the sufficient nutritional care of older adults.

New research with promising results of hospital nutritional care

Two meta-analyses found no significant improvements in the clinical outcome. associated with nutritional interventions in medical inpatients (42,43). This may have demotivated health professionals from spending time on the systematic approach reflected in the nutritional care process. A recent randomized study contradicted these findings. The study included 2000 medical in-hospital patients. The study investigated the effect of systematic individualized nutrition intervention in order to obtain at least 75% of the individuals energy and protein requirements. Food intake was reassessed every 24-48 hours throughout the hospital stay. After five days without

reaching 75% of caloric and protein requirements, the patients had enteral nutrition (tube feeding) added to reach the goal. After further five days without reaching the requirements the patients had supplementary parenteral nutrition. Only 2% off the intervention group were supplemented with enteral or parenteral feeding. The patients in the intervention group were compared with patients who received usual hospital food. Within the intervention group 80% reached the goal of 75% of their nutritional requirements, against 55% of the control group. Significantly fewer patients in the intervention group suffered from the combined outcomes of complications, admission to intensive care unit, readmission to hospital, loss of functions, and death within 30 days after admission to hospital (44). This individualized and systematic approach may be adopted to other medical in-hospital patients to counteract in hospital malnutrition.

Continuity of nutritional care and documentation

As older undernourished people move back and forth along the continuum of care (e.g. between home, hospital, rehabilitation and nursing home) intervention initiated within one care setting should continue in the next and provide opportunity to evaluate the outcome as well as the process of the intervention. Documentation in relation to a person's transfers between health care sectors should contain essential information about the older person's present health and nutritional status, including communicative and functional capacity, previous care and planned intervention (24). The general practitioner is meant to play a key role to ensure continuity across sectors and time. The literature lacks studies about general practitioners' involvement in nutritional research. Undernourished people see their general practitioner twice as often, have more hospital admissions and stay longer in hospital than the well-nourished (23).

Older people appreciate continuity of nutritional care across sectors, but often consider it to be missing. Individuals who have had nutritional follow-up after discharge find this intervention valuable, because communication with a single person in their own home gives them time and space to understand, reflect and respond to new information, as opposed to information received in the busy hospital ward (45).

Barriers to continuity of nutritional care across sectors

Lack of communication, coordination, inadequate and systematic documentation as well as lack of willingness to share responsibility between health care professionals cause fragmented or in worst case wrong or missing nutritional care (10,46-50).

Nutritional interventions

The recently updated 'ESPEN guideline on clinical nutrition and hydration in geriatrics' revealed several evidence based recommendations on nutritional interventions (34). The guideline emphasizes interventions to be individualized and the most appropriate combination of therapies identified to be adapted for the individual older person (51).

The food

Food and beverage for older persons should contain the currently recommended content of energy and protein and be suited the older person's preferences (18). Institution kitchens, meals on wheels providers and organisations responsible for daily food preparation for older adults must ensure that the food has the currently recommended content of energy and protein and fortified food or texture-modified food if needed (34). Fortified food is food that has been added nutrients, vitamins or minerals to increase energy or nutrient density without increasing the amount of food offered (21,52).

Oral nutritional supplements

Oral nutritional supplement (ONS) is energy and nutrient dense solutions that are provided as ready to drink liquids. ONS increases intake of energy and protein, reduce risk of complications, readmission and mortality (53-55). Additionally, ONS may have impact in reducing health care costs of older adults (22).

ESPEN guidelines recommend ONS to provide at least 400 kcal/day, including 30 g or more protein/day. ONS must be continued for at least one month and adherence regularly assessed. In cooperation with the older person, the health care professionals assess the ONS consumption in regard to type, flavour, texture and time of consumption and adapt to the person's taste and eating capacities (34). Older people may have problems with the ability to consume ONS due to its flavour, texture or to gastro-intestinal problems. Adherence has been found to improve when ONS is provided as an energy dense, low volume option (50-125 ml.) (56). The idea is to look upon ONS as a prescribed treatment rather than as food. Older people with dementia have increased level of adherence when they received ONS as part of medical rounds between meals and were encouraged by care providers (21). This way of providing ONS can easily be implemented in nursing homes and hospitals.

In-between-meals and drinks

Older adults should have constant access to snacks and offered in-between meals to facilitate dietary intake (34). This requires that health care professionals organize their work to ensure that older individuals, also those who are physically or mentally dependent, at any time should have access to food and beverage that meet their preferences. Older persons are at high risk of dehydration and the following risk of constipation. Therefore, they should be encouraged to consume adequate amounts of drinks (34).

Nutritional counselling

Nutritional counselling is a supportive process to set priorities, establish goals, and create individual action plans that acknowledge and fosters responsibility for self-care (57). This implies repeated personal talks and discussions with the older person to create a meaningfulness that motivates a change from unfavourable eating and meal habits to a healthy nutritional behaviour. Food and meal habits can be difficult to change, because they have been established over a long time (58). Older persons have a strong desire to maintain independency which can be a motivating argument for changing eating and meal habits (45,59). In order to be effective, the counselling is recommended to consist of several sessions over a period of at least eight weeks (34). The general practitioner is intended to play a key role with responsibility for providing information to their patients and at all times be aware of their nutritional status (29).

A review and meta-analysis has documented that individualized nutritional counselling following discharge from hospital, provided by a clinical dietician, increases intake of energy and protein as well as body weight (60). Other nutritional counselling studies alone or in combination with ONS, conducted in older peoples' homes, showed positive effect on body weight, functional status, maintained ADL functions, and reduced both readmissions to hospital and mortality (61-66).

Individualized approach

Undernourished older adults are a heterogeneous group with various levels of functioning, physically as well as mentally. Therefore, different approaches and support are required to achieve beneficial outcomes from the interventions. A hospital-based study found that undernourished patients could be divided into a 'passive' and an 'active' group. The patients in the 'passive' group suffered from fatigue, lack of concentration and short-term memory (39). A community-based study

on change in behavior described two groups of older people. One group was frail older adults who had complicated health needs, including cognitive impairment. Another group was 'pre-frail' older adults who were in an intermediate state between frail and robust (67). Motivating factors to increase food intake within the pre-frail group were 'to maintain current independency and live without the assistance of others', whereas practical and emotional support were valuable for those with complicated health needs (68).

Active involvement of older people and their families

Involving older people in their own medical care means enabling them to take an active role in deciding about and planning their own primary medical care (69). Active involvement of older adults and programs customized to the individual older adult have shown positive results with regard to readmission rates in care transition interventions following discharge, discharge planning and disease management programs (70-72). Moreover, actively involving older people in their nutritional care increases daily intake of energy and protein (73,74).

Older persons find it important to involve the family in their nutritional care, because families possess significant knowledge and attachment to the older person (45).

An interview study found that nursing home residents only to a limited extent were involved in activities concerning food and meals, such as menu planning, food preparation and setting or cleaning tables. Furthermore, only few residents were able to choose where and when they would eat (75).

Eating alone or with others

A pleasant dining environment in a family style as well as eating with others encourage older individuals to eat more than they would have if they were alone and thereby increase quality of life (16,18,41,76-78). Older people who live alone have fewer daily meals, poorer appetite, lower daily food intake and a larger number of self-reported food problems than persons living in a family environment (41,79,80). Furthermore, widows are more likely to be at nutritional risk than those who live with another person or are divorced or have never married (81). Recent loss of a spouse affects appetite and food intake negatively, because feelings of grief and loneliness alter the social meaning and daily routines associated with eating (41,82).

Mealtime assistance

Older persons who are offered meal-time assistance improve intake of energy and protein. The assistance can cover form of positioning the older person, opening food and beverages, removing lids, feeding, encourage intake and provide social support during meal-time (34,51,83).

Physical activity and rehabilitation

Unintended weight loss in older adults implies loss of muscles and diminished ability to perform activities of daily living (ADL) (37). Bed rest during disease or hospitalisation leads to loss of muscles and physical function, which have long-term consequences, such as problems with regaining functions and dependence on help in performing ADL (84,85). Exercise in combination with nutritional treatment can restore muscle mass, strength, and function and reverse the negative health outcomes associated with muscle loss. Therefore, undernourished older people or people at risk of undernutrition should be encouraged to be physically active and to exercise. This is also true for frail, institutionalized older people (27,86). During rehabilitation periods with physical exercise interventions, adequate amounts of energy and protein should be provided (34). On the other hand, exercise without nutritional support, increases risk of undernutrition due to more loss of body weight and may limit the effect of physical rehabilitation (87).

Multi-disciplinary teams

Due to the complexity of the undernourished older individuals' condition and situation, it is essential to adopt a multi-disciplinary and multimodal treatment approach. This is underlined by the European Counsel that recommends a multidisciplinary approach on multiple levels in order to tackle undernutrition successfully: the undernourished person, the health care workers (medical and non-medical), the caregivers, the public, the policy makers and society stakeholders (29). Multi-disciplinary nutritional teams may increase energy and protein intake (88) and have positive effect on quality of life, muscle strength and oral care (89). Older people value multi-disciplinary cooperation and coordination because it provides holistic care that helps them overcome the complex situation in relation to diseases and nutritional problems (45). Unfortunately, there seems to be a lack of clarity about the role of health care professionals in the nutritional management and fragmentation of nutrition care into discipline specific tasks. The difference between professions leads to lack of a coordinated approach, poor interdisciplinary communication, and lack of shared responsibility (90).

Nursing staffs play an essential role in preventing and treating undernutrition, because of their everyday contact with older people and awareness of potentially nutritional problems (29). A focus group study among hospital nurses found that although nutrition is a multi-disciplinary field, nurses consider themselves primary responsible as no one else assume responsibility. Medical doctors often show low involvement and engagement in nutritional care, and clinical dieticians, who are a useful and necessary resource, are seldom available (38). The presence of a trained dietician improves medical doctors' and nurses' awareness of nutritional issues and thereby improves patients' energy and protein intake (40).

Nutritional knowledge among older adults and their informal caregivers

A recent explorative study among older people and their informal caregivers found that older people at nutritional risk rarely recognize appetite and weight loss as a problem, but are more aware of the risk of being overweight (91). Most of the older individuals think that weight loss is associated with aging and for that reason they don't talk to their general practitioner about it. Furthermore, older people find it difficult to give a definition of healthy eating and their response were information from the media promoting fruit, vegetables, low fat and low sugar consumption. This view is supported by a previous study where older people considered a "slimming diet" and vegetables as appropriate when recovering from diseases (73). The food recommendations for older people to recover after diseases are often contrary to the food recommendations targeted younger individuals to prevent life style diseases, which may be confusing. There seems to be a knowledge gap about nutrition requirements in late life, in particular for those who are becoming frail.

Older people have not been made aware of the need to increase protein and calorie intake. Such information is neither widely available in the media nor provided by health care professionals.

Nutritional knowledge among the professionals

In order for patients to achieve nutritional knowledge, the health care professionals are required to possess in-depth knowledge about nutritional needs of older people. Nursing staff who achieves in-depth knowledge about nutritional care has shown to increase their nutritional awareness and provide nutritional knowledge to patients, which enables patients to be involved in own nutritional care (e.g. discuss eating problems with staff and ask for relevant assistance during mealtime) (33).

When older people are offered nutritional information and education, they want it to be provided clearly and in a simple way and the health care professionals to demonstrate patience and utilizing interpersonal communication skills (45).
Individual and collective factors that determine healthy eating must be taken in account.
For example training in nutrition for all health professionals and specialist training for medical doctors and nurses, education to formal and informal caregivers and public campaigns with recommendations for what a nutritious diet should consist of for older people in particular for those who are becoming frail (91).
The European Counsel recommends continuing education programs implemented for general practitioners and nursing staff involved in the feeding of patients, including the non-clinical staff, to make them aware of the continuous attention for patients' nutritional status (29). It is unknown to which extent education programs have been implemented in general practices, hospitals, home care and nursing homes.

Conclusion

Several studies on undernourished older people have demonstrated improved outcomes, but multiple barriers hinder effective implementation. Thus nutritional problems remain unrecognized and untreated. Research shows that it is worthwhile to combat undernutrition, both for the benefit of quality of life of the individual and for the society economy. A recent in-hospital study shows significant health outcomes by adopting a systematic approach that ensures patients 75% of their nutritional needs. Furthermore, studies show positive effect of ONS consumption, nutritional counselling, dining environment, mealtime assistance, and active involvement of the older individual. These interventions may counteract undernutrition in community health care. However, successful implementation of nutritional strategies requires a systematic and persistent approach with political and management endorsement. More research that involves the older individual's perspective on nutritional problems is needed.

References

(1) Agarwal E, Miller M, Yaxley A, Isenring E. Malnutrition in the elderly: a narrative review. Maturitas 2013 Dec;76(4):296-302.

(2) Holyday M, Daniells S, Bare M, Caplan GA, Petocz P, Bolin T. Malnutrition screening and early nutrition intervention in hospitalised patients in acute aged care: a randomised controlled trial. J Nutr Health Aging 2012;16(6):562-568.

(3) Sharma Y, Thompson P, Shari R, Hakendorf P, Miller M. Malnutrition in acutely unwell hospitalized elderly - "The skeletons are still rattling in the hospital closet". Journal of Nutrition, Health and Aging 2017;21(10):1210-1215.

(4) Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, et al. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. J Am Geriatr Soc 2010 Sep;58(9):1734-1738.

(5) Neumann SA, Miller MD, Daniels L, Crotty M. Nutritional status and clinical outcomes of older patients in rehabilitation. J Hum Nutr Diet 2005 Apr;18(2):129-136.

(6) Kiesswetter E, Pohlhausen S, Uhlig K, Diekmann R, Lesser S, Heseker H, et al. Malnutrition is related to functional impairment in older adults receiving home care. J Nutr Health Aging 2013 Apr;17(4):345-350.

(7) Locher JL, Ritchie CS, Robinson CO, Roth DL, Smith West D, Burgio KL. A multidimensional approach to understanding under-eating in homebound older adults: the importance of social factors. Gerontologist 2008 Apr;48(2):223-234.

(8) Sorbye LW, Schroll M, Finne Soveri H, Jonsson PV, Topinkova E, Ljunggren G, et al. Unintended weight loss in the elderly living at home: the aged in Home Care Project (AdHOC). J Nutr Health Aging 2008 Jan;12(1):10-16.

(9) Schilp J, Kruizenga HM, Wijnhoven HA, Leistra E, Evers AM, van Binsbergen JJ, et al. High prevalence of undernutrition in Dutch community-dwelling older individuals. Nutrition 2012 Nov-Dec;28(11-12):1151-1156.

(10) Håkonsen SJ, Bjerrum M, Bygholm A, Kjelgaard HH, Pedersen PU. The Routines, Knowledge and Attitudes towards Nutrition and Documentation of Nursing Staff in Primary Healthcare: A Cross-Sectional Study. Journal of Community & Public Health Nursing 2018;4(3).

(11) Beck AM, Damkjaer K, Simmons SF. The relationship between weight status and the need for health care assistance in nursing home residents. Journal of Aging Research & Clinical Practice 2012;1(2):173-177.

(12) Holst M, Zacher N, Østergaard T, Mikkelsen S. Disease related malnutrition in hospital outpatients, - time for action. International journal of food science and nutrition research 2019;1(1.1002).

(13) Jensen SA, Rasmussen HH, Engsig A, Holst M. Nutritional impact symptoms evoking unintended weight loss among elderly patients in general practice. Integrative Clinical Medicine and Therapeutics 2018;1(2).

(14) Giezenaar C, Chapman I, Luscombe-Marsh N, Feinle-Bisset C, Horowitz M, Soenen S. Ageing Is Associated with Decreases in Appetite and Energy Intake--A Meta-Analysis in Healthy Adults. Nutrients 2016 Jan 7;8(1):10.3390/nu8010028.

(15) Carlsson P, Tidermark J, Ponzer S, Soderqvist A, Cederholm T. Food habits and appetite of elderly women at the time of a femoral neck fracture and after nutritional and anabolic support. J Hum Nutr Diet 2005 Apr;18(2):117-120.

(16) Wysokinski A, Sobow T, Kloszewska I, Kostka T. Mechanisms of the anorexia of aging-a review. Age (Dordr) 2015 Aug;37(4):9821-015-9821-x. Epub 2015 Aug 1.

(17) Gellar MC, Alter D. The impact of dentures on nutritional health of elderly. Journal of Aging Research & Clinical Practice 2015;4(1):50-53.

(18) Nieuwenhuizen WF, Weenen H, Rigby P, Hetherington MM. Older adults and patients in need of nutritional support: Review of current treatment options and factors influencing nutritional intake. Clin Nutr 2010 /;29(2):160-169.

(19) Callen BL, Wells TJ. Views of community-dwelling, old-old people on barriers and aids to nutritional health. J Nurs Scholarsh 2003;35(3):257-262.

(20) Favaro-Moreira NC, Krausch-Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, et al. Risk Factors for Malnutrition in Older Adults: A Systematic Review of the Literature Based on Longitudinal Data. Adv Nutr 2016 May 16;7(3):507-522.

(21) Agarwal E, Marshall S, Miller M, Isenring E. Optimising nutrition in residential aged care: A narrative review. Maturitas 2016 Oct;92:70-78.

(22) Abizanda P, Sinclair A, Barcons N, Lizan L, Rodriguez-Manas L. Costs of Malnutrition in Institutionalized and Community-Dwelling Older Adults: A Systematic Review. J Am Med Dir Assoc 2016 Jan;17(1):17-23.

(23) Guest JF, Panca M, Baeyens JP, de Man F, Ljungqvist O, Pichard C, et al. Health economic impact of managing patients following a community-based diagnosis of malnutrition in the UK. Clin Nutr 2011 Aug;30(4):422-429.

(24) Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clin Nutr 2017 Feb;36(1):49-64.

(25) MacIntosh C, Morley JE, Chapman IM. The anorexia of aging. Nutrition 2000 Oct;16(10):983-995.

(26) Cruz-Jentoft AJ, Baeyens JP, Bauer JM, Boirie Y, Cederholm T, Landi F, et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. Age Ageing 2010 Jul;39(4):412-423.

(27) Argiles JM, Campos N, Lopez-Pedrosa JM, Rueda R, Rodriguez-Manas L. Skeletal Muscle Regulates Metabolism via Interorgan Crosstalk: Roles in Health and Disease. J Am Med Dir Assoc 2016 Sep 1;17(9):789-796.

(28) Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet 2013 Mar 2;381(9868):752-762.

(29) Arvanitakis M, Coppens P, Doughan L, Van Gossum A. Nutrition in care homes and home care: recommendations - a summary based on the report approved by the Council of Europe. Clin Nutr 2009 Oct;28(5):492-496.

(30) World Health Organisation. People-Centred Health Care: A policy framework. 2007.

(31) Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unosson M, Rothenberg E, et al. Insufficient nutritional knowledge among health care workers? Clin Nutr 2008 Apr;27(2):196-202.

(32) Bauer S, Halfens RJ, Lohrmann C. Knowledge and Attitudes of Nursing Staff Towards Malnutrition Care in Nursing Homes: A Multicentre Cross-Sectional Study. J Nutr Health Aging 2015;19(7):734-740.

(33) Pedersen PU, Tewes M, Bjerrum M. Implementing nutritional guidelines -- the effect of systematic training for nurse nutrition practitioners. Scand J Caring Sci 2012 Mar;26(1):178-185.

(34) Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clin Nutr 2019 Feb;38(1):10-47.

(35) Rasheed S, Woods RT. Malnutrition and quality of life in older people: a systematic review and meta-analysis. Ageing Res Rev 2013 Mar;12(2):561-566.

(36) The Danish Database for Geriatrics. Annual report 2017. 2018.

(37) Newman AB, Lee JS, Visser M, Goodpaster BH, Kritchevsky SB, Tylavsky FA, et al. Weight change and the conservation of lean mass in old age: the Health, Aging and Body Composition Study. Am J Clin Nutr 2005 Oct;82(4):872-8; quiz 915-6.

(38) Eide HD, Halvorsen K, Almendingen K. Barriers to nutritional care for the undernourished hospitalised elderly: perspectives of nurses. J Clin Nurs 2015 Mar;24(5-6):696-706.

(39) Holst M, Rasmussen HH, Laursen BS. Can the patient perspective contribute to quality of nutritional care? Scand J Caring Sci 2011 Mar;25(1):176-184.

(40) Jensen MEJ, Pedersen JL, Gregersen M. A dietician's bed-side suppervision in a geriatric ward is effective . Health 2018;10:1221-1232.

(41) de Boer A, Ter Horst GJ, Lorist MM. Physiological and psychosocial age-related changes associated with reduced food intake in older persons. Ageing Res Rev 2013 Jan;12(1):316-328.

(42) Feinberg J, Nielsen EE, Korang SK, Halberg Engell K, Nielsen MS, Zhang K, et al. Nutrition support in hospitalised adults at nutritional risk. Cochrane Database Syst Rev 2017;5: CD011598.

(43) Bally MR, Blaser Yildirim PZ, Bounoure L, Gloy VL, Mueller B, Briel M, et al. Nutritional Support and Outcomes in Malnourished Medical Inpatients: A Systematic Review and Meta-analysis. JAMA Intern Med 2016 Jan;176(1):43-53.

(44) Schuetz P, Fehr R, Baechli V, Geiser M, Deiss M, Gomes F, et al. Individualised nutritional support in medical inpatients at nutritional risk: a randomised clinical trial. Lancet 2019 Jun 8;393(10188):2312-2321.

(45) Hazzard E, Barone L, Mason M, Lambert K, McMahon A. Patient-centred dietetic care from the perspectives of older malnourished patients. J Hum Nutr Diet 2017 Oct;30(5):574-587.

(46) Carlsson E, Ehnfors M, Eldh AC, Ehrenberg A. Accuracy and continuity in discharge information for patients with eating difficulties after stroke. J Clin Nurs 2012 Jan;21(1-2):21-31.

(47) Halvorsen K, Eide HK, Sortland K, Almendingen K. Documentation and communication of nutritional care for elderly hospitalized patients: perspectives of nurses and undergraduate nurses in hospitals and nursing homes. BMC Nurs 2016 Dec 1;15:70-016-0193-z. eCollection 2016.

(48) Ross LJ, Mudge AM, Young AM, Banks M. Everyone's problem but nobody's job: Staff perceptions and explanations for poor nutritional intake in older medical patients. NUTR DIET 2011 03;68(1):41-46.

(49) Holst M, Rasmussen HH. Nutrition Therapy in the Transition between Hospital and Home: An Investigation of Barriers. J Nutr Metab 2013;2013:463751.

(50) Marshall S, Bauer J, Isenring E. The consequences of malnutrition following discharge from rehabilitation to the community: a systematic review of current evidence in older adults. J Hum Nutr Diet 2014 Apr;27(2):133-141.

(51) Perna S, Rondanelli M, Spadaccini D, Lenzi A, Donini LM, Poggiogalle E. Are the therapeutic strategies in anorexia of ageing effective on nutritional status? A systematic review with meta-analysis. J Hum Nutr Diet 2019 Feb;32(1):128-138.

(52) Mills SR, Wilcox CR, Ibrahim K, Roberts HC. Can fortified foods and snacks increase the energy and protein intake of hospitalised older patients? A systematic review. J Hum Nutr Diet 2018 Jun;31(3):379-389.

(53) Stratton RJ, Hebuterne X, Elia M. A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. Ageing Res Rev 2013 Sep;12(4):884-897.

(54) Cawood AL, Elia M, Stratton RJ. Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. Ageing Res Rev 2012 Apr;11(2):278-296.

(55) Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. Cochrane Database Syst Rev 2009 Apr 15;(2)(2):CD003288.

(56) Hubbard GP, Elia M, Holdoway A, Stratton RJ. A systematic review of compliance to oral nutritional supplements. Clin Nutr 2012 Jun;31(3):293-312.

(57) Spahn JM, Reeves RS, Keim KS, Laquatra I, Kellogg M, Jortberg B, et al. State of the evidence regarding behavior change theories and strategies in nutrition counseling to facilitate health and food behavior change. J Am Diet Assoc 2010 Jun;110(6):879-891.

(58) Avgerinou C, Bhanu C, Walters K, Croker H, Liljas A, Rea J, et al. Exploring the Views and Dietary Practices of Older People at Risk of Malnutrition and Their Carers: A Qualitative Study. Nutrients 2019 Jun 5;11(6):10.3390/nu11061281.

(59) Greaney ML, Lees FD, Greene GW, Clark PG. What older adults find useful for maintaining healthy eating and exercise habits. J Nutr Elder 2004;24(2):19-35.

(60) Munk T, Tolstrup U, Beck AM, Holst M, Rasmussen HH, Hovhannisyan K, et al. Individualised dietary counselling for nutritionally at-risk older patients following discharge from acute hospital to home: a systematic review and meta-analysis. J Hum Nutr Diet 2015 Mar 18.

(61) Beck AM, Kjaer S, Hansen BS, Storm RL, Thal-Jantzen K, Bitz C. Follow-up home visits with registered dietitians have a positive effect on the functional and nutritional status of geriatric medical patients after discharge: a randomized controlled trial. Clin Rehabil 2013 Jun;27(6):483-493.

(62) Persson M, Hytter-Landahl A, Brismar K, Cederholm T. Nutritional supplementation and dietary advice in geriatric patients at risk of malnutrition. Clin Nutr 2007 04;26(2):216-224.

(63) Pedersen JL, Pedersen PU, Damsgaard EM. Early Nutritional Follow-Up after Discharge Prevents Deterioration of ADL Functions in Malnourished, Independent, Geriatric Patients Who Live Alone - A Randomized Clinical Trial. J Nutr Health Aging 2016;20(8):845-853.

(64) Pedersen J, Pedersen P, Damsgaard E. Nutritional follow-up after discharge prevents readmission to hospital - a randomized clinical trial. Journal of Nutrition, Health and Aging 2017;21(1):75-82-8. DOI 10.1007/s12603-016-0745-7.

(65) Feldblum I, German L, Castel H, Harman-Boehm I, Shahar DR. Individualized nutritional intervention during and after hospitalization: the nutrition intervention study clinical trial. J Am Geriatr Soc 2011 Jan;59(1):10-17.

(66) Terp R, Jacobsen KO, Kannegaard P, Larsen AM, Madsen OR, Noiesen E. A nutritional intervention program improves the nutritional status of geriatric patients at nutritional risk-a randomized controlled trial. Clin Rehabil 2018 Jul;32(7):930-941.

(67) Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci 2001 Mar;56(3):M146-56.

(68) Avgerinou C, Gardner B, Kharicha K, Frost R, Liljas A, Elaswarapu R, et al. Health promotion for mild frailty based on behaviour change: Perceptions of older people and service providers. Health Soc Care Community 2019 May 31.

(69) Wetzels R, Harmsen M, Van Weel C, Grol R, Wensing M. Interventions for improving older patients' involvement in primary care episodes. Cochrane Database of Systematic Reviews 2007(1).

(70) Coleman EA, Parry C, Chalmers S, Min SJ. The care transitions intervention: results of a randomized controlled trial. Arch Intern Med 2006 Sep 25;166(17):1822-1828.

(71) Shepperd S, Lannin NA, Clemson LM, McCluskey A, Cameron ID, Barras SL. Discharge planning from hospital to home. Cochrane Database Syst Rev 2013 Jan 31;1:CD000313.

(72) Gonseth J, Guallar-Castillon P, Banegas JR, Rodriguez-Artalejo F. The effectiveness of disease management programmes in reducing hospital re-admission in older patients with heart failure: a systematic review and meta-analysis of published reports. Eur Heart J 2004 Sep;25(18):1570-1595.

(73) Pedersen PU. Nutritional care: the effectiveness of actively involving older patients. J Clin Nurs 2005 02;14(2):247-255.

(74) Ha L, Hauge T, Spenning AB, Iversen PO. Individual, nutritional support prevents undernutrition, increases muscle strength and improves QoL among elderly at nutritional risk hospitalized for acute stroke: a randomized, controlled trial. Clin Nutr 2010 Oct;29(5):567-573.

(75) Grondahl VA, Aagaard H. Older people's involvement in activities related to meals in nursing homes. Int J Older People Nurs 2016 Sep;11(3):204-213.

(76) Locher JL, Robinson CO, Roth DL, Ritchie CS, Burgio KL. The effect of the presence of others on caloric intake in homebound older adults. J Gerontol A Biol Sci Med Sci 2005 Nov;60(11):1475-1478.

(77) Wright L, Hickson M, Frost G. Eating together is important: using a dining room in an acute elderly medical ward increases energy intake. J Hum Nutr Diet 2006 Feb;19(1):23-26.

(78) Nijs KA, de Graaf C, Siebelink E, Blauw YH, Vanneste V, Kok FJ, et al. Effect of family-style meals on energy intake and risk of malnutrition in dutch nursing home residents: a randomized controlled trial. J Gerontol A Biol Sci Med Sci 2006 Sep;61(9):935-942.

(79) Ramic E, Pranjic N, Batic-Mujanovic O, Karic E, Alibasic E, Alic A. The effect of loneliness on malnutrition in elderly population. Med Arh 2011;65(2):92-95.

(80) Ferry M, Sidobre B, Lambertin A, Barberger-Gateau P. The SOLINUT study: analysis of the interaction between nutrition and loneliness in persons aged over 70 years. J Nutr Health Aging 2005 Jul-Aug;9(4):261-268.

(81) Wham CA, Teh RO, Robinson M, Kerse NM. What is associated with nutrition risk in very old age? J Nutr Health Aging 2011 Apr;15(4):247-251.

(82) Dahlberg L, Andersson L, McKee KJ, Lennartsson C. Predictors of loneliness among older women and men in Sweden: A national longitudinal study. Aging Ment Health 2015;19(5):409-417.

(83) Tassone EC, Tovey JA, Paciepnik JE, Keeton IM, Khoo AY, Van Veenendaal NG, et al. Should we implement mealtime assistance in the hospital setting? A systematic literature review with meta-analyses. J Clin Nurs 2015 Oct;24(19-20):2710-2721.

(84) Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability: "She was probably able to ambulate, but I'm not sure". JAMA 2011 Oct 26;306(16):1782-1793.

(85) Boyd CM, Landefeld CS, Counsell SR, Palmer RM, Fortinsky RH, Kresevic D, et al. Recovery of activities of daily living in older adults after hospitalization for acute medical illness. J Am Geriatr Soc 2008 Dec;56(12):2171-2179.

(86) Abizanda P, Lopez MD, Garcia VP, Estrella Jde D, da Silva Gonzalez A, Vilardell NB, et al. Effects of an Oral Nutritional Supplementation Plus Physical Exercise Intervention on the Physical Function, Nutritional Status, and Quality of Life in Frail Institutionalized Older Adults: The ACTIVNES Study. J Am Med Dir Assoc 2015 May 1;16(5):439.e9-439.e16.

(87) Miller MD, Crotty M, Whitehead C, Bannerman E, Daniels LA. Nutritional supplementation and resistance training in nutritionally at risk older adults following lower limb fracture: a randomized controlled trial. Clin Rehabil 2006 Apr;20(4):311-323.

(88) Bell JJ, Bauer JD, Capra S, Pulle RC. Multidisciplinary, multi-modal nutritional care in acute hip fracture inpatients - results of a pragmatic intervention. Clin Nutr 2014 Dec;33(6):1101-1107.

(89) Beck AM, Christensen AG, Hansen BS, Damsbo-Svendsen S, Moller TK. Multidisciplinary nutritional support for undernutrition in nursing home and home-care: A cluster randomized controlled trial. Nutrition 2016 Feb;32(2):199-205.

(90) ROSS LJ, MUDGE AM, YOUNG AM, BANKS M. Everyone's problem but nobody's job: Staff perceptions and explanations for poor nutritional intake in older medical patients. Nutrition & Dietetics 2011 03/01; 2019/07;68(1):41-46.

(91) Avgerinou C, Bhanu C, Walters K, Croker H, Liljas A, Rea J, et al. Exploring the Views and Dietary Practices of Older People at Risk of Malnutrition and Their Carers: A Qualitative Study. Nutrients 2019 Jun 5;11(6):10.3390/nu11061281.