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The role of the dietitian in the management of malnutrition in the elderly: a systematic review of current practices

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Key words: aged, nurses, physicians, malnutrition, dietetics, professional role, systematic review

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Abstract

Aim: the prevalence of age-related malnutrition is increasing in almost all Western countries. Because of their expertise, dietitians should have a central role in the management of malnutrition. This article reviews the literature on the role of the dietitian in the management of malnutrition in the elderly, in comparison to other health professionals. *Methods*: in November 2018, a systematic literature review was performed by a search in Embase, Medline Ovid, Cinahl Ebscohost, Cochrane Central, Web of Science, and Google Scholar for ‘dietitian', ‘elderly' and ‘malnutrition' as main search terms. Qualitative and quantitative empirical research studies that have the role of dietitians as the (main) subject of the study were included. Data extraction and data synthesis were done by the three authors, using a thematic synthesis approach. *Results*: Coding of the resulting 21 studies led to three themes. The first theme reveals that other health professionals' time for, and knowledge of screening policies negatively affects the role of the dietitian. The second theme reveals that the importance of nutritional care is acknowledged. However, this does not always imply familiarity with dietetics, nor does it always mean that other health professionals think involving dietitians is worth the effort. The third theme reveals that issues of workload appeared to be especially important in crossing or guarding role boundaries. *Conclusion*: the role of dietitians is not always clear and coherent. Therefore, it is open to debate how dietitians shape their role, to provide optimal management of malnutrition in the elderly.

Keywords: aged, nurses, physicians, malnutrition, dietetics, professional role, systematic review

Introduction

As life expectancy increases in almost all Western countries, the prevalence of age-related malnutrition also increases. Age-related malnutrition is a serious problem as it negatively affects the functional and medical status, quality of life, and survival rate of the elderly.[1,2] This is caused by many determinants, including physical (e.g. physically not being able to shop), medical (e.g. dysphagia that is induced by an underlying illness) and psychosocial (e.g. depression). These determinants are seen in every setting, including hospitals, nursing homes and communities.[3]

Due to these various and often interacting determinants, age-related malnutrition is not easily managed.[4] Moreover, malnutrition in the elderly is also hard to manage because food and eating and drinking don't just have a nutritional meaning, but also social, cultural and psychological meanings. Elderly people can have strongly ingrained food habits that are hard to change, although it might be medically necessary. They also have a higher chance of diseases that can influence the intake of food and drink directly (e.g. cancer induced dysphagia) or indirectly (e.g. dementia). Finally, the elderly (and health professionals) could face ethical dilemmas relating to decisions on artificial nutrition support.[5]

To reach optimal care, these broad multifaceted food-related problems require treatment from competent health professionals in well-organised care settings. When the elderly face malnutrition, whether in the context of hospitals, care homes or the community, multidisciplinary treatment is recommended.[6-8] Dietitians should be at the centre of the treatment of these problems, as they are experts on the aforementioned aspects of food-

related problems.[9-11] As such, patients should benefit from a central role of the dietitian in comparison to other health professionals, not only because of the specialised knowledge but also because dietitians may appreciate the consequences of the aforementioned social, cultural and psychological meanings of food for the management of malnutrition in the elderly.[12]

Other actors, such as informal caregivers and other health professionals, are also involved in nutrition-related care, whether in a multidisciplinary setting or not.[13-16] Dietetic expertise is adjacent to the expertise of many other disciplines, such as that of physicians, specialized nurses, nutrition assistants, etc. Dietitians are the nutritional experts, but they are not in the forefront of everyday care as they see patients much less frequently than nurses do.[17,18] And although physicians are not necessarily nutritional experts, they are often in charge and responsible for the treatment of patients.[19,20] The role of the dietitian, who is the expert on the management of malnutrition in the elderly, is therefore not always clear.[21]

Guidelines and protocols for the management of malnutrition in the elderly often remain theoretical and static and current practices may deviate from them.[22,23] Practical implementation is often dynamic and it depends on how each individual dietitian or other health professional draws up their role.[24,25] However, there is a shortage of literature that examines how dietitians, in everyday practice, draw up and shape their role as dietitians in comparison to other health professionals in the management of malnutrition in the elderly. To our best knowledge, there are no systematic review studies on this

topic.[15,23,26] The roles of nurses and physicians in comparison to other health professionals have been studied when it comes to the topic of management of malnutrition in the elderly.[27-29] The main question of this review of the literature, therefore, is: *What is the role of dietitians in the management of malnutrition in the elderly, in comparison to other health professionals*? By specifying the role of the dietitian, the aim is to contribute to the optimal management of malnutrition in the elderly.

2 Method

A systematic review was performed to analyse what has been written in empirical scientific studies about the role of the dietitian regarding the treatment of malnutrition in the elderly. We defined empirical studies as studies, "based on direct observation, use of statistical records, interviews, or experimental methods,"[30] of dietetic practices. Therefore, position papers, practice papers, newsletters and books were not part of the search strategy. Only studies published in scientific journals in English were included.

The search strategy was created in collaboration with an experienced librarian. The databases Embase, Medline Ovid, Cinahl Ebscohost, Cochrane Central, Web of Science, and Google Scholar, were used for the search. Initially, the search was not restricted by date, to identify all potentially relevant articles. The end date of the search was the same as the date of the run of the search: November 12, 2018. A hand search for additional records was done by using the reference lists of included studies. The search consisted of three main elements: 'dietitian', 'elderly' and 'malnutrition'. The term 'role' was not included in the search strategy because it would have led to redundancy as the term can refer to a professional role, but also for instance to the role of a process, a treatment, a medicine, a biochemical substance, etc. See Table 1 for the full search strategy.

Table 1. Search strategy

Database	Results
embase.com	1125
('dietitian'/exp OR 'dietetics'/de OR 'dietetics education'/de OR 'dietetics student'/de OR (dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* NEAR/3 scientist*)):ab,ti) AND ('malnutrition'/exp OR 'emaciation'/de OR 'nutritional deficiency'/exp OR 'nutritional support'/de OR 'dietary supplement'/de OR 'caloric intake'/de OR 'protein intake'/de OR 'nutritional status'/de OR (malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) NEAR/3 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR underfed* OR undernourish* OR undernutrit* OR ((under) NEXT/1 (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) NEAR/3 (intake* OR nutrient*)) OR ((unintention* OR prevent*) NEAR/6 weight NEAR/6 (loss OR lost OR losing)) OR (nutrition* NEAR/3 (status OR state))):ab,ti) AND (aged/exp OR 'elderly care'/exp OR 'geriatrics'/exp OR 'dementia'/exp OR 'nursing home'/de OR 'geriatric disorder'/de OR aging/de OR (((old* OR aged) NEXT/1 (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home NEAR/3 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR	

older OR over OR aged OR age) NEAR/3 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged NEAR/3 older) OR (community NEAR/3 dwell*) OR care-home*):ab,ti) NOT ([Conference Abstract]/lim OR [Letter]/lim OR [Note]/lim OR [Editorial]/lim) AND [english]/lim	
Medline Ovid	893
("Nutritionists"/ OR "Dietetics"/ OR (dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* ADJ3 scientist*)).ab,ti,kf.) AND (exp "malnutrition"/ OR "Emaciation"/ OR "Nutritional Support"/ OR exp "Dietary Supplements"/ OR "Energy Intake"/ OR "Nutritional Status"/ OR (malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) ADJ3 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR underfed* OR undernourish* OR undernutrit* OR ((under) ADJ (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) ADJ3 (intake* OR nutrient*)) OR ((unintention* OR prevent*) ADJ6 weight ADJ6 (loss OR lost OR losing)) OR (nutrition* ADJ3 (status OR state))).ab,ti,kf.) AND (exp Aged/ OR exp "Homes for the Aged"/OR exp "Health Services for the Aged"/ OR "Housing for the Elderly"/ OR "Geriatrics"/ OR exp "Dementia"/ OR "Nursing Homes"/ OR exp aging/ OR (((old* OR aged) ADJ (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home ADJ3 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR older OR over OR aged OR age) ADJ3 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged ADJ3 older) OR (community ADJ3 dwell*) OR care-home*).ab,ti,kf.) NOT (letter OR news OR comment OR editorial OR congresses OR abstracts).pt. AND english.la.	
CINAHL EBSCOhost	363
(MH "Dietitians" OR MH "Dietetics" OR TI (dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* N2 scientist*)) OR AB (dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* N2 scientist*))) AND (MH "malnutrition+" OR MH "Nutritional Support" OR MH "Dietary Supplements+" OR MH "Energy Intake" OR MH "Nutritional Status" OR TI (malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) N2 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR underfed* OR undernourish* OR undernutrit* OR ((under) N1 (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) N2 (intake* OR nutrient*)) OR ((unintention* OR prevent*) N5 weight N5 (loss OR lost OR losing)) OR (nutrition* N2 (status OR state))) OR AB (malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) N2 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR underfed* OR undernourish* OR undernutrit* OR ((under) N1 (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) N2 (intake* OR nutrient*)) OR ((unintention* OR prevent*) N5 weight N5 (loss OR lost OR losing)) OR (nutrition* N2 (status OR state)))) AND (MH Aged+ OR MH "Nursing Home Patients+"OR MH "Health Services for the Aged+" OR MH "Housing for the Elderly" OR MH "Geriatrics" OR MH "Desmentia+" OR MH "Nursing Homes" OR MH aging+ OR TI (((old* OR aged) N1 (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home N2 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR older OR over OR aged OR age) N2 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged N2 older) OR (community N2 dwell*) OR care-home*) OR AB (((old* OR aged) N1 (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home N2 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR older OR over OR aged OR age) N2 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged N2 older) OR (community N2 dwell*) OR care-home*)) NOT PT (letter OR news OR comment OR editorial OR congresses OR abstracts) AND LA (english)	
Cochrane CENTRAL	78
((dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* NEAR/3 scientist*)):ab,ti) AND ((malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) NEAR/3 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR underfed* OR undernourish* OR undernutrit* OR ((under) NEXT/1 (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) NEAR/3 (intake* OR nutrient*)) OR ((unintention* OR prevent*) NEAR/6 weight NEAR/6 (loss OR lost OR losing)) OR (nutrition* NEAR/3 (status OR state))):ab,ti) AND ((((old* OR aged) NEXT/1 (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home NEAR/3 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR older OR over OR aged OR age) NEAR/3 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged NEAR/3 older) OR (community NEAR/3 dwell*) OR care-home*):ab,ti)	
Web of science	731
TS=(((dietitian* OR dietetic* OR dietician* OR nutritionis* OR (nutrition* NEAR/2 scientist*))) AND ((malnutrit* OR ((deficien* OR insuffcien* OR defectiv* OR deficit* OR support* OR supplement* OR Inadequate*) NEAR/2 (nutri* OR diet* OR alimentar* OR intake* OR food OR meal OR calor*)) OR malnourish* OR underfeed* OR	

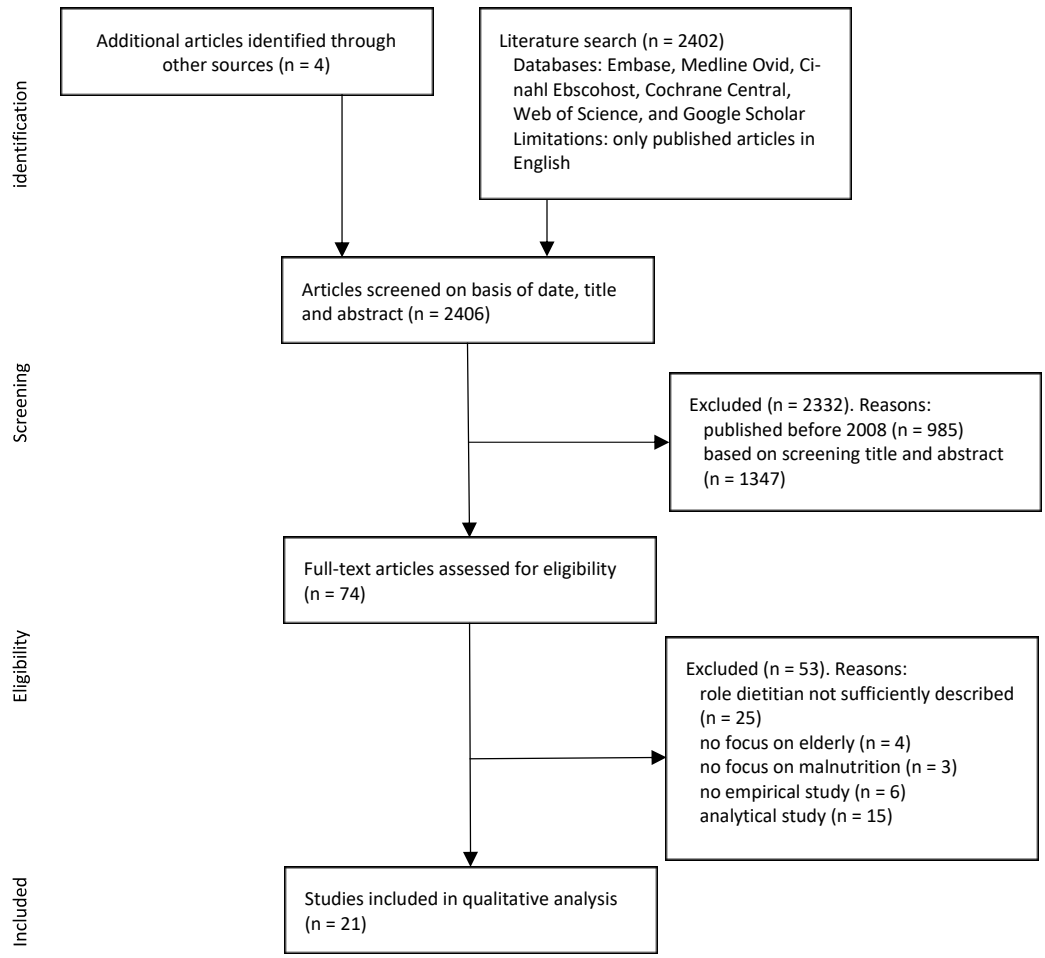
underfed* OR undernourish* OR undernutrit* OR ((under) NEAR/1 (feed* OR fed* OR nourish* OR nutrit*)) OR emaciat* OR ((poor OR low OR calor* OR protein*) NEAR/2 (intake* OR nutrient*)) OR ((unintention* OR prevent*) NEAR/5 weight NEAR/5 (loss OR lost OR losing)) OR (nutrition* NEAR/2 (status OR state)))) AND ((((old* OR aged) NEAR/1 (people* OR adult* OR person* OR population* OR resident* OR patient* OR inpatient* OR outpatient* OR communit* OR individual*)) OR aging OR senior* OR septagener* OR octogener* OR nonagenar* OR centenar* OR elderly OR (home NEAR/2 (aged OR nursing)) OR geriatric* OR dement* OR ((year* OR older OR over OR aged OR age) NEAR/2 (65 OR 70 OR 75 OR 80 OR 85 OR 90 OR 95 OR 100)) OR (aged NEAR/2 older) OR (community NEAR/2 dwell*) OR care-home*))) AND DT=(article) AND LA=(english)	
Google scholar	200*
dietitian|dietetics|dietician|nutritionist malnutrition|"Inadequate nutrition|diet|intake"|malnourishment|underfed|undernourished|undernutrition "old|aged people|adults|persons|population|residents|patients"|elderly	
Total	3390

* The search in Google Scholar database resulted in 20.900 results. Only the first 200 were included in the search strategy, as the remainder was deemed irrelevant.

Full-text versions of all resulting studies were available. These resulting studies were independently screened for eligibility on the title, abstract and, if necessary, complete article by the first and second author (dietitian, PhD). Disagreement between the first and second author was solved by consensus.

After conducting the initial search, it was clear that potentially relevant articles were available. As a result, we refined the inclusion criteria to include only studies published in the last 10 years (see Figure 1). We made this choice to provide a review of current practices.

Figure 1. PRISMA flowchart. Flowchart of the literature search and filtering results.



To describe the study selection, the PICo mnemonic (types of Participants, phenomena of Interest, Context)[31] was used.

Types of participants: this review considers studies that include dietitians as the main health professional. However, when relevant for the role of the dietitian, studies about other health professionals were also considered.

Phenomena of interest: the role of the dietitian in the management of malnutrition in the elderly, in comparison to other health professionals. Analogous to the MeSH term 'role'[32], we interpreted 'role' as the pattern of behaviour exhibited by dietitians as members of the dietetic profession. We considered studies in which this pattern of behaviour was directed at the management of malnutrition in the elderly and insofar this pattern of behaviour concerned other health professionals. As dietitians can have multiple roles, for instance as a manager or researcher, only studies about their role in the dietetic management of malnutrition were included. We excluded studies in which the role was just a minor subject. The term 'elderly' was interpreted as flexible and thus not defined a priori, to leave open the possibility of including studies that were not merely about the elderly or to consider studies that were indecisive about patient age. The term 'malnutrition' was also not defined a priori because there is no universally accepted definition.[3] The context is any setting where dietitians manage malnutrition in the elderly, such as hospitals, long-term care and the community setting.

Types of studies: as this review focuses on studies on the role of dietitians in the actual practice of the management of malnutrition, only descriptive studies were considered, while experimental analytic (cause-effect) studies were excluded. As only empirical studies were included, opinion articles or review articles were excluded; these types of studies are mostly on what the dietetic role should be (instead of what the role is). For the same reason, studies, where the role of the dietitian is mentioned merely in the discussion, were also excluded. Table 2 provides an overview of the inclusion and exclusion criteria.

Table 2 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
• Empirical research studies • Studies in which the role of dietitians is the (main) subject • Studies in which the role of dietitians is directed at the management of malnutrition in the elderly • Studies in which the role of dietitians concerns other health professionals	• Analytic studies (experimental or observational design) • Studies in which the role of the dietitian is not sufficiently mentioned or mentioned mainly in the discussion section

Studies that met the inclusion criteria were included in the analysis.

As we included both qualitative and quantitative studies, the likelihood of heterogeneity was high, therefore a pragmatic approach to data extraction and data synthesis was used. This pragmatic approach was based on the thematic synthesis approach developed by Thomas and Harden[33], but it deviated from it in two important ways. Firstly, as a mixed methods synthesis, this review also included quantitative studies. Secondly, we extracted the data by imposing the existing framework of the research question on the studies, instead of using the method of line-by-line coding as described by Thomas and Harden. We did this because of the heterogeneity of focus and methods of the included studies. It also prevented the chance of developing themes that would distract from the research question.

Data extraction was therefore undertaken using the following guidelines:

- The following data were extracted: aim and research question, country (context), study design and type, study subject, main results.
- By using the research question as a framework, only those parts of each included study that were valuable to the topic of the present study were used. Using the

framework of the research question meant that each part of the extracted data was judged on relevancy for the research question.

- There was no fundamental difference in data extraction of the included qualitative and quantitative studies. For instance, quantitative data was not statistically processed as is usual in meta-analyses.
- Quantitative results such as descriptive and inferential statistics were described in terms of 'most', 'more', 'less', 'equal to' when possible. When extracting numbers was necessary for a correct understanding, they were rounded to integers.

Within the framework of the research question, and with the data of the included studies as a starting point, the first author went through the process of inductive coding, using pen and paper rather than software. The codes were again scanned for relevancy for the research question. The process of coding was the same for qualitative and quantitative studies. The remaining codes were compared and structured into themes. These themes were discussed with the second and third author (both experienced researchers) until consensus was reached. Finally, in the discussion section, the themes were combined to address the research question.

As all included studies were cross-sectional studies, the Appraisal tool for Cross-Sectional Studies (AXIS), consisting of 20 criteria, was used to assess the quality of the included studies.[34] The use of this one tool rather than using different tools for different study methods enables quality comparison between studies. The criteria used covered four sections: introduction (one criterion), methods (ten criteria), results (five criteria), discussion (two criteria and other (2 criteria). When a criterion was met, one point was given. When a criterion was not met, one point was subtracted. When a criterion was

not relevant, 0 points were given. In qualitative studies, for example, criteria on statistics were not relevant. Consequently, the highest score that could be obtained was 20 and the lowest -20. See table 3 (Quality assessment of the included studies (AXIS evaluation tool)).[31]

Table 3: Quality assessment of the included studies (AXIS evaluation tool)

	Intro-duction	Methods											Results					Discussion		Other		
Author / year	(1) clear definition of objectives / aims?	(2) study design appropriate for the stated aims?	(3) sample size justified?	(4) target population clearly defined?	(5) sample taken from appropriate population?	(6) selection process likely to select representative subjects?	(7) measures to address non-responders?	(8) measurements valid?	(9) measurements reliable?	(10) clear use of inferential statistics?	(11) methods sufficiently described to be repeated?	(12) basic data adequately described?	(13) non-response bias?	(14) information about non-response?	(15) quantitative results internally consistent?	(16) results for all analyses?	(17) discussion and conclusion based on results?	(18) limitations of study discussed?	(19) funding sources and conflicts of interests?	(20) ethical approval and consent?	total
Craven et al. (2016)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	-1	1	1	12
Craven et al. (2017)	1	1	1	1	1	1	-1	1	1	0	1	1	1	-1	0	1	1	1	1	1	14
Demeny et al. (2015)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	14
Johnson et al. (2018)	1	1	-1	-1	1	1	-1	1	1	0	-1	1	1	-1	0	1	1	1	1	1	8
Kellett et al. (2016)	1	1	-1	-1	1	1	-1	1	1	1	-1	1	-1	-1	1	1	1	1	1	1	8
Milte et al. (2011)	1	1	1	1	1	1	1	1	1	0	1	1	-1	-1	1	1	1	1	-1	1	13
Nie-Visser, van et al. (2011)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	-1	1	1	12
Schönherr et al. (2012)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	-1	1	12
Tannen et al. (2012)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	14
Walton et al. (2012)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	-1	1	1	12
Awad et al. (2011)	1	1	-1	1	-1	-1	-1	1	1	1	-1	-1	-1	-1	1	1	1	1	1	-1	2
Beelen et al. (2017)	1	1	-1	1	-1	1	1	1	1	0	1	-1	1	1	0	1	1	-1	1	1	10
Lambert et al. (2017)	1	1	-1	1	1	1	-1	1	1	0	1	1	-1	-1	0	1	1	1	1	1	10
Ross et al. (2011)	1	1	-1	1	1	1	-1	1	1	0	1	-1	-1	-1	0	1	1	1	1	1	8

Porter et al. (2009)	1	1	-1	-1	1	1	-1	1	1	1	1	-1	-1	-1	1	1	1	1	1	1	8
Szeto et al. (2014)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	-1	1	12
Villalon et al. (2011)	1	1	1	1	1	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	14
Ziylan et al. (2015)	1	1	-1	1	1	1	-1	1	1	0	1	1	-1	1	0	1	1	1	1	1	12
Black et al. (2013)	1	1	-1	1	1	1	-1	1	1	1	-1	1	-1	-1	1	1	1	1	1	1	10
Stanley et al. (2013)	-1	-1	-1	1	1	1	-1	1	1	0	1	-1	-1	-1	0	1	1	1	1	1	4
Wassink et al. (2010)	1	1	-1	1	1	1	1	1	1	0	1	1	1	-1	0	1	1	1	-1	1	12

Results

After removing the 988 duplicates, the search in the aforementioned databases provided 2402 results. Four articles were found by hand searching. After exclusion of articles published before 2008, 1421 articles were scanned and 1347 were excluded on basis of screening of title and abstract. Of the resulting 74 articles, 25 articles were excluded because the role of the dietitian was not sufficiently described, seven were excluded because they were not on the elderly or malnutrition, and 21 were excluded because of study designs that did not match the inclusion criteria. Ultimately, 21 studies were included in the analysis (see Figure 3, PRISMA flowchart).

All included studies were based in Western countries: nine in Australia, five in Canada, two in the Netherlands, the UK and Austria and one in both The Netherlands and Germany. The hospital (nine), long-term care (six) and community settings (four) were included in the analysed studies, while one study was not set in a specific setting. All studies have a cross-sectional design. Eleven studies were quantitative, two studies were both qualitative and quantitative, and eight studies were qualitative. The average score for the appraisal of the quality of the included cross-sectional studies, which ranges from -20 to 20, was 12,5. The modal score was 12, the minimum score was two, the maximum score was 14, see Table 3 and 4.

Table 4 provides a summary of the results. The table is ordered per theme.

Table 4. Summary of included studies ordered per theme.

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
↓ Theme 1: Influences of settings on the role of the dietitian ↓							
Craven et al. (2016)[34], Australia, community setting.	Cross-sectional, quantitative and qualitative, survey, closed and open-ended questions.	133 dietitians (members of the Dietitians Association of Australia) working with older adults in the community in different organisations.	Descriptive statistics and inferences.	Malnutrition screening practices by dietitians.	Government organisations were more likely to screen compared with not-for-profit or private organisations. Half have a documented policy for malnutrition screening. Dietitians and nursing staff were most likely to conduct malnutrition screening. Most clients were screened on admission to the organisation or when referred to the dietitian. The majority reported a malnutrition screening tool was used.	Organizational aspects of the role of dietitians in screening for malnutrition.	12
Craven et al. (2017)[35], Australia, community setting.	Cross-sectional, qualitative, survey, open ended questions.	92 dietitians (members of the Dietitians Association of Australia) working with community living older adults.	Content analysis.	The barriers and enablers to malnutrition screening of community-living older adults (CLOA) as reported by dietitians.	Enablers to malnutrition screening (in parentheses: number of times mentioned): • Organisational (47): screening policy and procedure (23), provision of training and education (19), availability of funding and resources (5). • Staff (29): knowledge and support by other staff (16), advocacy and relationships (9), management support (4). • Screening (16): use of a simple and accessible tool (12), positive screening outcomes (4). Barriers to malnutrition screening: • Organisational (103): lack of time (40), lack of funding (29), lack of formalized policy and procedure (17), lack of training and education (17). • Staff (45): poor knowledge by other staff (34), other staff thinks screening is a burden or not part of their role (8), lack of management support (3) • CLOA (12): poor knowledge (8), poor communication (4).	Organizational aspects of the role of dietitians in screening for malnutrition.	12
Demeny et al. (2015)[23], Australia, multiple settings.	Cross-sectional; quantitative, survey, close ended questions.	160 dietitians (members of the Dietitians Association of Australia), working in different settings. Response rate: 5,4%.	Descriptive statistics and inferences (differences between groups).	The strategies dietitians use to assess, treat and monitor elderly patients diagnosed with, or at increased risk of, malnutrition.	General malnutrition policies existed in most places, but assessment, diagnosis and management of malnutrition were services that were less often offered (in decreasing frequency). Most mentioned reasons for not monitoring patients diagnosed with malnutrition or at risk of malnutrition were inadequate staffing (42%, 56%, respectively), patients discharged too quickly (26%, 24%, respectively), budget constraints, or specific facility policies.	Organizational aspects of the role of dietitians in the management of malnutrition.	14

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
Johnson et al. (2018)[36], Canada, long-term care setting.	Cross-sectional; qualitative, telephonic interviews.	9 dietitians working in two Saskatchewan health regions. Response rate: 82%.	Thematic summary.	The practices, policies and experienced barriers of dietitians related to nutritional care.	When nutrition screening is done by nurses, dietitians sometimes don't know how often it is completed. Sometimes, dietitians collaborate with other health professionals for information about residents to complete nutrition assessments and for nutrition follow-ups. Lack of time and lack of staff are main barriers for nutritional care. Barriers that were also mentioned were staff screening incorrectly or not screening all residents consistently and long term care staff inconsistently following the recommendations of the registered dietitian.	Organizational aspects of the role of dietitians in the management of malnutrition.	8
Kellett et al. (2016)[38], Australia, setting of residential aged care facilities.	Cross-sectional; quantitative, questionnaire by phone.	Directors of nursing of 229 residential aged care facilities (response rate: 26,4%), stratification based on state and territory in Australia.	Descriptive statistics and inferences (associations).	Practices following identification of residents at high risk of malnutrition.	82% of the facilities use a nutrition screening tool, 52% use a validated screening tool. Most often, the registered nurse performs the screening. A dietitian performed the screening in 5% of the cases. Most often, patients at risk were referred to a dietitian. Most facilities employed a dietitian, but often this was not on a full-time basis. Facilities that employed a dietitian were more likely to use a validated nutrition screening tool. In 75% of the facilities, dietitians were involved in menu review, in 58% in menu planning, in 52% in nutrition screening, and 94% were employed to conduct resident consultations.	Organizational aspects of the role of dietitians in the management of malnutrition.	8
Milte et al. (2011)[39], Australia, no specific setting.	Cross-sectional; quantitative; online survey; multiple choice questions.	168 dietitians (members of Dietitians Association of Australia).	Descriptive statistics.	The current usual nutritional care provided to femoral neck fracture patients by Australian dietitians.	70% stated that nurses were the source of majority of referrals. 42% stated that automatic referral systems were the source of major referrals. 35% of the respondents had dietetics assistants working. They mainly screen for risk of malnutrition and assist with choosing appropriate menu items. After their intervention, most dietitians (687%) would transfer their patients to another dietitian (76%), aged care nurse (30%) or general practitioner (21%). The most indicated barriers to increase service to clients include insufficient staff (52%), insufficient referrals (49%), patients not currently being a priority (17%) a lack of team approach to treatment (17%).	Organizational aspects of the role of dietitians in the management of malnutrition.	13
Nie-Visser, van et al. (2011)[40], the Netherlands and Germany, nursing home setting.	Cross-sectional; quantitative, National Prevalence Measurement of Care Problems questionnaire.	80 nursing homes (the Netherlands), 71 (Germany). 5848 and respectively 4923 residents. 260 and respectively 272 wards.	Descriptive statistics and inferences (differences between groups).	Differences in process indicators and structural indicators in nursing homes in Germany and the Netherlands.	In Germany, almost all residents were screened for nutritional risk at admission. In the Netherlands this happened less often. In the Netherlands, more of the malnourished residents were seen by a dietitian, than in Germany (37 vs. 9%). More Dutch institutions employ a dietitian, but they provide less education to the health care workers than in Germany. In Germany, more attention is paid to the process of nutritional care in daily practice, whereas in the Netherlands more attention is paid to nutritional care at the institutional and ward levels.	Organizational aspects of the role of dietitians in the management of malnutrition.	12

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
Schönherr et al. (2012)[41], Austria, hospital and nursing home setting.	Cross-sectional; quantitative, questionnaire.	18 hospitals (2326 patients) and 18 nursing homes (1487 patients).	Descriptive statistics and inferences (differences between groups).	Structural and process indicators of nutritional care in Austrian hospitals and nursing homes.	Nursing homes provided more structural indicators and performed more nutritional screening than hospitals did. Structural indicators: dietitians were employed in all hospitals and in 83% of the nursing homes. Auditing of guidelines happens in 43% of the hospitals and 33% of the nursing homes. An advisory committee for malnutrition is present in 57% resp. 72%. Process indicators: when a general nutritional screening was done, mostly weight measurements and clinical views were used. Nutritional screening tools were applied to 15% of the hospitalized and 29% of the nursing homes residents. When patients were malnourished, the rate of consultations for dietitians was 28% in hospitals and 74% in nursing homes.	Organizational aspects of the role of dietitians in the management of malnutrition.	12
Tannen et al. (2012)[42], Austria, hospital setting.	Cross-sectional, quantitative, questionnaire.	11 Austrian hospitals with 108 wards with 2,283 patients. Patient response: 72%.	Descriptive statistics.	Nutrition-related interventions for patients at risk of malnutrition and the availability of nutrition-related quality indicators.	Most of the patients (69%) were screened for malnutrition on admission. A screening instrument was used in only 9% of the cases. The more at risk for malnutrition patients are, the higher the chance they are visited by a nutritional expert, but even the patients that are at highest risk are only visited in 29% of the time. All hospitals employed dietitians. About half use guidelines for prevention and/or treatment of malnutrition. 5 hospitals have a multidisciplinary nutrition team.	Organizational aspects of the role of dietitians in the management of malnutrition.	14
Walton et al. (2012)[43], Australia, hospital setting.	Cross-sectional; quantitative, questionnaire.	92 dietitians, 58 food service managers and 68 nurse unit managers from 184 hospitals.	Descriptive statistics and inferences (differences between groups).	Current practices of food service provision, barriers to adequate dietary intakes.	60% of dietitians and 88% of nurse unit managers think nutritional needs are adequately assessed. Dietitians think the main barriers to adequate hospital nutrition are lack of feeding assistance and lack of flexibility of food service (both outside their immediate area of control). When all respondents (food service managers, nurse unit managers and dietitians) are concerned, lack of choice due to special diet and boredom due to length of stay are the main barriers mentioned. According to dietitians, food fortification and additional feeding assistance by nurses are the main priorities for adequate hospital nutrition. When all respondents are concerned, also food fortification and assistance with packaging are the main priorities.	Organizational aspects of the role of dietitians in the management of malnutrition.	12
↓ Theme 2: Attitudes of other health professionals towards the role of dietitians ↓							
Awad et al. (2010)[4], United Kingdom, hospital setting.	Cross-sectional; quantitative, multiple choice questions.	63 surgical trainee doctors and 25 dietitians from a university teaching hospital.	Descriptive statistics and inferences (differences between groups).	The similarities and differences in knowledge and attitudes of surgeon trainees and dietitians towards nutritional support.	Dietitians scored significantly better in a knowledge test about nutritional support. Surgical trainees also feel less sure about their knowledge and skills regarding nutritional support. However, they less often indicated that nutritional training would be valuable than dietitians did. All dietitians regularly made decisions regarding nutritional support, but not all surgical trainees do.	Attitudes and knowledge of dietitians and other health professionals towards	2

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
						role of dietitians in malnutrition.	
Beelen et al. (2017)[47]*, the Netherlands, multiple settings.	Cross-sectional, qualitative, interviews (face-to-face or telephonic)	13 dietitians working in various settings: primary care, hospitals, nursing homes and residential care.	Content analysis (coding and identification of themes).	Factors that influence the implementation of enriched foods	Primary care and nursing home dietitians mention they don't feel valued enough by all doctors, that not all physicians are aware that undernutrition is a health concern, that physicians sometimes refer to dietitians too late. Dietitians think doctors and nurses' attitude can stimulate or dissuade patient's opinion on and actual intake of oral nutritional supplements.	Attitudes of dietitians towards their role in treatment of malnutrition.	10
Lambert et al. (2017)[48], Australia, hospital setting.	Cross-sectional; qualitative; focus groups with health professionals.	63 health professionals: 27 nursing staff, 14 medical staff, 3 pharmacists, 19 dietetic staff.	Coding and identification of themes based on framework analysis.	Perspectives of health professionals on factors that influence the efficacy of a NAM (Nutrition as Medication) program.	Dietitians have more knowledge about the NAM program than other health professionals, which leads to undervaluation of the efficacy of the NAM program. Furthermore, all health professionals except dietitians experience confusion about role delineation in the NAM process. For instance, medical staff and dietitians think nurses are responsible for the selling of NAM to patients, but nurses are unhappy in this role because patients sometimes need to be persuaded to take the supplements.	Attitudes of dietitians and other health professionals towards their role in oral nutrition supplements.	10
Ross et al. (2011)[49], Australia, hospital setting.	Cross-sectional, qualitative, focus groups with health professionals.	22 health professionals (dietitians, speech pathologists, occupational therapists, a pharmacist, physiotherapists, dietetic assistants and nurses) in three separate focus groups. Medical staff was invited but did not participate.	Framework analysis, identification of themes.	The awareness, knowledge and perceptions of the staff of the nutritional care of older patients.	Non-dietetic staff has limited nutritional knowledge. There is also poor communication between disciplines about nutritional issues. Nurses approach medical staff about nutritional issues rather than dietetic staff. Furthermore, there is no clear role delineation. Nurses are often hold responsible for screening, monitoring and assistance, but nurses themselves do not always agree with that. Dietitians sometimes even criticize the role of other health professionals, for example during mealtimes. Even during meal times, food is not always the priority, as nurses sometimes prioritise drug rounds and allied health professionals prioritise discipline-specific activities. A sense of powerlessness exists because of hospital related barriers, such as interruption of meals, fasting patients for surgery and tests and lack of access to appropriate food outside the mealtimes. All staff think that education on dietetic practices is useful.	Attitudes of dietitians and other health professionals towards their role in nutritional care.	8

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
Porter et al. (2009)[25], Australia, hospital setting.	Cross-sectional; qualitative (focus groups with nurses) and quantitative (retrospective analysis of patient records).	Focus groups: convenience sample of nursing staff; (6 from gastroenterology ward and 12 from general ward) of a Melbourne hospital.	Qualitative: coding and identification of themes, themes and quotes. Quantitative: descriptive statistics and inferences (differences between groups).	The factors that supported or hindered nurses' use of the MUST screening tool.	Nurses indicate they did not have the time or enough staff to complete nutrition screening. They prioritize other tasks, and some nurses think that dietitians should pick up the screening role, as dietitians are the ones that are going to work with the outcomes. Nurses feel the screening tool is not easy to work with, and some also think that individual judgement works better than an evidence-based screening protocol. Also, some nurses refer to dietitians when they see one on the ward, instead of via the official forms. Nurses also expected better communication from dietitians to assist their understanding of the value and use of the tool.	Attitudes of other health professionals towards dietetic role in screening for malnutrition.	8
Szeto et al. (2014)[50], Canada, setting of hospitals and long-term care facilities.	Cross-sectional; quantitative.	396 dietitians (members of the Dietitians of Canada Gerontology Network) and 96 dietitians working in Complex Continuous Care. Response rate: 17,5%.	Descriptive statistics and inferences (associations).	Decision-making processes for PEG placement in the elderly.	87% of the dietitians had a role in decision-making processes. Registered dietitians are often involved in nutrition and PEG related discussions and in discussing consequences of options and alternatives and rarely in evaluating patients' competencies. Most often, physicians and dietitians both have a role in treatment decisions. When the relationship with the physician was more positive, registered dietitian's knowledge and skills more adequate and their role satisfaction was higher, the role of the registered dietitian in decision making processes was more extensive.	Attitudes of dietitians towards their role in tube feeding.	12
Villalon et al. (2011)[44], Canada, hospital and nursing home setting.	Cross-sectional; quantitative (close-ended questions).	158 physicians, 230 nurses and 69 dietitians from hospitals and nursing homes in Canada (New Brunswick). Institutional response: 62,5% and 68,8% respectively.	Descriptive statistics and inferences (differences between groups).	Health care professionals' perceptions of, practices in, and barriers to nutrition screening.	Dietitians report that nutritional screening is mostly done by dietitians (58%), then nursing staff (23%), physicians (14%) and diet technicians (5%). Most health professionals used a form of screening, but only 39,1% of the dietitians used a screening tool, nurses and physicians used a tool even less. A screening tool is used more often in hospitals than in nursing homes. Several barriers to nutritional screening were mentioned. Physicians experienced each of these barriers the most, then nursing staff and then dietitians. The three most mentioned barriers by each of three groups of respondents: not a priority, lack of professional resources to evaluate and treat clients at risk, lack of assistance. In nursing homes, less patients are screened on admission than in hospitals. A large majority of hospital dietitians and most nursing home dietitians think that nursing staff should be more aware of the importance of weighing patients and nursing staff should be more trained to do so.	Attitudes of other health professionals towards dietetic role in screening for malnutrition.	14
Ziylan et al. (2015)[51]*, the Nether-	Cross-sectional; qualitative, telephonic interviews.	Purposive sample of dietitians, meal service	Content analysis, (coding and identification of themes).	Experiences of Dutch nutrition and care profes-	As is not clear which health professional should have which role, the guidelines on undernutrition and management require more attention and facilitation. Shared opinion is that dietitians are not responsible for undernutrition monitoring in community dwelling older adults.	Attitudes of dietitians and other	12

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
lands, community setting.		employees, geriatric specialist, general practitioners, care consultants and nurses.		sionals and researchers with undernutrition awareness.	General practitioners and nurses are, but they often cannot prioritize the problem. Dietitians are involved too late, which leads to decreased treatment effectiveness. Dietitians can and should play a major role in improving patient's compliance regarding oral nutrition supplements (because prescribing without guiding is less effective) by personalizing for each individual patient, giving justification, timely implementation and evaluation of progress. Dietitians can train home care nurses in following guidelines on undernutrition treatment.	health professionals towards dietetic role in management of malnutrition.	
					↓ Theme 3: Dietetic role boundaries ↓		
Black et al. (2013)[53]*, Canada, long-term care setting.	Cross-sectional; quantitative, survey.	Purposive sample of dietitians working in 200 long-term care facilities in British Columbia. 75 respondents, facility-level response: 68%.	Descriptive statistics.	Current practices and workforce related issues of LTC dietitians.	44% of the dietitians report insufficient time to do the tasks they need to do. Among the actions taken to ensure the tasks are done anyway are: • Learn to say "no" to extra tasks. • Set very clear boundaries with the employer. • Use a communication and assessment tool for assessments. • Involve interdisciplinary team • Be more active on the team. • Network with other staff members in the facility. • Work very closely with the food and nutrition manager. • Share audits with the manager. • Delegate tasks to other team members. • Send reports to management to show what was planned and what was accomplished. • Ask for support from administration. • Work only in facilities where working in food services is not part of the job.	Organizational aspects of the role of dietitians in long term care.	10
Stanley et al. (2013)[21], United Kingdom, community setting.	Cross-sectional; qualitative, interviews.	6 dietitians obtained via a criterion-based, purposive sampling strategy.	Constant comparison (coding and identification of themes).	Experiences of dietitians with extended roles in home enteral tube feeding (HETF) within the context of workforce role transition.	• HETF emerged as a specialist dietetic role almost by default due to lack of available nursing experience. • Effectiveness of the role of dietitian in HETF was crucial in legitimising claims to HETF jurisdictions. • Role extension to HETF might enhance the social status of the dietitian. • Dietetic role extension to HETF did not lead to resistance from community nurses. • Dietetic role extension to HETF did lead to resistance from nutrition nurse specialists.	Practices of dietitians and other health professionals regarding their role in tube feeding.	4
Wassink et al. (2010)[26]*, Canada,	Cross-sectional; qualitative, semi-structured interviews.	All 20 dietitians working in long-term care facilities in one	Thematic analysis (coding and identification of themes).	Long term care dietitians' experience of clinical practice, with a focus on	Dietitians are dependent of a team to provide optimal care. Dietitians only consult and don't actually do, they can show but are not there very often. Therefore, dietitians provide leadership to teams, but do so unofficially.	Attitudes of dietitians towards their role in	12

Author (year), country of study, setting	Study design and type	Sample	Data analysis based on	Study subject	Main results	Category	Evaluation (score on AXIS-tool)
long-term care setting.		area in the Vancouver area. 13 respondents. Response: 65%.		their roles and specific factors that facilitate their success.	Dietitians experience their roles in two ways: doing specific required tasks (tasks to *do*). But to provide optimal care for residents, a well-functioning team is necessary, and therefore, beyond doing the required tasks, dietitians actively take on broader roles, e.g.: being a food and nutrition expert, being communicator, being role model, mentor or coach.	long-term care.	

* Studies found via hand-search. Abbreviations: HETF: Home Enteral Tube Feeding; PEG: Percutaneous Endoscopic Gastrostomy; CLOA: Community-Living Older Adults

Three themes, which were not necessarily mutually exclusive, emerged from the analysed studies.

Theme 1: Characteristics of settings influencing the dietetic role via screening.

Ten studies relating to the connection between the setting and the role of the dietitian were categorized into the first theme.[23,35-44] All studies revolved, in different care settings, around the extent to which screening instruments are used and around the practices that resulted from this screening. The starting point of most of these studies was the premise that the use of screening instruments is an important part of the management of malnutrition, and a shared problem is the lack of clarity of subsequent screening practices in different care settings.

The study of dietitians and older adults living in communities of Craven et al.[36] and the study of dietitians, nurses and physicians in health care facilities of Villalon et al.[45], both show that organisational factors around staff deployment can be important barriers to screening; other health professionals do not always have enough time and knowledge and there is a lack of assistance by other health professionals. Other organisational factors such as screening policies and procedures can also be important enablers to screening.[45] This seemingly contradictory observation is important in most studies grouped in the first theme. It appears that in most analysed settings screening for malnutrition, in one form or another, did occur but there was a lack of screening guideline policies or of compliance with these policies. Therefore, screening the elderly for malnutrition can have a non-routine and ad hoc character in everyday practice.

This can be illustrated by two examples. Firstly, it appears that screening practices differ per setting (e.g. hospital, nursing home), but that doesn't mean that one setting always performs better than the other.[39,41] The same applies to organisational type (e.g. government, private, not for profit); screening practices differs per organisational type.[42,46]

Secondly, ad hoc referral to dietitians also exists.[35,37,43] For patients to be referred, dietitians are often dependent on sufficient and effective screening for malnutrition by other health professionals. However, settings apparently don't focus on training other health professionals, given that they sometimes are unable to make (sufficient) referrals because of a lack of knowledge. They, therefore, indicate they should receive more training in topics relevant to malnutrition in the elderly.[36,37,39,45] Besides a lack of knowledge, screening also appears to be impeded by a lack of time of dietitians and other health professionals.[25,37]

Theme 2: Attitudes of other health professionals that influence the dietetic role. Eight studies were categorized on the attitudes of dietitians and other health professionals concerning the dietetic role.[25,45,47-52] In general, other health professionals have a positive attitude to and acknowledge the importance of nutritional care for the malnourished elderly.[38,50] From Szeto et al.[51], for example, it becomes clear that by working together with other health professionals, dietitians feel heard and taken seriously. Doctors ask dietitians for their opinions and these opinions also matter in the final decisions made by

doctors. Szeto et al. conclude that good personal relationships with other health professionals (i.e. the physician) stimulate the importance of the role of the dietitian, which, however, also underlines the 'ad hoc character' of the role of the dietitian.

Although other health professionals have a positive attitude to, and acknowledgement of the importance of nutritional care for the malnourished elderly, this does not always mean they are familiar with dietetics or that they think involving dietitians is worth the effort. This is apparent from the studies mentioned below.

Other health professionals are not always familiar with what dietitians actually do. The study of Ross, for instance, shows that not all other health professionals are informed about what dietetic management of malnourished patients comprises. Ross et al. show that other health professionals do acknowledge the importance of patients' nutritional status, but, at the same time, they propose to use informal techniques for identifying this status.[53] Nurses also would benefit from greater familiarity with dietetics. For instance, they think that dietitians should better communicate about the added value of screening.[25] The study of Awad et al. goes one step further by showing that, on the one hand, (surgical trainee) doctors also feel they don't have enough knowledge and abilities to provide optimal nutritional support care, but on the other hand, they do make decisions on nutritional care.[47] They also indicate they need training and information on nutritional support care.[47] Lambert et al. show that nurses, due to a lack of knowledge about the physical appearance of malnourished patients, can even be reluctant to provide specific nutritional care when patients are not obviously underweight or visibly malnourished. However, nurses also do see themselves as nutritionists, which means they do care for the nutritional status of their patients. However, being a nutritionist seems to

mean different things for nurses and dietitians, as nurses seem to think of basic nutritional care, while dietitians seem to think of specific nutritional care.[17] Ziylan et al.[52] also show a lack of undernutrition awareness among general practitioners and nurses. This may result in the inappropriate prescribing of oral nutrition supplements, a situation where a tailored approach would be better. Results from the study of Beelen et al.[48] are similar: primary care and nursing home dietitians can sometimes feel undervalued by general practitioners, and older adults are often referred to them too late, which hampers proper nutritional care. Dietitians can prescribe oral nutritional supplements, but they feel patients are less inclined to take these when other health professionals speak about them negatively. Dietitians sometimes conclude that they are not valued enough by doctors.

Other health professionals think that involving dietitians is not always worth the effort. For example, Villalon et al.[45] found that, when it comes to difficulties in screening for malnutrition, both nurses and physicians mentioned ‘no perceived need' and ‘no priority'.[45] The issue of ‘no priority’ returns in the research of Ziylan et al.[52], which shows a lack of undernutrition awareness among general practitioners and nurses. This lack of awareness is relative to other issues they must deal with in the management of their clients. Dietitians might frame this as a lack of knowledge and awareness, while general practitioners or nurses see it as a matter of priorities. For example, Ross et al. found that, in the hospital setting, even during patient mealtimes food is not always a priority of other health professionals, as they prioritise discipline-specific activities.[53]

Theme 3: dietetic role boundaries. Three studies were categorized on the role boundaries of dietitians.[21,26,54] In these studies, role boundaries are described procedurally (*how* do dietitians affirm or change role boundaries) and substantively (*what* roles do dietitians affirm or change). The issue of workload appeared to be especially important in crossing or guarding role boundaries.

The study of Black et al.[54] takes up the procedural perspective, showing the strategies that dietitians take up to demarcate their role when faced with an extra workload due to new regulations. Some of these strategies boil down to working longer and harder or by setting very clear boundaries. Other strategies explicitly involve other health professionals, for example by being more active on the team for efficiency reasons but also to delegate tasks to other team members.[54]

While the study of Black et al. shows that dietitians when faced with increasing workload also use the strategy to delegate tasks to other health professionals, Stanley et al.[21], taking up a substantive perspective, show that the other way around is also possible. Faced with a heavier workload, nurses employed in the home care setting delegate tasks (such as replacing balloon gastrostomies) to dietitians, leading to extended dietetic roles. Dietitians are satisfied with these extended roles, as it promotes the efficient management of malnutrition and does not lead to significant role boundary conflicts with nurses.

The study of Wassink et al.[26], which also has a substantive perspective, does not focus on time constraints, but on the teamwork that is necessary to manage malnutrition of the elderly efficiently. Dietitians stress that effective teamwork is necessary to reach the most important goal of optimal care for the patient. Dietitians also take up roles that are

not specified job descriptions. For instance, dietitians realize that nutritional assessments are important but not necessarily leading to good care, while teamwork does lead to good care. Effective teamwork implies an extended role: dietitians also take up roles that were not assigned, such as being a mentor, expert, communicator or coach. Wassink described that in the context of long-term care, dietitians were successfully able to position a team in such a way that optimal nutritional care for residents was made possible.[26]

Discussion

This is the first systematic review study of empirical studies about the role of the dietitian in comparison to other health professionals in the management of malnutrition in the elderly. The first theme that emerged from the results concerns studies that focus on the level of settings. It shows that the dietetic role is not clear and not coherent but dependent on settings; almost no setting appears to have optimally implemented screening procedures. Moreover, dietitians are dependent on other health professionals who sometimes do not have enough skills or time to comply with procedures regarding the management of malnutrition in the elderly. The second theme, focusing on a micro level, shows that the dietetic role is also dependent on the attitudes of other health professionals. There is a positive stance towards the importance of the dietetic management of malnutrition in the elderly. However, other health professionals are not always familiar with the work of dietitians or they think that involving a dietitian is not always worth the effort. Studies in the third theme specifically focus on role boundaries. These studies offer some perspectives on the management of malnutrition dietitians can provide apart from nutritional care policies. Procedural-oriented studies show that time is an important factor for dietitians to involve other health professionals and vice versa. Substantive-oriented studies show that dietitians can and have to go beyond procedures in order to deliver optimal care.

For dietetic practice, this conclusion means the following. Studies in the first theme (structural influences on the dietetic role) show the influence of the setting on screening the elderly for malnutrition. Strongly protocolled screening for malnutrition appears to be important for optimal management of malnutrition, but also for dietitians because it structures, legitimizes and consolidates the role of the dietitian.[35,36,38,39] However, as the

studies in the first theme also show, it appeared that such an ideal situation is not always realized in everyday practice.

Screening for malnutrition is just one step in the management of malnutrition in the elderly. The Nutrition Care Process shows that screening is not typically done by dietitians and also that it should be followed by actual intervention.[55] This review extensively shows that screening practices sometimes have an ad hoc character, but also, though less prominent, that dietitians are dependent on other health professionals for actual interventions.[26,37,44,56] This study also shows that these other health professionals are not always aware of dietetics or that they have other priorities.

For the dietetic management of malnutrition in the elderly, these results mean there is a double dependence. At the start of the nutrition care process, dietitians are dependent on other health professionals for screening and referrals.[55] After dietitians are called in for consultation, they are dependent again on other health professionals for the effecting of prescriptions. Dietetics, therefore, faces a dilemma because a call for more systematic procedural screening[25,39,40,42,45,57] will strengthen the role of the dietitian and increase dependency on other health professionals. At the same time, we concluded that other health professionals are not always well informed about the role of dietitians and they may have other priorities. The dependency on these other health professionals might weaken the role of the dietitian.

However, dietitians can also try to frame the lack of systematic procedural screening as positive because a dietetic role that is not captured in procedures may give room for the dietitian to take up a role that they find appropriate for good nutritional care. The third theme, on role boundaries, already points in that direction. For example, the study of Wassink et al.[26] states that dietitians take up roles that go beyond the specific required

tasks they have to do, meaning that there is a certain kind of freedom to take up a role and to involve other health professionals.

Dietitians should devote time to explain to managers and non-dietetic staff what dietetics actually entails and how it improves patients' health and well-being. As a discipline, dietetics cannot afford managers and non-dietetic staff to be uninformed about the role of dietetic management of malnutrition. Dietitians should realize that, despite formal nutrition policy, the management of malnutrition can and will not always be a priority of non-dietetic staff. In taking up their role, dietitians should not only focus on formal policies. Instead, dietitians should also be flexible by trying to shape their role independently of these policies.

This review has both strengths and limitations. One of the major strengths is that this review provides clarity about the role of dietitians in the management of malnutrition in the elderly in comparison to other health professionals, which was not systematically provided before. A systematic study of this role is important because due to ageing, complex age-related health problems like malnutrition will increasingly occur. The uniqueness of this review is partly due to the lack of empirical studies on this role.

As the review does not have a health-related outcome, we did not prospectively register it in PROSPERO or elsewhere. Not registering a review protocol increases the risk of reporting bias, which is a limitation of this review. Another limitation is that the included studies did not always address the research question directly and hence studies had to be included that indirectly answered the research question. Studies that do address the research question directly are mostly opinion articles.[44,58-60] Together with position papers of the dietetic associations on the role of the dietitians in several countries,

these opinion articles give valuable insight into what the role of dietitians should *be*, but not about what the role actually *is*.

Comparing the included studies sometimes turned out to be difficult because the present study did not elaborate on all variables that were and were not mentioned. For instance, as differences in years of a dietitian's working experience are not always mentioned in the included studies, they are not taken into consideration in the present review. The same holds for differences in setting culture, country policies on the dietetic role, and so on.

As can be seen in Table 3 and 4, the quality of most studies can improve when more would have been done to adequately report, prevent and reflect on non-response. This is important to avoid non-response bias in the study of current practices.

The rationale for this study is to shed light on the role of the dietitian in the management of malnutrition of the elderly. It appears there were few studies that were solely about this dietetic role and therefore there is a need for more research about this topic. Such research should be qualitative and focus on questions of why just a small percentage of patients are screened and what dietitians do to increase this percentage. It is also necessary to study the specific value of dietitians alongside their seemingly uncontested expertise on medical-nutritional aspects of malnutrition. Do dietitians, compared to other health professionals, hold distinct views about the social, cultural and psychological values of food and nutrition for the elderly? And how do dietitians implement these views? It must also be studied as to whether the lack or the presence of such an added value affects the role of the dietitian in comparison to other health professionals. As, in Western countries, the elderly tend to live in their homes longer, it is also important to study the role of the dietitian in comparison to the caring role of informal carers.[61]

In general, many studies included in the discussion section call for dietitians to make their role clearer and more importantly, for example, by trying to create a culture that values nutrition.[14,16] However, empirical research on *how* this should or can be done is scarce. Therefore, it is imperative to analyse how dietitians can influence stakeholders and how dietitians can create, within their setting and beyond, a culture in which malnutrition in the elderly receives the attention it should receive.

This study reviewed the empirical research of the role of dietitians in comparison to other health professionals in the management of malnutrition in the elderly. It shows that this role is not clear or coherent but is shaped by the structural characteristics of settings, by the way, other health professionals and dietitians deal with these characteristics and by the attitude of other health professionals. It is open to debate how dietitians, given this enforced and maybe involuntary freedom, provide optimal management of malnutrition in the elderly.

References

1. Smoliner C, Norman K, Wagner K, Hartig W, Lochs H, Pirlich M. Malnutrition and depression in the institutionalised elderly. *Br J Nutr*. 2009;102(11):1663-1667.

2. Leslie W, Hankey C. Aging, nutritional status and health. *Healthcare*. 2015;3(3):648-658.

3. Agarwal E, Miller M, Yaxley A, Isenring E. Malnutrition in the elderly: A narrative review. *Maturitas*. 2013.

4. Aziz, Nur Adilah Shuhada Abd, Teng, Nur Islami Mohd Fahmi, Hamid MRA, Ismail NH. Assessing the nutritional status of hospitalized elderly. *Clin Interv Aging*. 2017;12:1615.

5. Palecek EJ, Teno JM, Casarett DJ, Hanson LC, Rhodes RL, Mitchell SL. Comfort feeding only: A proposal to bring clarity to decision-making regarding difficulty with eating for persons with advanced dementia. *J Am Geriatr Soc*. 2010;58(3):580-584.

6. Hickman I, Tapsell L. Evidence based practice guidelines for the nutritional management of malnutrition in adult patients across the continuum of care. *Nutr Diet*. 2009;66(s3).

7. Meijers JM, Halfens RJ, Dassen T, Schols JM. Malnutrition in Dutch health care: Prevalence, prevention, treatment, and quality indicators. *Nutrition*. 2009;25(5):512-519.

8. Partnership for Health in Aging Workgroup on Interdisciplinary Team Training in Geriatrics. Position statement on interdisciplinary team training in geriatrics: An essential component of quality health care for older adults. *J Am Geriatr Soc*. 2014;62(5):961-965.

9. Dorner B, Friedrich EK. Position of the academy of nutrition and dietetics: Individualized nutrition approaches for older adults: Long-term care, post-acute care, and other settings. *J Acad Nutr Diet*. 2018;118(4):724-735.

10. Shatenstein B. Impact of health conditions on food intakes among older adults. *J Nutr Elder*. 2008;27:333-361.

11. Khan M, Hui K, McCauley SM. What is a registered dietitian nutritionist's role in addressing malnutrition? *J Acad Nutr Diet*. 2018;118(9):1804.

12. Freeland-Graves JH, Nitzke S. Position of the Academy of Nutrition and Dietetics: Total diet approach to healthy eating. *J Acad Nutr Diet*. 2013;113(2):307-317.

13. Bocock MA, Keller HH, Brauer PM. Defining malnutrition risk for older home care clients. *Can J Diet Pract Res*. 2008;69:171-176.

14. Dutch Malnutrition Steering Group. The Dutch approach on malnutrition. https://www.fightmalnutrition.eu/thedutchapproach. Updated 2018. Accessed 06/23, 2018.

15. Gaskill D, Black LJ, Isenring EA, Hassall S, Sanders F, Bauer JD. Malnutrition prevalence and nutrition issues in residential aged care facilities. *Australas J Ageing*. 2008;27:189-194.

16. Tappenden KA, Quatrara B, Parkhurst ML, Malone AM, Fanjiang G, Ziegler TR. Critical role of nutrition in improving quality of care: An interdisciplinary call to action to address adult hospital malnutrition. *J Acad Nutri Diet*. 2013;113:1219-1237.

17. Lambert K, Potter J, Lonergan M, Tapsell L, Charlton KE. Efficacy of nutrition as medication in malnourished hospitalised patients is strongly influenced by environmental factors. *Nutr Diet.* 2014;71:73-78.

18. Mogre V, Ansah GA, Marfo DN, Garti HA. Assessing nurses' knowledge levels in the nutritional management of diabetes. *Int J Afr Nurs Sci*. 2015;3:40-43.

19. Hurt RT, McClave SA, Evans DC, et al. Targeted physician education positively affects delivery of nutrition therapy and patient outcomes: Results of a prospective clinical trial. *JPEN J Parenter Enteral Nutr*. 2015;39:948-952.

20. Mowe M, Bosaeus I, Rasmussen HH, et al. Insufficient nutritional knowledge among health care workers? *Clin Nutr*. 2008;27(2):196-202.

21. Stanley W, Borthwick A. Extended roles and the dietitian: Community adult enteral tube care. *J Hum Nutr Diet*. 2013;26(3):298-305.

22. Meijers JMM, Schols JMG, Jackson PA, Langer G, Clark M, Halfens RJG. Differences in nutritional care in pressure ulcer patients whether or not using nutritional guidelines. *Nutrition*. 2008;24:127-132.

23. Demeny D, Jukic K, Dawson B, O'Leary F. Current practices of dietitians in the assessment and management of malnutrition in elderly patients. *Nutr Diet.* 2015;72:254-260.

24. Adams NE, Bowie AJ, Simmance N, Murray M, Crowe TC. Recognition by medical and nursing professionals of malnutrition and risk of malnutrition in elderly hospitalised patients. *Nutr Diet.* 2008;65:144-150.

25. Porter J, Raja R, Cant R, Aroni R. Exploring issues influencing the use of the malnutrition universal screening tool by nurses in two Australian hospitals. *J Hum Nutr Diet*. 2009;22:203-209.

26. Wassink HL, Chapman GE. Vancouver dietitians' perspectives on their roles in long-term care. *Can J Diet Pract Res*. 2010;71(1):e12-e17.

27. Boeykens K, Van Hecke A. Advanced practice nursing: Nutrition nurse specialist role and function. *Clin Nutr ESPEN*. 2018.

28. Jefferies D, Johnson M, Ravens J. Nurturing and nourishing: The nurses' role in nutritional care. *J Clin Nurs*. 2011;20(3-4):317-330.

29. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unosson M, Irtun O. Nutritional routines and attitudes among doctors and nurses in Scandinavia: A questionnaire based survey. *Clin Nutr*. 2006;25(3):524-532.

30. National Library of Medicine (NLM). MeSH term: 'Empirical research'. https://www.ncbi.nlm.nih.gov/mesh/?term=empirical+research. Updated 2003. Accessed March/3, 2019.

31. Lockwood C, Porritt K, Munn Z, et al. Chapter 2: Systematic reviews of qualitative evidence. In: Aromataris E, Munn Z, eds. *Joanna Briggs institute reviewer's manual*; 2017. https://reviewersmanual.joannabriggs.org/.

32. National Library of Medicine (NLM). MeSH term: 'Role'. https://www.ncbi.nlm.nih.gov/mesh/68012380. Updated 1969. Accessed February 22, 2019.

33. Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol*. 2008;8(1):45.

34. Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ Open*. 2016;6(12).

35. Craven DL, Pelly FE, Lovell GP, Ferguson M, Isenring E. Malnutrition screening of older adults in the community setting: Practices reported by Australian dietitians. *Nutr Diet.* 2016;73:383-388.

36. Craven DL, Pelly FE, Isenring E, Lovell GP. Barriers and enablers to malnutrition screening of community-living older adults: A content analysis of survey data by Australian dietitians. *Aust J Prim Health*. 2017;23(2):196.

37. Johnson S, Nasser R, Rustad K, et al. Review of nutrition screening and assessment practices for long-term care residents. *J Nutr Gerontol Geriatr*. 2018:1-14.

38. Keller H, Allard JP, Laporte M, et al. Predictors of dietitian consult on medical and surgical wards. *Clin Nutr*. 2015;34:1141-1145.

39. Kellett J, Kyle G, Itsiopoulos C, Naunton M. Nutrition screening practices amongst Australian residential aged care facilities. *J Nutr Health Aging*. 2016;20:1040-1044.

40. Milte R, Miller M. Dietetic care of hip fracture patients across Australia: Are we doing enough? *Nutr Diet.* 2011;68:214-220.

41. Nie-Visser NCV, Meijers JM, Schols JM, Lohrmann C, Bartholomeyczik S, Halfens RJ. Comparing quality of nutritional care in Dutch and German nursing homes. *J Clin Nurs*. 2011;20:2501-2508.

42. Schönherr S, Halfens RJG, Schols JMGA, Lohrmann C. Structural and process indicators of nutritional care: A comparison between Austrian hospitals and nursing homes. *Nutrition*. 2012;28:868-873.

43. Tannen A, Lohrmann C. Malnutrition in austrian hospital patients: Prevalence, risk factors, nursing interventions, and quality indicators: A descriptive multicentre study. *J Adv Nurs*. 2013;69:1840-1849.

44. Walton K, Williams P, Tapsell L. Improving food services for elderly, long-stay patients in Australian hospitals: Adding food fortification, assistance with packaging and feeding assistance. *Nutr Diet.* 2012;69:137-144.

45. Villalon L, Laporte M, Carrier N. Nutrition screening for seniors in health care facilities: A survey of health professionals. *Can J Diet Pract Res*. 2011;72:162-169.

46. Craven DL, Pelly FE, Lovell GP, Ferguson M, Isenring E. Malnutrition screening of older adults in the community setting: Practices reported by Australian dietitians. *Nutr Diet.* 2016;73:383-388.

47. Awad S, Herrod PJJ, Forbes E, Lobo DN. Knowledge and attitudes of surgical trainees towards nutritional support: Food for thought. *Clin Nutr*. 2010;29:243-248.

48. Beelen J, Vasse E, Ziylan C, Janssen N, de Roos NM, de Groot LC. Undernutrition: Who cares? Perspectives of dietitians and older adults on undernutrition. *BMC Nutr*. 2017;3(1):24.

49. Lambert K, Potter J, Lonergan M, Tapsell L, Charlton KE. Qualitative study of patients and health-care professionals' views on the efficacy of the nutrition as medication oral nutrition supplement program. *Nutr Diet.* 2017;74:341-348.

50. 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;68:41-46.

51. Szeto MOP, Maillet JO, Brody RA, Parrott JS. Registered dietitians' roles in decision-making processes for PEG placement in the elderly. *Can.J.Diet.Pract.Res.* 2014;75:78-83.

52. Ziylan C, Haveman-Nies A, van Dongen EJ, Kremer S, de Groot LC. Dutch nutrition and care professionals' experiences with undernutrition awareness, monitoring, and treatment among community-dwelling older adults: A qualitative study. *BMC Nutr*. 2015;1(1):38.

53. 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;68:41-46.

54. Black JL, Dunham R, Kafka T. A study of challenges and opportunities: For long-term care dietitians in British Columbia. *Can J Diet Pract Res*. 2013;74(3):131-137.

55. Writing Group of the Nutrition Care Process/Standardized Language Committee. Nutrition care process and model part I: The 2008 update. *J Acad Nutr Diet*. 2008;108(7):1113.

56. Adams NE, Bowie AJ, Simmance N, Murray M, Crowe TC. Recognition by medical and nursing professionals of malnutrition and risk of malnutrition in elderly hospitalised patients. *Nutr Diet.* 2008;65:144-150.

57. Keller H, Allard JP, Laporte M, et al. Predictors of dietitian consult on medical and surgical wards. *Clin Nutr*. 2015;34:1141-1145.

58. Chwang L. Nutrition and dietetics in aged care. *Nutr Diet.* 2012;69:203-207.

59. Delegge MH, Kelley AT. State of nutrition support teams. *Nutr Clin Prac*. 2013;28:691-697.

60. Dorner B, Posthauer ME, Friedrich EK, Robinson GE. Enteral nutrition for older adults in nursing facilities. *Nutr Clin Prac*. 2011;26:261-272.

61. Marshall S, Reidlinger DP, Young A, Isenring E. The nutrition and food-related roles, experiences and support needs of female family carers of malnourished older rehabilitation patients. *J Hum Nutr Diet*. 2017;30:16-26.