Tackling the increasing problem of malnutrition in older persons: The Malnutrition in the Elderly (MaNuEL) Knowledge Hub

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Abstract

In order to tackle the increasing problem of malnutrition (*i.e.* protein-energy malnutrition) in the older population, the Joint Action *Malnutrition in the Elderly* (*MaNuEL*) Knowledge Hub has been recently launched as part of the Strategic Research Agenda of the Joint Programming Initiative (JPI) A Healthy Diet for a Healthy Life (HDHL). This paper introduces this new European initiative and describes its objectives and design. The *MaNuEL* Consortium consists of 22 research groups from seven countries (Austria, France, Germany, Ireland, Spain, the Netherlands and New Zealand). The Consortium aims to extend scientific knowledge; strengthen evidence-based practice in the management of malnutrition in older persons; build a sustainable, transnational, competent network of malnutrition experts; and harmonise research and clinical practice. *MaNuEL* is built on five interconnected work packages that focus on 1) defining treatable malnutrition; 2) screening of malnutrition in different settings; 3) determinants of malnutrition; 4) prevention and treatment of malnutrition; and 5) policies and education regarding malnutrition screening and treatment in older persons across Europe. Systematic literature reviews will be performed to assess current research on malnutrition and identify potential knowledge gaps. Secondary data analyses of nutritional intervention trials and observational studies will also be conducted. Using web-based questionnaires, *MaNuEL* will provide insight into current clinical practice, policies, and health professionals' education on malnutrition and will make recommendations for improvement. *MaNuEL* is being advised by a stakeholder board of five experts in geriatric nutrition who represent relevant European professional societies.

Key words: protein-energy malnutrition, screening, determinants, prevention, treatment, policy

Introduction

Protein-energy malnutrition in older Europeans is an increasing health problem, mainly due to the changes in demographics. In 2015, 18.9% of the European population was aged 65 years and older. This percentage is expected to increase to 28.1% in 2050 (Eurostat 2017). The prevalence of malnutrition varies widely across different population subgroups of older persons, but is generally acknowledged to be higher in older persons with deteriorating health and functional status and increasing dependency and disability. In the community, malnutrition affects less than 10% of independently living older persons; however, the prevalence of malnutrition has been reported to be 50% and higher in nursing-home residents, geriatric patients in acute-care hospitals and patients in geriatric rehabilitation (Kaiser *et al.* 2010; Cereda 2012; Kruizenga *et al.* 2016; Rojer *et al.* 2016; van Zwienen-Pot *et al.* 2016). Apart from prevalent malnutrition, in all settings a large proportion of older people are at risk of developing malnutrition (Kaiser *et al.* 2010; Cereda 2012).

Unequivocally, malnutrition is associated with serious functional and health problems, which impact negatively on the well-being and quality of life of the individual and also health-care systems (Abizanda *et al.* 2016). Earlier studies have focused on malnutrition in older persons in terms of clinical outcomes and consistently reported an increased risk of morbidity (*e.g.* the development of pressure ulcers and poor wound-healing, infectious complications and hospital readmissions) and mortality (Sullivan & Walls 1998; McMinn *et al.* 2011) but, in recent years, the relationship between nutritional deficits and functional impairment has become more apparent (Kiesswetter *et al.* 2014). Energy intake below bodily requirements and the accompanying weight loss aggravate age-related loss of muscle mass and physical function (Newman *et al.* 2005; Ritchie *et al.* 2008). Thus, malnutrition has emerged as an important aetiological factor in the development of sarcopenia and frailty, two major geriatric health threats, which, in turn, provoke nutritional problems and may further aggravate malnutrition (Cruz-Jentoft *et al.* 2010, Mezuk *et al.* 2016).

Despite increasing scientific interest in malnutrition in older persons over the last decades, many uncertainties remain. There is, for example, still debate about a uniform definition of malnutrition in older persons and consequently about the optimal screening tool to identify malnourished persons. The effectiveness of nutritional interventions remains unclear (Health Council of the Netherlands 2011), especially in community-dwelling older adults (De van der Schueren *et al.* 2016). In addition, it is unclear who will benefit most from which intervention and in what setting.

Although malnutrition is currently higher on the agenda of policy makers in several European countries, there is still a low awareness of malnutrition in many health care settings among health care professionals and older persons themselves and their caring relatives (Monteagudo *et al.* 2015; Ziylan *et al.* 2015; Craven *et al.* 2016). Furthermore, research, educational programmes and health policies that contribute to tackling malnutrition in old age mainly take place at a local or national level and employ different methods and strategies. Thus, there is a clear need for more attention to the problem of malnutrition in older adults (Volkert 2013) and for increased communication and cooperation between key stakeholders in government,

healthcare and academia in order to harmonize efforts and strengthen malnutrition research, education and policy-making. A European joint effort could contribute to achieving these aims.

In 2010, the Joint Programming Initiative (JPI) A Healthy Diet for a Healthy Life (HDHL) was launched to achieve the vision that by 2030 all citizens will have the motivation, ability and opportunity to consume a healthy diet from a variety of foods, have healthy levels of physical activity, and that the incidence of diet-related diseases will have decreased significantly (JPI 2015). Within this initiative, in 2015 a call for a Joint Action 'Malnutrition in the Elderly Knowledge Hub' was launched to support networking activities in this field. On March 1, 2016, the "Malnutrition in the Elderly (MaNuEL) Knowledge Hub was established. It includes a consortium of 22 research groups from seven countries [(Austria, France, Germany, Ireland, Spain, the Netherlands and New Zealand (Table 1)] supported by a stakeholder advisory board of geriatric nutrition experts who represent relevant European expert societies (Table 2). This paper introduces this new European initiative and describes its objectives and design.

Objectives of the MaNuEL Knowledge Hub

The *MaNuEL* Knowledge Hub focuses on protein-energy malnutrition in older persons aged 65 years and older. Its four overarching objectives are: gaining knowledge; strengthening evidence-based best practice; building capacity; and harmonising research and clinical practice across Europe.

Gaining knowledge

MaNuEL intends to summarise all available information and, thereby, extend scientific knowledge on the definition, prevalence, effective screening and aetiology of protein-energy malnutrition in older persons (aged 65 years and older). Effective interventions to prevent and treat malnutrition in older persons in different health care settings across Europe are being evaluated. Thus, *MaNuEL* will critically appraise the current literature on malnutrition and identify knowledge gaps to be addressed in future projects.

Strengthening evidence-based best practice

MaNuEL will translate scientific knowledge into effective evidence-based strategies, such as providing recommendations on the screening and identification of persons who will benefit from nutritional interventions. The project will also contribute to the identification of effective nutritional interventions for older persons. Finally, it will propose validated methods for assessment of determinants of malnutrition and raise awareness of different nutritional needs in specific subgroups of older persons.

Building capacity

MaNuEL will develop a productive, sustainable and competent network of researchers from various European countries and beyond with complementary expertise in the field of malnutrition in older persons. It will support transnational communication and collaboration between individual researchers, research groups, European research organisations and other stakeholders, and thus support 'joined-up' research and advice in the area of malnutrition in older persons.

Harmonising research and clinical practice

MaNuEL will promote harmonisation of clinical practice, research, policies and education with regard to malnutrition. Particular emphasis will be placed on harmonising screening and assessment of malnutrition in older persons in clinical practice and research. Furthermore, harmonisation of data collection, databases and data analyses will occur within *MaNuEL*. Together, these efforts will facilitate future collaborative projects in European countries and optimise ongoing work in the area.

Design of the MaNuEL Knowledge Hub

The *MaNuEL* Knowledge Hub comprises five interrelated work packages focused on: 1) the definition of malnutrition; 2) screening of malnutrition; 3) determinants of malnutrition; 4) interventions to prevent and treat malnutrition; and 5) policies and education regarding malnutrition screening and interventions. These work packages are built on the *MaNuEL* conceptual model of malnutrition (Figure 1). A sixth work package is dedicated to the management of the *MaNuEL* Knowledge Hub. The objectives and work plan of each work package are highlighted below (Table 3).

The definition of malnutrition

Protein-energy malnutrition in older persons is not well defined, which has resulted in incomparable and widely varying prevalence data and confusion about correctly identifying affected persons. Definitions tend to be consensus based and not empirically derived, for example, the recently published ESPEN (The European Society for Clinical Nutrition and Metabolism) criteria for the diagnosis of malnutrition (Cederholm *et al.* 2015).

The first objective of this work package is to develop a definition of treatable malnutrition in older persons based on empirical data. Treatable malnutrition describes malnutrition that can be successfully treated using a nutritional intervention (*i.e.* by the supplementation of energy and protein) leading to improved nutritional status and clinical outcome. The clear advantage of developing criteria for treatable malnutrition is that it allows the identification of those older

persons who are more likely to directly benefit from treatment. It also contributes to more effective screening and intervention, not only benefitting the malnourished older individual but also healthcare in general by improving intervention strategies and reducing care costs. If possible, the definition of treatable malnutrition will be based on secondary data analyses of multiple, international nutritional intervention trials conducted in older persons with malnutrition or at high risk of malnutrition. The study participant data from these studies will be harmonised and pooled to establish a unique international database. In case of insufficient information on, or inadequate data quality of, the required variables in the available trials, the pooled dataset will be used to determine the overall effectiveness of nutritional interventions in older persons and to identify potential factors (*e.g.* intervention or patient characteristics) that may influence their effectiveness. The second objective of this work package is to report the prevalence of malnutrition across Europe using a standardized definition and secondary data analyses of multiple existing datasets available within the Knowledge Hub (see also work package 3). By using a standardized definition, prevalence data can be directly compared between cohorts, countries, settings, and sex and age groups. The third and final objective of this work package is to provide insight into body composition characteristics of older persons with malnutrition. Existing databases, which include detailed body composition measures using accurate techniques such as dual-energy x-ray absorptiometry, computed tomography and/or magnetic resonance imaging, are being consolidated for standardised secondary analyses.

Screening of malnutrition

Early detection of malnutrition or risk of developing malnutrition is important to start effective treatment or mitigate its development and the associated negative health effects. Screening should focus on those at risk as well as on those already affected as both can be addressed by intervention. Screening tools that consider several aspects of malnutrition simultaneously are currently considered appropriate for the identification of persons with malnutrition or at risk of malnutrition (Kondrup *et al.* 2003; Bauer *et al.* 2010). Unfortunately, there is presently no agreement on the types and combination of factors which should be assessed by these tools. Currently a multitude of tools are available differing in, for example, the parameters included, tested validity and reproducibility, time to administer and practicability for use in older persons. Importantly, screening should detect older persons who are likely to be malnourished *and*, if malnutrition is confirmed after assessment, who are likely to benefit from nutritional intervention, as this will lead to (cost-)effective screening and treatment of malnutrition. Finally, older persons at risk of developing malnutrition should also be screened, so that preventive measures may be started to avert malnutrition. Screening tools addressing the risk of malnutrition should use evidence-based information on the most relevant determinants of malnutrition (Figure 1), but this information is currently lacking.

The first objective of this work package is to identify existing screening tools for malnutrition in older adults reported in the scientific literature. Following a comprehensive search for existing tools, details about each tool (*e.g.* setting, screening parameters, validity, reproducibility, language) will be listed. The second objective is to select the best malnutrition screening tool(s)

for older adults in different community and health care settings. This will be achieved by developing an objective rating system based on, among others, the validity and suitability of the parameters included to assess malnutrition risk in older people and its practical use (*e.g.* time taken to perform the screening). The third objective is to obtain malnutrition and malnutrition risk prevalence data in older adults across Europe (and beyond) by reviewing published literature and analysing existing datasets using the identified preferred screening tools. By restricting the previously published prevalence data to those collected by the preferred tool(s), the obtained prevalence data can be compared across different sex and age groups, setting and countries.

Determinants of malnutrition

Generally, malnutrition is caused by an imbalance between energy intake through the diet and energy requirements. In older persons, many factors may contribute to this imbalance. In addition to the age-related physiological decrease in appetite [*i.e.* anorexia of aging (Landi *et al.* 2010)], many common characteristics of older age – for example, sensory decline, chewing and swallowing problems, physical and cognitive impairment, depression, polypharmacy, low-grade inflammation, imbalanced gut microbiome, poverty and loneliness – may reduce dietary intake and could be regarded as causes of malnutrition (Clarke *et al.* 1998; McMinn *et al.* 2011, Claesson *et al.* 2012; Van der Pols-Vijlbrief *et al.* 2014). An imbalance between energy intake and requirements may also develop when nutritional needs increase; for example, as a consequence of acute or chronic disease, maldigestion and malabsorption, which are most prevalent in geriatric patients in acute care and rehabilitation. Inadequate dietary intake and increased nutritional requirements will result in malnutrition in older persons. There is a clear lack of knowledge about determinants of malnutrition in older persons based on prospective studies. Furthermore, knowledge is lacking on how these determinants might interact. Finally, previous studies used different definitions of malnutrition and different assessment tools to measure the determinants, which complicates their interpretation. Lastly, determinants may vary according to older persons' characteristics (e.g. according to function level)or healthcare setting.

The first objective of this work package is to summarise the present knowledge about determinants of malnutrition in older persons by means of a systematic literature review with a focus on longitudinal studies (which are more informative than cross-sectional studies regarding the direction of a potential relationship) and modifiable determinants (which are most relevant to the prevention and treatment of malnutrition). The findings will be combined in a model, similar to the Determinants Of Nutrition and Eating (DONE) model developed in the DEDIPAC (Determinants of Diet and Physical Activity) Knowledge Hub (Stok *et al.* 2017). The second objective is to identify determinants of (incident) malnutrition in existing datasets from *MaNuEL* partners by secondary data analysis using uniform and standardized approaches. The third objective is to create a list of commonly used methods to specifically assess the identified determinants of malnutrition (*e.g.* questionnaires to assess poor appetite), including information about their validity and reliability for older persons in different settings, derived

from the literature and personal experience. It is hoped that this work package will result in a better understanding of the aetiology and complex network of determinants of malnutrition, which is important for effective prevention and treatment of malnutrition.

Interventions to prevent and treat malnutrition

Malnutrition due to anorexia of aging is regarded as a true geriatric syndrome (Morley 2012) that needs active prevention and treatment. Treatment of malnutrition currently does not receive appropriate attention within health care due to low awareness (Leach *et al.* 2013). In addition, the effectiveness of many malnutrition treatment strategies used in clinical practice and potential differences in their efficacy in different care settings are still largely unknown. Treatment has mainly focused on increasing energy and protein intake through oral nutritional supplements, dietary counselling or the combination of both, but other treatment interventions (*e.g.* involving food fortification, texture modification and physical activity) as well as preventive interventions (*e.g.* elimination of risk factors) are relatively understudied (Van der Pols-Vijlbrief *et al.* 2016). An assessment of the benefits achieved by specific intervention approaches to prevent and/or treat malnutrition is needed. This will support the development of effective, evidence-based approaches for different healthcare settings.

The first objective of this work package is to review the effectiveness of nutritional and other non-pharmacological interventions for the prevention and treatment of malnutrition in older persons. This will be achieved by means of a systematic literature review using the SENATOR-ONTOP systematic review protocol (Abraha *et al.* 2015). The second objective is to develop an international inventory of all on-going and planned nutritional and non-nutritional (excluding pharmacological) intervention studies for the prevention and treatment of malnutrition in older persons. Thus, this work package will provide evidence-based and current recommendations on the prevention and treatment of malnutrition in older persons on which future practice and scientific studies can be based.

Policies and education regarding screening and intervention for malnutrition

Although it is known that policies and practices for screening and treatment of malnutrition in older persons vary widely across Europe (Vandewoude *et al.* 2011; Cruz-Jentoft 2011; Hrnciarikova & Zadak 2011; Ihle-Hansen *et al.* 2011), at present little is known about the specific activities in different countries. Best practice examples may exist and serve as models for other countries. Also, it is known that health care professionals receive little education on nutrition despite this being highly relevant for patient care (Devries *et al.* 2014) and it is unknown to what extent and in which form knowledge about malnutrition in older persons is imparted to different groups of healthcare professionals. Therefore, it is imperative to determine the policies, practices, and education curricula that are implemented across Europe in order to establish the best practice.

The first objective of this work package is to review current policies and practices across Europe regarding screening and treatment of malnutrition in older persons in different healthcare settings. The second objective is to review the formal education of healthcare professionals across Europe about the screening and treatment of malnutrition in older persons. This work will be conducted using web-based surveys among relevant stakeholders throughout the EU.

Management

The *MaNuEL* Knowledge Hub is managed by two co-coordinators: Professor Dorothee Volkert (Friedrich-Alexander University, Nurnberg, Germany) and Professor Marjolein Visser (VU University Medical Center and Vrije Universiteit Amsterdam, the Netherlands). In addition, leaders and co-leaders have been appointed to manage the work conducted within the work packages (see Table 1). The *MaNuEL* Knowledge Hub is supported by a stakeholder advisory board, which includes five international malnutrition experts who also represent relevant European professional societies (see Table 2).

Conclusion

Dietary behaviour and nutrition are considered key factors influencing healthy aging (WHO 2015). In older persons the problem of malnutrition and its negative consequences are well acknowledged; however, many challenges remain with regard to the optimal screening, assessment and treatment of malnutrition. *MaNuEL* aims to fulfil the need for an international approach to address these challenges. The two-year *MaNuEL* project will serve as an important basis for establishing a collaborative network of researchers in the field of malnutrition in older persons.

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Conflict of interest

The authors have no conflict of interest to disclose.

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Table 1. List of the *MaNuEL* Knowledge Hub partners, involved researchers and their project management roles (WP: work package)

Country	Partner organization	Names of researchers involved	Role in project
Netherlands	VU University Medical Center, Amsterdam	Prof. Marjolein Visser	Knowledge Hub co-coordinator, WP1 leader, WP6 leader
		Dr. Ilse Reinders	
		Judith van Zwienen-Pot	
	Wageningen University, Wageningen	Prof. Lisette de Groot	WP1 leader
		Ellen Smeets	
	Nijmegen University of Applied Sciences, Nijmegen	Dr. Marian de van der Schueren	WP2 leader
		Dr. Susanne Leij-Halfwerk	
	Dutch Malnutrition Steering Group, Amsterdam	Dr. Eva Leistra	
		Dr. Elke Naumann	
		Ellen van der Heijden	
Germany	Friedrich-Alexander Universität Erlangen-Nürnberg	Prof. Dorothee Volkert	Knowledge Hub co-coordinator, WP3 leader, WP6 leader
		Dr. Eva Kieswetter	
		Melanie Streicher	
		Gabriel Torbahn	
	University Kiel, Kiel	Dr. Corinna Geisler	WP4 leader
	Leibniz Institute for Prevention Research and Epidemiology, Bremen	Dr. Antje Hebestreit	
		Dr. Maike Wolters	
	Ulm University, Ulm	Dr. Gabriele Nagel	
		Dr. Marion Flechtner-Mors	
	German Institute for Nutrition Research, Potsdam-Rehbruecke, Potsdam	Prof. Heiner Boeing	
		Dr. Marta Stelmach-Mardas	
Austria	Medical University Vienna, Vienna	Dr. Karin Schindler	WP5 leader
		Tamara Ranzenberger-Haider	
	Medical University Graz, Graz	Prof. Christa Lohrmann	WP5 leader
		Dr. Sandra Schüssler	
		Doris Eglseer	
		Isabell Kravanja	
France	Champmaillot Centre Geriatric Research Unit, Dijon	Dr. Virginie van Wymelbeke	
	French National Institute for Agricultural Research, Dijon	Dr. Claire Sulmont Rossé	
	French National Institute for Agricultural Research, Clermont-Ferrand	Dr. Dominique Dardevet	
	School of Agricultural Studies, Angers	Dr. Isabelle Maître	
	University Hospital Centre, Toulouse	Prof. Yves Rolland	
Ireland	University College Dublin, Dublin	Dr. Clare Corish	WP2 leader
		Dr. Eileen Gibney	
		Dr Michelle Clarke	
		Prof. Giuseppe De Vito	
		Laura Bardon	
		Lauren Power	
	University of Limerick, Limerick	Dr. Eiblhís O'Connor	WP3 leader
		Dr. Mary O´Keeffe	
		Mary Kelly	

		Prof. Paul O´Toole	
		Dr. Eileen O'Herlihy	
		Prof. Patricia Kearney	
		Dr. Suzanne Timmons	
Spain	Instituto Ramón y Cajal de Investigación Sanitaria, Madrid	Prof. Alfonso Cruz-Jentoft	WP4 leader
		Dr. Isabel Lozano	
		Dr. Andrea Correa	
New Zealand	University of Auckland, Auckland	Dr. Ruth Teh	

Table 3. The *MaNuEL* Knowledge Hub work packages (WP) and related tasks

WP number	WP title	WP tasks
1	Defining treatable malnutrition in older persons	1.1 Develop a definition of treatable malnutrition 1.2 Report the prevalence of treatable malnutrition 1.3 Provide insight into body composition characteristics of older adults with treatable malnutrition in existing datasets
2	Screening of malnutrition in older persons	2.1 Create an overview of existing screening tools for malnutrition in older adults 2.2 Select preferred malnutrition screening tools for older adults 2.3 Collect prevalence data on malnutrition in older adults in different settings and countries based on the preferred screening tools
3	Determinants of malnutrition in older persons	3.1 Perform a systematic literature review on the determinants of malnutrition 3.2 Perform secondary data analyses regarding the relation between determinants and malnutrition 3.3 Compile valid and reliable instruments to assess the determinants of malnutrition
4	Prevention and treatment of malnutrition in older persons	4.1 Perform a systematic literature review on non-pharmacological intervention studies for the prevention and treatment of malnutrition 4.2 Create an overview of ongoing and planned non-pharmacological intervention studies for the prevention and treatment of malnutrition
5	Policies and education regarding malnutrition screening and treatment in older persons across Europe	5.1 Determine policies and current practice on screening and treatment of malnutrition in older adults across Europe 5.2 Determine the extent and content of formal education of health care professionals on screening and treatment of malnutrition in older adults across Europe
6	MaNuEL project management	1.1 Organise an efficient project structure 1.2 Install a stakeholder advisory board 1.3 Report project progress to the HDHL JPI Knowledge Hub Steering Board.

Table 2. Members of the *MaNuEL* Knowledge Hub stakeholder advisory board

Name	Representing organisation
Elizabeth Archer	The European Federation of the Associations of Dietitians (EFAD)
Dr. Anne Marie Beck	Herlev University Hospital, Gentofte, Denmark
Prof. Alfonso Cruz-Jentoft	European Union Geriatric Medicine Society (EUGMS)
Prof. Marcello Maggio	University of Parma, Italy
Dr. Frank de Man	The European Nutrition for Health Alliance (ENHA) Optimal Nutrition Care for All (ONCA)
Dr. Marian de van der Schueren	The European Society for Clinical Nutrition and Metabolism (ESPEN)

Figure legend

Figure 1. The *MaNuEL* Knowledge Hub conceptual model of malnutrition in old age